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DECUS NO.	8-309
TITLE	PATCHES AND A UTILITY PROGRAM FOR LAB-8
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COMPANY	Digital Equipment Corporation Maynard, Massachusetts
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SOURCE LANGUAGE	PAL III

PATCHES AND A UTILITY PROGRAM FOR LAB-8

DECUS Program Library Write-up DECUS No. 8-309

Patch for the Basic Averager to allow the high-speed punch to dump the ASCII values which are received after a T command in the first section.

Instructions:

1. LOAD and start the BASIC Averager as usual.

2. Stop it and load the first part of the patch.

3. Restart the program at 6511. The response to the T command will now be punched on the high speed punch (instead of typed).

4. When punching has stopped, read in the second part of the patch and restart at 6621. The program is now unchanged.

5. If more than one average is to be punched, steps 2 through 4 must be followed for each average. The reason for this is that after punching, all TTY output will be on the high speed paper punch. The program must be repatched to avoid this.

LAB-8

Patch to change the nature of LAB-8 contingency inputs as they are used in the ADVANCED Averager.

As used in the ADVANCED Averager, Version C, the contents of the contingency inputs are logically ANDed with the sort code. If the result of the AND procedure is equal to the sort code, then the contingency condition is satisfied. Two patches are available which alter the function of the contingency input.

	Change Location	From	To
1)	7412	0172	7000
	7414	1151	1172
2)	6747	6331	7604

Patch 1 effects a direct comparison of the contingency inputs with the sort code. There must be one to one correspondence of the bits for the contingency condition to be satisfied. This facilitates the editing of bad sweeps.

Patch 2 is useful if the LAB-8 does not have Option XR (contingency inputs). This allows the ADVANCED Averager to reference the front switches of the 8/I or 8/L for its contingency reading rather than the standard contingency inputs of the AXØ8. The contents of the switches can be directly compared or ANDed with the sort code depending on the use of Patch 1.

Patch to omit the calibration mark in Section V display of the ADVANCED Averager

Change location	From	To
6662	1321	5274

```
*L
/PATCH TO LAB-8 ADVANCED AVERAGER PROGRAM, VERSION C, SECTION 5
/
/PATCH PROVIDES FOR PUNCHING OF LEADER/TRAILER TAPE WHEN
/PROGRAM OPTION "T" OF SECTION 5 IS UTILIZED.
/
/NOTE: WHEN OPTION "P" IS USED, THE WORD "LIFT" IS NOT TYPED
/WITH THIS PATCH, BUT IS REPLACED BY "↑".
/
/       LOCATION        CODE            INSTRUCTION
        7225            4640    TYPDUN, JMS I CRLFX
        7226            4627            JMS I LPTCH1
        7227            7570    LPTCH1, PTCH1
        7230            3177            DCA SFACTR
        7300            4701            JMS I LPTCH2
        7301            7553    LPTCH2, PTCH2
        7550            0212    LIFT,   0212    /TYPE LINE FEED
        7551            0336            0336    /TYPE "↑"
        7552            0000            0000    /MESSAGE TERMINATOR
        7553            0000    PTCH2,  0000
        7554            4361            JMS LT
        7555            7240            CLA CMA
        7556            1012            TAD GETPNT
        7557            2353            ISZ PTCH2
        7560            5753            JMP I PTCH2
        7561            0000    LT,     0       /LEADER-TRAILER
        7562            1376            TAD KMLT/ SUBROUTINE
        7563            3377            DCA MLT
        7564            4665            JMS I TYPEZ
        7565            2377            ISZ MLT
        7566            5364            JMP .-2
        7567            5761            JMP I LT
        7570            0000    PTCH1,  0
        7571            4361            JMS LT
        7572            2370            ISZ PTCH1
        7573            7344            MTW
        7574            1177            TAD SFACTR
        7575            5770            JMP I PTCH1
        7576            7700    KMLT,   7700
        7577            0000    MLT,    0000

*
```

LAB-8 RC CLOCK CALIBRATOR

This program continuously types out the RC clock rate in micro-seconds. Typing CARRIAGE RETURN will halt the program. It can be used as a sub-routine or a stand-alone program. The algorithm is the same as that found in the BASIC Averager. The RC clock is set to the fast mode and the number of crystal clock beats occuring during 100 RC clock beats is equal to the RC clock rate in micro-seconds.

If slower clock rates are desired, the clock can be calibrated in the fast mode and then the additional 3-bit counting chain can be enabled for actual use. The resulting rate will be eight times slower than the calibrated speed.

