DECUS
PROGRAM LIBRARY

DECUS NO.	8-137
TITLE	PROGRAMS FOR STORAGE MANIPULATION AND CALCULATION OF DATA USING DECTAPE
AUTHOR	D. Eugene Hokanson
COMPANY	Veterans Administration Hospital Seattle, Washington
DATE	July 2, 1968
SOURCE LANGUAGE	

PROGRAMS FOR STORAGE MANIPULATION AND CALCULATION OF DATA USING DECTAPE

DECUS Program Library Write-up DECUS No. 8-137

INTRODUCTION: These programs use DECtape for the storage of data files. Once data has been stored on DECtape, the statistical or calculation programs will operate on particular parts of it selected by the user. All programs are conversant. They ask questions regarding execution and accept answers via the teletype.

Tape unit #1 is used for data tape. Data tapes may be formatted in standard (129_{10}) or shorter block lengths. Data is stored and operated on in floating point. Data files may be complete or partial blocks of tape. Each file is terminated by a "$" (244) on DECtape. Up to 42 numbers may be stored on one block of standard data tape.

GENERAL OPERATING INSTRUCTIONS: Programs which have the capability of writing on data tape will first query the user about data tape format. Standard data tapes have (129_{10}) computer words per block. All questions requiring yes or no answers are answered by typing "Y" or "N". The floating point input subroutine is used for all inputs so all number answers to questions are in decimal.

Line or block numbers may be input singly or successively and input is terminated by typing "CTRL/FORM". An example is:
BLOCK NUMBERS : 10 23,27 50 (CTRL/FORM typed here)
This would cause the program to read data in blocks 10, 23, 24, 25, 26, 27, and 50.
The only exception to this is in FORT where the last group of block numbers is terminated by typing "$".

After execution of a program, the character CTRL/C (↑C) will return control to the Monitor so the next program can be called. Use of this feature enables the user to make a control paper tape which contains program calls and the appropriate answers and commands for execution so that long periods of unattended data processing are possible.

SUBROUTINES: SUBS is a package of four subroutines used by most of these programs. SUBS contains six pointers on page zero and subroutines in the area from 4000 to 7577.

These subroutines are:

MESSAGE	<4000,4057>	Type packed text
UNFLOAT	<4100,4130>	Unfloat floating point numbers
RWTAPE	<4200,4342>	Read and Write DECtape
FPOINT	<4400,7577>	Floating point Output Controller

The pointers are:

0002	4200	/RWTAPE
0003	4000	/MESSAGE
0004	4100	/UNFLOAT
0005	7400	/FPOINT Input
0006	7200	/FPOINT Output
0007	5600	/FPOINT Arithmetic Interpreter

FLEX is an extended version of Floating Point which lacks the Output Controller. It is used to overlay the FPOINT section of SUBS in the programs which use extended Floating Point.

LISTINGS: Source programs are furnished as symbolic files on DECtape. In order to compile one of the programs it is necessary to create one file which is composed of several symbolics for use with XPAL. SUBS should be called before using XLOAD to load the Pass 2 output of XPAL. The resulting program is updated including the area used by SUBS.

Three programs, LCOVAR, BCALC AND LCALC, use extended Floating Point without the Output Controller (FLEX). The procedure to initially load one of these programs is to call SUBS, then FLEX, and then XLOAD the Pass 2 of XPAL.

The source programs are made up of the following symbolic files in order:

SYMBOLIC	SOURCE	NO. of BLOCKS
DATR1		15
DATR2		15
	DATRIT	30
ED1		15
ED2		12
ED3		12
ED4		12
ED5		6
	EDATA	57
S1		10
S2		10
S3		12
S4		10
S5		4
	SDT	46
F1		16
F2		12
F3		15
F4		12
F5		12
F6		6
	FORT	73
C1		12
C2		12
C3		12
C4		12
C5		12
C6		8
	COVAR	68

SYMBOLIC	SOURCE	NO. of BLOCKS
C1		12
C2		12
C3		12
LC4		12
LC5		12
C6		8
	LCOVAR	68
TP1		12
TP2		15
TP3		15
TP4		8
	TPAIR	50
BC1		12
BC2		10
BC3		3
	BCALC	25
LC1		12
LC2		12
LC3		6
	LCALC	30

```
*4000
MESS,       0
            CLA CMA
            TAD MESS
            DCA 0017
            TAD I 0017
            DCA MSRGHT
            TAD MSRGHT
            RTR
            RTR
            RTR
            JMS TYPECH
            TAD MSRGHT
            JMS TYPECH
            JMP MESS+4
MSRGHT,     0
TYPECH,     0
            AND MASK77
            SNA
            JMP I 0017
            TAD M40
            SMA
            JMP .+3
            TAD C340
            JMP MTP
            TAD M3
            SZA
            JMP .+3
            TAD C212
            JMP MTP
            TAD M2
            SZA
            JMP .+3
            TAD C215
            JMP MTP
            TAD C245
MTP,        TSF
            JMP .-1
            TLS
            CLA
            JMP I TYPECH
MASK77,     0077
M40,        7740
C340,       0340
M3,         7775
C212,       0212
M2,         7776
C215,       0215
C245,       0245
*4100
UNFL,       0
            CLA
            TAD 44
```

```
            SZA SMA
            JMP .+3
            CLA
            JMP DONE+1
            TAD M13
            SNA
            JMP DONE
            SMA
            JMP ERROR
            DCA 44
GO,         CLL
            TAD 45
            SPA
            CML
            RAR
            DCA 45
            ISZ 44
            JMP GO
DONE,       TAD 45
            JMP I UNFL
M13,        -13
ERROR,      HLT
*2
            4200        /POINTER TO READ-WRITE TAPE ROUTINES
            4000        /POINTER TO MESSAGE SUBROUTINE
            4100        /POINTER TO UNFLOAT SUBROUTINE
```

```
/SUBROUTINE TO READ AND WRITE ON MAG TAPE
/USES THE FOLLOWING CALLING SEQUENCE :
/         JMS I RWTAPE          /CALL SUBR.
/         XYZZ        /X=UNIT #,  Y=4 FOR WRITE
/                     /Y=2 FOR READ,  Z=# OF BLOCKS
/BLOCK,   0000        /STARTING BLOCK #
/         0000        /CORE LOCATION READ OR WRITTEN INTO
/         0000        /PROGRAM RETURNS HERE WITH TAPE HALTED
*4200
RWTAPE, 0
    CLA CLL
    TAD I RWTAPE
    ISZ RWTAPE
    DCA RWREGA
    TAD I RWTAPE
    ISZ RWTAPE
    DCA RWBLK
    CMA
    TAD I RWTAPE
    ISZ RWTAPE
    DCA RWCLOC
    TAD RWM12
    DCA RWTCNT
RWBGN, TAD RWADBN
    DCA I RWADCA
    TAD RWREGA
    AND RW0077
    CMA
    DCA RWBCNT


    TAD RWREGA
    AND RW7000
    TAD RW0610
    DTCA DTXA
RWREV, JMS RWWAIT
    JMP RWFWD-4
    TAD RWBN
    CMA
    TAD RWBLK
    SPA CLA
    JMP RWREV


    TAD RWREGA
    AND RW7000
    TAD RW0210
    DTCA DTXA
RWFWD, JMS RWWAIT
    JMP RWBGN
    TAD RWBN
    CIA
    TAD RWBLK
```

```
    SNA
    JMP .+4
    SPA CLA
    JMP RWBGN
    JMP RWFWD


    TAD RWREGA
    CLL RTR
    RAR
    AND RW0070
    TAD RW0110
    DTXA
    TAD RWCLOC
    DCA I RWADCA
RWAGN, ISZ RWBCNT
    JMP .+4
    TAD RW0200
    DTXA
    JMP I RWTAPE
    TAD RWM200
    DCA I RWADWC
    JMS RWWAIT
    JMP RWBGN
    JMP RWAGN


RWWAIT, 0
    DTXA
    DTSF
    JMP .-1
    DTRB
    SMA CLA
    JMP RWWOUT
    ISZ RWTCNT
    JMP I RWWAIT
    DTRA
    AND RW0200
    SZA
    DTXA
    DTRB
    HLT
    JMP .-1
RWWOUT, ISZ RWWAIT
    JMP I RWWAIT


RWTCNT, 0
RWM12, -12
RWBN, 0
RWREGA, 0
RWCLOC, 0
RWBLK, 0
```

```
RWBCNT, 0
RWADCA, 7755
RWADWC, 7754
RWADBN, RWBN
RW7000, 7000
RW0610, 0610
RW0210, 0210
RW0110, 0110
RW0200, 0200
RW0077, 0077
RW0070, 0070
RWM200, -200
DTRA=6761
DTCA=6762
DTXA=6764
DTSF=6771
DTRB=6772
DTLB=6774
$
```

DATRIT = DATA WRITE

PURPOSE: This is a program to write data on DECtape directly from the ASR-33. Numerical data is stored on DECtape in floating point format and a "$" (244) is written immediately following the last data point to signify the end of data in each block of tape.

OPERATION: The program will query the user about the format of the data tape mounted on unit #1. Next, the program asks "START AT BLOCK : " and the user types the block number (decimal) of the first data block to be recorded.

At this point the program waits for data input. Only valid floating point inputs are accepted; illegal characters are ignored. Up to 42 floating point numbers and the terminating "$" may be recorded on a block of standard data tape. After the input of the maximum number of data points (42 for standard data tape), data will automatically be recorded in the starting block number previously specified. Successive data will be recorded in successive blocks.

CONTROL CHARACTERS:

$ If less than the maximum number of data points per block are to be recorded the input of a "$" will terminate data input for that block and cause recording of data up to the "$". Next data will go in the next successive block.

/ This character causes the program to type the block number of the next data block to be recorded, "NEXT BLOCK = nn ".

This character is used if data is not to be recorded in successive blocks of data tape. It causes the program to return to "START AT BLOCK : ".

CTRL/C Return to tape Monitor.

```
DATRIT ↵                                  /Call program

STD FORMAT ? N                            /No
BLOCK LENGTH (DEC) : 60 ↵                 /60 words per block

TYPE OUT ? Y                              /Type out data input
START AT BLOCK : 10 ↵
1 2 3 4 5 6 7 8 9 10 ↵                    /Data input
1 2 3 4 5 6 7 8 9 ↵                       /19 numbers per block max.
LF
1 2 3 4 5 6 7 8 9 10 ↵
11 12 13 14 15 16 17 18 19 ↵              /Next block of data input
LF
1 2 3 4 5 $ ↵                             /Next block of data input
2 3 4 5 6 $ ↵                             /Next block of data input
/                                         /Request for next block #
NEXT BLOCK = +  14
#                                         /Request new starting block #
START AT BLOCK : 20 ↵
1 2 3 4 5 6 $ ↵                           /Data input block #20
6 5 4 3 2 1 $ ↵                           /Data input block #21
2 4 6 8 10 12 $ ↵                         /Data input block #22
↑C                                        /Return control to tape Monitor
```

```
                /DATRIT, DATA WRITE
                /MOUNT DATA TAPE ON UNIT #1. ANSWER QUESTIONS
   @            /"Y" OR "N".  IF LESS THAN FULL DATA BLOCK
                /TERMINATE DATA BY "$".  "/" CAUSES TYPEOUT
                /OF NEXT BLOCK #.  "#" CAUSES REQUEST FOR
                /NEW STARTING BLOCK #.  "CTRL/C" RETURNS
                /CONTROL TO MONITOR.
                *200
0200  6046              TLS
0201  7200              CLA
0202  1154  FORMAT,     TAD TXT1/  "STD FORMAT ? "
0203  3012              DCA 12
0204  1123              TAD M128
0205  3537              DCA I WORDS
0206  1126              TAD M42
0207  3127              DCA MINC
0210  1143              TAD OUT
0211  3542              DCA I FLOUT
0212  1211              TAD .-1
0213  3303              DCA TAKN+1
0214  4063              JMS TYPE
0215  4405              JMS I 5
0216  1057              TAD 57
0217  1131              TAD MN/     NO?
0220  7640              SZA CLA
0221  5243              JMP YES/    CHECK IF Y
0222  1155              TAD TXT2/  "BLOCK LENGTH (DEC) : "
0223  3012              DCA 12
0224  4063              JMS TYPE
0225  4405              JMS I 5
0226  4074              JMS UNFL
0227  3127              DCA MINC/  TEMPORARY
0230  1127              TAD MINC
0231  7041              CIA
0232  3537              DCA I WORDS
0233  1127              TAD MINC
0234  1124              TAD M1
0235  7427              7427/       MQL DVI
0236  0003              0003
0237  7701              7701/       CLA MQA
0240  7041              CIA
0241  3127              DCA MINC
0242  5250              JMP TYPOUT
0243  7200  YES,        CLA
0244  1057              TAD 57
0245  1132              TAD MY
0246  7640              SZA CLA
0247  5215              JMP FORMAT+13          /NOT Y OR N INPUT
0250  1157  TYPOUT,     TAD TXT5/  "TYPE OUT ? "
0251  3012              DCA 12
0252  4063              JMS TYPE
0253  4405              JMS I 5
```

```
0254  1057            TAD 57
0255  1131            TAD MN
0256  7650            SNA CLA
0257  5270            JMP SB
0260  1057            TAD 57
0261  1132            TAD MY
0262  7640            SZA CLA
0263  5267            JMP .+4
0264  1140            TAD NOOP
0265  3303            DCA TAKN+1
0266  5270            JMP SB
0267  5253            JMP TYPOUT+3          /NOT Y OR N INPUT
0270  1160  SB,       TAD TXT6/  "START AT BLOCK : "
0271  3012            DCA 12
0272  4063            JMS TYPE
0273  4405            JMS I 5
0274  4074            JMS UNFL
0275  3345            DCA BLOCK
0276  1127            TAD MINC
0277  3130            DCA INC
0300  1141            TAD DATA
0301  3010            DCA 10
0302  1140  TAKN,      TAD NOOP
0303  3542            DCA I FLOUT
0304  4405            JMS I 5
0305  1060            TAD 60
0306  7640            SZA CLA
0307  5331            JMP STN/   VALID, STORE NUMBER
0310  1057            TAD 57
0311  1133            TAD MCC
0312  7650            SNA CLA
0313  5544            JMP I TAPE
0314  1057            TAD 57
0315  1125            TAD MLB
0316  7650            SNA CLA
0317  5270            JMP SB
0320  1057            TAD 57
0321  1134            TAD MSL/   CHECK IF SLASH
0322  7650            SNA CLA
0323  4352            JMS SL
0324  1057            TAD 57
0325  1135            TAD MDOL/  END OF INPUT FOR THIS BLOCK?
0326  7650            SNA CLA
0327  5341            JMP ADOL
0330  5302            JMP TAKN
0331  1044  STN,       TAD 44
0332  3410            DCA I 10
0333  1045            TAD 45
0334  3410            DCA I 10
0335  1046            TAD 46
0336  3410            DCA I 10
0337  2130            ISZ INC/   INPUT COUNTER
0340  5302            JMP TAKN
```

```
0341  1136  ADOL,     TAD DOL
0342  3410            DCA I 10
0343  4550            JMS I RWTAPE
0344  1401            1401/       1 BLOCK ON UNIT 1, WRITE
0345  0000  BLOCK,    0
0346  1000            1000
0347  2345            ISZ BLOCK
0350  7200            CLA
0351  5276            JMP TAKN-4
0352  0000  SL,       0
0353  1161            TAD TXT7/  "NEXT BLOCK = "
0354  3012            DCA 12
0355  4063            JMS TYPE
0356  1345            TAD BLOCK
0357  3045            DCA 45
0360  3046            DCA 46
0361  1147            TAD C13
0362  3044            DCA 44
0363  4407            JMS I 7
0364  7000            FNOR
0365  1151            FADD PT1
0366  0000            FEXT
0367  4406            JMS I 6
0370  5752            JMP I SL
```

```
                *62
0062  0004              0004
0063  0000  TYPE,       0
0064  7200              CLA
0065  1412              TAD I 12
0066  6041              TSF
0067  5066              JMP .-1
0070  6046              TLS
0071  7440              SZA
0072  5064              JMP .-6
0073  5463              JMP I TYPE
0074  0P00  UNFL,       0
0075  7200              CLA
0076  1044              TAD 44
0077  7540              SZA SMA
0100  5103              JMP .+3
0101  7200              CLA
0102  5122              JMP DONE+1
0103  1146              TAD M13
0104  7450              SNA
0105  5121              JMP DONE
0106  7500              SMA
0107  5145              JMP ERROR
0110  3044              DCA 44
0111  7100  GO,         CLL
0112  1045              TAD 45
0113  7510              SPA
0114  7020              CML
0115  7010              RAR
0116  3045              DCA 45
0117  2044              ISZ 44
0120  5111              JMP GO
0121  1045  DONE,       TAD 45
0122  5474              JMP I UNFL
0123  7600  M128,       -200
0124  7777  M1,         -1
0125  7535  MLB,        -243
0126  7726  M42,        -52
0127  0000  MINC,       0
0130  0000  INC,        0
0131  7462  MN,         -316
0132  7447  MY,         -331
0133  7575  MCC,        -203
0134  7521  MSL,        -257
0135  7534  MDOL,       -244
0136  0244  DOL,        244
0137  4342  WORDS,      4342
0140  7000  NOOP,       NOP
0141  0777  DATA,       0777
0142  7151  FLOUT,      7151
0143  4766  OUT,        4766
0144  7600  TAPF,       7600
```

```
0145   7402   ERROR,     7402
0146   7765   M13,       -13
0147   0013   C13,       0013
0150   4200   RWTAPE,    4200
0151   7775   PT1,       7775
0152   3146              3146
0153   3146              3146
0154   0400   TXT1,      T1
0155   0420   TXT2,      T2
0156   0450   TXT4,      T4
0157   0455   TXT5,      T5
0160   0473   TXT6,      T6
0161   0517   TXT7,      T7
              *400
0400   0000   T1,        0
0401   0215              215
0402   0212              212
0403   0323              323
0404   0324              324
0405   0304              304
0406   0240              240
0407   0306              306
0410   0317              317
0411   0322              322
0412   0315              315
0413   0301              301
0414   0324              324
0415   0240              240
0416   0277              277
0417   0240              240
0420   0000   T2,        0
0421   0215              215
0422   0212              212
0423   0302              302
0424   0314              314
0425   0317              317
0426   0303              303
0427   0313              313
0430   0240              240
0431   0314              314
0432   0305              305
0433   0316              316
0434   0307              307
0435   0324              324
0436   0310              310
0437   0240              240
0440   0250              250
0441   0304              304
0442   0305              305
0443   0303              303
0444   0251              251
0445   0240              240
0446   0272              272
```

```
0447   0240                240
0450   0000   T4,          0
0451   0277                277
0452   0277                277
0453   0215                215
0454   0212                212
0455   0000   T5,          0
0456   0215                215
0457   0212                212
0460   0324                324
0461   0331                331
0462   0320                320
0463   0305                305
0464   0240                240
0465   0317                317
0466   0325                325
0467   0324                324
0470   0240                240
0471   0277                277
0472   0240                240
0473   0000   T6,          0
0474   0215                215
0475   0212                212
0476   0323                323
0477   0324                324
0500   0301                301
0501   0322                322
0502   0324                324
0503   0240                240
0504   0301                301
0505   0324                324
0506   0240                240
0507   0302                302
0510   0314                314
0511   0317                317
0512   0303                303
0513   0313                313
0514   0240                240
0515   0272                272
0516   0240                240
0517   0000   T7,          0
0520   0215                215
0521   0212                212
0522   0316                316
0523   0305                305
0524   0330                330
0525   0324                324
0526   0240                240
0527   0302                302
0530   0314                314
0531   0317                317
0532   0303                303
0533   0313                313
```

0534	0240	240
0535	0275	275
0536	0240	240
0537	0000	0

ADOL	0341
BLOCK	0345
C13	0147
DATA	0141
DOL	0136
DONE	0121
ERROR	0145
FLOUT	0142
FORMAT	0202
GO	0111
INC	0130
MCC	0133
MDOL	0135
MINC	0127
MLB	0125
MN	0131
MSL	0134
MY	0132
M1	0124
M128	0123
M13	0146
M42	0126
NOOP	0140
OUT	0143
PT1	0151
RWTAPE	0150
SB	0270
SL	0352
STN	0331
TAKN	0302
TAPE	0144
TXT1	0154
TXT2	0155
TXT4	0156
TXT5	0157
TXT6	0160
TXT7	0161
TYPE	0063
TYPOUT	0250
T1	0400
T2	0420
T4	0450
T5	0455
T6	0473
T7	0517
UNFL	0074
WORDS	0137
YES	0243

EDATA = EDIT DATA

PURPOSE: This is a program to edit data files created on DECtape by DATRIT.

OPERATION: The program will query the user about the format of the data tape mounted on unit #1. After that, the teletype bell will ring and EDATA waits for a command from the user. This program uses a core buffer to store the data file being edited.

The following commands are possible in EDATA :

R↵	READ	This command causes the program to type "BLOCK NUMBER : ". The user types the block number (in decimal) of data tape to be read. READ destroys data previously in the buffer by reading in over it.
RA↵	READ APPEND	This command is similar to READ. Data read in prior to RA will be retained and data in the new block will append the original. If there is more data in the new block than can be added to data already in the buffer, "OVERFLOW" will be typed and the buffer is left unchanged.
W↵	WRITE	This command causes the program to type "BLOCK NUMBER : ". The user types the block number (decimal) of tape on which data in the buffer will be written. The buffer is not affected by this command.
D↵	DELETE	This command deletes all data in the buffer.
L↵	LIST	This command causes the program to list all the data in the buffer.

EDATA = EDIT DATA (continued)

/↵	SLASH	This command causes the program to type "LAST DATA AT nn" where nn indicates the total number of data points in the buffer.
nL↵	LIST	This command causes the program to list data point n.
n,mL↵	LIST	This command causes the program to list data points n through m inclusive.
nD↵	DELETE	This command causes the program to delete data point n.
n,mD↵	DELETE	This command causes the program to delete data points n through m inclusive.
nC↵	CHANGE	This command causes the program to change data point n. Additional data points (after the first which replaces point n) are added after n. After the desired changes are completed, this command must be terminated by "CTRL/FORM".
nI↵	INSERT	This command causes the program to insert data point n. Similar to CHANGE - after this command data is typed in to be inserted starting at point n. Data inserted will appear before the data point previously at n. This command must be terminated with "CTRL/FORM".
A↵	APPEND	After this command, data is accepted to be added after data already in the file. This command must be terminated by "CTRL/FORM".

CTRL/C	This command returns control to the tape Monitor.

The commands CHANGE, INSERT, and APPEND terminate automatically when the buffer becomes full and the program types "BLOCK FULL".

An error in the format of a command causes the program to type "??" carriage return, line feed.

