DECUS
PROGRAM LIBRARY

DECUS NO.	12-24
TITLE	OVERLAYS TO FOCAL-12
AUTHOR	Several (See individual overlays)
COMPANY	Submitted by: Marty Kaye Digital Equipment Corporation Maynard, Massachusetts
DATE	February 11, 1971
SOURCE LANGUAGE	DIAL

FOCL-12K

by George Thissell

DECUS Program Library Write-up DECUS No. 12-24.1

1.0 Introduction

FOCL-12K is FOCAL-12 plus an adaptation of the standard 8K overlay for FOCAL-8. It stores text into FIELD 2 and uses the FIELD Ø area for variables and the Push Down List (PDL). By using FOCL-12K, the TEXT capacity is increased about 5 fold. For example, the standard FOCAL-12 will allow about 23 lines of 60 characters each in a given overlay while FOCL-12K will allow about 120 such lines per overlay.

Ignoring any PDL requirements, there is room for 130 variables in FIELD Ø. In view of FOCAL-12's facility for storing variables in files, this seems sufficient. If more are needed, FEXP, FLOG, and FATN may be deleted as described in the FOCAL-12 manual and PWAFAKE can be moved correspondingly.

2.0 Description

Just as with the standard 8K overlay for FOCAL-8, the various TEXT pointer references are bracketed with the appropriate CDF's. However, the routines which previously were located in the gaps in the floating point code are

now located at the end of the user area in FIELD Ø. The LIBRARY commands are patched to save and load 2Ø blocks - the 4 normally saved by FOCAL-12 plus FIELD 2. Obviously, overlays saved by FOCAL-12 can not be loaded by FOCL-12K and vice versa. The FNTABF and BOTTOM values from a FOCAL-12 overlay have to be moved to allow for the 12K overlay routines already in the "TEXT" area.

3.0 Operating Instructions

The program is loaded under LAP6/DIAL-MS by

→LO FOCL-12K,unit)

Otherwise the program operates just as does FOCAL-12. (Document available from Digital Equipment Program Library as DEC-12-AJAA-D)