The program is loaded with the Binary Loader. Starting address = 200.

```
                *200
0200    7300    CLA CLL
0201    6046    TLS
0202    4327    INIT, JMS CRLF   /TYPE CR LF
0203    1344    TAD M10          /SET LINE COUNTER
0204    3343    DCA COUNT
0205    3341    LOOP, DCA ARITH1
0206    3342    DCA ARITH2       /CLEAR WORKING AREA
0207    6346    6346             /ZTEN OTEN
0210    6356    6356             /CLKK CLRK
0211    7326    7326             /MAKE AC 2
0212    6321    6321             /SKKK
0213    5212    JMP .-1          /SNYC CLOCK
0214    6346    6346             /ZTEN OTEN SET AKOS
0215    6352    6352             /CLKK
0216    1346    TAD M144         /GET -100 OCTAL
0217    6354    TLOOP, 6354      /CLRK
0220    6321    6321             /SKS/KK
0221    5224    JMP .+3
0222    6352    6352             /CLKK
0223    2342    ISZ ARITH2       /COUNT A XTAL TICK
0224    5226    JMP .+2
0225    2341    ISZ ARITH1       /ACCOUNT FOR OVERFLO
0226    6341    6341             /SKRK
0227    5220    JMP TLOOP+1
0230    7001    IAC              /COUNT AN RC TICK
0231    7440    SZA              /100 COUNTED YET
0232    5217    JMP TLOOP        /NO CONTINUE
0233    6346    6346             /YES, ZTEN OTEN
0234    3347    TYPE, DCA TEMP   /CLEAR DEFLATE COUNTER
0235    1337    TAD RADI1        /GET LOCATION OF HI ORDER DEFLATOR
0236    3335    DCA RAD1
0237    1340    TAD RADI2        /LOCATION OF LO ORDER DEFLATOR
0240    3336    DCA RAD2
0241    7300    AGAIN, CLA CLL   /CLEAR AC AND LINK
0242    1342    TAD ARITH2       /GET LO ORDER
0243    1736    TAD I RAD2       /DEFLATE
0244    3342    DCA ARITH2       /SAVE RESULTS
0245    7004    RAL              /NOTE DISPOSITION OF LINK
0246    1341    TAD ARITH1       /GET HI ORDER
0247    1735    TAD I RAD1       /DEFLATE
0250    7510    SPA              /GONE TOO FAR?
0251    5255    JMP NEG          /YES CORRECT DEFLATEE
0252    2347    ISZ TEMP         /NO, NOTE DEFLATION AND GO ON
0253    3341    DCA ARITH1       /SAVE HI ORDER
0254    5241    JMP AGAIN
0255    3341    NEG, DCA ARITH1
0256    1736    TAD I RAD2       /GET LO ORDER DEFLATOR
0257    7041    CMA IAC          /NEGATE IT
0260    7100    CLL
0261    1342    TAD ARITH2       /ADD OVER DEFLATED LO ORDER
0262    3342    DCA ARITH2       /IT IS NOW RESTORED
0263    7004    RAL              /SAVE ANY CARRIES
```

```
0264  7041  CMA IAC          /NEGATE THE CARRY
0265  1735  TAD I RAD1       /GET HI ORDER DEFLATOR
0266  7040  CMA              /FORM 1'S COMPLEMENT OF IT
0267  1341  TAD ARITH1       /ADD HI ORDER
0270  3341  DCA ARITH1       /DOUBLE PRESITION NUMBER RESTORED
0271  1347  TAD TEMP         /HOW MANY TIMES DID WE DEFLATE
0272  1351  TAD K260         /MAKE IT ASCII
0273  4321  JMS TYPA         /TYPE IT
0274  3347  DCA TEMP         /CLEAR TEMP
0275  2335  ISZ RAD1
0276  2335  ISZ RAD1         /MOVE RADIX POINTERS UP
0277  2336  ISZ RAD2
0300  2336  ISZ RAD2
0301  1736  TAD I RAD2       /ARE WE DONE DEFLATING YET
0302  7640  SZA CLA
0303  5241  JMP AGAIN        /NO. DEFLATE WITH NEXT RADIX
0304  1350  TAD K240         /YES. TYPE SPACE
0305  4321  JMS TYPA
0306  6031  KSF              /ANY KEYBOARD COMMANDS?
0307  5316  JMP ON           /NO
0310  6036  KRB              /YES. READ IT
0311  1345  TAD M215         /CHECK FOR CR
0312  7640  SZA CLA
0313  5316  JMP ON           /NOT A CR. IGNORE
0314  4327  JMS CRLF         /CR. TYPE CR LF
0315  7402  HLT
0316  2343  ON, ISZ COUNT    /SHOULD WE START ANOTHER LINE?
0317  5205  JMP LOOP         /NO THERE IS STILL ROOM
0320  5202  JMP INIT         /YES. THIS ONE IS FILLED UP
0321  0000  TYPA,0            /SUBROUTINE TO TYPE AC
0322  6041  TSF
0323  5322  JMP .-1
0324  6046  TLS
0325  7200  CLA
0326  5721  JMP I TYPA
0327  0000  CRLF,0
0330  1371  TAD K15
0331  4321  JMS TYPA
0332  1372  TAD K212
0333  4321  JMS TYPA
0334  5727  JMP I CRLF
0335  0000  RAD1, 0
0336  0000  RAD2, 0
0337  0353  RADI1, RD1
0340  0354  RADI2, RD2
0341  0000  ARITH1, 0
0342  0000  ARITH2, 0
0343  0000  COUNT, 0
0344  7770  M10, -10
0345  7563  M215, -215
0346  7634  M144, -144
0347  0000  TEMP, 0
0350  0240  K240, 240
0351  0260  K260, 260
0352  0000  FIRST, 0
```

```
0353  7747  RD1, 7747          /-100,000 (HI ORDER)
0354  4540  RD2, 4540          /LO ORDER
0355  7775  7775              /-10,000 (HI ORDER)
0356  4360  4360              /LO ORDER
0357  7777  7777              /HI ORDER
0360  6030  6030              /-1,000 (LO ORDER)
0361  7777  7777              /-100 (HI ORDER)
0362  7634  7634              /LO ORDER
0363  7777  7777              /-10 (HI ORDER)
0364  7766  7766              /LO ORDER
0365  7777  7777              /-1 (HI ORDER)
0366  7777  7777              /LO ORDER
0367  0000  0
0370  0000  0                 /END OF LIST
0371  0215  K15, 215
0372  0212  K212, 212

AGAIN  0241
ARITH1 0341
ARITH2 0342
COUNT  0343
CRLF   0327
FIRST  0352
INIT   0202
K15    0371
K212   0372
K240   0350
K260   0351
LOOP   0205
M10    0344
M144   0346
M215   0345
NEG    0255
ON     0316
RADI1  0337
RADI2  0340
RAD1   0335
RAD2   0336
RD1    0353
RD2    0354
TEMP   0347
TLOOP  0217
TYPA   0321
TYPE   0234
```

ADVANCED AVERAGER SECTION III PATCH

FOR HIGH/LOW SPEED PUNCH

OF ACCUMULATED AVERAGES

Patch to allow Section III of the ADVANCED Averager to reside in core, dump averaged data, and live to average again.

This patch is in RIM format. It is loaded by the RIM loader into the area of core normally occupied by the BIN loader. It can be entered any number of times.

To use:

1. Run through Sections I and II as usual.

2. Load Section III and press CONTINUE.

3. Press STOP.

4. Load patch in with RIM Loader 7756 in SR, LOAD ADDRESS, START.

5. Press STOP.

6. Restart Section III at location 653Ø .

7. Average as normal.

8. When average is complete and dump is desired, hit CTRL/P.

9. Program will halt.

10. Set the number of the averages to be dumped in the SR.

    SR(11) for AVG#1
    SR(10) for AVG#2
    etc...

    (They will be dumped in order of numerical priority.)

11. Press CONTINUE.

12. Again the program halts.

13. Turn on the low speed punch.

14. Press CONTINUE.

15. The dump will now proceed.

16. Program halts at the end of the dump of one average.

17. Turn off punch. Add any spacer tape desired manually.

18. Press START

19. Patch checks for more dumps. If found, it returns to the halt at instruction 12. Otherwise, it proceeds to the start of Section III and sets up for another average.

NOTES ON FORMAT:

The data is stored in core in double precision, lo-order first. Negative values are in two's complement.

The dump will be in Binary Format. Two rows of punched paper tape equal one 12-bit word (6 bits to a row). The first row is the left-most 6 bits, the second row is the right-most.

The first two rows of dump are the number of the average that is being dumped. The next two rows contain minus the number of points. Next two rows contain the number of sweeps in the average. Following this is the data . The data represents the SUM of the sweeps. It must be divided by the number of sweeps to get the average.