After the completion of any command, the bell will ring and the program waits for a new command.

```
EDATA ↵                                  /Call program

STD BLOCKS ? Y                           /Yes
R ↵                                      /Read data block

BLOCK NUMBER : 10                        /# 10

/ ↵                                      /List last line #

LAST DATA AT + 19

19L ↵                                    /List line #19
+0.8999999E+01

RA ↵                                     /Read and append

BLOCK NUMBER : 11                        /Read data block #11

/ ↵                                      /List last line #

LAST DATA AT + 38

38L ↵                                    /List line #38
+0.1899999E+02

38C ↵                                    /Change line #38
20 21 (CTRL/FORM)                        /and add a new line
/ ↵                                      /List last line #

LAST DATA AT + 39

37L ↵                                    /List line #37
+0.1800000E+02

37D ↵                                    /Delete line #37

36,38L ↵                                 /List lines #36 through #38
+0.1700000E+02
+0.2000000E+02
+0.2100000E+02

A ↵                                      /Append
22 23 24 25 ↵                            /Block filled, terminates automatically
BLOCK FULL
38,42L ↵                                 /List lines #38 through #42
+0.2100000E+02
+0.2199999E+02
+0.2300000E+02
+0.2400000E+02
+0.2500000E+02
```

```
/↵                                  /List last line #

LAST DATA AT + 42

43L??                               /Error, line #43 does not exist
41I↵                                /Insert line #41

BLOCK FULL                          /Block already full
41D↵                                /Delete line #41

41I↵                                /Insert a new line #41
635↵
BLOCK FULL                          /Block filled, terminates automatically
/L??                                /Error, illegal command
/↵                                  /List last line #

LAST DATA AT + 42

42L↵                                /List line #42
+0.2500000E+02

1,3L↵                               /List lines #1 through #3
+0.1000000E+01
+0.2000000E+01
+0.3000000E+01

4,40D↵                              /Delete lines #4 through #40

L↵                                  /List all data
+0.1000000E+01
+0.2000000E+01
+0.3000000E+01
+0.6349999E+03
+0.2500000E+02

W↵                                  /Write on data tape

BLOCK NUMBER : 18↵                  /At block #

RA↵                                 /Read append

BLOCK NUMBER : 18↵                  /Read data block #18

L↵                                  /List all data
+0.1000000E+01
+0.2000000E+01
+0.3000000E+01
+0.6349999E+03
+0.2500000E+02
+0.1000000E+01
+0.2000000E+01
+0.3000000E+01
+0.6349999E+03
+0.2500000E+02

1D↵                                 /Delete line #1

W↵                                  /Write on data tape

BLOCK NUMBER : 19↵                  /At block #19
```

```
2C ↵                                    /Change line #2
2 3 4 CTRL/FORM)                        /and add two new lines
1,5L ↵                                  /List lines #1 through #5
+0.2000000E+01
+0.2000000E+01
+0.3000000E+01
+0.4000000E+01
+0.6349999E+03

5,12D??                                 /Delete lines #5 through #12
/ ↵                                     /List last line #
LAST DATA AT + 11

5,11D ↵                                 /Delete lines #5 through #11

W ↵                                     /Write on data tape

BLOCK NUMBER : 30 ↵                     /At block #30
W ↵                                     /Write on data tape

BLOCK NUMBER : 31 ↵                     /At block #31

D ↵                                     /Delete all data in buffer

/ ↵                                     /List last line #

LAST DATA AT +

A ↵                                     /Append
1 1.5 2 4 6 8 9 ↵
11 11 13 14 (CTRL/FORM)
W ↵                                     /Write on data tape

BLOCK NUMBER : 32 ↵                     /At block #32

A ↵                                     /Append
16 16.5 17 18 (CTRL/FORM)
/ ↵                                     /List last line #

LAST DATA AT + 15

W ↵                                     /Write on data tape

BLOCK NUMBER : 33 ↵                     /At block #33

↑C                                      /Return control to tape Monitor
```

```
                /EDATA, EDIT DATA
                /THE FOLLOWING COMMANDS ARE POSSIBLE. EACH MUST
                /BE FOLLOWED BY A CARRIAGE RETURN.
                /"R"        READ A DATA BLOCK INTO THE CORE BUFFER
                /"RA"       READ A DATA BLOCK AND APPEND BUFFER
                /"W"        WRITE THE BUFFER ON DATA TAPE
                /"D"        DELETE ALL DATA IN THE BUFFER
                /"L"        LIST THE CONTENTS OF THE BUFFER
                /"/"        TYPE # OF LAST LINE IN BUFFER
                /"3L"       LIST LINE 3 OF BUFFER
                /"3,5L"     LIST LINES 3 THRU 5
                /"3D"       DELETE LINE 3
                /"3,5D"     DELETE LINES 3 THRU 5
                /"3C"       CHANGE LINE 3, TERMINATE CHANGE WITH CTRL/FORM
                /"3I"       INSERT A NEW LINE 3 BEFORE PRESENT LINE 3
                /           TERMINATE INSERT WITH CTRL/FORM
                /"A"        APPEND BUFFER, TERMINATE APPEND WITH CTRL/FORM
                /MOUNT DATA TAPE ON UNIT #1.  "CTRL/C" WILL RETURN
                /CONTROL TO THE MONITOR.
                *0200
0200  6046              TLS
0201  7200              CLA
0202  1063              TAD STD
0203  3464              DCA I BLL
0204  1110              TAD DOL
0205  3473              DCA I BUF1
0206  1154              TAD TXT1    /"STD BLOCKS ?"
0207  4532              JMS I TYPEP
0210  4405              JMS I 5
0211  1057              TAD 57
0212  1130              TAD MY
0213  7650              SNA CLA
0214  5232              JMP DIV
0215  1057              TAD 57
0216  1121              TAD MN
0217  7640              SZA CLA
0220  5200              JMP 200
0221  1155              TAD TXT2    /"BLOCK LENGTH (DEC) : "
0222  4532              JMS I TYPEP
0223  4405              JMS I 5
0224  1060              TAD 60
0225  7650              SNA CLA
0226  5200              JMP 200
0227  4533              JMS I UNFLP
0230  7041              CIA
0231  3464              DCA I BLL
0232  1464  DIV,        TAD I BLL
0233  7041              CIA
0234  1131              TAD M1      /M1, -1
0235  7427              7427        /LOAD MQ & DIV
0236  0003              0003        /BY 3
0237  7701              7701        /CLEAR AC & READ MQ
```

```
0240  7041            CIA
0241  3065            DCA NPB     /NPB, (-# PER BLOCK)
0242  1156  INPUT,    TAD TXT3    /"CR,LF,BELL"
0243  4532            JMS I TYPEP
0244  4405            JMS I 5
0245  1060            TAD 60
0246  7650            SNA CLA
0247  5310            JMP INVAL  /INVALID, CHECK IF L,W,R,A,/.↑C
0250  4533            JMS I UNFLP             /VALID
0251  3070            DCA LINE1  /STORE
0252  1070            TAD LINE1
0253  7041            CIA
0254  3071            DCA LINE2
0255  1057            TAD 57      /CHECK TERMINATOR
0256  1127            TAD MCOM
0257  7650            SNA CLA
0260  4345            JMS COMMA  /TERM IS A COMMA
0261  1100            TAD NUMS
0262  1071            TAD LINE2
0263  7710            SPA CLA
0264  5305            JMP ERRIN  /THIS LINE IS NOT IN THE BUFFER
0265  1057  TERM,     TAD 57
0266  1120            TAD ML
0267  7650            SNA CLA
0270  5534            JMP I LISTP             /LISTP, LIST
0271  1057            TAD 57
0272  1115            TAD MC
0273  7650            SNA CLA
0274  5535            JMP I CHANGP            /CHANGP, CHANGE
0275  1057            TAD 57
0276  1117            TAD MI
0277  7650            SNA CLA
0300  5536            JMP I INSERP            /INSERP, INSERT
0301  1057            TAD 57
0302  1116            TAD MD
0303  7650            SNA CLA
0304  5537            JMP I DELETP
0305  1157  ERRIN,    TAD TXT4    /"?? CR LF"
0306  4532            JMS I TYPEP
0307  5244            JMP INPUT+2
0310  1057  INVAL,    TAD 57
0311  1123            TAD MW
0312  7650            SNA CLA
0313  5540            JMP I WRITEP
0314  1057            TAD 57
0315  1122            TAD MR
0316  7650            SNA CLA
0317  5541            JMP I READP
0320  1057            TAD 57
0321  1114            TAD MA
0322  7650            SNA CLA
0323  5542            JMP I ADDP
0324  1057            TAD 57
```

```
0325  1126             TAD MSL
0326  7650             SNA CLA
0327  5543             JMP I SLASHP
0330  1057             TAD 57
0331  1120             TAD ML
0332  7650             SNA CLA
0333  5544             JMP I LISTAP
0334  1057             TAD 57
0335  1116             TAD MD
0336  7650             SNA CLA
0337  5356             JMP DELETA /DELETE ALL
0340  1057             TAD 57
0341  1125             TAD MCC
0342  7650             SNA CLA
0343  5472             JMP I TAPE
0344  5305             JMP ERRIN
0345  0000  COMMA,      0
0346  4405             JMS I 5
0347  1060             TAD 60
0350  7650             SNA CLA
0351  5305             JMP ERRIN
0352  4533             JMS I UNFLP
0353  7041             CIA
0354  3071             DCA LINE2  /MINUS LINE2
0355  5745             JMP I COMMA
0356  4546  DELETA,     JMS I CARETP
0357  1110             TAD DOL
0360  3473             DCA I BUF1
0361  3100             DCA NUMS
0362  5242             JMP INPUT
```

```
                *400
0400    1073    READ,   TAD BUF1
0401    3234            DCA CORER
0402    4405            JMS I 5
0403    1057            TAD 57      /IS R FOLLOWED BY A?
0404    1114            TAD MA
0405    7650            SNA CLA
0406    5216            JMP SETB2  /READ DATA IN FOLLOWING PRESENT DATA
0407    1057            TAD 57
0410    1124            TAD MCR
0411    7640            SZA CLA
0412    5545            JMP I ERRINP            /NOT A OR CR
0413    1110            TAD DOL
0414    3474            DCA I BUF2
0415    5221            JMP .+4
0416    4546    SETB2,  JMS I CARETP            /IS A FOLLOWED BY CR?
0417    1074            TAD BUF2
0420    3234            DCA CORER
0421    1160            TAD TXT5   /"BLOCK NUMBER : "
0422    4532            JMS I TYPEP
0423    4405            JMS I 5
0424    1060            TAD 60
0425    7650            SNA CLA
0426    5545            JMP I ERRINP
0427    4533            JMS I UNFLP
0430    3233            DCA BLOCKR
0431    4477            JMS I RWTAPE
0432    1201            1201
0433    0000    BLOCKR, 0000
0434    0000    CORER,  0000
0435    1075            TAD DATA
0436    4336            JMS DOLL
0437    3100            DCA NUMS
0440    1076            TAD DATA2
0441    4336            JMS DOLL
0442    3101            DCA NUMS2
0443    1065            TAD NPB
0444    1131            TAD M1
0445    1100            TAD NUMS
0446    1101            TAD NUMS2
0447    7700            SMA CLA     /SKIP IF AC<0
0450    5261            JMP .+11
0451    1100            TAD NUMS
0452    7001            IAC
0453    3067            DCA LINE
0454    1100            TAD NUMS
0455    1101            TAD NUMS2
0456    3100            DCA NUMS
0457    4357            JMS LINECT
0460    5371            JMP MOVAD+1
0461    1161            TAD TXT6   /"OVERFLOW
0462    4532            JMS I TYPEP
```

```
0463  5550            JMP I INPUTP
0464  4546  WRITE,    JMS I CARETP
0465  1160            TAD TXT5   /"BLOCK NUMBER : "
0466  4532            JMS I TYPEP
0467  4405            JMS I 5
0470  1060            TAD 60
0471  7650            SNA CLA
0472  5545            JMP I ERRINP
0473  4533            JMS I UNFLP
0474  3277            DCA BLOCKW
0475  4477            JMS I RWTAPE
0476  1401            1401
0477  0000  BLOCKW,    0000
0500  1400            1400
0501  5550            JMP I INPUTP
0502  4546  DELETE,    JMS I CARETP
0503  1070            TAD LINE1
0504  3067            DCA LINE
0505  4357            JMS LINECT
0506  1010            TAD 10
0507  3011            DCA 11
0510  1071            TAD LINE2  /MINUS LINE 2
0511  7041            CIA        /PLUS LINE 2
0512  7001            IAC
0513  3067            DCA LINE
0514  4357            JMS LINECT
0515  1410            TAD I 10
0516  1112            TAD MDOL   /END OF DATA?
0517  7450            SNA
0520  5330            JMP .+8
0521  1110            TAD DOL    /NO, RESTORE
0522  3411            DCA I 11   /MORE DATA BACK
0523  1410            TAD I 10
0524  3411            DCA I 11
0525  1410            TAD I 10
0526  3411            DCA I 11
0527  5315            JMP .-12   /(10 DEC)
0530  1110            TAD DOL
0531  3411            DCA I 11
0532  1075            TAD DATA
0533  4336            JMS DOLL
0534  3100            DCA NUMS
0535  5550            JMP I INPUTP
0536  0000  DOLL,     0          /COUNT # DATA POINTS
0537  3010            DCA 10
0540  3066            DCA NUM
0541  1410            TAD I 10
0542  1112            TAD MDOL
0543  7640            SZA CLA
0544  5347            JMP .+3
0545  1066            TAD NUM    /# OF DATA POINTS
0546  5736            JMP I DOLL
0547  2010            ISZ 10
```

```
0550  2010            ISZ 10
0551  1065            TAD NPB
0552  1066            TAD NUM
0553  7700            SMA CLA
0554  5736            JMP I DOLL
0555  2066            ISZ NUM
0556  5341            JMP DOLL+3
0557  0000  LINECT,    0
0560  1067            TAD LINE
0561  1131            TAD M1
0562  7425            7425        /MUL=MQL+MUY
0563  0003            0003
0564  7701            7701        /CLA + MQA
0565  1075            TAD DATA
0566  3010            DCA 10
0567  5757            JMP I LINECT
0570  4551  MOVAD,    JMS I SADDP
0571  1010            TAD 10
0572  3011            DCA 11
0573  1076            TAD DATA2
0574  3010            DCA 10
0575  4552            JMS I MOVEP
0576  5550            JMP I INPUTP
```

```
                *600
0600    4361    CHANGE,     JMS CARET
0601    1070                TAD LINE1  /LINE TO BE CHANGED
0602    7001                IAC
0603    3067                DCA LINE
0604    4547                JMS I LINCTP
0605    1076                TAD DATA2
0606    3011                DCA 11
0607    4236                JMS MOVE
0610    1070                TAD LINE1
0611    3067                DCA LINE
0612    1100                TAD NUMS
0613    1131                TAD M1
0614    3100                DCA NUMS
0615    5553                JMP I MOVADP
0616    4361    INSERT,     JMS CARET
0617    1070                TAD LINE1
0620    3067                DCA LINE
0621    4547                JMS I LINCTP
0622    1076                TAD DATA2
0623    3011                DCA 11
0624    4236                JMS MOVE
0625    5553                JMP I MOVADP
0626    4361    ADD,        JMS CARET
0627    1100                TAD NUMS
0630    7001                IAC
0631    3067                DCA LINE
0632    4255                JMS SADD
0633    1110                TAD DOL
0634    3410                DCA I 10
0635    5550                JMP I INPUTP
0636    0000    MOVE,       0           /FROM BUFFER 10 TO BUFF 11
0637    1410                TAD I 10
0640    1112                TAD MDOL    /END OF DATA?
0641    7450                SNA
0642    5252                JMP .+8     /YES, DEPOSIT $
0643    1110                TAD DOL     /NO, RESTORE
0644    3411                DCA I 11
0645    1410                TAD I 10
0646    3411                DCA I 11
0647    1410                TAD I 10
0650    3411                DCA I 11
0651    5237                JMP MOVE+1
0652    1110                TAD DOL
0653    3411                DCA I 11
0654    5636                JMP I MOVE
0655    0000    SADD,       0
0656    1065                TAD NPB
0657    1100                TAD NUMS
0660    7700                SMA CLA
0661    5356                JMP ERFULL
0662    4547                JMS I LINCTP
```

```
0663  4405            JMS I 5     /TAKE IN A NO.
0664  1060            TAD 60
0665  7650            SNA CLA
0666  5300            JMP .+12    /DEC 10
0667  1044            TAD 44      /VALID STORE AFTER DATA
0670  3410            DCA I 10
0671  1045            TAD 45
0672  3410            DCA I 10
0673  1046            TAD 46
0674  3410            DCA I 10
0675  2100            ISZ NUMS
0676  2067            ISZ LINE
0677  5256            JMP SADD+1
0700  1057            TAD 57
0701  1113            TAD MFORM   /END OF ADDITION ?
0702  7650            SNA CLA
0703  5655            JMP I SADD
0704  5263            JMP SADD+6
0705  4361  LIST,      JMS CARET
0706  1100            TAD NUMS
0707  1071            TAD LINE2   /IS LAST DATA POINT IN BUFFER?
0710  7710            SPA CLA
0711  5545            JMP I ERRINP
0712  1070            TAD LINE1   /LIST THE POINT
0713  3067            DCA LINE
0714  4547            JMS I LINCTP
0715  1410            TAD I 10
0716  3044            DCA 44
0717  1410            TAD I 10
0720  3045            DCA 45
0721  1410            TAD I 10
0722  3046            DCA 46
0723  4406            JMS I 6     /OUT PUT NUMBER
0724  1071            TAD LINE2   /MINUS LINE2
0725  1070            TAD LINE1
0726  7700            SMA CLA
0727  5550            JMP I INPUTP
0730  2070            ISZ LINE1
0731  5306            JMP LIST+1
0732  4361  LISTA,     JMS CARET   /LIST COMPLETE BUFFER
0733  1065            TAD NPB
0734  1131            TAD M1
0735  1100            TAD NUMS
0736  7700            SMA CLA
0737  5545            JMP I ERRINP
0740  1075            TAD DATA
0741  3010            DCA 10
0742  1410            TAD I 10
0743  1112            TAD MDOL    /END OF DATA ?
0744  7450            SNA
0745  5550            JMP I INPUTP
0746  1110            TAD DOL     /NO, RESTORE
0747  3044            DCA 44
```

```
0750  1410            TAD I 10
0751  3045            DCA 45
0752  1410            TAD I 10
0753  3046            DCA 46
0754  4406            JMS I 6     /OUTPUT
0755  5342            JMP LISTA+10
0756  1162  ERFULL,    TAD TXT7    /"BLOCK FULL "
0757  4532            JMS I TYPEP
0760  5655            JMP I SADD
0761  0000  CARET,     0
0762  4405            JMS I 5
0763  1057            TAD 57
0764  1124            TAD MCR     /CARRIAGE RETURN?
0765  7640            SZA CLA
0766  5545            JMP I ERRINP
0767  5761            JMP I CARET
```

```
                *1000
1000    0000    TYPE,       0
1001    3012                DCA 12
1002    1412                TAD I 12
1003    6041                TSF
1004    5203                JMP .-1
1005    6046                TLS
1006    7640                SZA CLA
1007    5202                JMP TYPE+2
1010    5600                JMP I TYPE
1011    4546    SLASH,      JMS I CARETP
1012    1107                TAD C3
1013    3062                DCA 62
1014    1163                TAD TXT8    /"LAST DATA AT"
1015    4532                JMS I TYPEP
1016    1100                TAD NUMS
1017    3045                DCA 45
1020    3046                DCA 46
1021    1106                TAD C13
1022    3044                DCA 44
1023    4407                JMS I 7
1024    7000                FNOR
1025    1103                FADD PT1
1026    0000                FEXT
1027    4406                JMS I 6
1030    7200                CLA
1031    3062                DCA 62
1032    5550                JMP I INPUTP
1033    0000    UNFL,       0
1034    7200                CLA
1035    1044                TAD 44
1036    7540                SZA SMA
1037    5242                JMP .+3
1040    7200                CLA
1041    5261                JMP DONE+1
1042    1111                TAD M13
1043    7450                SNA
1044    5260                JMP DONE
1045    7500                SMA
1046    5102                JMP ERROR
1047    3044                DCA 44
1050    7100    GO,         CLL
1051    1045                TAD 45
1052    7510                SPA
1053    7020                CML
1054    7010                RAR
1055    3045                DCA 45
1056    2044                ISZ 44
1057    5250                JMP GO
1060    1045    DONE,       TAD 45
1061    5633                JMP I UNFL
1062    0000    T1,         0
```

```
1063   0215              215
1064   0212              212
1065   0323              323
1066   0324              324
1067   0304              304
1070   0240              240
1071   0302              302
1072   0314              314
1073   0317              317
1074   0303              303
1075   0313              313
1076   0323              323
1077   0240              240
1100   0277              277
1101   0240              240
1102   0000   T2,         0
1103   0215              215
1104   0212              212
1105   0302              302
1106   0314              314
1107   0317              317
1110   0303              303
1111   0313              313
1112   0240              240
1113   0314              314
1114   0305              305
1115   0316              316
1116   0307              307
1117   0324              324
1120   0310              310
1121   0240              240
1122   0250              250
1123   0304              304
1124   0305              305
1125   0303              303
1126   0251              251
1127   0240              240
1130   0272              272
1131   0240              240
1132   0000   T3,         0
1133   0215              215
1134   0212              212
1135   0207              207
1136   0000   T4,         0
1137   02W7              277
1140   0277              277
1141   0215              215
1142   0212              212
1143   0000   T5,         0
1144   0215              215
1145   0212              212
1146   0302              302
1147   0314              314
```

```
1150   0317              317
1151   0303              303
1152   0313              313
1153   0240              240
1154   0316              316
1155   0325              325
1156   0315              315
1157   0302              302
1160   0305              305
1161   0322              322
1162   0240              240
1163   0272              272
1164   0240              240
1165   0000   T6,        0
1166   0215              215
1167   0212              212
1170   0317              317
1171   0326              326
1172   0305              305
1173   0322              322
1174   0306              306
1175   0314              314
1176   0317              317
1177   0327              327
1200   0000   T7,        0
1201   0215              215
1202   0212              212
1203   0302              302
1204   0314              314
1205   0317              317
1206   0303              303
1207   0313              313
1210   0240              240
1211   0306              306
1212   0325              325
1213   0314              314
1214   0314              314
1215   0000   T8,        0
1216   0215              215
1217   0212              212
1220   0314              314
1221   0301              301
1222   0323              323
1223   0324              324
1224   0240              240
1225   0304              304
1226   0301              301
1227   0324              324
1230   0301              301
1231   0240              240
1232   0301              301
1233   0324              324
1234   0240              240
```

1235 0000 0

```
                *62
0062  0000
0063  7600  STD,       -200
0064  4342  BLL,       4342
0065  0000  NPB,       0
0066  0000  NUM,       0
0067  0000  LINE,      0
0070  0000  LINE1,     0
0071  0000  LINE2,     0
0072  7600  TAPE,      7600
0073  1400  BUF1,      1400
0074  2600  BUF2,      2600
0075  1377  DATA,      1377
0076  2577  DATA2,     2577
0077  4200  RWTAPE,    4200
0100  0000  NUMS,      0
0101  0000  NUMS2,     0
0102  7402  ERROR,     HLT
0103  7775  PT1,       7775
0104  3146              3146
0105  3146              3146
0106  0013  C13,       13
0107  0003  C3,        3
0110  0244  DOL,       244
0111  7765  M13,       -13
0112  7534  MDOL,      -244
0113  7564  MFORM,     -214
0114  7477  MA,        -301
0115  7475  MC,        -303
0116  7474  MD,        -304
0117  7467  MI,        -311
0120  7464  ML,        -314
0121  7462  MN,        -316
0122  7456  MR,        -322
0123  7451  MW,        -327
0124  7563  MCR,       -215
0125  7575  MCC,       -203
0126  7521  MSL,       -257
0127  7524  MCOM,      -254
0130  7447  MY,        -331
0131  7777  M1,        -1
0132  1000  TYPEP,     TYPE
0133  1033  UNFLP,     UNFL
0134  0705  LISTP,     LIST
0135  0600  CHANGP,    CHANGE
0136  0616  INSERP,    INSERT
0137  0502  DELETP,    DELETE
0140  0464  WRITEP,    WRITE
0141  0400  READP,     READ
0142  0626  ADDP,      ADD
0143  1011  SLASHP,    SLASH
0144  0732  LISTAP,    LISTA
```

```
0145   0305   ERRINP,     ERRIN
0146   0761   CARETP,     CARET
0147   0557   LINCTP,     LINECT
0150   0242   INPUTP,     INPUT
0151   0655   SADDP,      SADD
0152   0636   MOVEP,      MOVE
0153   0570   MOVADP,     MOVAD
0154   1062   TXT1,       T1
0155   1102   TXT2,       T2
0156   1132   TXT3,       T3
0157   1136   TXT4,       T4
0160   1143   TXT5,       T5
0161   1165   TXT6,       T6
0162   1200   TXT7,       T7
0163   1215   TXT8,       T8
```

ADD 0626
ADDP 0142
BLL 0064
BLOCKR 0433
BLOCKW 0477
BUF1 0073
BUF2 0074
CARET 0761
CARETP 0146
CHANGE 0600
CHANGP 0135
COMMA 0345
CORER 0434
C13 0106
C3 0107
DATA 0075
DATA2 0076
DELETA 0356
DELETE 0502
DELETP 0137
DIV 0232
DOL 0110
DOLL 0536
DONE 1060
ERFULL 0756
ERRIN 0305
ERRINP 0145
ERROR 0102
GO 1050
INPUT 0242
INPUTP 0150
INSERP 0136
INSERT 0616
INVAL 0310
LINCTP 0147
LINE 0067
LINECT 0557
LINE1 0070
LINE2 0071
LIST 0705
LISTA 0732
LISTAP 0144
LISTP 0134
MA 0114
MC 0115
MCC 0125
MCOM 0127
MCR 0124
MD 0116
MDOL 0112
MFORM 0113
MI 0117

```
ML          0120
MN          0121
MOVAD       0570
MOVADP      0153
MOVE        0636
MOVEP       0152
MR          0122
MSL         0126
MW          0123
MY          0130
M1          0131
M13         0111
NPB         0065
NUM         0066
NUMS        0100
NUMS2       0101
PT1         0103
READ        0400
READP       0141
RWTAPE      0077
SADD        0655
SADDP       0151
SETB2       0416
SLASH       1011
SLASHP      0143
STD         0063
TAPE        0072
TERM        0265
TXT1        0154
TXT2        0155
TXT3        0156
TXT4        0157
TXT5        0160
TXT6        0161
TXT7        0162
TXT8        0163
TYPE        1000
TYPEP       0132
T1          1062
T2          1102
T3          1132
T4          1136
T5          1143
T6          1165
T7          1200
T8          1215
UNFL        1033
UNFLP       0133
WRITE       0464
WRITEP      0140
```

SDT = STANDARD DEVIATION

PURPOSE: This is a program to calculate Mean and Standard Deviation from data files stored on DECtape data tape. The output consists of:

1. Sample Size N.
2. Sample Mean.
3. Sample Variance.
4. Sample Standard Deviation.
5. Standard Error of the Mean.

OPERATION: When SDT is called, it will type "READ LINES : ". The user may input specific lines of data blocks and terminate this input with "CTRL/FORM" or he may type "A" for all if complete data files are to be used. The program will then ask "BLOCK NUMBERS : " and the user should input block numbers terminated by "CTRL/FORM". After the input of block numbers, the program will proceed through calculation and output, and return to "READ LINES : " unless this request has previously been answered by "A" in which case the program will start at "BLOCK NUMBERS : ".