4.0 Listing

```
-
0000                    *20
0001                    /12K EXTENSION FOR FOCAL-12
0002                    /TEXT IS IN FIELD 2;VARIABLES AND PDL,IN FIELD 0
0003                            PMODE
0004                            AXIN=10
0005                            AXOUT=17
0006                            BOTTOM=35
0007                            BUFR=60
0010                            CFRS=133
0011                            CHFLAG=147
0012                            COMBOT=226
0013                            COMBUF=132
0014                            COMEIN=3140
0015                            C200=123
0016                            DGRP1=441
0017                            DOK=2113
0020                            DOONE=463
0021                            END=134
0022                            ENDT=135
0023                            ERG=2227
0024                            ERT=2216
0025                            ERV=2221
0026                            ERVX=2241
0027                            FEND3=2257
0030                            FEXP=4620
0031                            FILSTR=1326
0032                            FINDN=2250
0033                            GET3=2345
0034                            GOTO=603
0035                            GS1=1435
0036                            GTEM=21
0037                            INBUF=34
0040                            INPUTX=271
0041                            ITSAGO=1736
0042                            LASTV=31
0043                            LINE1=111
0044                            LINEND=67
0045                            LLOAD=1203
0046                            LSAVE=1233
0047                            LSBLK=1324
0050                            M100=101
0051                            OP=3115
0052                            O6000=173
0053                            O7=1776
0054                            P=0
0055                            PACX=2530
0056                            PC=22
0057                            PCK1=2535
0060                            PT1=30
0061                            PWAIT=174
0062                            QADD=61
0063                            RECOVR=2740
0064                            RECOVX=2761
0065                            RETRN=1563
0066                            RITEOU=3651
0067                            ROT=2557
0070                            RUB3=3030
0071                            SCONT=1266
```

```
                        SRETN=261
                        START=177
                        T=20
                        TDUMP=3052
-
                        THISLN=23
                        TSTGRP=4563
                        WATT=7657
                        WALL=664
                        WTEST2=653
                        XENDLN=2360
                        XGETOUT=1254
                        XI33=2666
                        XOUTL=2676
                        XR1=14
                        XR2=15
                        XRT=11
                    FIELD 0
                    LINE0=100
                    *PC
          0022  0000        0
                    *LASTV
          0131  3143        COMEIN
                        *BOTTOM
          0135  4425        PWAFAKE-1       /DELETES ABOUT 20 VARIABLES
                    *BUFR
          3060  0111        LINE1
                    *COMBUF
          1132  0010        10
                    *CFRS
          0133  0100        LINE0    /START OF TEXT
                    *ENDT
          0135  0111        LINE1
                        *PWAIT
          0174  4547  DTHIS,  THISD    /THISLN
                    *START+2
          0201  7000        NOP
                    *COMBOT
          0226  0100        LINE0
                    *SRETN-5
          0254  4655        JMS I .+1       /DCA I AXIN
          0255  4436        DAXINFAK
                    *INPUTX+2
          0273  4674        JMS I .+1
          0274  4522        DPCFAKE
                    *DGRP1-4
          0435  4636        JMS I .+1            /TAD I XRT IN OTHER D.F.
          0436  4454        DXRTFAKE
                    *DGRP1+4
          0445  4646        JMS I .+1
          0446  4522        DPCFAKE
                        *DOONE-6
          0455  4656        JMS I .+1       /TAD I PT1 IN OTHER DF
          0456  4472        PT1DF1
                    *DOONE-3
          0460  4661        JMS I .+1
          0461  4503        PT1DF2
                    *WTEST2-1
```

```
0163    0652  4574          JMS I DTHIS     /TAD I THISLN
0164                *WALL-4
0165    0660  4661          JMS I .+1       /TAD I PT1
0166    0661  4512          PT1DF3
0167                *WALL
0170    0664  4665          JMS I .+1
0171    0665  4503          PT1DF2
0172                *SCONT-4
0173    1262  4663          JMS I .+1       /(DCA I AXIN)
0174    1263  4436          DAXINFAK
-


0175                *GS1+6
0176    1443  1134          TAD END
0177                *RETRN
0200    1563  7000          NOP
0201                *DOK-4
0202    2107  6221          CDF T
0203                *ERV-1
0204    2220  6221          CDF T
0205    2221  3533          DCA I CFRS      /LEAVE THE VARIABLES ALONE
0206    2222  6201          CDF P
0207                *ERG+4
0210    2233  4574          JMS I DTHIS     /TAD I THISLN
0211    2234  4563          TSTGRP
0212    2235  5177          JMP START
0213    2236  4574          JMS I DTHIS
0214                *ERVX
0215    2241  1134          TAD END
0216                *FINDN+4
0217    2254  4655          JMS I .+1
0220    2255  4463          DXRTFK
0221                *FEND3-3
0222    2264  4574          JMS I DTHIS
0223                *GET3
0224    2345  4746          JMS I .+1
0225    2346  4532          DXOFAKE
0226                *XENDLN+1
0227    2361  6221          CDF T
0230                *XENDLN+14
0231    2374  6201          CDF P
0232    2375  5760          JMP I XENDLN
0233                *PACX
0234    2530  6201          CDF P
0235                *PCK1+4
0236    2541  4742          JMS I .+1       /CLEAR
0237    2542  4445          FDAXIND
0240    2543  7100          CLL
0241    2544  1101          TAD M100        /CMD BF ENDS
0242    2545  7000          NOP             /FLD,LOC,100
0243    2546  1010          TAD AXIN        /INPUT PTR
0244    2547  7640          SZA CLA
0245                /MAKING CODING ROOM
0246                *XI33+1
0247    2667  4670          JMS I .+1
0250    2670  4426          PWAFAKE
0251    2671  7657  PWAIT1, WAIT
```

```
0252                    *XOUTL+5
0253    2703  4671              JMS I PWAIT1
0254                    *RECOVR+10
0255    2750  6201              CDF
0256                    *RECOVX+6
0257    2767  4770              JMS I .+1
0260    2770  4522              DPCFAKE
0261                    *RUB3-10
0262    3720  6221              CDF T
0263                    *TDUMP
0264    3752  1134              TAD END
0265                    *TDUMP+10
0266    3762  5716              JMP I OP+1
0267                    *OP
0270    3115  0003              0003
0271    3116  4541              TDUMPX
0272                            *RITEOU-3       /SET UP FIELD 2 HDR
0273    3546  5647              JMP I .+1
-


0274    3647  4000              SETFL2
0275                            *4000
0275    4000  1232  SETFL2,     TAD M10
0277    4001  3237              DCA MOVCTR
0300    4002  1234              TAD DUMMY
0301    4003  3014              DCA XR1
0302    4004  1235              TAD REALOC
0303    4005  3015              DCA XR2
0304    4006  6201  LOOP1,     CDF P
0305    4007  1414              TAD I XR1
0306    4010  6221              CDF T
0307    4011  3415              DCA I XR2
0310    4012  2237              ISZ MOVCTR
0311    4013  5206              JMP LOOP1
0312    4014  1233              TAD M11
0313    4015  3237              DCA MOVCTR
0314    4016  1236              TAD RELOC2
0315    4017  3015              DCA XR2
0316    4020  6201  LOOP2,     CDF P
0317    4021  1414              TAD I XR1
0320    4022  6221              CDF T
0321    4023  3415              DCA I XR2
0322    4024  2237              ISZ MOVCTR
0323    4025  5220              JMP LOOP2
0324    4026  6201              CDF P
0325    4027  6001              ION
0326    4030  5631              JMP I .+1
0327    4031  2216              ERT
0330    4032  7770  M10,        -10