Dump is good for averages only. i.e. confidence limits or trend must not be present.

```
                    *7600
7600  6002          IOF
7601  6346          6346
7602  7602          HLT CLA /PAUSE:SET SR AND CLEAR AC
7603  3310          DCA NUMB        /SET COUNTER TO ZERO
7604  7100          CLL
7605  7604          LAS     /READ THEM
7606  7010  MORE,    RAR     /WHICH JOB?
7607  7430          SZL     /THIS ONE?
7610  5215          JMP SETUP       /YES
7611  2310          ISZ NUMB        /NO
7612  7440          SZA     /ARE THERE ANY MORE?
7613  5206          JMP MORE        /GO BACK RETRY
7614  5717          JMP I START     /NO MORE: RETURN TO AVGER
7615  3311  SETUP,  DCA WHICH       /SAVE AVG INDICATOR
7616  1310          TAD NUMB
7617  7140          CMA CLL
7620  3312          DCA MNUM        /1S COMP OF JOB
7621  1313          TAD K223
7622  1314          TAD K007
7623  2312          ISZ MNUM
7624  5222          JMP .-2
7625  3316          DCA LOC /AC CONT DAT LOC
7626  1716          TAD I LOC       /- POINTS
7627  3307          DCA MPOINT
7630  1315          TAD K002        /MOVE IN J LIST
7631  1316          TAD LOC
7632  3316          DCA LOC
7633  1716          TAD I LOC
7634  3010          DCA 10  /AUTO INDEX XR
7635  4240          JMS DUMP
7636  1311          TAD WHICH
7637  5206          JMP MORE
7640  0000  DUMP,   0       /DUMP ROUTINE
7641  6046          TLS     /OR PCF: CLEAR TTY FLAG
7642  7602          HLT CLA /TURN ON PUNCH
7643  2310          ISZ NUMB        /MAKE NUMB = AVG BEING DUMPED
7644  1310          TAD NUMB        /BRING IT TO THE AC
7645  4263          JMS PUNCH       /PUNCH IT OUT
7646  1307          TAD MPOINT
7647  4263          JMS PUNCH       /- POINTS
7650  1410          TAD I 10
7651  4263          JMS PUNCH       /NUMB OF SWEEPS
7652  1307          TAD MPOINT
7653  7004          RAL     /PTS X 2= WORDS
7654  3307          DCA MPOINT
7655  1410  LOOP,   TAD I 10
7656  4263          JMS PUNCH
7657  2307          ISZ MPOINT
7660  5255          JMP LOOP
7661  7402          HLT     /TURN OFF PUNCH
7662  5640          JMP I DUMP
                    /
                    /
```

```
                /
                /
7663  0000  PUNCH,  0          /PUCH NUM IN AC
7664  3306           DCA TEMP
7665  1306           TAD TEMP
7666  7012           RTR;
7667  7012  RTR;
7670  7012  RTR
7671  0305           AND MASK
7672  6041           TSF       /PSF FOR HI SPEED PUNCH
7673  5272           JMP .-1
7674  6046           TLS       /PLS FOR HI SPEED PUNCH
7675  7300           CLA CLL
7676  1306           TAD TEMP
7677  0305           AND MASK
7700  6041           TSF       /PSF FOR HI SPEED PUNCH
7701  5300           JMP .-1
7702  6046           TLS       /PLS FOR HI SPEED PUNCH
7703  7300           CLA CLL
7704  5663           JMP I PUNCH
7705  0077  MASK,    0077
7706  0000  TEMP,    0
7707  0000  MPOINT,  0
7710  0000  NUMB,    0
7711  0000  WHICH,   0
7712  0000  MNUM,    0
7713  0223  K223,    223
7714  0007  K007,  007
7715  0002  K002,  002
7716  0000  LOC,  0
7717  6530  START,  6530
                *6564
6564  7600           7600

DUMP    7640
K002    7715
K007    7714
K223    7713
LOC     7716
LOOP    7655
MASK    7705
MNUM    7712
MORE    7606
MPOINT  7707
NUMB    7710
PUNCH   7663
SETUP   7615
START   7717
TEMP    7706
WHICH   7711
```

OVERLAY FOR SECTION 3
OF DEC-LB-U17C-PB

An overlay for Section 3 of DEC-LB-U17C-PB (second section of U18B-PB), the LAB-8 Averager Program is enclosed. The overlay allows the user to output information on an X-Y analog recorder without going through the process of reading in Sections 4 and 5 of the LAB-8 Averager Program Tape. In contrast to Section 5 of the LAB-8 Averager Program Tape, the overlay Does Not:

1. Include a routine for calibrating the X-Y Recorder ("Gain...", "Bias...", etc.).

2. Offer a variable plotting rate. That is, the plot rate is a function of the clock rate; regardless of the distance between two successive points.

3. Include a routine for drawing borders and axes (grids) on the X-Y Recorder paper.

4. Inform the user when to lift and lower the pen on the recorder and consequently does not provide the user with an indication that the computer is "waiting" for him to type LINE FEED.

DEC-LB-U17C-D

1. Abstract

An overlay to Section 3 of DEC-LB-U17C-PB (second section of U18B-PB), the LAB-8 Averager Program, to run an XY Analog Recorder.

2. Requirements

XY recorder should be connected in parallel with the LAB-8 oscilloscope. Analog output will vary between Ø and -10 volts.

AX-Ø8

PDP-8/I

Oscilloscope

3. Loading

With the online averaging program (U17B or U18B) in core and an average completed, turn the reader to "STOP" or "FREE" and position overlay binary tape (U19B-PB) in reader. Bit Ø of the switch register should be up to use the ASR-33, down to use the PC-8I. Strike <CTRL> P and turn reader to START. When tape stops, verify that accumulator lights show Ø (all off). (If they do not, reposition tape and press CONT on console.) Then, turn reader to "STOP" and press CONT.

4. Usage

1. Note the position of the RANGE switch of the TIMING CONTROL, and then set it full clockwise.

2. The program waits for the user to lift the pen and strike LINE FEED.

3. The pen is moved to the left margin and the program waits for the user to lower the pen and strike LINE FEED.

4. The first average is then plotted at a rate determined by the RANGE switch of the timing control. Adjust the coarse control until the desired plot rate is attained.