DESCRIPTION: SDT will accommodate data tapes with standard length (129_{10}) or shorter block length since it reads standard length blocks and takes the "$" as the end of a data file.

SDT is a two-pass program. On the first pass, data is summed and counted. The Mean is calculated before pass 2. During pass 2 the Sum of Squared Deviations from the Mean is computed. This is the most accurate method of computation for large numbers of large data. The program reads data tape in order (from the smallest block numbers to the largest during pass 1, and from the largest to the smallest during pass 2) so as to minimize tape spinning.

SDT = STANDARD DEVIATION (continued)

Calculations used in this program are as follows :

N = the number of data points operated on.

$$\text{MEAN} = \frac{\Sigma x}{N} = \bar{x}$$

$$\text{SAMPLE VARIANCE} = \frac{\Sigma (x - \bar{x})^2}{(N - 1)}$$

$$\text{SAMPLE STANDARD DEVIATION} = \sqrt{\frac{\Sigma (x - \bar{x})^2}{(N - 1)}}$$

$$\text{STANDARD ERROR of MEAN} = \sqrt{\frac{\Sigma (x - \bar{x})^2}{(N - 1)}}$$

SDT 2 /Call program

READ LINES : 1 3,6 (CTRL/FORM) /Read lines 1,3,4,5,6

BLOCK NUMBERS : 20 10,13 32 18 (CTRL/FORM) /of these block #'s

N : 32

MEAN : +0.2412500E+02 SAMP. VAR. : +0.1244352E+05

SEM : +0.2003506E+02 SAMP. DEV. : +0.1115505E+03

READ LINES : 1,4 (CTRL/FORM) /Read lines #1 through #4

BLOCK NUMBERS : 20 32 10,13 18 (CTRL/FORM) /of these block #'s

N : 28

MEAN : +0.2512499E+02 SAMP. VAR. : +0.1428743E+05

SEM : +0.2300356E+02 SAMP. DEV. : +0.1195300E+03

READ LINES : A /Read all of

BLOCK NUMBERS : 10,13 (CTRL/FORM) /these block #'s

N : 48

MEAN : +0.6770832E+01 SAMP. VAR. : +0.2307397E+02

SEM : +0.7006677E+00 SAMP. DEV. : +0.4803537E+01

BLOCK NUMBERS : 30,32 1,3 (CTRL/FORM) /Read all of these block #'s

N : 1534

MEAN : +0.3316832E+569 SAMP. VAR. : +0.7187141E+446

SEM : +0.2165244E+222 SAMP. DEV. : +0.8477693E+223

BLOCK NUMBERS : 15,20 30,32 (CTRL/FORM) /Read all of these block #'

N : 127

MEAN : +0.1975984E+02 SAMP. VAR. : +0.9250204E+04

SEM : +0.8568212E+01 SAMP. DEV. : +0.9617798E+02

BLOCK NUMBERS : ↑C /Return control to tape Monitor

```
                /SDT, MEAN AND SAMPLE DEVIATION
                /MOUNT DATA TAPE ON UNIT #1
                /TERMINATE LINE OR BLOCK #'S INPUT
                /WITH CTRL-FORM.  TO READ COMPLETE
                /BLOCKS RESPOND TO "READ LINES : " WITH "A"
                *200
0200  6046  START,    TLS
0201  4403            JMS I MESS /READ LINES :
0202  4543            4543
0203  4322            4322
0204  0501            0501
0205  0440            0440
0206  1411            1411
0207  1605            1605
0210  2340            2340
0211  7240            7240
0212  0000            0000
0213  1073            TAD LTAB
0214  4553            JMS I LOADP
0215  1065            TAD SETSW
0216  3063            DCA SW      /COMPLETE BLOCK SWITCH
0217  1074            TAD NUM
0220  7041            CIA
0221  3075            DCA NL      /MINUS # OF LINES
0222  4403  BLOAD,    JMS I MESS /BLOCK NUMBERS :
0223  4543            4543
0224  4302            4302
0225  1417            1417
0226  0313            0313
0227  4016            4016
0230  2515            2515
0231  0205            0205
0232  2223            2223
0233  4072            4072
0234  4000            4000
0235  1076            TAD BTAB
0236  4553            JMS I LOADP
0237  1074            TAD NUM
0240  7041            CIA
0241  3077            DCA NB      /MINUS # OF BLOCKS
0242  4407            JMS I 7
0243  5121            FGET ZERO   /CLEAR
0244  6135            FPUT FN
0245  6127            FPUT SUMX
0246  6132            FPUT SUMX2
0247  0000            FEXT
0250  3064            DCA SWID    /CLEAR, INCREASING ORDER
0251  4551            JMS I ORDERP          /ORDER BLOCK #'S
0252  4544            JMS I RTP   /READ TAPE
0253  4545            JMS I RBP   /READ ONE LINE OF BUFFER
0254  4546            JMS I SUMP
0255  5253            JMP .-2
```

```
0256  2110          ISZ CNTR
0257  5252          JMP .-5
0260  4407          JMS I 7     /CALCULATE MEAN
0261  5127          FGET SUMX
0262  4135          FDIV FN
0263  6124          FPUT MEAN
0264  0000          FEXT
0265  2064          ISZ SWID
0266  4551          JMS I ORDERP          /REVERSE BLOCK #'S
0267  4544          JMS I RTP
0270  4U45          JMS I RBP
0271  4547          JMS I SUMSQP
0272  5270          JMP .-2
0273  2110          ISZ CNTR
0274  5267          JMP .-5
```

```
0275  4403          JMS I MESS /N :
0276  4543          4543
0277  4343          4343
0300  1640          1640
0301  4040          4040
0302  4072          4072
0303  4040          4040
0304  0000          0000
0305  4407          JMS I 7
0306  5135          FGET FN
0307  0000          FEXT
0310  4550          JMS I OUT4P
0311  4403          JMS I MESS / MEAN :
0312  4543          4543
0313  4315          4315
0314  0501          0501
0315  1640          1640
0316  7240          7240
0307  4000          4000
0320  4407          JMS I 7
0321  5124          FGET MEAN
0322  0000          FEXT        /MEAN
0323  4406          JMS I 6
0324  4403          JMS I MESS / SAMP. VAR. :
0325  4040          4040
0326  4040          4040
0327  4040          4040
0330  4040          4040
0331  2301          2301
0332  1520          1520
0333  5640          5640
0334  2601          2601
0335  2256          2256
0336  4072          4072
0337  4040          4040
0340  0000          0000
0341  4407          JMS I 7
0342  5135          FGET FN
0343  2113          FSUB ONE
0344  6135          FPUT FN     /N-1
0345  5132          FGET SUMX2
0346  4135          FDIV FN
0347  6140          FPUT FTEMP
0350  0000          FEXT        /SUM X2(N-1)
0351  4406          JMS I 6
0352  4403          JMS I MESS / SEM    :
0353  4543          4543
0354  4323          4323
0355  0515          0515
0356  4040          4040
0357  7240          7240
0360  4000          4000
```

```
0361  4407          JMS I 7
0362  5132          FGET SUMX2
0363  0002          SQROOT
0364  4135          FDIV FN
0365  0000          FEXT       /SQROOT(SUMX2)/(N-1)
0366  4406          JMS I 6
0367  4403          JMS I MESS / SAMP. DEV. :
0370  4040          4040
0371  4040          4040
0372  4040          4040
0373  4040          4040
0374  2301          2301
0375  1520          1520
0376  5640          5640
0377  0405          0405
0400  2656          2656
0401  4072          4072
0402  4040          4040
0403  0000          0000
0404  4407          JMS I 7
0405  5140          FGET FTEMP
0406  0002          SQROOT
0407  0000          FEXT       /SQROOT(SUMX2/(N-1))
0410  4406          JMS I 6
0411  4403          JMS I MESS /%######
0412  4543          4543
0413  4343          4343
0414  4343          4343
0415  4300          4300
0416  1063          TAD SW
0417  7650          SNA CLA
0420  5543          JMP I STARTP
0421  5552          JMP I BLOADP          /FOR COMPLETE BLOCKS
```

```
0422  0000  LOAD,    0           /LOAD TABLE STARTING AT I 10
0423  3010            DCA 10
0424  3074            DCA NUM
0425  3065            DCA SETSW
0426  4405            JMS I 5
0427  1060            TAD 60
0430  7650            SNA CLA
0431  5263            JMP TERM    /INVALID, CHECK TERMINATOR
0432  4404            JMS I UNFL
0433  3100            DCA TEMP1
0434  1100            TAD TEMP1
0435  3410            DCA I 10    /DEPOSIT IN TABLE
0436  2074            ISZ NUM     /COUNT #'S IN TABLE
0437  1057            TAD 57
0440  1102            TAD MCOM
0441  7640            SZA CLA
0442  5226            JMP LOAD+4 /NOT A COMMA
0443  4405            JMS I 5     /COMMA, SET TABLE
0444  1060            TAD 60
0445  7650            SNA CLA
0446  5243            JMP .-3     /INVALID TRY AGAIN
0447  4404            JMS I UNFL
0450  7041            CIA
0451  3101            DCA TEMP2  /MINUS 2ND #
0452  1100            TAD TEMP1
0453  1101            TAD TEMP2
0454  7700            SMA CLA
0455  5226            JMP LOAD+4 /SET, GET NEXT #
0456  2100            ISZ TEMP1
0457  1100            TAD TEMP1
0460  3410            DCA I 10
0461  2074            ISZ NUM
0462  5252            JMP .-10
0463  1057  TERM,     TAD 57
0464  1066            TAD MCC
0465  7650            SNA CLA
0466  5467            JMP I TAPE
0467  1057            TAD 57
0470  1103            TAD MFORM
0471  7650            SNA CLA
0472  5622            JMP I LOAD /END OF TABLE
0473  1057            TAD 57
0474  1070            TAD MA
0475  7640            SZA CLA
0476  5226            JMP LOAD+4 /NOT END OF TABLE
0477  2065            ISZ SETSW
0500  5622            JMP I LOAD
0501  0000  RT,       0
0502  1410            TAD I 10
0503  3310            DCA BLOCK
0504  1106            TAD DATA
0505  3012            DCA 12      /SET INDEX FOR READING BUFFER
```

```
0506  4402            JMS I RWTAPE
0507  1201            1201
0510  0000  BLOCK,     0
0511  1000            1000        /READ DATA INTO 1000
0512  1063            TAD SW
0513  7640            SZA CLA
0514  5701            JMP I RT    /DO NOT SELECT PARTIAL BLOCKS
0515  1073            TAD LTAB
0516  3013            DCA 13      /LINE TABLE
0517  1075            TAD NL      /MINUS # OF LINES
0520  3345            DCA CNT
0521  1413  SET,      TAD I 13    /LINE NUMBER
0522  1107            TAD M1
0523  7425            7425        /MUY
0524  0003            0003
0525  7701            7701        /CLA+MQA
0526  1106            TAD DATA
0527  3014            DCA 14      /3(LINE-1)+DATA
0530  1414            TAD I 14
0531  3412            DCA I 12
0532  1414            TAD I 14
0533  3412            DCA I 12
0534  1414            TAD I 14
0535  3412            DCA I 12
0536  2345            ISZ CNT
0537  5321            JMP SET
0540  1104            TAD DOL
0541  3412            DCA I 12
0542  1106            TAD DATA
0543  3012            DCA 12      /SET INDEX
0544  5701            JMP I RT
0545  0000  CNT,      0
            *600
0600  0000  SUM,      0
0601  4407            JMS I 7
0602  1127            FADD SUMX
0603  6127            FPUT SUMX
0604  5113            FGET ONE
0605  1135            FADD FN
0606  6135            FPUT FN
0607  0000            FEXT
0610  5600            JMP I SUM
0611  0000  SUMSQ,     0
0612  4407            JMS I 7
0613  2124            FSUB MEAN
0614  0001            SQUARE
0615  1132            FADD SUMX2
0616  6132            FPUT SUMX2
0617  0000            FEXT
0620  5611            JMP I SUMSQ
0621  0000  RB,        0
0622  1221            TAD RB
0623  1240            TAD C2
```

```
0624  3241            DCA BEND
0625  1412            TAD I 12
0626  1105            TAD MDOL
0627  7450            SNA
0630  5641            JMP I BEND /END OF BLOCK
0631  1104            TAD DOL    /RESTORE
0632  3044            DCA 44
0633  1412            TAD I 12
0634  3045            DCA 45
0635  1412            TAD I 12
0636  3046            DCA 46
0637  5621            JMP I RB
0640  0002  C2,       2
0641  0000  BEND,     0
```

```
0642  0000  ORDER,    0
0643  1077            TAD NB
0644  3110            DCA CNTR
0645  1076            TAD BTAB
0646  3010            DCA 10
0647  3111            DCA NINV    /# OF INVERSIONS
0650  2110            ISZ CNTR
0651  7410            SKP
0652  5273            JMP TEST+6
0653  1410            TAD I 10
0654  3100            DCA TEMP1
0655  1410            TAD I 10
0656  3101            DCA TEMP2
0657  1064            TAD SWID    /INCREASE/DECREASE SWITCH
0660  7640            SZA CLA
0661  5303            JMP DEC
0662  1100            TAD TEMP1
0663  7041            CIA
0664  1101            TAD TEMP2
0665  7710  TEST,     SPA CLA
0666  5307            JMP INVERT
0667  1010            TAD 10
0670  1107            TAD M1
0671  3010            DCA 10      /SET INDEX BACK 1
0672  5250            JMP ORDER+6
0673  1111            TAD NINV
0674  7640            SZA CLA
0675  5243            JMP ORDER+1
0676  1077            TAD NB      /ORDER ACHIEVED
0677  3110            DCA CNTR
0700  1076            TAD BTAB
0701  3010            DCA 10      /SET INDICES
0702  5642            JMP I ORDER
0703  1101  DEC,      TAD TEMP2
0704  7041            CIA
0705  1100            TAD TEMP1
0706  5265            JMP TEST
0707  1010  INVERT,   TAD 10
0710  1112            TAD M2
0711  3010            DCA 10
0712  1101            TAD TEMP2
0713  3410            DCA I 10
0714  1100            TAD TEMP1
0715  3410            DCA I 10
0716  2111            ISZ NINV
0717  5267            JMP TEST+2
0720  0000  OUTT,     0           /OUTPUT MAX OF 4 DIGITS, NO SIGN
0721  4407            JMS I 7
0722  1116            FADD PT1
0723  0000            FEXT
0724  1341            TAD C4
0725  3062            DCA 62
```

```
0726  3737            DCA I FP1
0727  3740            DCA I FP2
0730  4406            JMS I 6
0731  1342            TAD C253    /RESTORE FLOATING POINT
0732  3737            DCA I FP1
0733  1240            TAD C2
0734  3W40            DCA I FP2
0735  3062            DCA 62
0736  5720            JMP I OUT4
0737  7327  FP1,       7327
0740  7330  FP2,       7330
0741  0004  C4,        4
0742  0253  C253,      253
```

```
                *62
0062    0000            0
0063    0000    SW,     0
0064    0000    SWID,   0
0065    0000    SETSW,  0
0066    7575    MCC,    -203
0067    7600    TAPE,   7600
0070    7477    MA,     -301
0071    7447    MY,     -331
0072    7462    MN,     -316
0073    1177    LTAB,   1177
0074    0000    NUM,    0
0075    0000    NL,     0
0076    1377    BTAB,   1377
0077    0000    NB,     0
0100    0000    TEMP1,  0
0101    0000    TEMP2,  0
0102    7524    MCOM,   -254
0103    7564    MFORM,  -214
0104    0244    DOL,    244
0105    7534    MDOL,   -244
0106    0777    DATA,   0777
0107    7777    M1,     -1
0110    0000    CNTR,   0
0111    0000    NINV,   0
0112    7776    M2,     -2
0113    0001
0114    2000
0115    0000    ONE,    1;2000;0
0116    7775
0117    3146
0120    3146    PT1,    7775;3146;3146
0121    0000
0122    0000
0123    0000    ZERO,   0;0;0
0124    0000
0125    0000
0126    0000    MEAN,   0;0;0
0127    0000
0130    0000
0131    0000    SUMX,   0;0;0
0132    0000
0133    0000
0134    0000    SUMX2,  0;0;0
0135    0000
0136    0000
0137    0000    FN,     0;0;0
0140    0000
0141    0000
0142    0000    FTEMP,  0;0;0
0143    0200    STARTP, START
0144    0501    RTP,    RT
```

```
0145   0621   RBP,        RB
0146   0600   SUMP,       SUM
0147   0611   SUMSQP,     SUMSQ
0150   0720   OUT4P,      OUT4
0151   0642   ORDERP,     ORDER
0152   0222   BLOADP,     BLOAD
0153   0422   LOADP,      LOAD
              *7341
7341   0000               0
7342   0000               0
              MESS=3
              RWTAPE=2
              UNFL=4
              SQUARE=1
              SQROOT=2
```

BEND	0641
BLOAD	0222
BLOADP	0152
BLOCK	0510
BTAB	0076
CNT	0545
CNTR	0110
C2	0640
C253	0742
C4	0741
DATA	0106
DEC	0703
DOL	0104
FN	0135
FP1	0737
FP2	0740
FTEMP	0140
INVERT	0707
LOAD	0422
LOADP	0153
L TAB	0073
MA	0070
MCC	0066
MCOM	0102
MDOL	0105
MEAN	0124
MESS	0003
MFORM	0103
MN	0072
MY	0071
M1	0107
M2	0112
NB	0077
NINV	0111
NL	0075
NUM	0074
ONE	0113
ORDER	0642
ORDERP	0151
OUT4	0720
OUT4P	0150
PT1	0116
RB	0621
RBP	0145
RT	0501
RTP	0144
RWTAPE	0002
SET	0521
SETSW	0065
SQROOT	0002
SQUARE	0001
START	0200

```
STARTP   0143
SUM      0600
SUMP     0146
SUMSQ    0611
SUMSQP   0147
SUMX     0127
SUMX2    0132
SW       0063
SWID     0064
TAPE     0067
TEMP1    0100
TEMP2    0101
TERM     0463
TEST     0665
UNFL     0004
ZERO     0121
```

FORT = F OR T
ANALYSIS OF VARIANCE

PURPOSE: This program calculates an analysis of variance table similar to DECUS NO. 5/8-9 using data files stored on DECtape data tape. The output is :

A. For each sample
   1. Sample size
   2. Sample mean
   3. Sample variance
   4. Sample standard deviation

B. Grand Mean

C. Analysis of Variance Table
   1. Total sum of squares of deviations from the grand mean
   2. Total degrees of freedom
   3. Total variance
   4. The pooled sum of squares of deviations of sample values from sample means
   5. Degrees of freedom within groups
   6. Variance within groups
   7. Weighted sum of squares of sample means about the grand mean
   8. Degrees of freedom between samples
   9. Variance between samples
   10. F, the ratio of the variance between samples to the variance within samples if there are more than two groups of inputs
   11. T, the square root of F in case there are only two groups input

FORT = F OR T (continued)

OPERATION: When called FORT will type "READ LINES : ". The user will answer by typing line numbers of data to be operated on terminated by "CTRL/FORM". The user may reply to "READ LINES : " by typing "A" indicating all. In this case FORT will read complete data blocks instead of selected lines. Once the instruction "A" has been given the program will only demand "BLOCK NUMBERS : " unless the program is restarted.

After "READ LINES : " FORT will type "BLOCK NUMBERS : ". The user then types the block numbers of blocks on data tape containing the desired data terminated by "CTRL/FORM" with the exception that the last group of block numbers is terminated by "$". After completion the program will restart at "READ LINES : " unless this request has been answered by "A" in which case the program will restart at "BLOCK NUMBERS : ".

DESCRIPTION: FORT will accommodate data tapes with standard (129_{10}) or shorter block length. After each set of line and block numbers FORT performs an ordered, two pass calculation of Sample Mean, Variance and Sample Standard Deviation similar to that done by SDT. A cumulative sum and count of data points is kept so that the Grand Mean is calculated immediately after the last sample input. A third pass of the data tape is done in which all data blocks are read in order of increasing block numbers and the Grand Mean is subtracted from each data point in order to calculate the total sum of squares of deviations from the Grand Mean.

FORT = F OR T (continued)

Calculations performed by this program are as follows:

A. For each sample

1. Sample size = N or Nsample
2. Sample mean = $\frac{\Sigma x}{N} = \bar{x}$
3. Sample variance = $\frac{\Sigma(x - \bar{x})^2}{N-1}$
4. Sample standard deviation = $\sqrt{\frac{\Sigma(x - \bar{x})^2}{N-1}}$

B. Grand Mean = $(\frac{\Sigma x}{N})$Total = $\bar{x}_G$

C. Analysis of Variance Table

1. Total sum of squares = $\Sigma(x - \bar{x}_G)^2$Total
2. Total degrees of freedom = NTotal - 1
3. Total variance = $\frac{\Sigma(x - \bar{x}_G)^2}{NTotal-1}$
4. Within samples sum of squares = $\Sigma\{\Sigma(x - \bar{x})^2\}$
   = Sum of Sum of squares of individual samples
5. Within samples degrees of freedom = Σ(Nsample -1)
   = NTotal - # of samples
6. Within samples variance = $\frac{\Sigma\{\Sigma(x - \bar{x})^2\}}{\Sigma(Nsample-1)}$
7. Between samples sum of squares = Total sum of squares - within samples sum of squares
8. Between samples degrees of freedom = Total degrees of freedom - Within samples degrees of freedom
9. Between samples variance = Between samples sum of squares/Between samples degrees of freedom

FORT = F OR T (continued)

10. F ratio = Between samples variance/Within sample variance

11. T ratio = $+\sqrt{\text{F ratio}}$

FORT 2

READ LINES : 2,10 14 (CTRL/FORM) /Read lines #2 through #10 and #14

BLOCK NUMBERS : 40,42 44 (CTRL/FORM) /of these block #'s (first group)

SIZE	MEAN	VARIANCE	SAMP. DEV.
40	+0.6754997E+01	+0.1150969E+02	+0.3392593E+01

BLOCK NUMBERS : 60 62,64 43 (CTRL/FORM) /And these block #'s (second group)

SIZE	MEAN	VARIANCE	SAMP. DEV.
50	+0.6679993E+01	+0.9989767E+01	+0.3160659E+01

BLOCK NUMBERS : 61 43 $ /And these block #'s
/(third and last group)

SIZE	MEAN	VARIANCE	SAMP. DEV.
20	+0.6669998E+01	+0.1062640E+02	+0.3259816E+01

GRAND MEAN = +0.6705441E+01

ANALYSIS OF VARIANCE TABLE :

SOURCE	SUM OF SQUARES	DF	VARIANCE
TOTAL :	+0.1140429E+04	109	+0.1046266E+02
WITHIN SAMPLES :	+0.1140278E+04	107	+0.1065680E+02
BETWEEN SAMPLES :	+0.1518554E+00	2	+0.7592773E-01