0331    4033  7767  M11,        -11
0332    4034  4037  DUMMY,      TABLE-1
0333    4035  7777  REALOC,     -1
0334    4036  0077  RELOC2,     77
0335    4037  0000  MOVCTR,     0
0336    4040  0000  TABLE,      0               /ZERO PC
0337    4041  0000              0
0340    4042  0000              0               /TDUMP DATA
```

```
0341    4043  0000          0
0342    4044  0000          0
0343    4045  5051          5051
0344    4046  0060          BUFR
0345    4047  0111          LINE1
0346                  /10-77:COMMAND INPUT BUFFER
0347                  /*LINE0-START OF TEXT
0350    4050  0000          0
0351    4051  0000          0
0352    4052  0355
0352    4053  6162
0352    4054  1340
0352    4055  0617
0352    4056  0314
0352    4057  6162
0352                        TEXT ZC-12K FOCL12Z
0353    4060  7715          7715
0354                  /*ST12K; START 12K USER FILE AT THIS ADDRESS,111,
                      11)
0355                        *FEXP-172                                  (LINE1=1
0356    4426  0000  PWAFAKE,        0
0357    4427  2226          ISZ PWAFAKE
0360    4430  2226          ISZ PWAFAKE
0361    4431  1034          TAD INBUF
0362    4432  7450          SNA
0363    4433  4635          JMS I WAIT1
-


0364    4434  5626          JMP I PWAFAKE
0365    4435  7657  WAIT1,  WAIT
0366    4436  0000  DAXINFAK,       0
0367    4437  1067          TAD LINENO
0370    4440  6221          CDF T
0371    4441  3410          DCA I AXIN
0372    4442  6201          CDF P
0373    4443  2236          ISZ DAXINFAK
0374    4444  5636          JMP I DAXINFAK
0375    4445  0000  FDAXIND,       0
0376    4446  6221          CDF T
0377    4447  3410          DCA I AXIN
0400    4450  6201          CDF P
0401    4451  3061          DCA QADD
0402    4452  2245          ISZ FDAXIND
0403    4453  5645          JMP I FDAXIND
0404    4454  0000  DXRTFAK,       0
0405    4455  3011          DCA XRT
0406    4456  6221          CDF T
0407    4457  1411          TAD I XRT
0410    4460  6201          CDF P
0411    4461  2254          ISZ DXRTFAK
0412    4462  5654          JMP I DXRTFAK
0413    4463  0000  DXRTFK, 0
0414    4464  7141          CLL CMA IAC
0415    4465  6221          CDF T
0416    4466  1411          TAD I XRT
0417    4467  6201          CDF P
0420    4470  2263          ISZ DXRTFK
```

```
0421    4471  5663          JMP I DXRTFK
0422    4472  0000  PT1DF1, 0
0423    4473  2272          ISZ PT1DF1
0424    4474  6221          CDF T
0425    4475  1430          TAD I PT1
0426    4476  6201          CDF P
0427    4477  4563          TSTGRP
0430    4500  5672          JMP I PT1DF1
0431    4501  2272          ISZ PT1DF1
0432    4502  5672          JMP I PT1DF1
0433    4503  0000  PT1DF2, 0
0434    4504  6221          CDF T
0435    4505  1430          TAD I PT1
0436    4506  6201          CDF P
0437    4507  3067          DCA LINENO
0440    4510  2303          ISZ PT1DF2
0441    4511  5703          JMP I PT1DF2
0442    4512  0000  PT1DF3, 0
0443    4513  2312          ISZ PT1DF3
0444    4514  7710          SPA CLA
0445    4515  5712          JMP I PT1DF3
0446    4516  6221          CDF T
0447    4517  1430          TAD I PT1
0450    4520  6201          CDF P
0451    4521  5712          JMP I PT1DF3
0452    4522  0000  DPCFAKE,       0
0453    4523  2322          ISZ DPCFAKE
0454    4524  6221          CDF T
0455    4525  1422          TAD I PC
0456    4526  6201          CDF P
0457    4527  7440          SZA
0460    4530  2322          ISZ DPCFAKE
0461    4531  5722          JMP I DPCFAKE
0462    4532  0000  DXOFAKE,       0
-


0463    4533  6221          CDF T
0464    4534  1417          TAD I AXOUT
0465    4535  6201          CDF P
0466    4536  3021          DCA GTEM
0467    4537  2332          ISZ DXOFAKE
0470    4540  5732          JMP I DXOFAKE
0471    4541  6221  TDUMPX, CDF T
0472    4542  3745          DCA I .+3
0473    4543  6201          CDF P
0474    4544  5746          JMP I .+2
0475    4545  0004          4
0476    4546  3063          TDUMP+11
0477    4547  0000  THISD,  0
0500    4550  6221          CDF T
0501    4551  1423          TAD I THISLN
0502    4552  6201          CDF P
0503    4553  5747          JMP I THISD
0504                  /
0505                  /THIS RTN SAVES OR LOADS FIELD 2 TEXT
0506                  /
0507    4554  0000  DIALIO, 0                /TEMP
0510    4555  7774  PREAD,  7774
0511    4556  1326  PFILSTRT,       FILSTRT
0512    4557  1324  PLSBLK, LSBLK
```

```
0513    4560  0000  PTR,    0               /UNIT
0514    4561  0040          40              /FIELD 2
0515    4562  0000          0               /STARTING TBLK
0516    4563  0020          20              /ALL OF FIELD 2
0517    4564  7001  WRITE,  IAC             /7775 FOR WRITE
0520    4565  1355  READ,   TAD PREAD       /7774 FOR READ
0521    4566  3354          DCA DIALIO
0522    4567  6211          CDF 10
0523    4570  1757          TAD I PLSBLK    /UNIT
0524    4571  3360          DCA PTR
0525    4572  7307          CLA CLL IAC RTL /4
0526    4573  1756          TAD I PFILSTRT  /STARTING TBLK
0527    4574  6201          CDF 0
0530    4575  3362          DCA PTR+2
0531    4576  6212          CIF 10
0532    4577  4754          JMS I DIALIO    /READ OR WRITE
0533    4600  4560          PTR
0534    4601  6001          ION
0535    4602  7201          CLA IAC
0536    4603  6211          CDF 10
0537    4604  2614          ISZ I PCHFLAG
0540    4605  7200          CLA
0541    4606  6203          CDF CIF 0
0542    4607  7640          SZA CLA
0543    4610  5613          JMP I PGOTO
0544    4611  5612          JMP I .+1
0545    4612  0177          START
0546    4613  0503  PGOTO,  GOTO
0547    4614  0147  PCHFLAG,       CHFLAG
0550                /
0551                /FIELD 1 CHANGES FOR SAVING AND LOADING PROGRAMS
0552                /
0553                      FIELD 1
0554                      *06000
0555    0173  7754  MLENGTH,       7754    /COMP OF ID
0556    0174  0024  XLENGTH,       24      /24 TBLKS;ALSO NEW ID
0557                      *LLOAD+6
0560    1211  1174        TAD XLENGTH     /NEW LENGTH IS 24 TBLKS
0561                      *LSAVE-6
-


0562    1225  1173        TAD MLENGTH     /1ST WD MUST BE 24
0563                      *LSAVE-1
0564    1232  5257        JMP XGETOUT+3
0565                      *LSAVE+3
0566    1236  1174        TAD XLENGTH     /24 TBLKS
0567                      *XGETOUT-5
0570    1247  1174        TAD XLENGTH     /ID IS 24
0571                      *XGETOUT
0572    1254  6203        CDF CIF
0573    1255  5656        JMP I .+1
0574    1256  4564        WRITE
0575    1257  6203        CDF CIF
0576    1260  5661        JMP I .+1
0577    1261  4565        READ
0600                      *ITSAGO+3
0601    1741  1377        TAD X6000       /MAKING CODING ROOM
0602                      *07+1
0603    1777  6000  X6000, 6000
0604                      LISTAPE -7
```

```
NO ERRORS
AXIN    0010
AXOUT   0017
BOTTOM  0035
BUFR    0060
CFRS    0133
CHFLAG  0147
COMBOT  0226
COMBUF  0132
COMEIN  3140
C230    0123
DAXINF  4436
DCRP1   0441
DIALIC  4554
DOK     2113
DOONF   3463
DPCFAK  4532
DTHIS   0174
DUMMY   4064
DXOFAK  4532
DXRTFA  4454
DXRTFK  4463
ELD     0134
ENDT    0135
ERG     2227
ERT     2218
ERV     2221
ERVX    2241
FDAXIN  4445
FEND3   2257
FEXP    4621
FILSTR  1326
FINDN   2251
GET3    2345
GOTO    0523
GS1     1435
GTEM    0021
INBUF   0234
INPUTX  0271
ITSAGO  1736
LASTV   0231
LINEND  0267
LINE0   0100
LINE1   0111
LLOAD   1203
LOOP1   4006
LOOP2   4020
LSAVE   1233
LSBLK   1324
MLENGT  0173
MOVCTR  4037
M10     4032
M100    0101
M11     4033
OP      3115
OPCODE  0173
O7      1776
P       0000
```

```
PACX    2534
PC      3422
PCHFLA  4614
PCK1    2535
PFILST  4556
PGOTO   4613
-

PLSBLK  4557
PREAD   4555
PTR     4551
PT1     3430
PT1DF1  4472
PT1DF2  4523
PT1DF3  4512
PWAFAK  4425
PWAIT   3174
PWAIT1  2671
QADD    3461
READ    4565
REALOC  4435
RECOVR  2740
RECOVX  2761
RELOC2  4435
RETRN   1563
RITSOU  3651
RST     2557
RUN3    3330
SCONT   1266
SETFL2  4330
SRETN   2281
START   2177
T       0020
TABLE   4043
TDUMP   3052
TDUMPX  4541
THISD   4547
THISLN  3023
TSTGRP  4563
WAIT    7657
WAIT1   4435
WALL    2554
WRITE   4564
WTEST2  3653
XENDLN  2331
XGETOU  1254
XI33    2666
XLENGT  3174
XOUTL   2676
XRT     2211
XR1     2214
XR2     2215
X6200   1777
```