5. When the average has been plotted, the program waits for the user to lift the pen and strike LINE FEED.

6. The pen is then moved to the left margin and the program waits for the user to lower the pen and strike LINE FEED.

7. This is repeated for each average to be plotted.

8. When all averages have been plotted, strike ⟨CTRL⟩ P.

9. Reset the RANGE control to its position at the start of this program.

10. Turn the reader to "START."

11. The averaging program is then restored. When the tape stops, verify that accumulator shows Ø.

12. Turn the reader to "STOP"or "FREE."

13. Press CONT on the console.

14. ⟨CTRL⟩R or⟨CTRL⟩Z will reinitialize for more averaging.

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10. Turn the reader to "START."

11. The averaging program is then restored. When the tape stops, verify that accumulator shows Ø.

12. Turn the reader to "STOP"or "FREE."

13. Press CONT on the console.

14. ⟨CTRL⟩R or⟨CTRL⟩Z will reinitialize for more averaging.

```
.PALD
*OUT-S:OVER1
*
*IN-S:OVER1
*
*OPT-T
```

DT punch

1st overlay

```
                *160
0160    0000    0
                *175
0175    0000    0
                *6406
6406    7000    NOP
6407    7000    NOP
                *6413
6413    5222    JMP 6422
                *7100
7100    4770    JMS I 7170
7101    5300    JMP 7100
7102    7330    CLA CLL CML RAR
7103    1114    TAD 0114
7104    6346    6346
7105    7000    NOP
                *7141
7141    4770    JMS I 7170
7142    5341    JMP 7141
7143    0017    0017
7144    5677    JMP I 7077
                *7164
7164    6341    6341
7165    5364    JMP 7164
7166    6354    6354
7167    7610    7610
7170    6400    6400
7171    7000    NOP
                *7600
7600    1215    TAD 7615
7601    7442    7442
7602    5300    JMP 7700
7603    1200    TAD 7600
7604    3277    DCA 7677
7605    2214    ISZ 7614
7606    5205    JMP 7605
7607    6012    6012
7610    7200    CLA
7611    5617    JMP I 7617
                *7617
7617    7306    7306
                *7677
7677    5200    JMP 7600
```

```
.PALD
*OUT-S:OVR2
*
*IN-S:OVER2
*
*OPT-T

                *175
0175    0000    0
                *6406
6406    5330    JMP 6530
6407    5373    JMP 6573
                *6413
6413    5224    JMP 6424
                *7100
7100    7630    7630
7101    1041    1041
7102    3344    3344
7103    7630    7630
7104    1042    1042
7105    3342    3342
                *7141
7141    5677    JMP I 7077
                *7164
7164    2342    2342
7165    7610    7610
7166    6325    6325
7167    2344    2344
7170    7610    7610
7171    6326    6326
                *7600
7600    1215    1215
7601    7442    7442
7602    5300    5300
7603    1200    1200
7604    3277    3277
7605    2214    2214
7606    5205    5205
7607    6012    6012
7610    7200    7200
7611    5617    5617
                *7617
7617    7306    7306
                *7677
7677    5200    JMP 7600
```

2nd overlay

digital

May 20, 1970

Dr. Donald I. Tepas
Department of Psychology
Saint Louis University
Saint Louis, Missouri 63103

Dear Don:

Thank you for all of the literature you sent me. This gives me a good excuse to put my heels up and relax while I am educating myself.

Enclosed please find a revised X-Y plotter overlay for the ADVANCED Averager, Section III. You are now the proud owner of the first released copy. I am also enclosing an overlay to allow a binary dump of the data in Section III via the high speed punch (I sent the low speed dump program before). The only difference between the low and the high speed dump is that after the dump you must press the START key rather than the CONTinue key.

I have no programs currently available for manipulation of the dumped data-- sorry.

There is no easy way to change the scale for the plotter outputs. Could this not be done by adjusting the gain controls of the X-Y Plotter.

Again, I'm sorry about the last two points. I'll be in touch with you soon about the Newsletter and User's Group.