F RATIO : BETWEEN/WITHIN = +0.7124811E-02

```
READ LINES : A                          /Read all of
BLOCK NUMBERS : 44 40,43 (CTRL/FORM)  /These block #'s  (first group)
SIZE      MEAN              VARIANCE          SAMP. DEV.
  75      +0.7963994E+01    +0.1843903E+02    +0.4294069E+01
BLOCK NUMBERS : 60,64 $               /And these block #'s (second and last group)
SIZE      MEAN              VARIANCE          SAMP. DEV.
  75      +0.7950658E+01    +0.1773678E+02    +0.4211506E+01

GRAND MEAN = +0.7957315E+01
ANALYSIS OF VARIANCE TABLE :
SOURCE              SUM OF SQUARES        DF      VARIANCE
TOTAL :             +0.2677009E+04        149     +0.1796650E+02
WITHIN SAMPLES :    +0.2677010E+04        148     +0.1808790E+02
BETWEEN SAMPLES :   -0.1464843E-02          1     -0.1464843E-02
T = +0.8999148E-02                  WITH DF =  148


BLOCK NUMBERS : ↑C                    /Return control to tape Monitor
```

```
                / FORT, ANALYSIS OF VARIANCE
                /MOUNT DATA TAPE ON UNIT #1. TERMINATE GROUPS
                /OF BLOCK #'S BY CTRL-FORM EXCEPT FOR LAST
                /GROUP. TERMINATE LAST GROUP BY $
                *200
0 200   1200   CALCP,     CALC
0 201   0600   LOADP,     LOAD
0 202   7447   MY,        -331
0 203   7462   MN,        -316
0 204   6046   START,     TLS
0 205   4403              JMS I MESS
0 206   4543              4543          /%#
0 207   4322              4322          /#R
0 210   0501              0501          /EA
0 211   0440              0440          /D
0 212   1411              1411          /LI
0 213   1605              1605          /NE
0 214   2340              2340          /S
0 215   7240              7240          /:
0 216   0000              0000
0 217   1064              TAD LTABLE
 0220   3010              DCA 10
0 221   4601              JMS I LOADP
 0222   1072              TAD NB
0 223   7041              CIA
0 224   3073              DCA NL        /MINUS # OF LINES
0 225   1030              TAD SETSW
 0226   3075              DCA SW1       /COMPLETE BLOCK SWITCH
0 227   4407   CL,        JMS I 7
0 230   5120              FGET ZERO     /CLEAR
0 231   6123              FPUT FNG      /# OF GROUPS
0 232   6131              FPUT SUMT     /TOTAL OF ALL X'S
0 233   6137              FPUT FNT      /TOTAL # OF X'S
0 234   6156              FPUT SSW      /SUM OF SQUARES WITHIN GROUPS
0 235   0000              FEXT
0 236   3074              DCA TNB       /CLEAR TOTAL # OF BLOCKS
0 237   4403   BLOAD,     JMS I MESS
0 240   4543              4543          /%#
0 241   4302              4302          /#B
0 242   1417              1417          /LO
0 243   0313              0313          /CK
0 244   4016        @     4016          / N
0 245   2515              2515          /UM
0 246   0205              0205          /BE
0 247   2223              2223          /RS
 0250   4072              4072          / :
0 251   4000              4000
0 252   1063              TAD BTABLE
0 253   1074              TAD TNB
0 254   3010              DCA 10
0 255   4601              JMS I LOADP
0 256   4600              JMS I CALCP
```

```
0257  1076          TAD SW2     /LAST GROUP SWITCH
0260  7650          SNA CLA
0261  5237          JMP BLOAD   /GET NEXT GROUP OF BLOCK #'S
0262  4403          JMS I MESS
0263  4543          4543        /%#
0264  4343          4343        /##
0265  0722          0722        /GR
0266  0116          0116        /AN
0267  0440          0440        /D
0270  1505          1505        /ME
0271  0116          0116        /AN
0272  4075          4075        / =
0273  4000          4000
0274  4407          JMS I 7
0275  5120          FGET ZERO   /CLEAR
0276  6161          FPUT SUM2
0277  5131          FGET SUMT
0300  4137          FDIV FNT
0301  6142          FPUT MEAN
0302  0000          FEXT
0303  4406          JMS I 6     /GRAND MEAN
0304  4403          JMS I MESS
0305  4543          4543        /%#
0306  4301          4301        /#A
0307  1601          1601        /NA
0310  1431          1431        /LY
0311  2311          2311        /SI
0312  2340          2340        /S
0313  1706          1706        /OF
0314  4026          4026        / V
0315  0122          0122        /AR
0316  1101          1101        /IA
0317  1603          1603        /NC
0320  0540          0540        /E
0321  2401          2401        /TA
0322  0214          0214        /BL
0323  0540          0540        /E
0324  7245          7245        /:%
0325  4343          4343        /##
0326  2317          2317        /SO
0327  2522          2522        /UR
0330  0305          0305        /CE
0331  4040          4040
0332  4040          4040
0333  4040          4040
0334  4040          4040
0335  4040          4040
0336  4040          4040
0337  4023          4023        / S
0340  2515          2515        /UM
0341  4017          4017        / 0
0342  0640          0640        /F
0343  2321          2321        /SQ
```

```
0344  2501        2501        /UA
0345  2205        2205        /RE
0346  2340        2340        /S
0347  4040        4040
0350  4040        4040
0351  4040        4040
0352  4004        4004        / D
0353  0640        0640        /F
0354  4040        4040
0355  4040        4040
0356  4026        4026        / V
0357  0122        0122        /AR
0360  1101        1101        /IA
0361  1603        1603        /NC
0362  0545        0545        /E%
0363  4343        4343        /##
0364  2417        2417        /TO
0365  2401        2401        /TA
0366  1440        1440        /L
0367  7240        7240        /:
0370  4040        4040
0371  4040        4040
0372  4040        4040
0373  4040        4040
0374  4040        4040
0375  4000        4000
```

```
0376  1074          TAD TNB
0377  7041          CIA
0400  3110          DCA CNTR    /MINUS TOTAL BLOCKS
0401  1063          TAD BTABLE
0402  3010          DCA 10      /SET BLOCK TABLE
0403  4505          JMS I ORDERP
0404  4500          JMS I READTP          /READ A BLOCK OF TAPE
0405  4501          JMS I READBP          /READ ONE DATA POINT
0406  4753      @   JMS I SCALCP
0407  5205          JMP .-2
0410  2110          ISZ CNTR    /BEND, END OF BUFFER
0411  5204          JMP .-5
0412  4407          JMS I 7
0413  5161          FGET SUM2   /SUM OF X'S SQUARED
0414  6153          FPUT SS     /SUM SQUARES
0415  5137          FGET FNT    /TOTAL # OF X'S
0416  2112          FSUB ONE
0417  6150          FPUT DF     /DEGREES OF FREEDOM
0420  0000          FEXT
0421  4502          JMS I OUTP /TOTAL:
0422  4403          JMS I MESS
0423  4543          4543        /%#
0424  4327          4327        /#W
0425  1124          1124        /IT
0426  1011          1011        /HI
0427  1640          1640        /N
0430  2301          2301        /SA
0431  1520          1520        /MP
0432  1405          1405        /LE
0433  2340          2340        /S
0434  7240          7240        /:
0435  4040          4040
0436  0000          0000
0437  4407          JMS I 7
0440  5156          FGET SSW    /SUM OF SQUARES WITHIN GROUPS
0441  6153          FPUT SS
0442  5137          FGET FNT
0443  2123          FSUB FNG    /# OF GROUPS
0444  6150          FPUT DF
0445  0000          FEXT
0446  4502          JMS I OUTP /WITHIN SAMPLES:
0447  4403          JMS I MESS
0450  45T3          4543        /%#
0451  4302          4302        /#B
0452  0524          0524        /ET
0453  2705          2705        /WE
0454  0516          0516        /EN
0455  4023          4023        / S
0456  0115          0115        /AM
0457  2014          2014        /PL
0460  0523          0523        /ES
0461  4072          4072        / :
```

```
0462  4040            4040
0463  0000            0000
0464  4407            JMS I 7
0465  5145            FGET FTEMP
0466  6167            FPUT MSW    /MEAN SQUARE WITHIN SAMPLES
0467  5161            FGET SUM2
0470  2156            FSUB SSW
0471  6153            FPUT SS
0472  5123            FGET FNG
0473  2112            FSUB ONE
0474  6150            FPUT DF
0475  0000            FEXT
0476  4502            JMS I OUTP /BETWEEN SAMPLES:
0477  4407            JMS I 7
0500  5145            FGET FTEMP
0501  6164            FPUT MSB    /MEAN SQUARE BETWEEN SAMPLES
0502  5123            FGET FNG
0503  2112            FSUB ONE
0504  2112            FSUB ONE
0505  0000            FEXT
0506  4404            JMS I UNFL
0507  7650            SNA CLA
0510  5750            JMP I TOUTP             /2 GROUPS, OUTPUT T
0511  5751            JMP I FOUTP             /OUTPUT F RATIO
0512  4403  END,      JMS I MESS
0513  4543            4543        /%#
0514  4343            4343
0515  4343            4343
0516  4343            4343
0517  4300            4300
0520  1075            TAD SW1
0521  7650            SNA CLA
0522  5752            JMP I STARTP
0523  5724            JMP I CLP
0524  0227  CLP,      CL
0525  0000  OUT4,     0           /OUTPUT MAX OF 4 DIGITS, NO SIGN
0526  4407            JMS I 7
0527  1115            FADD PT1
0530  0000            FEXT
0531  1346            TAD C4
0532  3062            DCA 62
0533  3744            DCA I FP1
0534  3745            DCA I FP2
0535  4406            JMS I 6
0536  1347            TAD C253    /RESTORE FLOATING POINT
0537  3744            DCA I FP1
0540  1067            TAD C2
0541  3745            DCA I FP2
0542  3062            DCA 62
0543  5725            JMP I OUT4
0544  7327  FP1,      7327
0545  7330  FP2,      7330
0546  0004  C4,       4
```

```
0 547   0253   C253,       253
0 550   1001   TOUTP,      TOUT
0 551   1040   FOUTP,      FOUT
0 552   0204   STARTP,     START
0 553   1350   SCALCP,     SCALC
```

```
                *600
0600    0000    LOAD,   0               /LOAD TABLE STARTING AT I 10
0601    3072            DCA NB
0602    3030            DCA SETSW
0603    3076            DCA SW2
0604    4405            JMS I 5
0605    1060            TAD 60
0606    7650            SNA CLA
0607    52T1            JMP TERM        /INVALID, CHECK TERMINATOR
0610    4404            JMS I UNFL
0611    3020            DCA TEMP1
0612    1020            TAD TEMP1
0613    3410            DCA I 10        /DEPOSIT IN TABLE
0614    2072            ISZ NB          /COUNT #'S DEPOSITED
0615    1057            TAD 57
0616    1023            TAD MCOM
0617    7640            SZA CLA
0620    5204            JMP LOAD+4      /NOT A COMMA, GET NEXT #
0621    4405            JMS I 5         /GET # AFTER COMMA
0622    1060            TAD 60
0623    7650            SNA CLA
0624    5221            JMP .-3         /INVALID, TRY AGAIN
0625    4404            JMS I UNFL
0626    7041            CIA
0627    3021            DCA TEMP2       /MINUS 2ND #
0630    1020            TAD TEMP1
0631    1021            TAD TEMP2
0632    7700            SMA CLA
0633    5204            JMP LOAD+4      /TABLE SET FROM 1ST TO 2ND #'S
0634    2020            ISZ TEMP1
0635    1020            TAD TEMP1
0636    3410            DCA I 10        /DEPOSIT IN TABLE
0637    2072            ISZ NB          /COUNT #'S DEPOSITED
0640    5230            JMP .-10
0641    1057    TERM,   TAD 57
0642    1066            TAD MCC
0643    7650            SNA CLA
0644    5470            JMP I TAPE      /RETURN TO TAPE SYSTEM
0645    1057            TAD 57
0646    1025            TAD MA
0647    7640            SZA CLA
0650    5253            JMP .+3
0651    2030            ISZ SETSW       /READ COMPLETE BLOCKS
0652    5600            JMP I LOAD
0653    1057            TAD 57
0654    1024            TAD MFORM
0655    7650            SNA CLA
0656    5600            JMP I LOAD
0657    1057            TAD 57
0660    1106            TAD MDOL
0661    7640            SZA CLA
0662    5204            JMP LOAD+4      /INVALID TERM., GET NEXT #
```

```
0663  2076            ISZ SW2     /LAST GROUP
0664  5600            JMP I LOAD
0665  0000  ORDER,     0           /PUT TABLE AT I 10 IN ORDER
0666  1010            TAD 10
0667  3022            DCA TEMP3   /SAVE POINTER
0670  1110            TAD CNTR
0671  3026            DCA CNTR1   /SET CNTR1
0672  1022            TAD TEMP3
0673  3010            DCA 10      /SET INDEX
0674  3071            DCA NINV    /CLEAR # OF INVERSIONS
0675  2026            ISZ CNTR1
0676  7410            SKP
0677  5320            JMP DONE
0700  1410            TAD I 10
0701  3020            DCA TEMP1
0702  1410            TAD I 10
0703  3021            DCA TEMP2
0704  1077            TAD SWID    /INCREASE-DECREASE SWITCH
0705  7640            SZA CLA
0706  5327            JMP INVERT-4
0707  1020            TAD TEMP1
0710  7041            CIA
0711  1021            TAD TEMP2
0712  7710            SPA CLA     /SKIP IF #2 .> #1
0713  5333            JMP INVERT
0714  1010            TAD 10
0715  1065            TAD M1
0716  3010            DCA 10      /SET INDEX BACK 1
0717  5275            JMP ORDER+10
0720  1071  DONE,     TAD NINV
0721  7640            SZA CLA
0722  5270            JMP ORDER+3             /REPEAT
0723  1022            TAD TEMP3
0724  3010            DCA 10      /RESTORE 10
0725  3077            DCA SWID    /CLEAR SWITCH
0726  5665            JMP I ORDER
0727  1021            TAD TEMP2   /DECREASING ORDER
0730  7041            CIA
0731  1020            TAD TEMP1
0732  5312            JMP DONE-6
0733  1010  INVERT,    TAD 10
0734  1027            TAD M2
0735  3010            DCA 10      /SET INDEX BACK 2
0736  1021            TAD TEMP2
0737  3410            DCA I 10
0740  1020            TAD TEMP1
0741  3410            DCA I 10
0742  2071            ISZ NINV
0743  5314            JMP DONE-4
0744  0000  OUT,      0
0745  4407            JMS I 7
0746  5153            FGET SS
0747  0000            FEXT
```

```
0750  4406          JMS I 6     /SUM OF SQUARES
0751  4403          JMS I MESS
0752  4040          4040        /6 SPACES
0753  4040          4040
0754  4040          4040
0755  0000          0000
0756  4407          JMS I 7
0757  5150          FGET DF
0760  0000          FEXT
0761  4503          JMS I OUT4P             /DEGREES OF FREEDOM
0762  4403          JMS I MESS
0763  4040          4040        /6 SPACES
0764  4040          4040
0765  4040          4040
0766  0000          0000
0767  4407          JMS I 7
0770  5153          FGET SS
0771  4150          FDIV DF
0772  6145          FPUT FTEMP
0773  0000          FEXT
0774  4406          JMS I 6     /MEAN SQUARE
0775  5744          JMP I OUT
```

```
                *1000
1000   0515   ENDP,    END
1001   4403   TOUT,    JMS I MESS
1002   4543            4543        /%#
1003   4324            4324        /#T
1004   4075            4075        / =
1005   4000            4000
1006   4407            JMS I 7
1007   5164            FGET MSB
1010   4167            FDIV MSW
1011   0002            SQROOT
1012   0000            FEXT
1013   4406            JMS I 6
1014   4403            JMS I MESS
1015   4040            4040        /14 SPACES
1016   4040            4040
1017   4040            4040
1020   4040            4040
1021   4040            4040
1022   4040            4040
1023   4040            4040
1024   2711            2711        /WI
1025   2410            2410        /TH
1026   4004            4004        / D
1027   0640            0640        /F
1030   7540            7540        /=
1031   0000            0000
1032   4407            JMS I 7
1033   5137            FGET FNT
1034   2123            FSUB FNG
1035   0000            FEXT
1036   4503            JMS I OUT4P
1037   5600            JMP I ENDP
1040   4403   FOUT,    JMS I MESS
1041   4543            4543        /%#
1042   4306            4306        /#F
1043   4022            4022        / R
1044   0124            0124        /AT
1045   1117            1117        /IO
1046   4072            4072        / :
1047   4002            4002        / B
1050   0524            0524        /ET
1051   2705            2705        /WE
1052   0516            0516        /EN
1053   5727            5727        //W
1054   1124            1124        /IT
1055   1011            1011        /HI
1056   1640            1640        /N
1057   7540            7540        /=
1060   0000            0000
1061   4407            JMS I 7
1062   5164            FGET MSB
```

```
1063  4167             FDIV MSW
1064  0000             FEXT
1065  4406             JMS I 6
1066  5600             JMP I ENDP
1067  0000  READT,     0
1070  1410             TAD I 10    /BLOCK INDEX
1071  3276             DCA BLOCK
1072  1111             TAD DATA
1073  3011             DCA 11      /READ INDEX
1074  4402             JMS I RWTAPE
1075  1201             1201
1076  0000  BLOCK,     0
1077  2000             2000        /READ DATA INTO 2000
1100  1075             TAD SW1
1101  7640             SZA CLA
1102  5667             JMP I READT             /COMPLETE BLOCKS
1103  1064             TAD LTABLE
1104  3013             DCA 13
1105  1073             TAD NL      /MINUS # OF LINES
1106  3353             DCA CNT
1107  1413  SET,       TAD I 13    /LINE #
1110  1065             TAD M1
1111  7425             7425        /MUY
1112  0003             0003
1113  7701             7701        /CLA+MQA
1114  1111             TAD DATA
1115  3012             DCA 12      /3(LINE-1)+DATA
1116  1412             TAD I 12
1117  3411             DCA I 11
1120  1412             TAD I 12
1121  3411             DCA I 11
1122  1412             TAD I 12
1123  3411             DCA I 11
1124  2353             ISZ CNT
1125  5307             JMP SET
1126  1107             TAD DOL
1127  3411             DCA I 11    /TERMINATE DATA
1130  1111             TAD DATA
1131  3011             DCA 11      /SET READ INDEX
1132  5667             JMP I READT
1133  0000  READB,     0           /READ DATA BUFFER
1134  1333             TAD READB
1135  1067             TAD C2
1136  3352             DCA BEND    /JMPS HERE AT END OF BLOCK
1137  1411             TAD I 11
1140  1106             TAD MDOL
1141  7450             SNA
1142  5752             JMP I BEND /END OF BLOCK
1143  1107             TAD DOL
1144  3044             DCA 44      /LOAD FAC
1145  1411             TAD I 11
1146  3045             DCA 45
1147  1411             TAD I 11
```

PAGE 4

```
1 1U0  3046            DCA 46
1 151  5733            JMP I READB              /FAC LOADED
1 152  0000  BEND,     0
1 153  0000  CNT,      0
1 154  0000  SETR,     0          /SET INDICES
1 155  1072            TAD NB
1 156  7041            CIA
1 157  3110            DCA CNTR
1 160  1110            TAD CNTR
1 161  1010            TAD 10
1 162  3010            DCA 10     /BLOCK TABLE
1 163  5754            JMP I SETR
```

```
                *1R00
1 200   0000    CALC,       0
1 201   1072                TAD NB
1 202   1074                TAD TNB
1 203   3074                DCA TNB     /TOTAL BLOCKS
1 204   4407                JMS I 7
1 205   5120                FGET ZERO   /CLEAR
1 206   6134                FPUT FN
1 207   6126                FPUT SUM
1 210   6161                FPUT SUM2
1 211   5112                FGET ONE
1 212   1123                FADD FNG
1 213   6123                FPUT FNG
1 214   0000                FEXT
1 215   4504                JMS I SETRP
1 216   4505                JMS I ORDERP
1 217   4500                JMS I READTP            /READ TAPE
1 220   4501                JMS I READBP            /READ ONE POINT IN DATA BUFR
1 221   4360                JMS MCALC   /SUM X'S
1 222   5220                JMP .-2
1 223   2110                ISZ CNTR    /BEND
1 224   5217                JMP .-5
1 225   4407                JMS I 7
1 226   5126                FGET SUM
1 227   4134                FDIV FN
1 230   6142                FPUT MEAN
1 231   0000                FEXT
1 232   4504                JMS I SETRP
1 233   2077                ISZ SWID    /DECREASING ORDER BTABLE
1 234   4505                JMS I ORDERP
1 235   4500                JMS I READTP
1 236   4501                JMS I READBP
1 237   4350                JMS SCALC   /CALCULATE SUM OF SQUARES
1 2T0   5236                JMP .-2
1 241   2110                ISZ CNTR
1 242   5235                JMP .-5
1 243   4403                JMS I MESS
1 244   4543                4543        /%#
1 245   4323                4323        /#S
1 246   1132                1132        /IZ
1 247   0540                054P        /E
1 250   4040                4040        /6 SPACES
1 251   4040                4040
1 252   T015                4015        / M
1 253   0501                0501        /EA
1 254   1640                1640        /N
1 255   4040                4040        /13 SPACES
1 256   4040                4040
1 257   4040                4040
1 260   4040                4040
1 261   4040                4040
1 262   4040                4040
```

```
1263  2601          2601        /VA
1264  2211          2211        /RI
1265  0116          01Q6        /AN
1266  0305          0305        /CE
1267  4040          4040        /9 SPACES
1270  4040          4040
1271  4040          4040
1272  4040          4040
1273  4023          4023        / S
1274  0115          0115        /AM
1275  2056          2056        /P.
1276  4004          4004        / D
1277  0526          0526        /EV
1300  5645          5645        /.%
1301  4343          4343        /##
1302  0000          0000
1303  4407          JMS I 7
1304  5134          FGET FN
1305  0000          FEXT
1306  4503          JMS I OUT4P              /SIZE
1307  4403          JMS I MESS
1310  4040          4040        /6 SPACES
1311  4040          4040
1312  4040          4040
1313  0000          0000
1314  4407          JMS I 7
1315  5142          FGET MEAN
1316  0000          FEXT
1317  4406          JMS I 6     /MEAN
1320  4403          JMS I MESS
1321  4040          4040
1322  4000          4000
1323  4407          JMS I 7
1324  5161          FGET SUM2
1325  1156          FADD SSW
1326  6156          FPUT SSW
1327  5134          FGET FN
1330  2112          FSUB ONE
1331  6134          FPUT FN
1332  5161          FGET SUM2
1333  4134          FDIV FN
1334  6145          FPUT FTEMP
1335  0000          FEXT
1336  4406          JMS I 6     /VARIANCE
1337  4403          JMS I MESS
1340  4040          4040
1341  4000          4000
1342  4407          JMS I 7
1343  5145          FGET FTEMP
1344  0002          SQROOT
1345  0000          FEXT
1346  4406          JMS I 6     /SAMPLE DEVIATION
1347  5600          JMP I CALC
```

```
1 350  0000  SCALC,   0           /SUM X'S SQUARED
1 351  4407           JMS I 7
1 352  2142           FSUB MEAN
1 353  0001           SQUARE
1 354  1161           FADD SUM2
1 355  6161           FPUT SUM2
1 356  0000           FEXT
1 357  5750           JMP I SCALC
1 360  0000  MCALC,   0           /SUM OF X'S
1 361  4407           JMS I 7
1 362  6145           FPUT FTEMP
1 363  1126           FADD SUM    /SUM X, THIS GROUP
1 364  6126           FPUT SUM
1 365  5145           FGET FTEMP
1 366  1131           FADD SUMT   /SUM OF ALL X'S
1 367  6131           FPUT SUMT
1 370  5112           FGET ONE
1 371  1134           FADD FN     /COUNT X'S THIS GROUP
1 372  6134           FPUT FN
1 373  5112           FGET ONE
1 374  1137           FADD FNT    /COUNT TOTAL X'S
1 375  6137           FPUT FNT
1 376  0000           FEXT
1 377  5760           JMP I MCALC
```

```
                *20
0020    0000    TEMP1,      0
0021    0000    TEMP2,      0
0022    0000    TEMP3,      0
0023    7524    MCOM,       -254
0024    7564    MFORM,      -214
0025    7477    MA,         -301
0026    0000    CNTR1,      0
0027    7776    M2,         -2
0030    0000    SETSW,      0
                *62
0062    0000                0
0063    2377    BTABLE,     2377
0064    2177    LTABLE,     2177
0065    7777    M1,         -1
0066    7575    MCC,        -203
0067    0002    C2,         2
0070    7600    TAPE,       7600
0071    0000    NINV,       0
0072    0000    NB,         0
0073    0000    NL,         0
0074    0000    TNB,        0
0075    0000    SW1,        0
0076    0000    SW2,        0
0077    0000    SWID,       0
0100    1067    READTP,     READT
0101    1133    READBP,     READB
0102    0744    OUTP,       OUT
0103    0525    OUT4P,      OUT4
0104    1154    SETRP,      SETR
0105    0665    ORDERP,     ORDER
0106    7534    MDOL,       -244
0107    0244    DOL,        244
0110    0000    CNTR,       0
0111    1777    DATA,       1777
0112    0001
0113    2000
0114    0000    ONE,        1;2000;0
0115    7775
0116    3146
0117    3146    PT1,        7775;3146;3146
0120    0000
0121    0000
0122    0000    ZERO,       0;0;0
0123    0000
0124    0000
0125    0000    FNG,        0;0;0
0126    0000
0127    0000
0130    0000    SUM,        0;0;0
0131    0000
0132    0000
```

```
0133   0000   SUMT,        0;0;0
0134   0000
0135   0000
0136   0000   FN,          0;0;0
0137   0000
0140   0000
0141   0000   FNT,         0;0;0
0142   0000
0143   0000
0144   0000   MEAN,        0;0;0
0145   0000
0146   0000
0147   0000   FTEMP,       0;0;0
0150   0000
0151   0000
0152   0000   DF,          0;0;0
0153   0000
0154   0000
0155   0000   SS,          0;0;0
0156   0000
0157   0000
0160   0000   SSW,         0;0;0
0161   0000
0162   0000
0163   0000   SUM2,        0;0;0
0164   0000
01V5   0000
0166   0000   MSB,         0;0;0
0167   0000
0170   0000
0171   0000   MSW,         0;0;0
              *7341
7341   0000                0
7342   0000                0
              SQUARE=1
              SQROOT=2
              RWTAPE=2
              MESS=3
              UNFL=4
```

BEND	1152
BLOAD	0237
BLOCK	1076
BTABLE	0063
CALC	1200
CALCP	0200
CL	0227
CLP	0524
CNT	1153
CNTR	0110
CNTR1	0026
C2	0067
C253	0547
C4	0546
DATA	0111
DF	0150
DOL	0107
DONE	0720
END	0512
ENDP	1000
FN	0134
FNG	0123
FNT	0137
FOUT	1040
FOUTP	0551
FP1	0544
FP2	0545
FTEMP	0145
INVERT	0733
LOAD	0600
LOADP	0201
LTABLE	0064
MA	0025
MCALC	1360
MCC	0066
MCOM	0023
MDOL	0106
MEAN	0142
MESS	0003
MFORM	0024
MN	0203
MSB	0164
MSW	0167
MY	0202
M1	0065
M2	0027
NB	0072
NINV	0071
NL	0073
ONE	0112
ORDER	0665
ORDERP	0105

```
OUT       0744
OUTP      0102
OUT4      0525
OUT4P     0103
PT1       0115
READB     1133
READBP    0101
READT     1067
READTP    0100
RWTAPE    0002
SCALC     1350
SCALCP    0553
SET       1107
SETR      1154
SETRP     0104
SETSW     0030
SQROOT    0002
SQUARE    0001
SS        0153
SSW       0156
START     0204
STARTP    0552
SUM       0126
SUMT      0131
SUM2      0161
SWID      0077
SW1       0075
SW2       0076
TAPE      0070
TEMP1     0020
TEMP2     0021
TEMP3     0022
TERM      0641
TNB       0074
TOUT      1001
TOUTP     0550
UNFL      0004
ZERO      0120
```

COVAR = COVARIANCE

PURPOSE: This program calculates the necessary values for an analysis of covariance from data files stored on DECtape data tape. The paired input consists of matching files of x and y data. The output is:

A. Number of pairs.
B. Correlation coefficient.
C. T value to test the correlation coefficient against the null hypothesis i.e. the correlation coefficient is not different from zero.
D. Degrees of freedom for T.
E. Equation of best-fit linear regression line.
F. Sum of squared deviations of y's about the regression line.
G. Standard error of the estimate.
H. Sum of products xy is the sum of the cross products of x and y deviations from their respective means.
I. Sample covariance.
J. For the x group and the y group.
    1. Mean.
    2. Sum of squared deviations from the mean.
    3. Sample variance.
    4. Sample standard deviation.