$TEXT

by Bob Hughes

DECUS Program Library Write-up DECUS No. 12-24.2

1.0 INTRODUCTION

An overlay for FOCAL-12, $TEXT, permits text (typically, a header) to be stored into a file and later retrieved and printed. (Document for FOCAL-12 available from Digital Equipment Program Library as DEC-12-AJAA-D)

2.0 LOADING $TEXT

After FOCAL-12 has been loaded, $TEXT can be called when needed by a LIBRARY LOAD command:

```
L L,$TEXT,n
```

where n is the unit containing the overlay.

3.0 USAGE

The overlay uses the FNEW function in a statement, such as

```
SET  A=FNEW(n)
```

where

n≠Ø prints FLAC

n=Ø takes the next character from the teleprinter and stores it in FLAC.

4.0 EXAMPLE

```
*1.Ø1  L  M,1,TEXT,1
*1.Ø2  L  O,FØ,1,TEXT,1
*1.Ø3  F  I=Ø,19;S FØ(I)=FNEW(Ø)
*1.Ø4  L  O,FØ,S,TEXT,1;OI,.2
*1.Ø5  F  I=1Ø,3Ø;S FØ(I)=FADC(5);O I
*1.Ø6  L  C,FØ;Q

*2.Ø1  L  O,FØ,1,TEXT,1
*2.Ø2  F  I=Ø,19;S A=FNEW(FØ(I) )
*2.Ø3  L  O,FØ,S,TEXT,1
*2.Ø4  F  I=1Ø,3Ø;T FØ(I),!
*2.Ø5  L  C,FØ;Q
*G
12345678900987654321*
```

would 1.Ø2 define file TEXT to be integers;
1.Ø3 accept a 2Ø character header from the Teletype and store into the first 2Ø words of TEXT;
1.Ø4 redefine TEXT to be signed fractions;
1.Ø5 acquire 2Ø readings from channel 5 and store them into TEXT immediately after the heading;
1.Ø6 close the file and quit.

The file (overlay and program) can be saved and, at a later time, loaded and the stored header and acquired readings printed by issuing a GOTO 2.Ø1 command which would:

2.Ø1 open file TEXT as integers;
2.Ø2 print out the header;
2.Ø3 redefine TEXT as signed fractions;
2.Ø4 print out the values;
2.Ø5 close the file and quit.

```
*G 2.Ø1

123456789ØØ987654321     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
     Ø.4492
```

5.0 PROGRAM LISTING

```
-
0000                    *20
0001                            PMODE
0002                            FLAC=44
0003                            INBUF=34
0004                            EFUN3I=136
0005                            PRINTC=4551
0006                            INTEGER=53
0007                            BOTTOM=35
0010                            PFNEW=410
0011                            FINT=4407
0012                            FNOR=7000
0013                            FEXT=0
0014                            FEXP=4620
0015                            *BOTTOM
0016    0035    4566            OUTPUT-1        /NB USUALLY FNEW-1
0017                            *PFNEW
0020    0410    4572            FNEW
0021                            *FEXP-31
0022    4567    4453    OUTPUT, JMS I INTEGER
0023    4570    4551            PRINTC
0024    4571    5536            JMP I EFUN3I
0025                    /S A=FNEW(N)  IF N=0,TYPE FLAC;IF NOT 0,KBD TO FLAC
0026    4572    4453    FNEW,   JMS I INTEGER
0027    4573    7640            SZA CLA
0030    4574    5367            JMP OUTPUT
0031    4575    1034            TAD INBUF
0032    4576    7450            SNA
0033    4577    5375            JMP .-2
0034    4600    4551            PRINTC
0035    4601    1034            TAD INBUF
0036    4602    3046            DCA FLAC+2
0037    4603    3045            DCA FLAC+1
0040    4604    3034            DCA INBUF
0041    4605    1213            TAD P27
0042    4606    3044            DCA FLAC
0043    4607    4407            FINT
0044    4610    7000            FNOR
0045    4611    0000            FEXT
0046    4612    5536            JMP I EFUN3I
0047    4613    0027    P27,    27
0050                            LISTAP -7


NO    0
E UN3I 0136
FEXP   4620
FEXT   0000
FINT   4407
FLAC   0044
FNEW   4572
FNOR   7000
INBUF  0034
INTEGE 0053
OUTPUT 4567
PFNEW  0410
PRINTC 4551
P27    4613
```

$RELAY
by Marty Kaye

DECUS Program Library Write-up DECUS No. 12-24.3

The $RELAY overlay for FOCAL-12 can be used to set one of the PDP-12 relays and to clear all the relays. The FX function has been implemented to accept a value from Ø to 5 indicating the relay to be set. For example, to set relay 3, the correct command is:

```
SET A=FX(3)
```

The relay is set immediately after the command is executed. To clear all relays, the FOCAL-12 command is:

```
SET A=FX(6)
```

If a value greater than 6 is typed, the error message ?18.88 is printed; if a negative number is typed, error message ?18.85 is printed.