Sincerely,

Charlie

Charles P. Merrill
LAB-8 Marketing

CPM/hmw

Enclosures

DIGITAL EQUIPMENT CORPORATION, 146 MAIN STREET, MAYNARD, MASSACHUSETTS 01754
(617)897-5111 TWX: 710 347-0212 TELEX: 94-8457

```
                /APE II - AVERAGE PUNCHOUT EVALUATION FORM II
                /MERGES DATA FROM SIMILAR TAPES AND
                /COMPUTES SUM FOR EACH DATA POINT.
                /WRITTEN BY D.T.TEXAS-JULY 1970-SAINT LOUIS UNIV.
                /FOR ANALYSIS OF HIGH SPEED PUNCH DUMP DATA
                /FROM PART 3, LAB-8 ADVANCED AVERAGER
                /THE STARTING ADDRESS FOR THIS PROGRAM IS 200
                *100 /STARTING ADDRESS FOR PREP SUBROUTINE
     0100  7300  PREP, CLA CLL /PREPARE FOR DATA
6036 -0101  6014  RFC /FETCH TAPE CHARACTER  KRB
6036 -0102  6011  PEEK, RSF /SKIP IF FLAG =1  KSF
     0103  5102  JMP PEEK /TEST FLAG AGAIN
     0104  7200  CLA /CLEAR AC
6034 -0105  6012  RRB /LOAD AC FROM RB  KRS
     0106  7440  SZA /SKIP IF NO PUNCHES
     0107  5111  JMP GOGO /INFORMATION IN AC!
     0110  5101  JMP PREP+1 /NO DATA YET, TRY AGAIN.
     0111  3030  GOGO, DCA AVNA /STORE RT HALF AV. NO.
     0112  7300  CLA CLL  /CLEAR
     0113  3031  DCA AVNB /STORE MOST SIG. HALF OF AV. NO.
36 -0114  6014  RFC /FETCH CHARACTER FROM TAPE
31 -0115  6011  SEEK, RSF /SKIP IF FLAG=1
     0116  5115  JMP SEEK /TEST FLAG AGAIN
     0117  7200  CLA /CLEAR AC
6034 -0120  6012  RRB /LOAD AC FROM RB
     0121  3033  DCA PTNB /STORE HALF OF NO. POINTS
     0122  7300  CLA CLL /CLEAR
36 -0123  6014  RFC /FETCH
31 -0124  6011  VIEW, RSF /SKIP IF F=1
     0125  5124  JMP VIEW /TEST FLAG AGAIN
     0126  7200  CLA
34 -0127  6012  RRB /LOAD AC FROM RB
     0130  3032  DCA PTNA /STORE HALF OF NO. PTS.
     0131  7300  CLA CLL /CLEAR
6036 -0132  6014  RFC /FETCH
6031 -0133  6011  XAMA, RSF /SKIP IF F=1
     0134  5133  JMP XAMA /TEST FLAG
     0135  7200  CLA
6034 -0136  6012  RRB /LOAD AC FROM RB
     0137  3035  DCA NSB /STORE HALF OF SWEEPS NUMBER
     0140  7300  CLA CLL
6036 -0141  6014  RFC /FETCH
6031 -0142  6011  XAMB, RSF /SKIP IF F=1
     0143  5142  JMP XAMB /TEST FLAG
     0144  7200  CLA
6034 -0145  6012  RRB /LOAD AC FROM RB
     0146  3034  DCA NSA /STORE OTHER HALF OF SWEEPS NO.
     0147  7300  CLA CLL
     0150  1032  TAD PTNA
     0151  0041  AND MSKB
     0152  3174  DCA PSTORE
     0153  1033  TAD PTNB
     0154  7106  CLL RTL
     0155  7006  RTL
```

```
     0156  7006   RTL
     0157  0040   AND MSKA
     0160  1174   TAD PSTORE
   * 0161  3171   DCA PCONST /NO. POINTS "CONSTANT"
     0162  1171   TAD PCONST
     0163  3172   DCA PCOUNT /SET POINTS COUNTER
     0164  1171   TAD PCONST
     0165  3173   DCA PTALLY /SET POINTER COUNTER
     0166  4446   JMS I JTYCR
     0167  5500   JMP I PREP /END OF SUBROUTINE
                  *200 /STARTING ADDRESS FOR PROGRAM
     0200  7300   CLA CLL
     0201  4100   JMS PREP
     0202  7300   BEGIN, CLA CLL
6036 -0203  6014   RFC /FETCH CHARACTER FROM TAPE
6031 -0204  6011   LOOK, RSF /SKIP IF FLAG=1
     0205  5204   JMP LOOK /TEST FLAG
     0206  7200   CLA /CLEAR
6034 -0207  6012   RRB /LOAD AC WITH LEFT HALF, LO ORDER WORD
     0210  7106   STORE, CLL RTL /ROTATE DATA
     0211  7006   RTL
     0212  7006   RTL
     0213  0040   AND MSKA /GET RID OF RT 6 BITS
     0214  3036   DCA LOCC /TEMP. STORE LEFT HALF LO ORDER WORD
     0215  7300   CLA CLL
6036 -0216  6014   RFC /FETCH CHARACTER
6031 -0217  6011   SEE, RSF /SKIP IF FLAG=1
     0220  5217   JMP SEE /TEST FLAG AGAIN
     0221  7200   CLA /CLEAR AC
6034 -0222  6012   RRB /LOAD AC WITH RT HALF, LO ORRDER WORD
     0223  0041   AND MSKB /GET RID OF LFT 6 BITS
     0224  1036   TAD LOCC /ADD LEAST  & MOST SIG PTS, LO ORDER WORD
     0225  3042   DCA LOW /TEMPORARY STORE, LOW ORDER WORD
     0226  7300   CLA CLL
6036 -0227  6014   RFC /FETCH CHARACTER FROM TAPE
6031 -0230  6011   LOHL, RSF /SKIP IF FLAG =1
     0231  5230   JMP LOHL /TEST FLAG
     0232  7200   CLA /CLEAR
6034 -0233  6012   RRB /LOAD AC WITH LFT HALF, HI ORDER WORD
     0234  7106   CLL RTL /ROTATE DATA
     0235  7006   RTL
     0236  7006   RTL
     0237  0040   AND MSKA /GET RID OF RT 6 BITS
     0240  3037   DCA LOCD /TEMPORARY STORE.,LFT HALF HI ORDER WORD
     0241  7300   CLA CLL
6036 -0242  6014   RFC /FETCH CHARACTER
6031 -0243  6011   LOHR, RSF /SKIP IF FLAG=1
     0244  5243   JMP LOHR /TEST FLAG
     0245  7200   CLA /LLEAR
6034 -0246  6012   RRB /LOAD AC WITH RT HALF, HI ORDER WORD
     0247  0041   AND MSKB /GET RID OF LEFT 6 BITS
     0250  1037   TAD LOCD /ADD LEAST & MOST SIG. BITS, HI ORDER WORD
     0251  3043   DCA HIGH /TEMP STORE HI ORDER WORD
     0252  7300   CLA CLL
```

```
0253  1043  TAD HIGH /HI ORDER WORD TO AC
0254  3411  DCA I LOCA /AUTOINDEX STORE OF HI ORDER WORD
0255  1042  TAD LOW /LO ORDER WORD TO AC
0256  3411  DCA I LOCA /AUTOINDEX STORE OF LO ORDER WORD
0257  7300  CLA CLL
0260  1172  TAD PCOUNT
0261  7001  IAC /INCREMENT POINTER COUNTER
0262  3172  DCA PCOUNT /SKIP IF ALL DATA IN
0263  1172  TAD PCOUNT
0264  7440  SZA /SKIP ON ZERO AC
0265  5202  JMP BEGIN
0266  7300  FULL, CLA CLL
0267  1011  TAD LOCA /LAST ADDRESS TO AC
0270  3044  DCA LOCR /SAVE THAT ADDRESS
0271  1045  TAD CONST /FETCH FIRST DATA STORE ADDRESS
0272  3011  DCA LOCA /RESET AUTOINDEX FOR DATA PRINT-
0273  4446  JMS I JTYCR /MAKE CR & LF _
0274  7300  CLA CLL
0275  1030  TAD AVNA /START AV. NO. PRINT
0276  0041  AND MSKB
0277  3030  DCA AVNA /STORE MASKEDNO,
0300  7100  CLL
0301  1031  TAD AVNB
0302  7006  RTL
0303  7006  RTL
0304  7006  RTL
0305  0040  AND MSKA
0306  1030  TAD AVNA
0307  4447  JMS I PSP /PRINT AVERAGE NO.
0310  4446  JMS I JTYCR
0311  7300  CLA CLL
0312  1032  TAD PTNA
0313  0041  AND MSKB
0314  3032  DCA PTNA
0315  1033  TAD PTNB
0316  7106  CLL RTL
0317  7006  RTL
0320  7006  RTL
0321  0040  AND MSKA
0322  1032  TAD PTNA
0323  4447  JMS I PSP /PRINY NEG NO PTS
0324  4446  JMS I JTYCR
0325  7300  CLA CLL
0326  1034  TAD NSA /PRINT NO SWEEPS
0327  0041  AND MSKB
0330  3034  DCA NSA
0331  1035  TAD NSB
0332  7106  CLL RTL
0333  7006  RTL
0334  7006  RTL
0335  0040  AND MSKA
0336  1034  TAD NSA
0337  4447  JMS I PSP /NOW PRINT NO OF SWEEPS!
0340  4446  JMS I JTYCR
→ 0341  5420  JMP I JMERG /TO MERGE SUBROUTINE-
```