By proper arrangement of input data the user may obtain values for each sample and for a total of all samples as a group. Sums of sample values will give the Within Samples Sums for comparison with Between Samples Sums (Total - Within Samples values) for F tests on several groups of samples. Various tests in the analysis of variance may be performed using the output of this program. The user is referred to Statistical Methods, sixth edition, by G. W. Snedicor and W. G. Cochran, Iowa State University Press, 1967, for a discussion of analysis of covariance tests.

COVAR = COVARIANCE (continued)

OPERATION: When COVAR is called it will type "READ X LINES : ". The user will type line numbers of x data to be operated on and terminate line input with "CTRL/FORM". If all lines, complete data blocks, are to be used for both x and y inputs the user may type "A" for all. The program will ask for "X BLOCK NUMBERS : ", "READ Y LINES : " and "Y BLOCK NUMBERS : ". In each case, the user supplies block and line numbers and terminates input with "CTRL/FORM". Data input should be paired. The first x data point is paired with the first y data point and data blocks are read in pairs by the program so that the number of x lines to be read must equal the number of y lines and the number of x blocks must equal the number of y blocks. Unpaired data input will cause the program to type "UNPAIRED DATA " and return to the beginning. After the input of y block numbers, the program will proceed through calculation and output and return to "READ X LINES : " unless this request has previously been answered by "A" in which case the program will start over at "X BLOCK NUMBERS : ".

DESCRIPTION: COVAR will accommodate data tapes of standard (129_{10}) or shorter block length. Two complete passes of the data are done. On pass 1 the sums of x's and y's are totaled and the data is counted. The means of x and y are calculated before pass 2.

During pass 2 the sums of squared deviations from the mean and the sum of cross products of the deviations are calculated. The necessity to compute cross products demands that data be read in pairs. This program, therefore, reads a block of x data and a block of y data and then proceeds to read an x data point and a y data point.

COVAR = COVARIANCE (continued)

The following calculations are used in COVAR:

A. Number of pairs = N

B. For x and y (x shown)

1. Mean = $\frac{\Sigma x}{N} = \bar{x}$

2. Sum of Squares = $\Sigma(x-\bar{x})^2$

3. Sample Variance = $\frac{\Sigma(x - \bar{x})^2}{(N-1)}$

4. Sample Standard Deviation = $\sqrt{\frac{\Sigma(x - \bar{x})^2}{(N-1)}}$

C. Sum of products xy = $\Sigma(x - \bar{x})(y - \bar{y})$

D. Sample Covariance = $\frac{\Sigma(x - \bar{x})(y - \bar{y})}{(N-1)}$

E. Correlation Coefficient = $\frac{\Sigma(x - \bar{x})(y - \bar{y})}{\sqrt{\Sigma(x - \bar{x})^2\Sigma(y - \bar{y})^2}} = R$

F. T = $\frac{R\sqrt{(N-2)}}{\sqrt{1-R^2}}$

G. Degrees of Freedom = N - 2

H. Equation of best-fit Line $Y' = aX + b$

1. Slope = a = $\frac{\Sigma(x - \bar{x})(y - \bar{y})}{\Sigma(x - \bar{x})^2}$

2. Intercept b = $\bar{y} - \frac{\bar{x}\Sigma(x - \bar{x})(y - \bar{y})}{\Sigma(x - \bar{x})^2}$

I. Sums of Squared Deviations = $\Sigma(y - \bar{y})^2 - \frac{\{\Sigma(x - \bar{x})(y - \bar{y})\}^2}{\Sigma(x - \bar{x})^2}$

J. Standard Error of Estimate = $\sqrt{\frac{\Sigma(y - \bar{y})^2 - \frac{\{\Sigma(x - \bar{x})(y - \bar{y})\}^2}{\Sigma(x - \bar{x})^2}}{(N-2)}}$

COVAR 2 /Call program

READ X LINES : 2 4 6,15 (CTRL/FORM) /Read these lines of x block #'s

READ Y LINES : 1 3 6,15 (CTRL/FORM) /Read these lines of y block #'s

X BLOCK NUMBERS : 60,63 (CTRL/FORM)

Y BLOCK NUMBERS : 40 42,44 (CTRL/FORM)

NUMBER OF PAIRS : 48

CORRELATION COEFFICIENT : +0.9959431E+00

T : +0.7506659E+02 WITH DF : 46

Y' = (+0.1090463E+01)X -0.9485721E+00

SUM OF SQUARED DEVIATIONS : +0.6412597E+01

STANDARD ERROR OF ESTIMATE : +0.3733687E+00

SUM OF PRODUCTS XY : +0.7203584E+03

SAMPLE COVARIANCE : +0.1532677E+02

	X	Y
MEAN :	+0.9149993E+01	+0.9029163E+01
SUM OF SQUARES :	+0.6605982E+03	+0.7919371E+03
SAMPLE VARIANCE :	+0.1405528E+02	+0.1684972E+02
SAMPLE DEVIATION :	+0.3749037E+01	+0.4104841E+01

READ X LINES : A /Read all of both x and y block #'s

X BLOCK NUMBERS : 40,42 (CTRL/FORM)

Y BLOCK NUMBERS : 62,64 (CTRL/FORM)

NUMBER OF PAIRS : 45

CORRELATION COEFFICIENT : +0.9959295E+00

T : +0.7245501E+02 WITH DF : 43

Y' = (+0.9660537E+00)X +0.2466697E+00

SUM OF SQUARED DEVIATIONS : +0.6398559E+01

STANDARD ERROR OF ESTIMATE : +0.3857508E+00

SUM OF PRODUCTS XY : +0.8086355E+03

SAMPLE COVARIANCE : +0.1837808E+02

	X	Y
MEAN :	+0.7986665E+01	+0.7962217E+01
SUM OF SQUARES :	+0.8370503E+03	+0.7875839E+03
SAMPLE VARIANCE :	+0.1902386E+02	+0.1789963E+02
SAMPLE DEVIATION :	+0.4361635E+01	+0.4230796E+01

X BLOCK NUMBERS : ↑C /Return control to tape Monitor

```
                /COVAR, ANALYSIS OF COVARIANCE
                /MOUNT DATA TAPE ON UNIT #1. TERMINATE LINE
                /OR BLOCK # INPUT WITH CTRL/FORM.  TO READ
                /COMPLETE BLOCKS RESPOND TO "READ LINES : "
                /WITH "A".  X DATA IS PAIRED IN ORDER WITH
                /Y DATA.
                *200
0200  6046  START,      TLS
0201  4403              JMS I MESSP           /READ X LINES :
0202  4543              4543
0203  4322              4322
0204  0501              0501
0205  0440              0440
0206  3040              3040
0207  1411              1411
0210  1605              1605
0211  2340              2340
0212  7240              7240
0213  0000              0000
0214  1072              TAD XLT     /X LINE TABLE
0215  3010              DCA 10
0216  4565              JMS I BLOADP          /LOAD X LINE TABLE
0217  1064              TAD SETSW
0220  3066              DCA SW      /COMPLETE BLOCK SWITCH
0221  1066              TAD SW
0222  7640              SZA CLA
0223  5251              JMP BN
0224  1073              TAD NB
0225  7041              CIA
0226  3074              DCA NXL     /MINUS # OF X LINES
0227  4403              JMS I MESSP           /READ Y LINES :
0230  4543              4543
0231  4322              4322
0232  0501              0501
0233  0440              0440
0234  3140              3140
0235  1411              1411
0236  1605              1605
0237  2340              2340
0240  7240              7240
0241  0000              0000
0242  1075              TAD YLT     /Y LINE TABLE
0243  3010              DCA 10
0244  4565              JMS I BLOADP          /LOAD Y LINE TABLE
0245  1073              TAD NB
0246  1074              TAD NXL
0247  7640              SZA CLA
0250  5566              JMP I ERRINP          /UNPAIRED LINES
0251  1106  BN,         TAD BTABLE
0252  3010              DCA 10
0253  4403              JMS I MESSP           /X BLOCK NUMBERS :
0254  4543              4543
```

```
0255  4330          4330
0256  4002          4002
0257  1417          1417
0260  0313          0313
0261  4016          4016
0262  2515          2515
0263  0205          0205
0264  2223          2223
0265  4072          4072
0266  4000          4000
0267  4565          JMS I BLOADP
0270  1073          TAD NB
0271  7041          CIA
0272  3076          DCA NXB    /MINUS # OF X BLOCKS
0273  4403          JMS I MESSP            /Y BLOCK NUMBERS :
0274  4543          4543
0275  4331          4331
0276  4002          4002
0277  1417          1417
0300  0313          0313
0301  4016          4016
0302  2515          2515
0303  0205          0205
0304  2223          2223
0305  4072          4072
0306  4000          4000
0307  4565          JMS I BLOADP
0310  1073          TAD NB
0311  1076          TAD NXB
0312  7640          SZA CLA
0313  5566          JMP I ERRINP           /UNPAIRED BLOCKS
0314  4407          JMS I 7
0315  5116          FGET ZERO  /CLEAR
0316  6121          FPUT SUMX
0317  6124          FPUT SUMX2
0320  6127          FPUT SUMY
0321  6132          FPUT SUMY2
0322  6135          FPUT SUMXY
0323  6140          FPUT FN
0324  0000          FEXT
0325  4572          JMS I SETP
0326  4573          JMS I RXYTP            /READ AN X & Y BLOCK
0327  4574          JMS I RXYBP            /READ AN X & Y DATA POINT
0330  4575          JMS I TOTALP
0331  5327          JMP .-2
0332  2111          ISZ CNTR
0333  5326          JMP .-5
0334  4407          JMS I 7    /TOTALS COMPLETE
0335  5121          FGET SUMX  /COMPUTE MEANS
0336  4140          FDIV FN
0337  6151          FPUT MEANX
0340  5127          FGET SUMY
0341  4140          FDIV FN
```

```
0342   6154          FPUT MEANY
0343   0000          FEXT
0344   4572          JMS I  SETP
0345   4573          JMS I  RXYTP          /READ AN X & A Y BLOCK
0346   4574          JMS I  RXYBP          /READ AN X & A Y DATA POINT
0347   4576          JMS I  SUMSQP
0350   5346          JMP .-2
0351   2111          ISZ CNTR
0352   5345          JMP .-5
```

```
0353  4403          JMS I MESSP             /NUMBER OF PAIRS :
0354  4543          4543
0355  4343          4343
0356  1625          1625
0357  1502          1502
0360  0522          0522
0361  4017          4017
0362  0640          0640
0363  2001          2001
0364  1122          1122
0365  2340          2340
0366  7240          7240
0367  0000          0000
0370  4407          JMS I 7
0371  5140          FGET FN
0372  0000          FEXT
0373  4567          JMS I OUT4P             /NUMBER OF PAIRS
0374  4403          JMS I MESSP             /CORRELATION COEFFIENT :
0375  4543          4543
0376  4303          4303
0377  1722          1722
0400  2205          2205
0401  1401          1401
0402  2411          2411
0403  1716          1716
0404  4003          4003
0405  1705          1705
0406  0606          0606
0407  1103          1103
0410  1105          1105
0411  1624          1624
0412  4072          4072
0413  4000          4000
0414  4407          JMS I 7
0415  5124          FGET SUMX2
0416  3139          FMPY SUMY2
0417  0002          SQROOT
0420  6143          FPUT FTEMP1
0421  5135          FGET SUMXY
0422  4143          FDIV FTEMP1             /  SUMXY/SQROOT( SUMX2 SUMY2
0423  6143          FPUT FTEMP1             /COR. COEF.
0424  0000          FEXT
0425  4406          JMS I 6    /OUTPUT R
0426  4403          JMS I MESSP             /T :
0427  4543          4543
0430  4324          4324
0431  4072          4072
0432  4000          4000
0433  4407          JMS I 7
0434  5143          FGET FTEMP1             /COR. COEF.
0435  0001          SQUARE
0436  6146          FPUT FTEMP2
```

```
0437  5157          FGET ONE
0440  2146          FSUB FTEMP2
0441  0002          SQROOT
0442  6146          FPUT FTEMP2           /SQROOT(1-R2)
0443  5140          FGET FN
0444  2157          FSUB ONE
0445  2157          FSUB ONE
0446  6140          FPUT FN     / N-2
0447  0002          SQROOT      /ROOT(N-2)
0450  3143          FMPY FTEMP1           /R
0451  4146          FDIV FTEMP2
0452  0000          FEXT        /R SQROOT(N-2) / SQROOT(1-R2)
0453  4406          JMS I 6     /OUTPUT T
0454  1112          TAD S1      /8 DEC
0455  4570          JMS I SPACEP
0456  4403          JMS I MESSP           /WITH DF :
0457  2711          2711
0460  2410          2410
0461  4004          4004
0462  0640          0640
0463  7240          7240
0464  0000          0000
0465  4407          JMS I 7
0466  5140          FGET FN
0467  0000          FEXT        / N-2
0470  4567          JMS I OUT4P
0471  4403          JMS I MESSP           /Y' = (
0472  4543          4543
0473  4343          4343
0474  3147          3147
0475  4075          4075
0476  4050          4050
0477  0000          0000
0500  4407          JMS I 7
0501  5135          FGET SUMXY
0502  4124          FDIV SUMX2
0503  6143          FPUT FTEMP1
0504  0000          FEXT        / SUMXY/SUMX2
0505  4406          JMS I 6     /COEF OF X
0506  4403          JMS I MESSP           /)X
0507  5130          5130
0510  4040          4040
0511  0000          0000
0512  4407          JMS I 7
0513  5143          FGET FTEMP1
0514  3151          FMPY MEANX
0515  6143          FPUT FTEMP1
0516  5154          FGET MEANY
0517  2143          FSUB FTEMP1
0520  0000          FEXT        /MEANY - MEANXSUMXY/SUMX2
0521  4406          JMS I 6     /OUTPUT INTERCEPT
0522  4403          JMS I MESSP           /SUM OF SQUARED DEVIATIONS :
0523  4543          4543
```

```
0524  4323          4323
0525  2515          2515
0526  4017          4017
0527  0640          0640
0530  2321          2321
0531  2501          2501
0532  2205          2205
0533  0440          0440
0534  0405          0405
0535  2611          2611
0536  0124          0124
0537  1117          1117
0540  1623          1623
0541  4072          4072
0542  4040          4040
0543  0000          0000
0544  4401          JMS I 7
0545  5135          FGET SUMXY
0546  0001          SQUARE
0547  4124          FDIV SUMX2
0550  6143          FPUT FTEMP1
0551  5132          FGET SUMY2
0552  2143          FSUB FTEMP1
0553  6143          FPUT FTEMP1
0554  0000          FEXT        /SUMY2 - SUMXY2/SUMX2
```

```
0555  4406          JMS I 6     /SUM2 OF DEV. FROM REGRESSION
0556  4403          JMS I MFSSP             /STANDARD ERROR OF ESTIMATE:
0557  4543          4543
0560  4323          4323
0561  2401          2401
0562  1604          1604
0563  0122          0122
0564  0440          0440
0565  0522          0522
0566  2217          2217
0567  2240          2240
0570  1706          1706
0571  4005          4005
0572  2324          2324
0573  1115          1115
0574  0124          0124
0575  0570          0570
0576  7240          7240
0577  0000          0000
0600  4407          JMS I 7
0601  5143          FGET FTEMP1
0602  4140          FDIV FN
0603  000           SQROOT
0604  000           FEXT        /SQROOT((SUMY2 - SUMXY2/SUMX2)/(N-2))
0605  4406          JMS I 6     /S E EST
0606  4403          JMS I MFSSP             /SUM OF PRODUCTS XY :
0607  4543          4543
0610  4323          4323
0611  2515          2515
0612  4017          4017
0613  0640          0640
0614  2022          2022
0615  1704          1704
0616  2503          2503
0617  2423          2423
0620  4030          4030
0621  3140          3140
0622  7240          7240
0623  0000          0000
0624  1112          TAD S1
0625  4570          JMS I SPACEP
0626  4407          JMS I 7
0627  5135          FGET SUMXY
0630  0000          FEXT
0631  4406          JMS I 6     /SUMXY
0632  4403          JMS I MFSSP             /SAMPLE COVARIANCE :
0633  4543          4543
0634  4323          4323
0635  0115          0115
0636  2014          2014
0637  0540          0540
0640  0317          0317
```

```
0641  2601          2601
0642  2211          2211
0643  0116          0116
0644  0305          0305
0645  4072          4072
0646  4040          4040
0647  0000          0000
0650  1112          TAD S1
0651  4570          JMS I SPACEP
0652  4407          JMS I 7
0653  5140          FGET FN
0654  1157          FADD ONE    / N-1
0655  6146          FPUT FTEMP2
0656  5135          FGET SUMXY
0657  4146          FDIV FTEMP2
0660  0000          FEXT        / SUMXY/(N-1)
0661  4406          JMS I 6     /SAMP COVARIANCE
0662  4403          JMS I MESSP             /CR LF LF LF
0663  4543          4543
0664  4343          4343
0665  0000          0000
0666  1113          TAD S2      /27 DEC
0667  4570          JMS I SPACEP
0670  4403          JMS I MESSP             /X
0671  3000          3000
0672  1114          TAD S3      /21 DEC
0673  4570          JMS I SPACEP
0674  4403          JMS I MESSP             /Y CR LF LF MEAN :
0675  3145          3145
0676  4343          4343
0677  1505          1505
0700  0116          0116
0701  4072          4072
0702  0000          0000
0703  1115          TAD S4      /15 DEC
0704  4570          JMS I SPACEP
0705  4407          JMS I 7
0706  5151          FGET MEANX
0707  0000          FEXT        /MEANX
0710  4406          JMS I 6     /X MEAN
0711  1112          TAD S1      /8 DEC
0712  4570          JMS I SPACEP
0713  4407          JMS I 7
0714  5154          FGET MEANY
0715  0000          FEXT        /MEANY
0716  4406          JMS I 6     /Y MEAN
0717  4403          JMS I MESSP             /SUM OF SQUARES :
0720  4543          4543
0721  4323          4323
0722  2515          2515
0723  4017          4017
0724  0640          0640
0725  2321          2321
```

```
0726  2501          2501
0727  2205          2205
0730  2340          2340
0731  7240          7240
0732  4040          4040
0733  4040          4040
0734  0000          0000
0735  4407          JMS I 7
0736  5124          FGET SUMX2
0737  0000          FFXT        /SUMX2
0740  4406          JMS I 6     /SUM X2
0741  1112          TAD S1
0742  4570          JMS I SPACEP
0743  4407          JMS I 7
0744  5132          FGET SUMY2
0745  0000          FFXT        /SUMY2
0746  4406          JMS I 6
0747  4403          JMS I MFSSP             /SAMPLE VARIANCE :
0750  4543          4543
0751  4323          4323
0752  0115          0115
0753  2014          2014
0754  0540          0540
0755  2601          2601
0756  2211          2211
0757  0116          0116
0760  0305          0305
0761  4072          4072
0762  4040          4040
0763  4040          4040
0764  0000          0000
```

```
0765  4407            JMS I 7
0766  5124            FGET SUMX2
0767  4146            FDIV FTEMP2
0770  6143            FPUT FTEMP1
0771  0000            FEXT        /SUMX2/(N-1)
0772  4406            JMS I 6     /X VARIANCE
0773  1112            TAD S1
0774  4570            JMS I SPACEP
0775  4407            JMS I 7
0776  5132            FGET SUMY2
0777  4146            FDIV FTEMP2
1000  6146            FPUT FTEMP2
1001  0000            FEXT        /SUMY2/(N-1)
1002  4406            JMS I 6     /Y VARIANCE
1003  4403            JMS I MESSP             /SAMPLE DEVIATION :
1004  4543            4543
1005  4323            4323
1006  0115            0115
1007  2014            2014
1010  0540            0540
1011  0405            0405
1012  2611            2611
1013  0124            0124
1014  1117            1117
1015  1640            1640
1016  7240            7240
1017  4040            4040
1020  0000            0000
1021  4407            JMS I 7
1022  5143            FGET FTEMP1
1023  0002            SQROOT
1024  0000            FEXT        /SQROOT( SUMX2/(N-1) )
1025  4406            JMS I 6     /X SAMPL DEV
1026  1112            TAD S1
1027  4570            JMS I SPACEP
1030  4407            JMS I 7
1031  5146            FGET FTEMP2
1032  0002            SQROOT
1033  0000            FEXT        /SQROOT( SUMY2/(N-1) )
1034  4406            JMS I 6     /Y SAMP DEV
1035  4403            JMS I MESSP
1036  4343            4343
1037  4343            4343
1040  4343            4343
1041  4343            4343
1042  4300            4300
1043  1066            TAD SW
1044  7650            SNA CLA
1045  5571            JMP I STARTP
1046  5647            JMP I BNP
1047  0251  BNP,       BN
1050  0000  TOTAL,     0
```

```
1051  4407              JMS I 7
1052  1127              FADD SUMY
1053  6127              FPUT SUMY   /SUM OF Y'S
1054  5143              FGET FTEMP1
1055  1121              FADD SUMX
1056  6121              FPUT SUMX   /SUM OF X'S
1057  5057              FGET ONE
1060  1140              FADD FN
1061  6140              FPUT FN     /NO OF PAIRS
1062  0000              FEXT
1063  5650              JMP I TOTAL
1064  0000  SUMSQ,      0
1065  4407              JMS I 7
1066  2154              FSUB MEANY
1067  6146              FPUT FTEMP2
1070  0001              SQUARE
1071  1132              FADD SUMY2
1072  6132              FPUT SUMY2 /SUM OF Y'S SQUARED
1073  5143              FGET FTEMP1
1074  2151              FSUB MEANX
1075  6143              FPUT FTEMP1
1076  0001              SQUARE
1077  1124              FADD SUMX2
1100  6124              FPUT SUMX2 /SUM OF X'S SQUARED
1101  5143              FGET FTEMP1
1102  3146              FMPY FTEMP2
1103  1135              FADD SUMXY
1104  6135              FPUT SUMXY /SUM OF XY'S
1105  0000              FEXT
1106  5664              JMP I SUMSQ
1107  0000  RXYR,       0           /READ AN X & A Y DATA POINT
1110  1307              TAD RXYR
1111  1063              TAD C2
1112  3344              DCA BEND
1113  1412              TAD I 12
1114  1345              TAD MDOL
1115  7450              SNA
1116  5337              JMP CHK     /END OF BLOCK
1117  1065              TAD DOL     /RESTORE
1120  3044              DCA 44
1121  1412              TAD I 12
1122  3045              DCA 45
1123  1412              TAD I 12
1124  3046              DCA 46
1125  4407              JMS I 7
1126  6143              FPUT FTEMP1             / Y DATA POINT
1127  0000              FEXT
1130  1414              TAD I 14
1131  3044              DCA 44
1132  1414              TAD I 14
1133  3045              DCA 45
1134  1414              TAD I 14
1135  3046              DCA 46
```

```
1136  5707            JMP I RXYP
1137  1414  CHK,      TAD I 14
1140  1345            TAD MDOL
1141  7640            SZA CLA
1142  5566            JMP I ERRINP          /X,Y'S DONT MATCH
1143  5744            JMP I BEND
1144  0000  BEND,     0
1145  7534  MDOL,     -244
1146  4403  ERRIN,    JMS I MESSP           /UNPAIRED DATA
1147  4543            4543
1150  2516            2516
1151  2001            2001
1152  1122            1122
1153  0504            0504
1154  4004            4004
1155  0124            0124
1156  0143            0143
1157  4343            4343
1160  4300            4300
1161  5571            JMP I STARTP
1162  0000  SET,      0           /SET INDICES FOR READING TAPE
1163  1106            TAD BTABLE
1164  3010            DCA 10      /X INDEX
1165  1073            TAD NB
1166  1106            TAD BTABLE
1167  3011            DCA 11      /Y INDEX
1170  1076            TAD NXB
1171  3111            DCA CNTR
1172  5762            JMP I SET
```

```
                *1200
1200    0000    BLOAD,      0           /SUBROUTINE TO SET THE BLOCK TABLE
1201    3073                DCA NB
1202    3064                DCA SETSW
1203    4405                JMS I 5
1204    1060                TAD 60
1205    7650                SNA CLA
1206    5240                JMP TERM    /INVALID, CHECK TERMINATOR
1207    4404                JMS I UNFLP
1210    3077                DCA TEMP1
1211    1077                TAD TEMP1
1212    3410                DCA I 10    /DEPOSIT IN BLOCK TABLE
1213    2073                ISZ NB      /COUNT BLOCKS
1214    1057                TAD 57
1215    1101                TAD MCOM
1216    7640                SZA CLA
1217    5203                JMP BLOAD+3             /NOT A COMMA, GET NEXT BLOCK
1220    4405                JMS I 5     /COMMA, SET BTABLE
1221    1060                TAD 60
1222    7650                SNA CLA
1223    5220                JMP .-3     /INVALID, TRY AGAIN
1224    4404                JMS I UNFLP
1225    7041                CIA
1226    3100                DCA TEMP2   /MINUS 2ND BLOCK #
1227    1077                TAD TEMP1
1230    1100                TAD TEMP2
1231    7700                SMA CLA
1232    5203                JMP BLOAD+3             /SET UP, GET NEXT #
1233    2077                ISZ TEMP1
1234    1077                TAD TEMP1
1235    3410                DCA I 10    /DEPOSIT IN BTABLE
1236    2073                ISZ NB      /COUNT BLOCKS
1237    5227                JMP .-10
1240    1057    TERM,       TAD 57
1241    1102                TAD MCC
1242    7650                SNA CLA
1243    5503                JMP I TAPE
1244    1057                TAD 57
1245    1067                TAD MFORM
1246    7650                SNA CLA
1247    5600                JMP I BLOAD             /END OF TABLE
1250    1057                TAD 57
1251    1256                TAD MA
1252    7640                SZA CLA
1253    5203                JMP BLOAD+3             /NOT END OF TABLE
1254    2064                ISZ SETSW
1255    5600                JMP I BLOAD
1256    7477    MA,         -301
1257    0000    RXYT,       0
1260    1410                TAD I 10
1261    3264                DCA XBLOCK
1262    4402                JMS I RWTAPE
```

```
1263  1201              1201
1264  0000  XBLOCK,     0
1265  2000              2000          /READ X DATA INTO 2000
1266  1066              TAD SW
1267  7640              SZA CLA
1270  5276              JMP .+6       /DO NOT REARRANGE DATA
1271  1072              TAD XLT       /X LINE TABLE
1272  3013              DCA 13
1273  1104              TAD XDATA
1274  3012              DCA 12
1275  4321              JMS ADAT      /ARRANGE DATA
1276  1411              TAD I 11
1277  3302              DCA YBLOCK
1300  4402              JMS I RWTAPE
1301  1201              1201
1302  0000  YBLOCK,     0
1303  2200              2200          /READ YDATA INTO 2200
1304  1066              TAD SW
1305  7640              SZA CLA
1306  5314              JMP .+6
1307  1075              TAD YLT       /Y LINE TABLE
1310  3013              DCA 13
1311  1105              TAD YDATA
1312  3012              DCA 12
1313  4321              JMS ADAT      /ARRANGE DATA
1314  1104              TAD XDATA
1315  3012              DCA 12
1316  1105              TAD YDATA
1317  3014              DCA 14
1320  5657              JMP I RXYT
1321  0000  ADAT,       0
1322  1074              TAD NXL       /MINUS # OF X LINES
1323  3110              DCA CNT
1324  1012              TAD 12
1325  3077              DCA TEMP1
1326  1413              TAD I 13
1327  1107              TAD M1
1330  7425              7425          /MUY
1331  0003              0003
1332  7701              7701          /CLA & MQA
1333  1077              TAD TEMP1     /3(LINE-1)+X OR Y DATA
1334  3015              DCA 15
1335  1415              TAD I 15
1336  3412              DCA I 12
1337  1415              TAD I 15
1340  3412              DCA I 12
1341  1415              TAD I 15
1342  3412              DCA I 12
1343  2110              ISZ CNT
1344  5326              JMP ADAT+5
1345  1065              TAD DOL
1346  3412              DCA I 12
1347  5721              JMP I ADAT
```

```
                *1400
1400    0000    OUT4,       0           /OUTPUT MAX OF 4 DIGITS, NO SIGN
1401    4407                JMS I 7
1402    1162                FADD PT1
1403    0000                FEXT
1404    1221                TAD C4
1405    3062                DCA 62
1406    3617                DCA I FP1
1407    3620                DCA I FP2
1410    4406                JMS I 6
1411    1222                TAD C253    /RESTORE FLOATING POINT
1412    3617                DCA I FP1
1413    1063                TAD C2
1414    3620                DCA I FP2
1415    3062                DCA 62
1416    5600                JMP I OUT4
1417    7327    FP1,        7327
1420    7330    FP2,        7330
1421    0004    C4,         4
1422    0253    C253,       253
1423    0000    SPACE,      0
1424    3111                DCA CNTR
1425    1235                TAD C240
1426    6041                TSF
1427    5226                JMP .-1
1430    6046                TLS
1431    7200                CLA
1432    2111                ISZ CNTR
1433    5225                JMP .-6
1434    5623                JMP I SPACE
1435    0240    C240,       240
```

```
                *62
0062    0000            0
0063    0002    C2,     2
0064    0000    SETSW,  0
0065    0244    DOL,    244
0066    0000    SW,     0
0067    7564    MFORM,  -214
0070    7447    MY,     -331
0071    7462    MN,     -316
0072    2400    XLT,    2400
0073    0000    NB,     0
0074    0000    NXL,    0
0075    2500    YLT,    2500
0076    0000    NXB,    0
0077    0000    TEMP1,  0
0100    0000    TEMP2,  0
0101    7524    MCOM,   -254
0102    7575    MCC,    -203
0103    7600    TAPE,   7600
0104    1777    XDATA,  1777
0105    2177    YDATA,  2177
0106    2600    BTABLE, 2600
0107    7777    M1,     -1
0110    0000    CNT,    0
0111    0000    CNTR,   0
0112    7770    S1,     -10
0113    7745    S2,     -33
0114    7753    S3,     -25
0115    7761    S4,     -17
0116    0000
0117    0000
0120    0000    ZERO,   0;0;0
0121    0000
0122    0000
0123    0000    SUMX,   0;0;0
0124    0000
0125    0000
0126    0000    SUMX2,  0;0;0
0127    0000
0130    0000
0131    0000    SUMY,   0;0;0
0132    0000
0133    0000
0134    0000    SUMY2,  0;0;0
0135    0000
0136    0000
0137    0000    SUMXY,  0;0;0
0140    0000
0141    0000
0142    0000    FN,     0;0;0
0143    0000
0144    0000
```

```
0145  0000  FTEMP1,    0;0;0
0146  0000
0147  0000
0150  0000  FTEMP2,    0;0;0
0151  0000
0152  0000
0153  0000  MEANX,     0;0;0
0154  0000
0155  0000
0156  0000  MEANY,     0;0;0
0157  0001
0160  2000
0161  0000  ONE,       1;2000;0
0162  7775
0163  3146
0164  3146  PT1,       7775;3146;3146
0165  1200  BLOADP,    BLOAT
0166  1146  ERRINP,    ERRIN
0167  1400  OUT4P,     OUT4
0170  1423  SPACEP,    SPACE
0171  0200  STARTP,    START
0172  1162  SETP,      SET
0173  1257  RXYTP,     RXYT
0174  1107  RXYRP,     RXYR
0175  1050  TOTALP,    TOTAL
0176  1064  SIMSQP,    SIMSQ
            *7341
7341  0000              0
7342  0000              0          /CLEAR THE CR AND LF IN FLOATING POINT
            MESSP=3
            UNFLP=4
            RWTAPE=2
            SQUARE=1
            SQROOT=2
```