The relay set facility is called by the FOCAL-12 command:

```
L L,$RELAY,unit
```

where unit is the device containing the overlay.

```
0000                    *20
0001                    /FOCAL-12 OVERLAY TO READ THE RELAYS
0002                    /WRITTEN BY MARTY KAYE
0003                    /DIGITAL EQUIPMENT CORP.
0004                    /
0005                    /USE THE COMMAND "SET A=FX(N)"
0006                    /WHERE N=0 TO 5 TO SET THAT RELAY;
0007                    /"SET A=FX(6)" CLEARS ALL RELAYS
0010                    /ERROR MESSAGES:
0011                    /?18.88 - NUMBER >6 TYPED
0012                    /?18.85 - NEGATIVE NUMBER TYPED
0013                            PMODE
0014                            BOTTOM=35
0015                            FEXP=4620
0016                            FLAC=44
0017                            EFUN3I=136
0020                            PFZ=412
0021                            PFX=PFZ-1
0022                            INTEGER=53
0023                            ERROR2=4566
0024                    /
0025                            *BOTTOM
0026    0035    4520            FX-1
0027                            *PFX
0030    0411    4521            FX
0031                            *FEXP-77        /SO SAME PAGE
0032    4521    4453    FX,     JMS I INTEGER   /GET ARG
0033    4522    3366            DCA TRY
0034    4523    1366            TAD TRY
0035    4524    7510            SPA             /ELIMINATE NEG NOS.
0036    4525    4566            ERROR2
0037    4526    1367            TAD M6          /CHECK FOR 0-6
0040    4527    7540            SZA SMA
0041    4530    4566            ERROR2          /NO. >6
0042    4531    7640            SZA CLA
0043    4532    5340            JMP TEST        /NO. IS 0-5
0044    4533    6002            IOF             /NO. IS 6;CLEAR
0045    4534    6141            LINC
0046                            LMODE
0047    0535    0014            ATR
0050    0536    0002            PDP
0051                            PMODE
0052    4537    5363            JMP TION        /RETN TO FOCAL
0053    4540    1365    TEST,   TAD P40         /TO SET RELAY
0054    4541    3360            DCA SR
0055    4542    1366            TAD TRY
0056    4543    7450            SNA
0057    4544    5354            JMP SET         /SET RELAY 0
0060    4545    7041            CIA
0061    4546    3370            DCA TEMP        /COUNTER
0062    4547    1360            TAD SR
0063    4550    7110    LOOP,   CLL RAR         /INIT FOR PROPER RELAY
0064    4551    2370            ISZ TEMP
0065    4552    5350            JMP LOOP
0066    4553    3360            DCA SR
0067    4554    6002    SET,    IOF             /SET PROPER RELAY
0070    4555    6141            LINC
0071                            LMODE
0072    0556    0015            RTA
0073    0557    1620            BSE I
0074    0560    0000    SR,     0000            /PUT VALUE IN AC
0075    0561    0014    LOAD,   ATR
```

```
0076        0562  0002            PDP
0077                              PMODE
0100        4563  6001  TION,     ION
0101        4564  5536            JMP I EFUN3I     /RETN TO FOCAL
0102        4565  0040  P40,      40
0103        4566  0000  TRY,      0000
0104        4567  7772  M6,       -6
0105        4570  0000  TEMP,     0000
0106                              LISTAP-7


NO ERRORS
BOTTOM 0035
EFUN3I 0136
ERROR2 4566
FEXP   4620
FLAC   0044
FX     4521
INTEGE 0053
LOAD   4561
LOOP   4550
M6     4567
PFX    0411
PFZ    0412
P40    4565
SET    4554
SR     4560
TEMP   4570
TEST   4540
TION   4563
TRY    4566
```

$SNS

by Marty Kaye

DECUS Program Library Write-up DECUS No. 12-24.4

The setting of console Sense Switches (SNS) can be read and incorporated into program operation via the $SNS overlay to FOCAL-12.

After loading the overlay by the command

```
L L,$SNS,unit
```

where unit is the device containing $SNS, n can be read by a FOCAL-12 command:

```
SET A=FX(n)
```

A statement such as

```
SET A=FX(3);TYPF A
```

reads SNS 3 and prints its value (Ø or 1). If a number greater than 5 is used the error message ?18.93 is printed.

```
0000                    *20
0001
0002                    /FOCAL-12 OVERLAY TO READ THE
0003                    /SWITCHES
0004                    /WRITTEN BY MARTY KAYE
0005                    /DIGITAL EQUIPMENT CORP.
0006                    /
0007                    /USE THE COMMAND:
0010                    /SET A=FX(N)
0011                    /WHERE N IS SNS 0 TO 5
0012                    /TO READ THAT SNS
0013                    /ERROR MESSAGE:
0014                    /?18.93 - N > 5 TYPED
0015                    /
0016                            *20
0017                            PMODE
0020                            BOTTOM=35
0021                            FEXP=4620
0022                            FLAC=44
0023                            ERROR2=4566
0024                            EFUN3I=136
0025                            PFZ=412
0026                            PFX=PFZ-1
0027                            INTEGER=53
0030                            *BOTTOM
0031    0035    4527            FX-1
0032                            *PFX
0033    0411    4530            FX
0034                            *FEXP-70
0035    4530    4453    FX,     JMS I INTEGER   /GET N
0036    4531    7510            SPA             /N MUST BE POS.
0037    4532    4566            ERROR2
0040    4533    1354            TAD M5
0041    4534    7740            SMA SZA CLA     /N MUST BE 0-5
0042    4535    4566            ERROR2
0043    4536    1046            TAD FLAC+2      /GET N
0044    4537    1357            TAD P440
0045    4540    3344            DCA TAG         /MAKE SNS INSTR.
0046    4541    7001            IAC
0047    4542    6002            IOF
0050    4543    6141            LINC
0051    4544    0000    TAG,    0               /READ SNS N
0052    4545    0011            11
0053    4546    0002            2
0054    4547    6001            ION
0055    4550    3046            DCA FLAC+2
0056    4551    5536            JMP I EFUN3I
0057    4552    0007    C7,     0007
0060    4553    0000    TEMP,   0000
0061    4554    7773    M5,     -5
0062    4555    0000    TRY,    0000
0063    4556    7770    C7770,  7770
0064    4557    0440    P440,   440
0065                            LISTAP-7
```

```
NO ERRORS
BOTTOM 0035
C7     4552
C7770  4556
EFUN3I 0136
ERROR2 4566
FEXP   4620
FLAC   0044
FX     4530
INTEGE 0053
M5     4554
PFX    0411
PFZ    0412
P440   4557
TAG    4544
TEMP   4553
TRY    4555
```