JMP I Jcount - 5576 - to print immediately

```
0342  7300  AGAIN, CLA CLL
0343  1044  TAD LOCB /LAST DATA ADDRESS
0344  7041  CIA
0345  1353  TAD IVAL
0346  7420  SNL /SKIP ON NEG I
0347  5351  JMP WRT
0350  5363  JMP END /EVERYTHING PRINTED
0351  7300  WRT, CLA CLL
0352  4450  JMS I NUMB
0353  2000  IVAL, 2000  /WHERE THE DATA IS
0354  7300  CLA CLL
0355  1353  TAD IVAL
0356  7001  IAC
0357  7001  IAC
0360  3353  DCA IVAL
0361  4446  JMS I JTYCR
0362  5342  JMP AGAIN /PRINT ANOTHER NUMBER
0363  7300  END, CLA CLL
0364  1051  TAD RESET
0365  3353  DCA IVAL
0366  7300  CLA CLL
0367  1052  TAD ASET
0370  3011  DCA LOCA
0371  1052  TAD ASET
0372  3045  DCA CONST
0373  5420  JMP I JMERG /GO TO APE II

      *30
0030  0000  AVNA, 0 /LO SIG HALF AVE NO STORE
0031  0000  AVNB, 0 /HI SIG HALF AV NO STORE
0032  0000  PTNA, 0 /LO SIG HALF NO PTS
0033  0000  PTNB, 0 /HI SIG HALF NO PTS
0034  0000  NSA, 0 /LO SIG HALF NO SWEEPS STORE
0035  0000  NSB, 0 /HI SIG HALF NO SWEEPS STORE
0036  0000  LOCC, 0 /LEFT HALF, LOW ORDER
0037  0000  LOCD, 0 /LEFT HALF HI ORDER
0040  7700  MSKA, 7700 /GETS RID OF UNWANTED BITS
0041  0077  MSKB, 0077 /GETS RID OF UNWANTED BITS
0042  0000  LOW, 0 /TEMP. STORE OF LOW ORDER WORD
0043  0000  HIGH, 0 /TEMP STORE OF HI ORDER WORD
0044  0000  LOCB, 0 /STORE LAST DATA ADDRESS
0045  1777  CONST, 1777 /AUTOINDEX RESET VALUE
0046  0617  JTYCR, 617 /TO CR & LF OF TTY
0047  1000  PSP, 1000 /TO SSP PRINT
0050  0400  NUMB, 400 /TO SDP PRINT
0051  2000  RESET, 2000 /CONSTANT FOR RESET
0052  1777  ASET, 1777 /DITTO
      *11 /AUTOINDEX
0011  1777  LOCA, 1777 /DATA STORE & PRINT POINTER
```

```
                PAUSE
                *20 /APE II START
0020  1200       JMERG, 1200 /TO MERGE PROGRAM
                *53 /ADDITIONAL APE II VARIOUS CONSTANTS ETC.
0053  0343       JAGAIN, 0343 /TO NO DIV TYP
0054  0000       HDIVIS, 0000
0055  0000       LDIVIS, 0000
0056  2000       LOCH, 2000
0057  2001       LOCL, 2001
0060  2000       HSET, 2000
0061  2001       LSET, 2001
0062  0000       DSET, 0000
0063  1675       NPRNT, 1675 /PRINT N=
0064  0605       JTYT, 0605 /TO PRINT 2 CH.
0065  2417       TOPRN, 2417 /PRINT "TO"
0066  2401       TAPRN, 2401 /PRINT "TA"
0067  1423       LSPRN, 1423 /PRINT "LS"
0070  0634       JTB, 0634 /TABULATE
0071  7773       TORLF, 7773 /COUNT FOR TYCR
0072  7773       TCON, 7773 /RESET FOR TORLF
0073  0516       ENTY, 0516 /EN
0074  0456       DPTY, 0456 /D.
                *1200 /START MERGE SUBROUTINE, APE II
1200  7300      MERG, CLA CLL
1201  7402      HLT /STOP- SET SR BIT 0=1 FOR PRINT , BIT 1=1 FOR ANOTHER TAPE
1202  7404      OSR /READ SR
1203  7510      SPA /SKIP IF AC POSITIVE
1204  5453      JMP I JAGAIN /PRINT CURRENT CONTENTS WITHOUT DIVISION
1205  7300      CLA CLL
1206  1055      TAD LDIVIS
1207  7001      IAC
1210  3055      DCA LDIVIS
1211  4570      JMS I JREDO /TOCLEAR SUBROUTINE
1212  7300      START, CLA CLL
1213  6014      RFC /FETCH TAPE CHARACTER
1214  6011      SEA, RSF
1215  5214      JMP SEA
1216  7200      CLA
1217  6012      RRB
1220  7440      SZA
1221  5223      JMP ONON /INFORMATION IN AC
1222  5213      JMP START+1 /NO DATA YET
1223  3030      ONON, DCA AVNA
1224  7300      CLA CLL
1225  3031      DCA AVNB
1226  6014      RFC
1227  6011      SEB, RSF
1230  5227      JMP SEB
1231  7200      CLA
1232  6012      RRB
1233  3033      DCA PINB
1234  7300      CLA CLL
1235  6014      RFC
1236  6011      SEC, RSF
1237  5236      JMP SEC
1240  7200      CLA
```