ADAT	1321
BEND	1144
BLOAD	1200
BLOADP	0165
BN	0251
BNP	1047
BTABLE	0106
CHK	1137
CNT	0110
CNTR	0111
C2	0063
C240	1435
C253	1422
C4	1421
DOL	0065
ERRIN	1146
ERRINP	0166
FN	0140
FP1	1417
FP2	1420
FTEMP1	0143
FTEMP2	0146
MA	1256
MCC	0102
MCOM	0101
MDOL	1145
MEANX	0151
MEANY	0154
MESSP	0003
MFORM	0067
MN	0071
MY	0070
M1	0107
NB	0073
NXB	0076
NXL	0074
ONE	0157
OUT4	1400
OUT4P	0167
PT1	0162
RWTAPE	0002
RXYB	1107
RXYBP	0174
RXYT	1257
RXYTP	0173
SET	1162
SETP	0172
SETSW	0064
SPACE	1423
SPACEP	0170
SQROOT	0002
SQUARE	0001

START	0200
STARTP	0171
SUMSQ	1064
SUMSQP	0176
SUMX	0121
SUMXY	0135
SUMX2	0124
SUMY	0127
SUMY2	0132
SW	0066
S1	0112
S2	0113
S3	0114
S4	0115
TAPE	0103
TEMP1	0077
TEMP2	0100
TERM	1240
TOTAL	1050
TOTALP	0175
UNFLP	0004
XBLOCK	1264
XDATA	0104
XLT	0072
YBLOCK	1302
YDATA	0105
YLT	0075
ZERO	0116

LCOVAR = LOGARITHMIC COVAR

PURPOSE: This program is a semi-logarithmic version of COVAR. y values are converted to $\log_\varepsilon$ y before calculation so that each "Y" in the output format means $\log_\varepsilon$ y. This program is useful for semi-logarithmic regression analysis.

OPERATION: Operation of LCOVAR is the same as that of COVAR.

DESCRIPTION: This program performs a linear correlation between x and $\log_\varepsilon$ y. The subroutine of COVAR to read the x and y buffers, RXYB, has been altered to convert y to $\log_\varepsilon$ y. Since this program is almost identical to COVAR, only the parts of the listing which differ from COVAR are given.

...

```
L COVAR
```

READ X LINES : A /Read all of both x and y block #'s

X BLOCK NUMBERS : 60,64 (CTRL/FORM)

Y BLOCK NUMBERS : 40,43 (CTRL/FORM)

UNPAIRED DATA /Number of x and y block #'s not equal

READ X LINES : A /Read all of both x and y block #'s

X BLOCK NUMBERS : 60,63 (CTRL/FORM)

Y BLOCK NUMBERS : 41,44 (CTRL/FORM)

```
NUMBER OF PAIRS : +0.6000000E+02

CORRELATION COEFFICIENT : +0.9370907E+00

T : +0.2044387E+02          WITH DF : +0.5800000E+02

Y' = (+0.1668171E+00)X  +0.5364816E+00

SUM OF SQUARED DEVIATIONS :  +0.4013981E+01

STANDARD ERROR OF ESTIMATE : +0.2630713E+00

SUM OF PRODUCTS XY :         +0.1733933E+03

SAMPLE COVARIANCE :          +0.2938870E+01

                          X                    Y

MEAN :          +0.7939994E+01       +0.1861009E+01

SUM OF SQUARES :    +0.1039421E+04       +0.3293396E+02

SAMPLE VARIANCE :   +0.1761730E+02       +0.5582876E+00

SAMPLE DEVIATION :  +0.4197297E+01       +0.7471864E+00
```

X BLOCK NUMBERS : ↑C /Return control to tape Monitor

```
0765  4407            JMS I 7
0766  5124            FGET SUMX2
0767  4146            FDIV FTEMP2
0770  6143            FPUT FTEMP1
0771  0000            FEXT        /SUMX2/(N-1)
0772  4406            JMS I 6     /X VARIANCE
0773  1112            TAD S1
0774  4570            JMS I SPACEP
0775  4407            JMS I 7
0776  5132            FGET SUMY2
0777  4146            FDIV FTEMP2
1000  6146            FPUT FTEMP2
1001  0000            FEXT        /SUMY2/(N-1)
1002  4406            JMS I 6     /Y VARIANCE
1003  4403            JMS I MESSP             /SAMPLE DEVIATION :
1004  4543            4543
1005  4323            4323
1006  0115            0115
1007  2014            2014
1010  0540            0540
1011  0405            0405
1012  2611            2611
1013  0124            0124
1014  1117            1117
1015  1640            1640
1016  7240            7240
1017  4040            4040
1020  0000            0000
1021  4407            JMS I 7
1022  5143            FGET FTEMP1
1023  0002            SQROOT
1024  0000            FEXT        /SQROOT( SUMX2/(N-1) )
1025  4406            JMS I 6     /X SAMPL DEV
1026  1112            TAD S1
1027  4570            JMS I SPACEP
1030  4407            JMS I 7
1031  5146            FGET FTEMP2
1032  0002            SQROOT
1033  0000            FEXT        /SQROOT( SUMY2/(N-1) )
1034  4406            JMS I 6     /Y SAMP DEV
1035  4403            JMS I MESSP
1036  4343            4343
1037  4343            4343
1040  4343            4343
1041  4343            4343
1042  4300            4300
1043  1066            TAD SW
1044  7650            SNA CLA
1045  5571            JMP I STARTP
1046  5647            JMP I BNP
1047  0251  BNP,       BN
1050  0000  TOTAL,     0
```

```
1051  4407            JMS I 7
1052  1127            FADD SUMY
1053  6127            FPUT SUMY  /SUM OF Y'S
1054  5143            FGET FTEMP1
1055  1121            FADD SUMX
1056  6121            FPUT SUMX  /SUM OF X'S
1057  5157            FGET ONE
1060  1140            FADD FN
1061  6140            FPUT FN    /NO OF PAIRS
1062  0000            FEXT
1063  5650            JMP I TOTAL
1064  0000  SUMSQ,    0
1065  4407            JMS I 7
1066  2154            FSUB MEANY
1067  6146            FPUT FTEMP2
1070  0001            SQUARE
1071  1132            FADD SUMY2
1072  6132            FPUT SUMY2 /SUM OF Y'S SQUARED
1073  5143            FGET FTEMP1
1074  2151            FSUB MEANX
1075  6143            FPUT FTEMP1
1076  0001            SQUARE
1077  1124            FADD SUMX2
1100  6124            FPUT SUMX2 /SUM OF X'S SQUARED
1101  5143            FGET FTEMP1
1102  3146            FMPY FTEMP2
1103  1135            FADD SUMXY
1104  6135            FPUT SUMXY /SUM OF XY'S
1105  0000            FEXT
1106  5664            JMP I SUMSQ
1107  0000  RXYB,     0          /READ AN X & A Y DATA POINT
1110  1307            TAD RXYB
1111  1063            TAD C2
1112  3347            DCA BEND
1113  1412            TAD I 12
1114  1350            TAD MDOL
1115  7450            SNA
1116  5342            JMP CHK    /END OF BLOCK
1117  1065            TAD DOL    /RESTORE
1120  3044            DCA 44
1121  1412            TAD I 12
1122  3045            DCA 45
1123  1412            TAD I 12
1124  3046            DCA 46
1125  4407            JMS I 7
1126  6143 @          FPUT FTEMP1          / X DATA POINT
1127  0000            FEXT
1130  1414            TAD I 14
1131  3044            DCA 44
1132  1414            TAD I 14
1133  3045            DCA 45
1134  1414            TAD I 14
1135  3046            DCA 46
```

```
1136  4407            JMS I 7     /CONVERT Y TO LN(Y)
1137  0007            0007        /FLOG
1140  0000            FEXT
1141  5707            JMP I RXYB
1142  1414  CHK,       TAD I 14
1143  1350            TAD MDOL
1144  7640            SZA CLA
0145  5566            JMP I ERRINP            /X,Y'S DONT MATCH
1146  5747            JMP I BEND
1147  0000  BEND,      0
1150  7534  MDOL,      -244
1151  4403  ERRIN,     JMS I MESSP             /UNPAIRED DATA
1152  4543            4543
1153  2516            2516
1154  2001            2001
1155  1122            1122
1156  0504            0504
1157  4004            4004
1160  0124            0124
1161  0143            0143
1162  4343            4343
1163  4300            4300
1164  5571            JMP I STARTP
1165  0000  SET,       0           /SET INDICES FOR READING TAPE
1166  1106            TAD BTABLE
1167  3010            DCA 10      /X INDEX
1170  1073            TAD NB
1171  1106            TAD BTABLE
1172  3011            DCA 11      /Y INDEX
1173  1076            TAD NXB
1174  3111            DCA CNTR
1175  5765            JMP I SET
```

```
                *1200
1200    0000    BLOAD,      0           /SUBROUTINE TO SET THE BLOCK TABLE
1201    3073                DCA NB
1202    3064                DCA SETSW
1203    4405                JMS I 5
1204    1060                TAD 60
1205    7650                SNA CLA
1206    5240                JMP TERM    /INVALID, CHECK TERMINATOR
1207    4404                JMS I UNFLP
1210    3077                DCA TEMP1
1211    1077                TAD TEMP1
1212    3410                DCA I 10    /DEPOSIT IN BLOCK TABLE
1213    2073                ISZ NB      /COUNT BLOCKS
1214    1057                TAD 57
1215    1101                TAD MCOM
1216    7640                SZA CLA
1217    5203                JMP BLOAD+3             /NOT A COMMA, GET NEXT BLOCK
1220    4405                JMS I 5     /COMMA, SET BTABLE
1221    1060                TAD 60
1222    7650                SNA CLA
1223    5220                JMP .-3     /INVALID, TRY AGAIN
1224    4404                JMS I UNFLP
1225    7041                CIA
1226    3100                DCA TEMP2   /MINUS 2ND BLOCK #
1227    1077                TAD TEMP1
1230    1100                TAD TEMP2
1231    7700                SMA CLA
1232    5203                JMP BLOAD+3             /SET UP, GET NEXT #
1233    2077                ISZ TEMP1
1234    1077                TAD TEMP1
1235    3410                DCA I 10    /DEPOSIT IN BTABLE
1236    2073                ISZ NB      /COUNT BLOCKS
1237    5227                JMP .-10
1240    1057    TERM,       TAD 57
1241    1102                TAD MCC
1242    7650                SNA CLA
1243    5503                JMP I TAPE
1244    1057                TAD 57
1245    1067                TAD MFORM
1246    7650                SNA CLA
1247    5600                JMP I BLOAD             /END OF TABLE
1250    1057                TAD 57
1251    1256                TAD MA
1252    7640                SZA CLA
1253    5203                JMP BLOAD+3             /NOT END OF TABLE
1254    2064                ISZ SETSW
1255    5600                JMP I BLOAD
1256    7477    MA,         -301
1257    0000    RXYT,       0
1260    1410                TAD I 10
1261    3264                DCA XBLOCK
1262    4402                JMS I RWTAPE
```

```
1263  1201              1201
1264  0000  XBLOCK,     0
1265  2000              2000          /READ X DATA INTO 2000
1266  1066              TAD SW
1267  7640              SZA CLA
1270  5276              JMP .+6       /DO NOT RERRANGE DATA
1271  1072              TAD XLT       /X LINE TABLE
1272  3013              DCA 13
1273  1104              TAD XDATA
1274  3012              DCA 12
1275  4321              JMS ADAT      /ARRANGE DATA
1276  1411              TAD I 11
1277  3302              DCA YBLOCK
1300  4402              JMS I RWTAPE
1301  1201              1201
1302  0000  YBLOCK,     0
1303  2200              2200          /READ YDATA INTO 2200
1304  1066              TAD SW
1305  7640              SZA CLA
1306  5314              JMP .+6
1307  1075              TAD YLT       /Y LINE TABLE
1310  3013              DCA 13
1311  1105              TAD YDATA
1312  3012              DCA 12
1313  4321              JMS ADAT      /ARRANGE DATA
1314  1104              TAD XDATA
1315  3012              DCA 12
1316  1105              TAD YDATA
1317  3014              DCA 14
1320  5657              JMP I RXYT
1321  0000  ADAT,       0
1322  1074              TAD NXL       /MINUS # OF X LINES
1323  3110              DCA CNT
1324  1012              TAD 12
1325  3077              DCA TEMP1
1326  1413              TAD I 13
1327  1107              TAD M1
1330  7425              7425          /MUY
1331  0003              0003
1332  7701              7701          /CLA & MQA
1333  1077              TAD TEMP1     /3(LINE-1)+X OR Y DATA
1334  3015              DCA 15
1335  1415              TAD I 15
1336  3412              DCA I 12
1337  1415              TAD I 15
1340  3412              DCA I 12
1341  1415              TAD I 15
1342  3412              DCA I 12
1343  2110              ISZ CNT
1344  5326              JMP ADAT+5
1345  1065              TAD DOL
1346  3412              DCA I 12
1347  5721              JMP I ADAT
```

```
1350  0000  OUT4,    0              /REVISED FROM COVAR
1351  4406           JMS I 6
1352  5750           JMP I OUT4
1353  0000  SPACE,   0
1354  3111           DCA CNTR
1355  1365           TAD C240
1356  6041           TSF
1357  5356           JMP .-1
1360  6046           TLS
1361  7200           CLA
1362  2111           ISZ CNTR
1363  5355           JMP .-6
1364  5753           JMP I SPACE
1365  0240  C240,    240
```

TPAIR = T TEST, PAIRED DATA

PURPOSE: This program performs a paired T test on data files stored on DECtape data tape. The input consists of paired files x and y data. TPAIR has the following output :

A. Mean difference
B. Standard deviation of difference
C. Standard error of mean difference
D. T value
E. Degrees of freedom

OPERATION: When TPAIR is called, it will type "READ X LINES : ". The user will type line numbers of x data to be operated on and terminate line input with "CTRL/FORM". If all lines, complete data blocks, are to be used for both x and y inputs the user may type "A" for all. The program will ask for "X BLOCK NUMBERS : ", "READ Y LINES : " and "Y BLOCK NUMBERS : ". In each case, the user supplies block and line numbers and terminates input with "CTRL/FORM". Data input should be paired. The first x data point is paired with the first y data point and data blocks are read in pairs by the program so that the number of x lines to be read must equal the number of y lines and the number of x blocks must equal the number of y blocks. Unpaired data input will cause the program to type "UNPAIRED DATA " and return to the beginning. After the input of y block numbers, the program will proceed through calculation and output and return to "READ X LINES : " unless this request has previously been answered by "A" in which case the program will start over at "X BLOCK NUMBERS : ".

DESCRIPTION: TPAIR will accommodate data tapes of standard (129_{10}) or shorter block length. During a single pass of the data tape the sum of the pair differences, and the sum of the pair differences

squared are computed and the number of x,y pairs are counted. The program reads a block of x data and a block of y data and then proceeds to compute using the first x point and the first y point as a pair.