$LP08

by Marty Kaye

DECUS Program Library Write-up DECUS No. 12-24.5

The FOCAL-12 overlay $LPØ8 uses the FX function to implement an interfaced LPØ8 line printer. During a FOCAL-12 program, subsequent output can be diverted to the LPØ8 by the statement

```
SET A=FX()
```

where there is no character between the parentheses. To switch back to the Teletype, issue an O T command. Note that for this overlay to function properly, the LPØ8 must interrupt only if a 6665 has been issued. Load the overlay by the FOCAL-12 command:

```
L L,$LPØ8,unit
```

where unit is the device containing the program.

```
-
0000                    *20
0001                            PMODE
0002                    /LINE PRINTER PATCH FOR FOCAL-12
0003                    /WRITTEN BY STEVE WELLCOME
0004                    /DIGITAL EQUIPMENT CORP.
0005                    /CALL:
0006                    /SET X=FX() TO SWITCH TO LP08
0007                    /DO AN "O T" COMMAND TO SWITCH BACK TO TTY.
0010                    /LP08 SHOULD BE SUCH THAT IT WILL INTERRUPT
0011                    /ONLY IF A 6665 HAS BEEN ISSUED.
0012                    /IF NOT, THIS MAY HAVE TO BE CHANGED
0013                    /BY DOING SOMETHING LIKE:
0014                    /       6666
0015                    /       6661
0016                    /       JMP     .-1
0017                    /       6662    /CLEAR FLAG
0020                    /
0021                            *35
0022    0035    4605            4605
0023                            *411
0024    0411    4606            FX
0025                            *4606
0026    4606    1377    FX,     TAD     PLP08   /AC=0
0027    4607    3063            DCA     X
0030    4610    6666            6666            /INITIALIZE
0031    4611    5536            JMP I   EFUN3I
0032    4612    0000    LP08,   0
0033    4613    6661            6661
0034    4614    5213            JMP     .-1
0035    4615    6666            6666
0036    4616    7200            CLA
0037    4617    5612            JMP I   LP08
0040                            *4777           /ONE FREE LOCATION
0041    4777    4612    PLP08,  LP08
0042                            EFUN3I=136
0043                            X=63
0044                            LISTAPE-1



NO ERRORS
EFUN3I  0136
FX      4606
LP08    4612
PLP08   4777
X       0063
```

Correction to $LPØ8 overlay for FOCAL-12

A problem has been discovered in saving this patch as an overlay. Location 4777 does not get saved when a "Library Save" is given and as a result is not included when the overlay is recalled. There are two possible solutions.

1) Patch word 4777 of the actual FOCAL-12 binary. This is an unused location in the functions area. It will then be loaded with FOCAL-12 rather than with the overlay, and be permanent.

2) Change the overlay as follows:

```
                *35
                FX-1
                *411
                FX
                *4604                   /REDUCE BY ONE LOCATION
FX,             TAD PLPØ8
                DCA X
                6666
                JMP I EFUN3I
LPØ8,           Ø
                6661
                JMP .-1
                6666
                CLA
                JMP I LPØ8
PLPØ8,          LPØ8                    /PUT THE CONSTANT HERE

                EFUN3I = 136
                     X =  63
```

$DEVICE
by Dave Cope

DECUS Program Library Write-up DECUS No. 12-24.6

The FOCAL-12 overlay $DEVICE combines the capabilities of some individual programs ($SNS, $RELAY) and adds several more facilities.

By setting "n" in the expression FX(n) to the appropriate value, the program can check the status of several devices, as follows:

n	device	result
Ø-5	Sense Switches Ø-5	types: Ø = not set 1 = set
6	Left Switches	types value (decimal)
7	Right Switches	types value (decimal)
1Ø-15	Relays Ø-5	types: Ø = open 1 = closed
2Ø-25	Relays Ø-5	opens relay n
3Ø-35	Relays Ø-5	opens relay n
4Ø-55	External Sense Lines	types: Ø = low 1 = high

Load the overlay by a library command such as:

```
L G, $DEVICE,Ø
```

Then use a FOCAL-12 statement in the program, such as:

```
SET Z=FX(3)
```

to check the appropriate device status.

$PLOT
by George Thissell

DECUS Program Library Write-up — DECUS No. 12-24.7

1. INTRODUCTION

The $PLOT program is FOCAL-12 plus the PLOTR overlay for FOCAL-8 modified to run under FOCAL-12. Using $PLOT, any combination of lines and curves can be drawn on an interfaced X-Y recorder. $PLOT uses the FX function call (rather than the FDIS call in FOCAL-8) and does not contain the extended functions FATN, FEXP and FLOG. Its implementation is the same as with FOCAL-8.