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1241  6012  RRB
1242  3032  DCA PTNA
1243  7300  CLA CLL
1244  6014  RFC
1245  6011  SED, RSF
1246  5245  JMP SED
1247  7200  CLA
1250  6012  RRB
1251  3035  DCA NSB
1252  7300  CLA CLL
1253  6014  RFC
1254  6011  SEF, RSF
1255  5254  JMP SEF
1256  7200  CLA
1257  6012  RRB
1260  3034  DCA NSA /STORE
1261  7300  REPEAT, CLA CLL
1262  6014  RFC
1263  6011  SEG, RSF
1264  5263  JMP SEG
1265  7200  CLA
1266  6012  RRB
1267  7106  SUM, CLL RTL
1270  7006  RTL
1271  7006  RTL
1272  0040  AND MSKA
1273  3036  DCA LOCC
1274  7300  CLA CLL
1275  6014  RFC
1276  6011  SEK, RSF
1277  5276  JMP SEK
1300  7200  CLA
1301  6012  RRB
1302  0041  AND MSKB
1303  1036  TAD LOCC
1304  3042  DCA LOW
1305  7300  CLA CLL
1306  6014  RFC
1307  6011  SEH, RSF
1310  5307  JMP SEH
1311  7200  CLA
1312  6012  RRB
1313  7106  CLL RTL
1314  7006  RTL
1315  7006  RTL
1316  0040  AND MSKA
1317  3037  DCA LOCD
1320  7300  CLA CLL
1321  6014  RFC
1322  6011  SEL, RSF
1323  5322  JMP SEL
1324  7200  CLA
```

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1325  6112  RRB
1326  0041  AND MSKB
1327  1037  TAD LOCD
1330  3043  DCA HIGH
1331  7300  DUBADD, CLA CLL
1332  1457  TAD I LOCL
1333  1042  TAD LOW
1334  3042  DCA LOW
1335  7004  RAL
1336  1456  TAD I LOCH
1337  1043  TAD HIGH
1340  3411  DCA I LOCA /STORE HI ORDER WORD SUM
1341  1042  TAD LOW
1342  3411  DCA I LOCA
1343  1057  TAD LOCL
1344  7001  IAC
1345  7001  IAC
1346  3057  DCA LOCL
1347  1056  TAD LOCH
1350  7001  IAC
1351  7001  IAC
1352  3056  DCA LOCH
1353  7300  CLA CLL
1354  1173  TAD PTALLY
1355  7001  IAC /INCREMENT POINT COUNTER
1356  3173  DCA PTALLY
1357  1173  TAD PTALLY
1360  7440  SZA /SKIP IF ALL POINTS STORED
1361  5261  JMP REPEAT
1362  7300  ALLIN, CLA CLL
1363  1011  TAD LOCA
1364  3044  DCA LOCB
1365  1045  TAD CONST
1366  3011  DCA LOCA
1367  4423  JMS I JTALLY /TO PRNT AV. NO., NO. PTS., NO. SWEEPS
1370  7300  CLA CLL
1371  7402  HLT
1372  7404  OSR /PRINT OR READ? 4000=PRINT, 2000=READ
1373  7510  SPA
1374  5576  JMP I JCOUNT /JMP TO PRINT
1375  4575  JMS I JPSET /TO POINT COUNTER RESET SUBROUT.
1376  5200  JMP MERG /READ!
            *23 /CONSTANT POINTER
0023  1060  JTALLY, 1060 /TO PRINT SUBROUTINE
            *1060 /START TALLY SUBROUTINE, APE II
1060  7300  TALLY, CLA CLL
1061  4446  JMS I JTYCR
1062  4446  JMS I JTYCR
1063  7300  CLA CLL
1064  1030  TAD AVNA
1065  0041  AND MSKB
1066  3030  DCA AVNA
1067  7100  CLL
1070  1031  TAD AVNB
```

```
1071  7006  RTL
1072  7006  RTL
1073  7006  RTL
1074  0040  AND MSKA
1075  1030  TAD AVNA
1076  4447  JMS I PSP /PRINT AV. NO.
1077  4446  JMS I JTYCR
1100  7300  CLA CLL
1101  1032  TAD PTNA
1102  0041  AND MSKB
1103  3032  DCA PTNA
1104  1033  TAD PTNB
1105  7106  CLL RTL
1106  7006  RTL
1107  7006  RTL
1110  0040  AND MSKA
1111  1032  TAD PTNA
1112  4447  JMS I PSP /PRINT NEG. NO. PTS.
1113  4446  JMS I JTYCR
1114  7300  CLA CLL
1115  1034  TAD NSA
1116  0041  AND MSKB
1117  3034  DCA NSA
1120  1035  TAD NSB
1121  7106  CLL RTL
1122  7006  RTL
1123  7006  RTL
1124  0040  AND MSKA
1125  1034  TAD NSA
1126  4447  JMS I PSP /PRINT NO. SWEEPS
1127  4446  JMS I JTYCR
1130  5660  JMP I TALLY
      *1400
1400  7300  TYPO, CLA CLL
1401  1045  TAD CONST
1402  3011  DCA LOCA
1403  7300  CLA CLL
1404  1051  TAD RESET
1405  3243  DCA MVAL
1406  4446  JMS I JTYCR
1407  7300  CLA CLL
1410  1063  TAD NPRNT
1411  4464  JMS I JTYT
1412  7300  CLA CLL
1413  1055  TAD LDIVIS
1414  4447  JMS I PSP
1415  7300  CLA CLL
1416  4446  JMS I JTYCR
1417  7300  CLA CLL
1420  1065  TAD TOPRN
1421  4464  JMS I JTYT
1422  7300  CLA CLL
1423  1066  TAD TAPRN
1424  4464  JMS I JTYT
1425  7300  CLA CLL
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1426  1067  TAD LSPRN
1427  4464  JMS I JTYT
1430  7360  CLA CLL
1431  4446  JMS I JTYCR
1432  7300  DPRNT, CLA CLL
1433  1044  TAD LOCB
1434  7041  CIA
1435  1243  TAD MVAL
1436  7420  SNL
1437  5241  JMP DWRT
1440  5270  JMP FINE
1441  7300  DWRT, CLA CLL
1442  4450  JMS I NUMB
1443  2000  MVAL, 2000
1444  7300  CLA CLL
1445  1243  TAD MVAL
1446  7001  IAC
1447  7001  IAC
1450  3243  DCA MVAL
1451  4470  JMS I JTB
1452  7300  CLA CLL
1453  1071  TAD TORLF
1454  7001  IAC
1455  7510  SPA
1456  5265  JMP GOPRN
1457  7300  CLA CLL
1460  4446  JMS I JTYCR
1461  7300  CLA CLL
1462  1072  TAD TCON
1463  3071  DCA TORLF
1464  5232  JMP DPRNT
1465  3071  GOPRN, DCA TORLF
1466  7300  CLA CLL
1467  5232  JMP DPRNT
1470  7300  FINE, CLA CLL
1471  1072  TAD TCON
1472  3071  DCA TORLF
1473  1060  TAD HSET
1474  3056  DCA LOCH
1475  1061  TAD LSET
1476  3057  DCA LOCL
1477  1062  TAD DSET
1500  3055  DCA LDIVIS
1501  1062  TAD DSET
1502  3054  DCA HDIVIS
1503  4446  JMS I JTYCR
1504  7300  CLA CLL
1505  1051  TAD RESET
1506  3243  DCA MVAL
1507  1052  TAD ASET
1510  3011  DCA LOCA
1511  1052  TAD ASET
1512  3045  DCA CONST
1513  1073  TAD ENTY
1514  4464  JMS I JTYT
```

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1515  7300  CLA CLL
1516  1074  TAD DPTY
1517  4464  JMS I JTYT
1520  7402  HLT
1521  7300  CLA CLL
1522  5131  JMP PREP+1
            PAUSE

            *171
0171  0000  PCONST, 0 /POINT COUNTER CONSTANT- ~~7402~~ 7014
0172  0000  PCOUNT, 0 /POINT COUNTER, FIRST TIME
0173  0000  PTALLY, 0 /POINT COUNTER, N TIMES
0174  0000  PSTORE, 0  / TEMPO STORE!