TPAIR uses the following calculations:

A. Number of pairs = N

B. Difference = $x - y = D$

C. Mean difference = $\frac{\Sigma(x - y)}{N} = \bar{D}$

D. Standard deviation of difference = $\sqrt{\frac{\Sigma D^2}{N} - \bar{D}^2}$

E. Standard error of mean difference = $\sqrt{\frac{\frac{\Sigma D^2}{N} - \bar{D}^2}{(N-1)}}$

F. $T = \frac{\bar{D}}{\sqrt{\frac{\frac{\Sigma D^2}{N} - \bar{D}^2}{N-1}}}$

G. Degrees of freedom = N - 1

```
TPAIR 2                                  /Call program

READ X LINES : A                         /Read all of both x and y block #'s
X BLOCK NUMBERS : 60 63 (CTRL/FORM)
Y BLOCK NUMBERS : 61 64 (CTRL/FORM)
MEAN DIFFERENCE : -0.2666667E-01
STD DEVIATION OF DIFFERENCE  : +0.1842702E+00
STD ERROR OF MEAN DIFFERENCE : +0.3421813E-01
T : -0.7793140E+00              WITH D F :   29


X BLOCK NUMBERS : 60,64                  /Read all of both x and y block #'s
Y BLOCK NUMBERS : 40,43 41
MEAN DIFFERENCE : -0.2399998E-01
STD DEVIATION OF DIFFERENCE  : +0.3420875E+00
STD ERROR OF MEAN DIFFERENCE : +0.3976687E-01
T : -0.6035169E+00              WITH D F :   74


X BLOCK NUMBERS : 60                     /Amount of data in block #'s 10 and 60
                                         /Not equal
Y BLOCK NUMBERS : 10
UNPAIRED DATA


X BLOCK NUMBERS : ↑C                     /Return control to tape Monitor
```

```
                /TPAIR, PAIRED T TEST. MOUNT DATA TAPE
                /ON UNIT #1. TERMINATE LINE OR BLOCK #'S
                /BY CTRL-FORM. TO READ COMPLETE BLOCKS
                /RESPOND TO "READ X LINES : " WITH "A"
                /X DATA IS PAIRED IN ORDER WITH Y DATA
                *200
0200  6046  START,    TLS
0201  4403            JMS I MESSP           /READ X LINES :
0202  4543            4543
0203  4322            4322
0204  0501            0501
0205  0440            0440
0206  3040            3040
0207  1411            1411
0210  1605            1605
0211  2340            2340
0212  7240            7240
0213  0000            0000
0214  1072            TAD XLT     /X LINE TABLE
0215  3010            DCA 10
0216  4545            JMS I BLOADP          /LOAD X LINE TABLE
0217  1064            TAD SETSW
0220  3066            DCA SW      /COMPLETE BLOCK SWITCH
0221  1066            TAD SW
0222  7640            SZA CLA
0223  5251            JMP BN
0224  1073            TAD NB
0225  7041            CIA
0226  3074            DCA NXL     /MINUS # OF X LINES
0227  4403            JMS I MESSP           /READ Y LINES :
0230  4543            4543
0231  4322            4322
0232  0501            0501
0233  0440            0440
0234  3140            3140
0235  1411            1411
0236  1605            1605
0237  2340            2340
0240  7240            7240
0241  0000            0000
0242  1075            TAD YLT     /Y LINE TABLE
0243  3010            DCA 10
0244  4545            JMS I BLOADP          /LOAD Y LINE TABLE
0245  1073            TAD NB
0246  1074            TAD NXL
0247  7640            SZA CLA
0250  5546            JMP I ERRINP          /UNPAIRED LINES
0251  1106  BN,       TAD BTABLE
0252  3010            DCA 10
0253  4403            JMS I MESSP           /X BLOCK NUMBERS :
0254  4543            4543
0255  4330            4330
```

```
0256  4002          4002
0257  1417          1417
0260  0313          0313
0261  4016          4016
0262  2515          2515
0263  0205          0205
0264  2223          2223
0265  4072          4072
0266  4000          4000
0267  4545          JMS I BLOADP
0270  1073          TAD NB
0271  7041          CIA
0272  3076          DCA NXB    /MINUS # OF X BLOCKS
0273  4403          JMS I MESSP           /Y BLOCK NUMBERS :
0274  4543          4543
0275  4331          4331
0276  4002          4002
0277  1417          1417
0300  0313          0313
0301  4016          4016
0302  2515          2515
0303  0205          0205
0304  2223          2223
0305  4072          4072
0306  4000          400P
0307  4545          JMS I BLOADP
0310  1073          TAD NB
0311  1076          TAD NXB
0312  7640          SZA CLA
0313  5546          JMP I ERRINP          /UNPAIRED BLOCKS
0314  4407          JMS I 7
0315  5112          FGET ZERO  /CLEAR
0316  6120          FPUT SUMD  /SUM OF DIFFERENCES
0317  6123          FPUT SUMD2 /SUM OF DIFFERENCES SQUARED
0320  6126          FPUT FN
0321  0000          FEXT
0322  4551          JMS I SETP
0323  4552          JMS I RXYTP           /READ AN X & Y BLOCK
0324  4553          JMS I RXYBP           /READ AN X & Y DATA POINT
0325  4554          JMS I SUMSP
0326  5324          JMP .-2
0327  2111          ISZ CNTR
0330  5323          JMP .-5
```

```
0331  4403    JMS I MESSP           /MEAN DIFFERENCE :
0332  4543    4543
0333  4315    4315
0334  0501    0501
0335  1640    1640
0336  0411    0411
0337  0606    0606
0340  0522    0522
0341  0516    0516
0342  0305    0305
0343  4072    4072
0344  4000    4000
0345  4407    JMS I 7
0346  5120    FGET SUMD
0347  4126    FDIV FN
0350  6115    FPUT MEAND
0351  0000    FEXT
0352  4406    JMS I 6     /OUTPUT MEAN DIFF.
0353  4403    JMS I MESSP           /STD DEVIATION OF DIFFERENCE
0354  4543    4543
0355  4323    4323
0356  2404    2404
0357  4004    4004
0360  0526    0526
0361  1101    1101
0362  2411    2411
0363  1716    1716
0364  4017    4017
0365  0640    0640
0366  0411    0411
0367  0606    0606
0370  0522    0522
0371  0516    0516
0372  0305    0305
0373  4040    4040
0374  7240    7240
0375  0000    0000
0376  4407    JMS I 7
0377  5115    FGET MEAND
0400  0001    SQUARE
0401  6131    FPUT FTEMP1
0402  5123    FGET SUMD2
0403  4126    FDIV FN
0404  2131    FSUB FTEMP1
0405  0002    SQROOT
0406  6131    FPUT FTEMP1
0407  0000    FEXT
0410  4406    JMS I 6     /OUTPUT STD DEV OF DIFF.
0411  4403    JMS I MESSP           /STD ERROR OF MEAN DIFFERENCE
0412  4543    4543
0413  4323    4323
0414  2404    2404
```

```
0415  4005          4005
0416  2222          2222
0417  1722          1722
0420  4017          4017
0421  0640          0640
0422  1505          1505
0423  0116          0116
0424  4004          4004
0425  1106          1106
0426  0605          0605
0427  2205          2205
0430  1603          1603
0431  0540          0540
0432  7240          7240
0433  0000          0000
0434  4407          JMS I 7
0435  5126          FGET FN
0436  2137          FSUB ONE
0437  0002          SQROOT
0440  6134          FPUT FTEMP2
0441  5131          FGET FTEMP1
0442  4134          FDIV FTEMP2
0443  6131          FPUT FTEMP1
0444  0000          FEXT
0445  4406          JMS I 6    /OUTPUT SE OF MEAN DIFF
0446  4403          JMS I MESSP            /T :
0447  4543          4543
0450  4324          4324
0451  4072          4072
0452  4000          4000
0453  4407          JMS I 7
0454  5115          FGET MEAND
0455  4131          FDIV FTEMP1
0456  0000          FEXT
0457  4406          JMS I 6    /OUTPUT T
0460  4403          JMS I MESSP            /12 SPACES & WITH D F :
0461  4040          4040
0462  4040          4040
0463  4040          4040
0464  4040          4040
0465  4040          4040
0466  4040          4040
0467  2711          2711
0470  2410          2410
0471  4004          4004
0472  4006          4006
0473  4072          4072
0474  4000          4000
0475  4407          JMS I 7
0476  5126          FGET FN
0477  2137          FSUB ONE
0500  0000          FEXT
0501  4547          JMS I OUT4P
```

```
0502  4403            JMS I MESSP           /8 LF'S
0503  4543            4543
0504  4343            4343
0505  4343            4343
0506  4343            4343
0507  4300            4300
0510  1066            TAD SW
0511  7650            SNA CLA
0512  5550            JMP I STARTP
0513  5714            JMP I BNP  /READ COMPLETE BLOCKS
0514  0251  BNP,       BN
0515  0000  RXYB,      0          /READ AN X & A Y DATA POINT
0516  1315            TAD RXYB
0517  1063            TAD C2
0520  3352            DCA BEND
0521  1412            TAD I 12
0522  1353            TAD MDOL
0523  7450            SNA
0524  5345            JMP CHK    /END OF BLOCK
0525  1065            TAD DOL    /RESTORE
0526  3044            DCA 44
0527  1412            TAD I 12
0530  3045            DCA 45
0531  1412            TAD I 12
0532  3046            DCA 46
0533  4407            JMS I 7
0534  6131            FPUT FTEMP1           / X DATA POINT
0535  0000            FEXT
0536  1414            TAD I 14
0537  3044            DCA 44
0540  1414            TAD I 14
0541  3045            DCA 45
0542  1414            TAD I 14
0543  3046            DCA 46
0544  5715            JMP I RXYB
0545  1414  CHK,       TAD I 14
0546  1353            TAD MDOL
0547  7640            SZA CLA
0550  5546            JMP I ERRINP          /X,Y'S DON'T MATCH
0551  5752            JMP I BEND
0552  0000  BEND,      0
0553  7534  MDOL,      -244
0554  4403  ERRIN,     JMS I MESSP           /UNPAIRED DATA
0555  4543            4543
0556  2516            2516
0557  2001            2001
0560  1122            1122
0561  0504            0504
0562  4004            4004
0563  0124            0124
0564  0143            0143
0565  4343            4343
0566  4300            4300
```

```
0567   1066          TAD SW
0570   7650          SNA CLA
0571   5550          JMP I STARTP
0572   5714          JMP I BNP
```

```
                *600
0600    0000    BLOAD,      0           /SUBROUTINE TO SET THE BLOCK TABLE
0601    3073                DCA NB
0602    3064                DCA SETSW
0603    4405                JMS I 5
0604    1060                TAD 60
0605    7650                SNA CLA
0606    5240                JMP TERM    /INVALID, CHECK TERMINATOR
0607    4404                JMS I UNFLP
0610    3077                DCA TEMP1
0611    1077                TAD TEMP1
0612    3410                DCA I 10    /DEPOSIT IN BLOCK TABLE
0613    2073                ISZ NB      /COUNT BLOCKS
0614    1057                TAD 57
0615    1101                TAD MCOM
0616    7640                SZA CLA
0617    5203                JMP BLOAD+3             /NOT A COMMA, GET NEXT BLOCK
0620    4405                JMS I 5     /COMMA, SET BTABLE
0621    1060                TAD 60
0622    7650                SNA CLA
0623    5220                JMP .-3     /INVALID, TRY AGAIN
0624    4404                JMS I UNFLP
0625    7041                CIA
0626    3100                DCA TEMP2   /MINUS 2ND BLOCK #
0627    1077                TAD TEMP1
0630    1100                TAD TEMP2
0631    7700                SMA CLA
0632    5203                JMP BLOAD+3             /SET UP, GET NEXT #
0633    2077                ISZ TEMP1
0634    1077                TAD TEMP1
0635    3410                DCA I 10    /DEPOSIT IN BTABLE
0636    2073                ISZ NB      /COUNT BLOCKS
0637    5227                JMP .-10
0640    1057    TERM,       TAD 57
0641    1102                TAD MCC
0642    7650                SNA CLA
0643    5503                JMP I TAPE
0644    1057                TAD 57
0645    1067                TAD MFORM
0646    7650                SNA CLA
0647    5600                JMP I BLOAD             /END OF TABLE
0650    1057                TAD 57
0651    1256                TAD MA
0652    7640                SZA CLA
0653    5203                JMP BLOAD+3             /NOT END OF TABLE
0654    2064                ISZ SETSW
0655    5600                JMP I BLOAD
0656    7477    MA,         -301
0657    0000    RXYT,       0
0660    1410                TAD I 10
0661    3264                DCA XBLOCK
0662    4402                JMS I RWTAPE
```

```
0663  1201              1201
0664  0000  XBLOCK,     0
0665  1200              1200          /READ X DATA INTO 1200
0666  1066              TAD SW
0667  7640              SZA CLA
0670  5276              JMP .+6       /DO NOT RERRANGE DATA
0671  1072              TAD XLT       /X LINE TABLE
0672  3013              DCA 13
0673  1104              TAD XDATA
0674  3012              DCA 12
0675  4321              JMS ADAT      /ARRANGE DATA
0676  1411              TAD I 11
0677  3302              DCA YBLOCK
0700  4402              JMS I RWTAPE
0701  1201              1201
0702  0000  YBLOCK,     0
0703  1400              1400          /READ Y DATA INTO 1400
0704  1066              TAD SW
0705  7640              SZA CLA
0706  5314              JMP .+6
0707  1075              TAD YLT       /Y LINE TABLE
0710  3013              DCA 13
0711  1105              TAD YDATA
0712  3012              DCA 12
0713  4321              JMS ADAT      /ARRANGE DATA
0714  1104              TAD XDATA
0715  3012              DCA 12
0716  1105              TAD YDATA
0717  3014              DCA 14
0720  5657              JMP I RXYT
0721  0000  ADAT,       0
0722  1074              TAD NXL       /MINUS # OF X LINES
0723  3110              DCA CNT
0724  1012              TAD 12
0725  3077              DCA TEMP1
0726  1413              TAD I 13
0727  1107              TAD M1
0730  7425              7425          /MUY
0731  0003              0003
0732  7701              7701          /CLA & MQA
0733  1077              TAD TEMP1     /3(LINE-1)+X OR Y DATA
0734  3015              DCA 15
0735  1415              TAD I 15
0736  3412              DCA I 12
0737  1415              TAD I 15
0740  3412              DCA I 12
0741  1415              TAD I 15
0742  3412              DCA I 12
0743  2110              ISZ CNT
0744  5326              JMP ADAT+5
0745  1065              TAD DOL
0746  3412              DCA I 12
0747  5721              JMP I ADAT
```

```
0750  0000  OUT4,     0           /OUTPUT MAX OF 4 DIGITS, NO SIGN
0751  4407            JMS I 7
0752  1142            FADD PT1
0753  0000            FEXT
0754  1371            TAD C4
0755  3062            DCA 62
0756  3767            DCA I FP1
0757  3770            DCA I FP2
0760  4406            JMS I 6
0761  1372            TAD C253    /RESTORE FLOATING POINT
0762  3767            DCA I FP1
0763  1063            TAD C2
0764  3770            DCA I FP2
0765  3062            DCA 62
0766  5750            JMP I OUT4
0767  7327  FP1,       7327
0770  7330  FP2,       7330
0771  0004  C4,        4
0772  0253  C253,      253
            *1000
1000  0000  SET,       0           /SET INDICES FOR READING TAPE
1001  1106            TAD BTABLE
1002  3010            DCA 10      /X INDEX
1003  1073            TAD NB
1004  1106            TAD BTABLE
1005  3011            DCA 11      /Y INDEX
1006  1076            TAD NXB
1007  3111            DCA CNTR
1010  5600            JMP I SET
1011  0000  SUMS,      0           /SUM DATA
1012  4407            JMS I 7
1013  6134            FPUT FTEMP2             /Y DATA POINT
1014  5131            FGET FTEMP1             /X DATA POINT
1015  2134            FSUB FTEMP2             /X-Y
1016  6131            FPUT FTEMP1
1017  1120            FADD SUMD
1020  6120            FPUT SUMD
1021  5131            FGET FTEMP1
1022  0001            SQUARE
1023  1123            FADD SUMD2
1024  6123            FPUT SUMD2
1025  5137            FGET ONE
1026  1126            FADD FN
1027  6126            FPUT FN
1030  0000            FEXT
1031  5611            JMP I SUMS
```

```
                *62
0062    0000            0
0063    0002    C2,     2
0064    0000    SETSW,  0
0065    0244    DOL,    244
0066    0000    SW,     0
0067    7564    MFORM,  -214
0070    7447    MY,     -331
0071    7462    MN,     -316
0072    2400    XLT,    2400
0073    0000    NB,     0
0074    0000    NXL,    0
0075    2500    YLT,    2500
0076    0000    NXB,    0
0077    0000    TEMP1,  0
0100    0000    TEMP2,  0
0101    7524    MCOM,   -254
0102    7575    MCC,    -203
0103    7600    TAPE,   7600
0104    1177    XDATA,  1177
0105    1377    YDATA,  1377
0106    1600    BTABLE, 1600
0107    7777    M1,     -1
0110    0000    CNT,    0
0111    0000    CNTR,   0
0112    0000
0113    0000
0114    0000    ZERO,   0;0;0
0115    0000
0116    0000
0117    0000    MEAND,  0;0;0
0120    0000
0121    0000
0122    0000    SUMD,   0;0;0
0123    0000
0124    0000
0125    0000    SUMD2,  0;0;0
0126    0000
0127    0000
0130    0000    FN,     0;0;0
0131    0000
0132    0000
0133    0000    FTEMP1, 0;0;0
0134    0000
0135    0000
0136    0000    FTEMP2, 0;0;0
0137    0001
0140    2000
0141    0000    ONE,    1;2000;0
0142    7775
0143    3146
0144    3146    PT1,    7775;3146;3146
```

```
0145   0600   BLOADP,    BLOAD
0146   0554   ERRINP,    ERRIN
0147   0750   OUT4P,     OUT4
0150   0200   STARTP,    START
0151   1000   SETP,      SET
0152   0657   RXYTP,     RXYT
0153   0515   RXYBP,     RXYB
0154   1011   SUMSP,     SUMS
              *7341
7341   0000              0
7342   0000              0          /CLEAR THE CR AND LF IN FLOATING POINT
              MESSP=3
              UNFLP=4
              RWTAPE=2
              SQUARE=1
              SQROOT=2
```

ADAT	0721
BEND	0552
BLOAD	0600
BLOADP	0145
BN	0251
BNP	0514
BTABLE	0106
CHK	0545
CNT	0110
CNTR	0111
C2	0063
C253	0772
C4	0771
DOL	0065
ERRIN	0554
ERRINP	0146
FN	0126
FP1	0767
FP2	0770
FTEMP1	0131
FTEMP2	0134
MA	0656
MCC	0102
MCOM	0101
MDOL	0553
MEAND	0115
MESSP	0003
MFORM	0067
MN	0071
MY	0070
M1	0107
NB	0073
NXB	0076
NXL	0074
ONE	0137
OUT4	0750
OUT4P	0147
PT1	0142
RWTAPE	0002
RXYB	0515
RXYBP	0153
RXYT	0657
RXYTP	0152
SET	1000
SETP	0151
SETSW	0064
SQROOT	0002
SQUARE	0001
START	0200
STARTP	0150
SUMD	0120
SUMD2	0123

SUMS	1011
SUMSP	0154
SW	0066
TAPE	0103
TEMP1	0077
TEMP2	0100
TERM	0640
UNFLP	0004
XBLOCK	0664
XDATA	0104
XLT	0072
YBLOCK	0702
YDATA	0105
YLT	0075
ZERO	0112

BCALC = BLOCK CALCULATOR

PURPOSE: This program enables the user to do calculations using data files on DECtape as variables in the calculation. Results of calculation are stored on DECtape. BCALC is a master program for handling the data files. The user must supply a floating point program, which is called by BCALC as a subroutine, for each specific calculation.

OPERATION: BCALC requires a floating point subroutine starting at memory address 3600. One page has been set aside for this subroutine. BCALC has been updated with the starting address of the tape system and subroutines are updated with a starting address of 0200. This enables the user to call the subroutine after calling BCALC and the program will begin running after the subroutine is called. If several calculations are to be done, the user may enter the tape Monitor and call the next successive calculation subroutine without recalling BCALC.

Start the tape Monitor and call BCALC and then the calculation subroutine. The program first queries the user about the block length of the data tape. Next the program will type "CONSTANT : ". After the user has typed in the first constant of his calculation and terminated the number by a non-valid floating point input (space, etc.) the program will again type "CONSTANT : ". The user should terminate the last constant input by "CTRL/FORM" which signals BCALC to go on and ask for "VARIABLE BLOCK : ". The user replies by typing the block number of the first variable in his calculation. Input is similar to the input of constants in that the last variable block number is terminated by "CTRL/FORM". BCALC will then ask "RESULT BLOCK : " and the user should type the block number of data tape in which he wishes to have the results of the calculation stored.

At this point the variable blocks are read into core memory, the computations are done and the results are written on data tape. Unless the program is restarted at 0200 future calculations will be done using the same constants and the program will return to "VARIABLE BLOCK : ".

DESCRIPTION: After instructions from the user BCALC reads the variable blocks into core memory. The first result is computed from the constants and first number of each variable block. The second result comes from the same calculation on the second number from each variable block. As many results will be computed as there are numbers in the first variable block.

Up to 10 constants and 11 variables may be used for one calculation.

EXAMPLE: Suppose the user wishes to calculate the values of z, where $z = ax^2 - by$ and to have the z's typed out after calculation. He would write the following type of calculation subprogram to be called by BCALC.

Let $x = V_1$, the first variable
$y = V_2$, the second variable
$a = C_1$, the first constant
$b = C_2$, the second constant

```
3600    0000    0000        /Calculation subroutine
3601    4407    JMS I 7
3602    5125    FGET V2
3603    3066    FMPY C2
3604    6130    FPUT V3     /Temporary storage
3605    5122    FGET V1
```

BCALC = BLOCK CALCULATOR (continued)

```
3606    0001    SQUARE
3607    3063    FMPY C1
3610    2130    FSUB V3
3611    6130    FPUT V3      /Store z
3612    0000    FEXT
3613    4406    JMS I 6      /Output z
3614    4407    JMS I 7
3615    5130    FGET V3      /Get z
3616    0000    FEXT
3617    5600    JMP I 3600
```

This program would be updated and given a name, say EXAMP, and a starting address of 0200.

ADDRESSES OF CONSTANTS AND VARIABLES:

C_1	0063	V_1	0122
C_2	0066	V_2	0125
C_3	0071	V_3	0130
C_4	0074	V_4	0133
C_5	0077	V_5	0136
C_6	0102	V_6	0141
C_7	0105	V_7	0144
C_8	0110	V_8	0147
C_9	0113	V_9	0152
C_{10}	0116	V_{10}	0155
		V_{11}	0160
		V_{12}	0163
		V_{13}	0166
		V_{14}	0171
		V_{15}	0174

```
BCALC ↵                                  /Call program

EXAMP ↵                                  /Call calculation subroutine

STD FORMAT ? Y                           /Yes

CONSTANT : 10 ↵                          /First constant

CONSTANT : 2( CTRL/FORM)                 /Second and last constant

VARIABLE BLOCK : 60 ↵                    /First variable block #

VARIABLE BLOCK : 40(CTRL/FORM)           /Second and last variable block #

RESULT BLOCK : 45 ↵                      /Result block #
+ 0.1439999E+02                          /Results
+ 0.3600000E+02
+ 0.8400000E+02
+ 0.1520000E+03
+ 0.2400000E+03
+ 0.3976000E+03
+ 0.4760000E+03
+ 0.6239999E+03
+ 0.7044999E+03
+ 0.9799998E+03
+ 0.1188000E+04
+ 0.1416000E+04
+ 0.1664000E+04
+ 0.1636099E+04
+ 0.2220000E+04

                                         /Same constants as above are used

VARIABLE BLOCK : 60 ↵                    /First variable block #

VARIABLE BLOCK : 60(CTRL/FORM)           /Second and last variable block #

RESULT BLOCK : 65 ↵                      /Result block #
+ 0.1429999E+02                          /Results
+ 0.3600000E+02
+ 0.8400000E+02
+ 0.1520000E+03
+ 0.2400000E+03
+ 0.3967999E+03
+ 0.4760000E+03
+ 0.6239999E+03
+ 0.7055000E+03
+ 0.9799998E+03
+ 0.1188000E+04
+ 0.1416000E+04
+ 0.1664000E+04
+ 0.1638299E+04
+ 0.2220000E+04
```

```
                /BCALC, VARIABLES ARE ARRANGED IN BLOCKS.
                /PLACE CALCULATION SUBROUTINE AT 3600
                /TERMINATE LAST CONSTANT AND LAST VARIABLE
                /WITH CTRL/FORM.  INPUT UP TO 10 CONSTANTS
                /AND 11 VARIABLES.
                *200
0200  6046              TLS
0201  4403              JMS I MESS /"STD FORMAT ? "
0202  4543              4543
0203  4323              4323
0204  2404              2404
0205  4006              4006
0206  1722              1722
0207  1501              1501
0210  2440              2440
0211  7740              7740
0212  0000              0000
0213  1345              TAD M200
0214  3746              DCA I WORDS             /STD, 129 WORDS/BLOCK
0215  4405              JMS I 5
0216  1057              TAD 57
0217  1347              TAD MY
0220  7650              SNA CLA
0221  5250              JMP YES     /YES
0222  1057              TAD 57
0223  1350              TAD MN
0224  7640              SZA CLA     /NO
0225  5215              JMP .-10
0226  4403              JMS I MESS /"BLOCK LENGTH (DEC) : "
0227  4543              4543
0230  4302              4302
0231  1417              1417
0232  0313              0313
0233  4014              4014
0234  0516              0516
0235  0724              0724
0236  1040              1040
0237  5004              5004
0240  0503              0503
0241  5140              5140
0242  7240              7240
0243  0000              0000
0244  4754              JMS I NP    /TAKE IN A VALID FLOATING #
0245  4404              JMS I UNFL
0246  7041              CIA
0247  3746              DCA I WORDS             /MINUS BLOCK LENGTH
0250  1062  YES,        TAD CTAB    /CONSTANT TABLE
0251  3010              DCA 10
0252  4403  CIN,        JMS I MESS /"CONSTANT : "
0253  4543              4543
0254  4303              4303
0255  1716              1716
```

```
0256  2324              2324
0257  0116              0116
0260  2440              2440
0261  7240              7240
0262  0000              0000
0263  4754              JMS I NP
0264  1044              TAD 44      /STORE CONSTANT
0265  3410              DCA I 10
0266  1045              TAD 45
0267  3410              DCA I 10
0270  1046              TAD 46
0271  3410              DCA I 10
0272  1057              TAD 57
0273  1351              TAD MFORM
0274  7640              SZA CLA     /SKIP AFTER LAST CONSTANT
0275  5252              JMP CIN     /GET NEXT CONSTANT
0276  1752              TAD I BTABP           /VARIABLE BLOCK TABLE
0277  3010              DCA 10
0300  3353              DCA NV      /CLEAR # OF VARIABLES
0301  4403  VIN,        JMS I MESS /"VARIABLE BLOCK : "
0302  4543              4543
0303  4326              4326
0304  0122              0122
0305  1101              1101
0306  0214              0214
0307  0540              0540
0310  0214              0214
0311  1703              1703
0312  1340              1340
0313  7240              7240
0314  0000              0000
0315  4754              JMS I NP
0316  4404              JMS I UNFL
0317  3410              DCA I 10    /DEPOSIT IN BTABLE
0320  2353              ISZ NV      /COUNT VARIABLES
0321  1057              TAD 57
0322  1351              TAD MFORM
0323  7640              SZA CLA
0324  5301              JMP VIN     /GET BLOCK # OF NEXT VARIABLE
0325  1353              TAD NV
0326  7041              CIA
0327  3353              DCA NV      /MINUS # OF VARIABLES
0330  4403              JMS I MESS /"RESULT BLOCK : "
0331  4543              4543
0332  4322              4322
0333  0523              0523
0334  2514              2514
0335  2440              2440
0336  0214              0214
0337  1703              1703
0340  1340              1340
0341  7240              7240
0342  0000              0000
```

```
0343   5744            JMP I P2
0344   0400   P2,      400
0345   7600   M200,    -200
0346   4342   WORDS,   4342
0347   7447   MY,      -331
0350   7462   MN,      -316
0351   7564   MFORM,   -214
0352   0533   BTABP,   BTAB
0353   0000   NV,      0
0354   0503   NP,      NO
```

```
                *400
0400   4303             JMS NO
0401   4404             JMS I UNFL
0402   3275             DCA BLOCKR /RESULT BLOCK #
0403   1333             TAD BTAB   /VARIABLE BLOCK # TABLE
0404   3010             DCA 10
0405   1315             TAD DATA
0406   7001             IAC
0407   3217             DCA CORE
0410   1727             TAD I NVP  /# OF VARIABLES
0411   3316             DCA CNTR
0412   1410  READT,     TAD I 10
0413   3216             DCA BLOCK
0414   4402             JMS I RWTAPE
0415   1201             1201
0416   0000  BLOCK,     0
0417   0000  CORE,      0
0420   1217             TAD CORE
0421   1317             TAD C200
0422   3217             DCA CORE   /SET CORE AHEAD ONE PAGE
0423   2316             ISZ CNTR
0424   5212             JMP READT  /READ NEXT VARIABLE
0425   1331             TAD RESULT
0426   3012             DCA 12     /STORE RESULTS AT I 12
0427   1315             TAD DATA
0430   3322             DCA INDEX  /INDEX TO READ VARIABLES
0431   1322             TAD INDEX
0432   3010             DCA 10
0433   1727  RD,        TAD I NVP
0434   3316             DCA CNTR
0435   1121             TAD VTAB
0436   3011             DCA 11     /FLOATING TABLE OF VARIABLES
0437   1410             TAD I 10
0440   1323             TAD MDOL
0441   7450             SNA
0442   5271             JMP END    /END OF DATA
0443   1324             TAD DOL    /RESTORE
0444   3411             DCA I 11
0445   1410             TAD I 10
0446   3411             DCA I 11
0447   14Q0             TAD I 10
0450   3411             DCA I 11
0451   1010             TAD 10
0452   1320             TAD C175
0453   3010             DCA 10     /SET INDEX AHEAD 125
0454   2316             ISZ CNTR
0455   5237             JMP RD+4   /READ NEXT VARIABLE
0456   4725             JMS I CALC
0457   1044             TAD 44     /STORE RESULT
0460   3412             DCA I 12
0461   1045             TAD 45
0462   3412             DCA I 12
```

```
0463  1046          TAD 46
0464  3412          DCA I 12
0465  1322          TAD INDEX
0466  1321          TAD THREE
0467  3322          DCA INDEX  /SET INDEX UP 3
0470  5231          JMP RD-2   /READ NEXT LINE
0471  1324  END,     TAD DOL
0472  3412          DCA I 12   /TERMINATE DATA BLOCK
0473  4402          JMS I RWTAPE
0474  1401          1401
0475  0000  BLOCKR,  0          /WRITE RESULTS AT BLOCK #
0476  0600          0600       /ANSWER BUFFER
0477  4403          JMS I MESS / LF LF
0500  4343          4343
0501  0000          0000
0502  5726          JMP I REPEAT          /GET NEW VARIABLES
0503  0000  NO,      0
0504  4405          JMS I 5
0505  1060          TAD 60
0506  7640          SZA CLA
0507  5703          JMP I NO
0510  1057          TAD 57
0511  1330          TAD MCC
0512  7650          SNA CLA
0513  5732          JMP I TAPE /RETURN TO TAPE SYSTEM
0514  5304          JMP NO+1
0515  0777  DATA,    777
0516  0000  CNTR,    0
0517  0200  C200,    200
0520  0175  C175,    175
0521  0003  THREE,   3
0522  0000  INDEX,   0
0523  7534  MDOL,    -244
0524  0244  DOL,     244
0525  3600  CALCL    3600
0526  0276  REPEAT,  VIN-3
0527  0353  NVP,     NV
0530  7575  MCC,     -203
0531  0577  RESULT,  577
0532  7600  TAPE,    7600
0533  0533  BTAB,    BTAB
```

```
                RWTAPE=2
                MESS=3
                UNFL=4
                *62
0062    0062    CTAB,       CTAB
0063    0000
0064    0000
0065    0000    C1,         0;0;0
0066    0000
0067    0000
0070    0000    C2,         0;0;0
0071    0000
0072    0000
0073    0000    C3,         0;0;0
0074    0000
0075    0000
0076    0000    C4,         0;0;0
0077    0000
0100    0000
0101    0000    C5,         0;0;0
0102    0000
0103    0000
0104    0000    C6,         0;0;0
0105    0000
0106    0000
0107    0000    C7,         0;0;0
0110    0000
0111    0000
0112    0000    C8,         0;0;0
0113    0000
0114    0000
0115    0000    C9,         0;0;0
0116    0000
0117    0000
0120    0000    C10,        0;0;0
0121    0121    VTAB,       VTAB
0122    0000
0123    0000
0124    0000    V1,         0;0;0
0125    0000
0126    0000
0127    0000    V2,         0;0;0
0130    0000
0131    0000
0132    0000    V3,         0;0;0
0133    0000
0134    0000
0135    0000    V4,         0;0;0
0136    0000
0137    0000
0140    0000    V5,         0;0;0
0141    0000
```

```
0142   0000
0143   0000   V6,          0;0;0
0144   0000
0145   0000
0146   0000   V7,          0;0;0
0147   0000
0150   0000
0151   0000   V8,          0;0;0
0152@  0000
0153   0000
0154   0000   V9,          0;0;0
0155   0000
0156   0000
0157   0000   V10,         0;0;0
0160   0000
0161   0000
0162   0000   V11,         0;0;0
0163   0000
0164   0000
0165   0000   V12,         0;0;0
0166   0000
0167   0000
0170   0000   V13,         0;0;0
0171   0000
0172   0000
0173   0000   V14,         0;0;0
0174   0000
0175   0000
0176   0000   V15,         0;0;0
```

BLOCK	0416
BLOCKR	0475
BTAB	0533
BTABP	0352
CALC	0525
CIN	0252
CNTR	0516
CORE	0417
CTAB	0062
C1	0063
C10	0116
C175	0520
C2	0066
C200	0517
C3	0071
C4	0074
C5	0077
C6	0102
C7	0105
C8	0110
C9	0113
DATA	0515
DOL	0524
END	0471
INDEX	0522
MCC	0530
MDOL	0523
MESS	0003
MFORM	0351
MN	0350
MY	0347
M200	0345
NO	0503
NP	0354
NV	0353
NVP	0527
P2	0344
RD	0433
READT	0412
REPEAT	0526
RESULT	0531
RWTAPE	0002
TAPE	0532
THREE	0521
UNFL	0004
VIN	0301
VTAB	0121
V1	0122
V10	0155
V11	0160
V12	0163
V13	0166

```
V14       0171
V15       0174
V2        0125
V3        0130
V4        0133
V5        0136
V6        0141
V7        0144
V8        0147
V9        0152
WORDS     0346
YES       0250
```

LCALC = LINE CALCULATOR

PURPOSE: This program enables the user to do calculations from data stored on DECtape using specific lines of a file as variables in the calculation. The result of the calculation may be stored on one line of the same file or a different file. LCALC is similar to BCALC.

OPERATION: LCALC requires a floating point subroutine starting at memory address 3600. Calculation subroutines for LCALC are identical in form to those used by BCALC and may be used with either program.

Operation of LCALC is similar to that of BCALC. LCALC asks "VARIABLE LINE : " instead of "VARIABLE BLOCK : " and in addition asks "INPUT BLOCK : " and "RESULT BLOCK : ". If the user wishes to use the same result block as input block he may answer "S" to "RESULT BLOCK : ". After the first execution the program does all calculations using the same constants and the same lines as variables. It returns to "INPUT BLOCK : " after execution.

"CTRL/C" will return control to the tape system index on unit #8.

DESCRIPTION: This program does one computation and produces one result per execution of the program. It is useful if data files contain nonhomogeneous data. If, for instance, the first number in each file is height; the second, weight; third, age; etc., one may wish to compute a factor which is a combination of these variables and have the result appear as the seventh number in the file. LCALC can also be used to check subroutines intended for use with BCALC.

```
L CALC ↵                                  /Call program

EXAMP ↵                                   /Call calculation subroutine

STD FORMAT ? Y                            /Yes

CONSTANT : 10 ↵                           /First constant

CONSTANT : 2(CTRL/FORM)                   /Second and last constant

VARIABLE LINE : 1 ↵                       /First variable line #

VARIABLE LINE : 4(CTRL/FORM)              /Second and last variable line #

RESULT LINE : 15 ↵                        /Result line #

INPUT BLOCK : 10 ↵                        /Input block #

RESULT BLOCK : 11 ↵                       /Result block #
+0.2000000E+01                            /Result (will be written on line 15
                                          / of block #11)

INPUT BLOCK : 11 ↵                        /Input block #

RESULT BLOCK : 12 ↵                       /Result block #
+0.2000000E+01                            /Result (will be written on line 15
                                          / of block #12)

INPUT BLOCK : 10 ↵                        /Input block #

RESULT BLOCK : S+0.2000000E+01            /Result block # same as input block #

INPUT BLOCK : 11 ↵                        /Result block # same as input block #.
+0.2000000E+01                            /Same constants and line #'s for variables
                                          /And results used throughout.

INPUT BLOCK : 12 ↵
+0.2000000E+01

INPUT BLOCK : ↑C                          /Return control to tape Monitor
```

```
                /LCALC, VARIABLES ARE INDIVIDUAL LINES
                /PLACE CALCULATION SUBROUTINE AT 3600
                /TERMINATE LAST CONSTANT AND LAST VARIABLE
                /WITH CTRL-FORM. RESPOND TO "RESULT
                /BLOCK : " WITH "S" IF IT IS ALWAYS TO BE THE
                /SAME AS THE INPUT BLOCK
                *200
0200  6046              TLS
0201  4403              JMS I MESS /"STD FORMAT ? "
0202  4543              4543
0203  4323              4323
0204  2404              2404
0205  4006              4006
0206  1722              1722
0207  1501              1501
0210  2440              2440
0211  7740              7740
0212  0000              0000
0213  1347              TAD M200
0214  3750              DCA I WORDS             /STD, 128 WORDS/BLOCK
0215  3761              DCA I RSWP
0216  4405              JMS I 5
0217  1057              TAD 57
0220  1351              TAD MY
0221  7650              SNA CLA
0222  5251              JMP CIN-2  /YES
0223  1057              TAD 57
0224  1352              TAD MN
0225  7640              SZA CLA    /NO
0226  5216              JMP .-10
0227  4403              JMS I MESS /"BLOCK LENGTH (DEC) : "
0230  4543              4543
0231  4302              4302
0232  1417              1417
0233  0313              0313
0234  4014              4014
0235  0516              0516
0236  0724              0724
0237  1040              1040
0240  5004              5004
0241  0503              0503
0242  5140              5140
0243  7240              7240
0244  0000              0000
0245  4755              JMS I NINP /TAKE IN A VALID FLOATING #
0246  4404              JMS I UNFL
0247  7041              CIA
0250  3750              DCA I WORDS             /MINUS BLOCK LENGTH
0251  1062              TAD CTAB   /CONSTANT TABLE
0252  3010              DCA 10
0253  4403  CIN,        JMS I MESS /"CONSTANT : "
0254  4543              4543
```

```
0255  4303              4303
0256  1716              1716
0257  2324              2324
0260  0116              0116
0261  2440              2440
0262  7240              7240
0263  0000              0000
0264  4755              JMS I NINP
0265  1044              TAD 44      /STORE CONSTANT
0266  3410              DCA I 10
0267  1045              TAD 45
0270  3410              DCA I 10
0271  1046              TAD 46
0272  3410              DCA I 10
0273  1057              TAD 57
0274  1353              TAD MFORM
0275  7640              SZA CLA     /SKIP AFTER LAST CONSTANT
0276  5253              JMP CIN     /GET NEXT CONSTANT
0277  1760              TAD I VLTABP          /VARIABLE LINE TABLE
0300  3010              DCA 10
0301  3356              DCA NV      /CLEAR # OF VARIABLES
0302  4403  VIN,        JMS I MESS /"VARIABLE LINE : "
0303  4543              4543
0304  4326              4326
0305  0122              0122
0306  1101              1101
0307  0214              0214
0310  0540              0540
0311  1411              1411
0312  1605              1605
0313  4072              4072
0314  4000              4000
0315  4755              JMS I NINP
0316  4404              JMS I UNFL
0317  3410              DCA I 10    /DEPOSIT IN VLTABLE
0320  2356              ISZ NV      /COUNT VARIABLES
0321  1057              TAD 57
0322  1353              TAD MFORM
0323  7640              SZA CLA     /SKIP AFTER LAST VARIABLE
0324  5302              JMP VIN     /GET LINE # OF NEXT VARIABLE
0325  1356              TAD NV
0326  7041              CIA
0327  3356              DCA NV      /MINUS # OF VARIABLES
0330  4403              JMS I MESS /"RESULT LINE : "
0331  45T3              4543
0332  4322              4322
0333  0523              0523
0334  2514              2514
0335  2440              2440
0336  1411              1411
0337  1605              1605
0340  4072              4072
0341  4000              4000
```

```
0342   4755             JMS I NINP
0343   4404             JMS I UNFL
0344   3757             DCA I RLP  /RESULT LINE
0345   5746             JMP I P1
0346   0400   P1,       400
0347   7600   M200,     -200
0350   4342   WORDS,    4342
0351   7447   MY,       -331
0352   7462   MN,       -316
0353   7564   MFORM,    -214
0354   0121   VTABP,    VTAB
0355   0600   NINP,     NIN
0356   0000   NV,       0
0357   0033   RLP,      RL
0360   0035   VLTABP,   VLTAB
0361   0034   RSWP,     RSW
```

```
                *400
0400   4403             JMS I MESS /"INPUT  BLOCK : "
0401   4543             4543
0402   4311             4311
0403   1620             1620
0404   2524             2524
0405   4002             4002
0406   1417             1417
0407   0313             0313
0410   4072             4072
0411   4000             4000
0412   4431             JMS I NINQ
0413   4404             JMS I UNFL
0414   3251             DCA RBL     /READ BLOCK
0415   1034             TAD RSW     /RESULT SWITCH
0416   7640             SZA CLA
0417   5243             JMP RTAPE
0420   4403             JMS I MESS /"RESULT BLOCK : "
0421   4543             4543
0422   4322             4322
0423   0523             0523
0424   2514             2514
0425   2440             2440
0426   0214             0214
0427   1703             1703
0430   1340             1340
0431   7240             7240
0432   0000             0000
0433   4431             JMS I NINQ
0434   4404             JMS I UNFL
0435   3370             DCA WBL     /WRITE BLOCK
0436   1021             TAD SETSW
0437   3034             DCA RSW     /ONE IF SAME AS INPUT
0440   1034             TAD RSW
0441   7650             SNA CLA
0442   5245             JMP .+3
0443   1251  RTAPE,     TAD RBL
0444   3370             DCA WBL     /RESULT BLOCK SAME AS INPUT BLOCK
0445   1370             TAD WBL
0446   3255             DCA RWBL
0447   4402             JMS I RWTAPE
0450   1201             1201
0451   0000  RBL,        0
0452   1000             1000        /INPUT BUFFER
0453   4402             JMS I  RWTAPE
0454   1201             1201
0455   0000  RWBL,       0
0456   1200             1200        /OUTPUT BUFFER
0457   1437             TAD I NVP
0460   3374             DCA CNTR
0461   1035             TAD VLTAB   /VARIABLE LINE TABLE
0462   3010             DCA 10
```

```
0463  1121            TAD VTAB   /VARIABLE TABLE
0464  3011            DCA 11
0465  1410            TAD I 10   /GET V LINE #
0466  4436            JMS I SETLP          /SET 12 TO READ V
0467  1412            TAD I 12
0470  3411            DCA I 11
0471  1412            TAD I 12
0472  3411            DCA I 11
0473  1412            TAD I 12
0474  3411            DCA I 11
0475  2374            ISZ CNTR
0476  5265            JMP .-11
0477  1033            TAD RL
0500  4436            JMS I SETLP
0501  1012            TAD 12
0502  1375            TAD C200
0503  3012            DCA 12     /SET 12 TO WRITE RESULT LINE
0504  1376            TAD DATA
0505  1375            TAD C200
0506  3010            DCA 10     /OUT PUT BUFFER
0507  3021            DCA SETSW
0510  1376            TAD DATA
0511  1375            TAD C200
0512  7041            CIA
0513  1432            TAD I WORDP          /BLOCK LENGTH
0514  3022            DCA 22     /TEMP
0515  1410  HUNT,     TAD I 10   /IS $ BEFORE RESULT LINE ?
0516  1030            TAD MDOL
0517  7640            SZA CLA
0520  5325            JMP .+5
0521  1010            TAD 10
0522  3020            DCA 20     /TEMP
0523  3420            DCA I 20   /DELETE $
0524  5351            JMP NODOL
0525  1012            TAD 12
0526  7041            CIA
0527  1010            TAD 10
0530  2010            ISZ 10
0531  2010            ISZ 10
0532  7710            SPA CLA
0533  5315            JMP HUNT
0534  2010            ISZ 10
0535  2010            ISZ 10
0536  2010            ISZ 10     /RESULT GOES IN HERE
0537  1410            TAD I 10   /LOOK FOR $ AFTER RESULT LINE
0540  1030            TAD MDOL
0541  7650            SNA CLA
0542  5352            JMP NODOL+1
0543  2010            ISZ 10
0544  2010            ISZ 10
0545  1022            TAD 22     /MINUS END OF BLOCK
0546  1010            TAD 10
0547  7710            SPA CLA
```

```
0550  5337          JMP .-11
0551  2021  NODOL,   ISZ SETSW  /$ NOT FOUND OR WAS DELETED
0552  4773          JMS I CALC
0553  1044          TAD 44
0554  3412          DCA I 12    /FILL IN RESULT LINE
0555  1045          TAD 45
0556  3412          DCA I 12
0557  1046          TAD 46
0560  3412          DCA I 12
0561  1021          TAD SETSW
0562  7650          SNA CLA
0563  5366          JMP .+3
0564  1377          TAD DOL     /RESULT IS LAST LINE
0565  3412          DCA I 12
0566  4402          JMS I RWTAPE
0567  1401          1401        /RECORD RESULT BLOCK
0570  0000  WBL,     0
0571  1200          1200        /OUTPUT BUFFER
0572  5200          JMP 400
0573  3600  CALC,    3600
0574  0000  CNTR,    0
0575  0200  C200,    200
0576  0777  DATA,    777
0577  0244  DOL,     244
            *30
0030  7534  MDOL,    -244
0031  0600  NINQ,    NIN
0032  4342  WORDP,   4342
0033  0000  RL,      0
0034  0000  RSW,     0
0035  1400  VLTAB,   1400
0036  0620  SETLP,   SETL
0037  0356  NVP,     NV
```

```
                *600
0600    0000    NIN,        0
0601    3021                DCA SETSW
0602    4405                JMS I 5
0603    1060                TAD 60
0604    7640                SZA CLA
0605    5600                JMP I NIN
0606    1057                TAD 57
0607    1231                TAD MCC
0610    7650                SNA CLA
0611    5634                JMP I TAPE /RETURN TO TAPE SYSTEM
0612    1057                TAD 57
0613    1232                TAD MS
0614    7640                SZA CLA
0615    5202                JMP NIN+2  /INVALID INPUT, TRY AGAIN
0616    2021                ISZ SETSW
0617    5600                JMP I NIN
0620    0000    SETL,       0
0621    1233                TAD M1
0622    7425                7425       /MQL+MUY
0623    0003                0003
0624    7701                7701       /3(LINE-1)
0625    1630                TAD I DATAP
0626    3012                DCA 12
0627    5620                JMP I SETL
0630    0576    DATAP,      DATA
0631    7575    MCC,        -203
0632    7T55    MS,         -323
0633    7777    M1,         -1
0634    7600    TAPE,       7600
                SETSW=21
                RWTAPE=2
                MESS=3
                UNFL=4
                *62
0062    0062    CTAB,       CTAB
0063    0000
0064    0000
0065    0000    C1,         0;0;0
0066    0000
0067    0000
0070    0000    C2,         0;0;0
0071    0000
0072    0000
0073    0000    C3,         0;0;0
0074    0000
0075    0000
0076    0000    C4,         0;0;0
0077    0000
0100    0000
0101    0000    C5,         0;0;0
0102    0000
```

```
0103   0000
0104   0000   C6,          0;0;0
0105   0000
0106   0000
0107   0000   C7,          0;0;0
0110   0000
0111   0000
0112   0000   C8,          0;0;0
0113   0000
0114   0000
0115   0000   C9,          0;0;0
0116   0000
0117   0000
0120   0000   C10,         0;0;0
0121   0121   VTAB,        VTAB
0122   0000
0123   0000
0124   0000   V1,          0;0;0
0125   0000
0126   0000
0127   0000   V2,          0;0;0
0130   0000
0131   0000
0132   0000   V3,          0;0;0
0133   0000
0134   0000
0135   0000   V4,          0;0;0
0136   0000
0137   0000
0140   0000   V5,          0;0;0
0141   0000
0142   0000
0143   0000   V6,          0;0;0
0144   0000
0145   0000
0146   0000   V7,          0;0;0
0147   0000
0150   0000
0151   0000   V8,          0;0;0
0152   0000
0153   0000
0154   0000   V9,          0;0;0
0155   0000
0156   0000
0157   0000   V10,         0;0;0
0160   0000
0161   0000
0162   0000   V11,         0;0;0
0163   0000
0164   0000
0165   0000   V12,         0;0;0
0166   0000
0167   0000
```

```
0170   0000   V13,        0;0;0
0171   0000
0172   0000
0173   0000   V14,        0;0;0
0174   0000
0175   0000
0176   0000   V15,        0;0;0
```

CALC	0573
CIN	0253
CNTR	0574
CTAB	0062
C1	0063
C10	0116
C2	0066
C200	0575
C3	0071
C4	0074
C5	0077
C6	0102
C7	0105
C8	0110
C9	0113
DATA	0576
DATAP	0630
DOL	0577
HUNT	0515
MCC	0631
MDOL	0030
MESS	0003
MFORM	0353
MN	0352
MS	0632
MY	0351
M1	0633
M200	0347
NIN	0600
NINP	0355
NINQ	0031
NODOL	0551
NV	0356
NVP	0037
P1	0346
RBL	0451
RL	0033
RLP	0357
RSW	0034
RSWP	0361
RTAPE	0443
RWBL	0455
RWTAPE	0002
SETL	0620
SETLP	0036
SETSW	0021
TAPE	0634
UNFL	0004
VIN	0302
VLTAB	0035
VLTABP	0360
VTAB	0121

VTABP	0354
V1	0122
V10	0155
V11	0160
V12	0163
VQ3	0166
V14	0171
V15	0174
V2	0125
V3	0130
V4	0133
V5	0136
V6	0141
V7	0144
V8	0147
V9	0152
WBL	0570
WORDP	0032
WORDS	0350

ADDENDUM TO DECUS NO. 8-137a

Program for Storage Manipulation and Calculation of Data Using DECtape

The DECtape for this program was not generated in a PS/8-OS/8 compatible format. One may bootstrap the tape using the old Disk Monitor System DECtape bootstrap. The instructions in the write-up should be sufficient for the running of the programs on the tape once the tape is bootstrapped. The listing for the bootstrap follows:

DECtape Location	Contents
0200	7600
0201	1216
0202	4210
0203	1217
0204	3620
0205	1222
0206	4210
0207	5600
0210	0000
0211	6766
0212	3621
0213	6771
0214	5213
0215	5610
0216	0600
0217	7577
0220	7755
0221	7754
0222	0220

Also, please note that these programs utilize the EAE hardware option.

Information for this addendum was contributed by:

Cheryl Holm
Medical Educational Computation Center
University of Texas Medical Branch
Galveston, Texas