2. Loading the Program

The plotter routine has been incorporated into its own version of FOCAL-12 and is called by the DIAL command

```
—> LO $PLOT,unit↵
```

3. Using $PLOT

To use $PLOT to graph a curve, the following group of lines (the finite difference equation of a circle) must be included in the program:

```
*16.2Ø  SET  P=X-XØ; SET Q=Y-YØ; SET R=FSQT(Q ↑ 2+P ↑ 2)
*16.3Ø  SET  Z=FX(6.3*R*C,P,Q,XØ,YØ,S/R)
*16.4Ø  SET  XØ=X; SET YØ=Y
```

For executing linear graphics, the linear difference equation is required in addition to the group 16 lines above.

```
*17.2Ø  DO 16.2; SET Z=FX(R,P/R,Q/R,XØ,YØ,Ø); DO 16.4
```

3.1 Parameters

Several of the following parameters must be specified for each segment to be graphed:

XØ,YØ	-	initial co-ordinates of vector
X,Y	-	terminating co-ordinates of vector
R	-	vector length
P,Q	-	vector components
C	-	arc length
S	-	direction of plotting of arc (+1 = counterclockwise -1 = clockwise)

The function call, FX, requires six parameters:

FX(R, P, Q, XØ, YØ, K)

3.2 Plotting Lines

For linear graphics:

R	-	vector length ($\sqrt{Q^2+P^2}$
P	-	length along X axis (X-XØ)
Q	-	length along Y axis (Y-YØ)
XØ	-	initial X co-ordinate
YØ	-	initial Y co-ordinate
K	-	equals Ø

Note that X and Y (the terminating co-ordinates) must be defined in the program.

Each set of [XØ, YØ] and [X, Y] co-ordinates must be followed by a DO 17 statement in order to actually draw that line. Thus to draw a line along the X-axis and then draw a line perpendicular to it, suitable code is:

```
*1.1  SET  XØ=Ø; SET YØ=Ø
*1.2  SET  A=8ØØ
*1.3  SET  X=A; SET Y=YØ; DO 17
*1.4  SET  Y=A; DO 17

*16.2  SET  P=X-XØ; SET Q=Y-YØ; SET R=FSQT(Q ↑ 2+P ↑ 2)
*16.3  SET  Z=FX(6.3*R*C, P, Q, XØ, YØ, S/R)
*16.4  SET  XØ=X; SET YØ=Y

*17.2  SET  DO 16.2; SET Z=FX(R, P/R, Q/R, XØ, YØ, Ø); DO 16.4
```

3.3 Plotting Arcs

For circular graphics:

R	-	radius
P	-	X component
Q	-	Y component
XØ, YØ	-	center of arc
K	-	equals S/R and defines direction of plotting

Four additional parameters must be defined in the program for plotting arcs:

X, Y	-	starting point of plotting
S	-	direction; +1 = counterclockwise -1 = clockwise
C	-	arc length; .5 = semi-circle 1 = circle

For each arc drawn, a DO 16 statement is required after defining the parameters. XØ, YØ are automatically set to X, Y at each completion of groups 16 + 17.

To draw a quarter of a circle about the point [2ØØ, 2ØØ] starting at [5Ø, 5Ø] and going counterclockwise, suitable code is:

```
1.1  SET S=1
1.2  SET C=.25
1.3  SET XØ=2ØØ; SET YØ=2ØØ
1.4  SET X=5Ø; SET Y=5Ø
1.5  DO 16

16.2  SET  P=X-XØ; SET Q=Y-YØ;  R=FSQT(Q ↑ 2+P ↑ 2)
16.3  SET  Z=FX(6.3*R*C,P,Q,XØ,YØ,S/R)
16.4  SET  XØ=X; SET YØ=Y
```

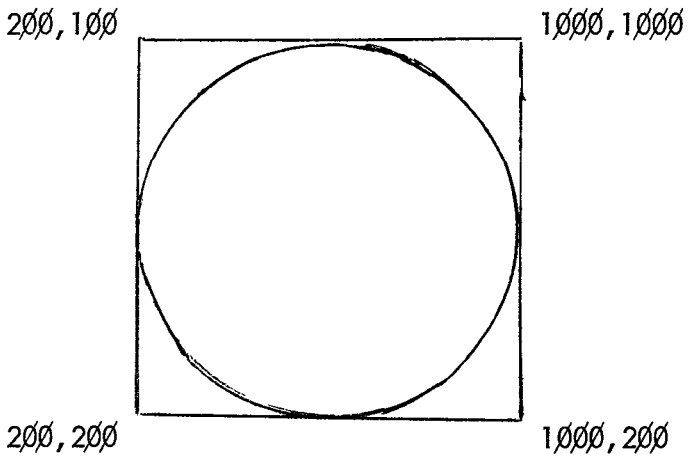
4. Example

The following program draws a square and an inscribed circle:

```
*1.1  SET  S=1; SET C=1
*1.2  SET  A=2ØØ; SET B=1ØØØ; SET D=6ØØ
*1.3  SET  XØ=A; SET YØ=A
*1.4  SET  X=B; SET Y=YØ; DO 17
*1.5  SET  Y=B; DO 17
*1.6  SET  X=A; DO 17
*1.7  SET  Y=A; DO 17
*1.8  SET  XØ=D; SET YØ=D
*1.9  SET  X=D; SET Y=A; DO 16

*16.2  SET P=X-XØ; SET Q=Y-YØ; SET R=FSQT(Q ↑ 2+P ↑ 2)
*16.3  SET  Z=FX(6.3*R*C,P,Q,XØ,YØ,S/R)
*16.4  SET  XØ=X; SET YØ=Y

*17.2  DO 16.2; SET Z=FX(R,P/R,Q/R,XØ,YØ,Ø); DO 16.4
```



5. Plotting a Data File

The $PLOT program can be used to plot a data file stored as a series of Y values. The demonstration program, $DATAPLT, written in FOCAL-12 converts a file to an (X,Y) file, displays the spectrum point by point on the scope and then plots it on an X-Y recorder. The user specifies the minimum and maximum Y values to be displayed; smaller values are displayed along the bottom and larger ones along the top of the scope. $DATAPLT is commented to facilitate modification.

To use this program call it by a library command such as L G, $DATAPLT,Ø. The format and location parameters in line 1.03 must be modified by the user for the file to be plotted. In addition, the routine can easily be modified to:

1. Plot by points rather than as a continuous line (7.20 S Y=F2(A)*400;S Z=FX(,,,X,Y);R

2. Plot for any Y scale factor - change the value of 400 in line 7.2

3. Display the entire file, not display values outside the specified range, display file only at end of calculation etc. - change lines 5.20 through 5.55.

$ECHO AND $ECHOFN

by Gary Fredrickson

DECUS Program Library Write-up

DECUS NO. 12-24.8

The FOCAL-12 overlays $ECHO and $ECHOFN will allow the FOCAL-12 user to delete or restore the Teletype keyboard echo by direct statements or under program control. By deleting the Teletype echo, a program or data may be read from the tape reader without an input buffer overflow. The patch is implemented as an additional function (FZ). To delete or restore, evaluate the FZ function with one argument (=Ø for echo and =1 for no echo). The program $ECHOFN (FOCAL + the source $ECHOFN) also provides echo control. It differs from $ECHO in that it deletes the FATN, FEXP, and FLOG functions. Included on the LINCtape is a sample program, $ECHOEX, to read 100 numbers from paper tape to LINCtape and display the file on the scope. Answer "Y" to the "Ready?" query.

```
                        *20

                        /
                        /THIS OVERLAY DEFINES AN FZ
                        /FUNCTION TO DELETE OR RESTORE
                        /THE TTY INPUT ECHO.
                        /
                        /FZ=0--RESTORE ECHO
                        /FZ=1--DELETE ECHO
                        /
                                PMODE
                                *35
0035    4403            XFZ-1           /BOTTOM
                                *412
0412    4404            XFZ             /INSERT FUNCTION IN TABLE
                                *2165
2165    4451 ECHOLC,    4451            /ECHO LOCATION
                                *4004
4004    4453 XFZ,       JMS I 53
4005    7640            SZA CLA
4006    5211            JMP .+3
4007    1215            TAD ECHO
4010    5612            JMP.+2
4011    1216            TAD NOECHO
4012    3417            DCA I LCECHO
4013    7300            CLA CLL
4014    5536            JMP I 136
4015    4451 ECHO,      4451
4016    7200 NOECHO,    7200
4017    2165 LCECHO,    ECHOLC
                        LISTAP-7
```

```
                        *20
                        /
                        /THIS OVERLAY DELETES THE FATN,
                        /FEXP,AND FLOG FUNCTIONS AND
                        /DEFINES AN FZ FUNCTION TO DELETE
                        /OR RESTORE THE TTY INPUT ECHO.
                        /
                        /FZ=0--RESTORE ECHO
                        /FZ=1--DELETE ECHO
                        /
                                PMODE
                                *35
0014    0000    5152            XFZ-1           /BOTTOM
                                *402            /DELETE:
0016    0402    2725            2725            /FATN
0017    0403    2725            2725            /FEXP
0020    0404    2725            2725            /FLOG
0021                            *412
0022    0412    5153            XFZ             /INSERT FUNCTION IN TABL
0023                            *2165
0024    2165    4551    ECHOLC, 4551            /ECHO LOCATION
0025                            *5153
0026    5153    4453    XFZ,    JMS I 53
0027    5154    7640            SZA CLA
0030    5155    5336            JMP .+3
0031    5156    1364            TAD ECHO
0032    5157    5361            JMP .+2
0033    5160    1365            TAD NOECHO
0034    5161    6776            DCA I LCECHO
0035    5162    7300            CLA CLL
0036    5163    4536            JMS I 136       /EFUN31 EXIT
0037    5164    4551    ECHO,   4551
0040    5165    7000    NOECHO, 7000
0041    5166    2165    LCECHO, ECHOLC
0042
0043                            FIELD 1
0044                            *1225
0045    1225    1067            1067
0046                            *1247
0047    1247    1173            1173
0050                            *1323
0051    1323    6017            6017
0052                            LISTAP-7
```

$CHARSIZ
by Steve Wellcome

DECUS Program Library Write-up DECUS NO. 12-24.9

The $CHARSIZ overlay for FOCAL-12 permits both full and half size characters to be generated on the display scope. To enable full size characters, insert the FX user's command without a parameter, for example as: SET L = FX(). To return to half size characters (the original size for FOCAL-12), simply insert an OUTPUT SCOPE command.

When using full size characters, remember that only half as many characters can fit on a scope line. Also note that two carriage returns are required to terminate a scope line to prevent vertical overlap. Thus, if the program is to display text or data full size, two exclamation marks should be used in the code to terminate each line. (This procedure does not work with the WRITE command - there will be vertical overlap.)

```
0000                    *20
0001                    /SCHARSIZ OVERLAY FOR FOCAL-12
0002                    /PERMITS FULL OR HALF SIZE
0003                    /CHARACTERS ON THE SCOPE
0004                    /
0005                    /WRITTEN BY STEVE WELLCOME
0006                    /DIGITAL EQUIPMENT CORP.
0007                    /1 APRIL 70
0010                    /
0011                    /FOR FULL SIZE: SET X=FX()
0012                    /FOR HALF SIZE: 0 S
0013                    /
0014                            PMODE
0015                            *411
0016    0411    4607            FX
0017                            *35
0020    0035    4606            FX=1
0021                            *4607
0022    4607    6002    FX,     IOF
0023    4610    1123            TAD 123         /LOAD 200 IN AC
0024    4611    6141            LINC
0025                            LMODE
0026    0612    0004            ESF
0027    0613    0002            PDP
0030                            PMODE
0031    4614    7200            CLA
0032    4615    6001            ION
0033    4616    5536            JMP I 136       /EXIT
0034                            LISTAPE -1
```

An interfaced AA50 D/A converter can be controlled by FOCAL-12. To send a digital signal of value V on channel C, a command in the general format

SET A = FX(V,C)

is required. A is some constant; C must be channel 1 to 6. V is determined according to the approximate limits:

Value		Volts
ØØØØ	=	Ø
↓		↓
3777	=	1Ø
4ØØØ	=	-1Ø
↓		↓
7777	=	Ø

Thus, to send a value of 1ØØØ to all 6 D/A channels during a program, code such as the following can be used.

```
1Ø.1        L L,$DTOA,1
1Ø.2        S V=1ØØØ
1Ø.3        F C=1,6;G 11.1
                .
                .
                .
                .
                .
                .
11.1        S L=FX (V,C)
```

Three error conditions can occur with this overlay, which will cause the following error messages to be printed:

18.:4	Must have a comma between the value and the channel in the command.
18.;Ø	Channel less than 1 specified
18.;3	Channel greater than 6 specified

The overlay is called in the usual FOCAL-12 manner:

L L,$DTOA, unit

Note that this overlay is inoperable on a PDP-12 with a Floating Point Processor.