            PAUSE

            *170 /POINTER TO REDO!

0170  1133  JREDO, 1133

            *1133 / REDO CLEAR SUBROUTINE
1133  7300  REDO, CLA CLL
1134  1060  TAD HSET
1135  3056  DCA LOCH
1136  1061  TAD LSET
1137  3057  DCA LOCL
1140  1052  TAD ASET
1141  3011  DCA LOCA
1142  5733  JMP I REDO
            *175
0175  1530  JPSET, 1530
            *1530
1530  7300  PSET, CLA CLL /RESET POINT COUNTER N
1531  7300  CLA CLL
1532  1171  TAD PCONST
1533  3173  DCA PTALLY
1534  5730  JMP I PSET
            *176
0176  1540  JCOUNT, 1540
            *1540
1540  7300  COUNT, CLA CLL
1541  7300  CLA CLL
1542  1055  TAD LDIVIS
1543  7001  IAC
1544  3055  DCA LDIVIS
1545  5200  JMP TYPO

            *400 /START DOUBLE PRECISION SIGNED PRINT SUBROUTINE
```

```
                /THIS IS AN OVERLAY FOR APE II
                /WRITTEN BY GK 11/19/71
                /THE OVERLAY PROVIDES THE CAPABILITY
                /OF SUBTRACTING ANY NUMBER OF DATA TAPES
                /FROM ANY OTHER NUMBER OF DATA TAPES THAT
                /HAVE FIRST BEEN ADDED TOGETHER WITH APE II.
                /THE PROGRAM IS CO-RESIDENT WITH APE II.
                *1600
1600  1642      SUBT, TAD LOW /THIS IS THE FIRST ADDRESS OF THE SUBTRACT SUB
1601  7041      CIA
1602  1457      TAD I LOCL /GET LOW HALF OF NUMBER
1603  3042      DCA LOW /DEPOSIT NEW HALF OF NUMBER
1604  7004      RAL
1605  3025      DCA KEEP /SAVE LINK
1606  1443      TAD HIGH
1607  7040      CMA
1610  1456      TAD I LOCH /GET OTHER HALF OF NEW NUMBER
1611  1025      TAD KEEP /ADD THE LINK TO THIS
1612  3411      DCA I LOCA /DEPOSIT OTHER HALF OF NEW NUMBER
1613  7300      CLA CLL
1614  5426      JMP I DEC /END OF SUBTRACT GO BACK TO OLD PROGRAM
1615  7300      CLA CLL
1616  7402      HLT /NOW DECIDE WHETHER TO ADD OR SUBTRACT
1617  1402      OSR /TO ADD SET SW TO 0000 TO SUBTRACT SET IT TO 4000
1620  1510      SPA
1621  5477      JMP I OLD / JUMP BACK TO APE II
1622  7300      CLA CLL
1623  5421      JMP I STG /JUMP BACK TO READ
1624  7300      CLA CLL
1625  1475      TAD FOR /GET THE INSTRUCTION TO BE INSERTED INTO APE II
1626  3476      DCA I CAR /INSERT IT
1627  5421      JMP I STG /JUMP BACK TO READ
                *1005
1005  5427      REF, JMP I HELL /THIS IS THE OLD INSTRUCTION BEING REPLACED
                *0024
0024  1600      HAF, 1600
                *0025
0025  0000      KEEP, 0000
                *0026
0026  1341      DEC, 1341
                *0027
0027  1615      HELL, 1615
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                *0021
0021    1206    STO, 1206
                *0075
0075    5424    BOF, 5424
                *0076
0076    1332    GAR, 1332
                *0077
0077    1624    OLD, 1624
                *0057
0057    2001    LOCL, 2001
                *0042
0042    0000    LOW, 0000
                *0056
0056    2000    LOCH, 2000
                *0043
0043    0000    HIGH, 0000
                *0011
0011    1777    LOCA, 1777

BOF     0075
GAR     0076
JAF     0004
HELL    0027
HIGH    0043
KEEP    0025
LOCA    0011
LOCH    0056
LOCL    0057
LOW     0042
OLD     0077
ORG     0026
STO     0021
SUBT    1600
```

```
                /THIS IS A PUNCH TEST PROGRAM WRITTEN BY DK TO BE USED IN
                /CONJUNCTION WITH THE APE II PROGRAM AND OVERLAY.
                /IT ALLOWS THE USER TO PUNCH OUT DATA THAT HAS BEEN
                /MANIPULATED BY THE APEII PROGRAM
                *200
0200  7300      START, CLA CLL
0201  1430      TAD I CONST  /GET POINT COUNTER FROM APE II
0202  3031      DCA NEW  /DEPOSIT INTO NEW COUNTER
0203  6026      PLS  /CLEAR TTY FLAG
0204  7002      HLT CLA  /TURN ON PUNCH
0205  1036      TAD NUMB /GET NUMBER OF AVERAGE
0206  4234      JMS PUNCH
0207  1031      TAD NEW /GET NUMBER OF POINTS
0210  4234      JMS PUNCH
0211  1037      TAD SWEEP /GET CONSTANT NUMBER OF SWEEPS
0212  4234      JMS PUNCH
0213  7300      LOOP, CLA CLL
0214  1411      TAD I LOCA /GET HIGH ORDER WORD
0215  3032      DCA HIGH
0216  1411      TAD I LOCA /GET LO-ORDER WORD
0217  3033      DCA LOW
0220  7300      CLA CLL
0221  1033      TAD LOW
0222  4234      JMS PUNCH
0223  1032      TAD HIGH
0224  4234      JMS PUNCH
0225  1031      TAD NEW /GET COUNT
0226  7001      IAC
0227  3031      DCA NEW
0230  1031      TAD NEW
0231  7440      SZA /SKIP ON ZERO AC
0232  5213      JMP LOOP
0233  7402      HLT /ALL DATA PUNCHED
0234  0000      PUNCH, 0000
0235  3034      DCA TEMP
0236  1034      TAD TEMP
0237  7012      RTR
0240  7012      RTR
0241  7012      RTR
0242  0035      AND MASK
0243  6021      PSF
0244  5243      JMP.-1
0245  6026      PLS
0246  7300      CLA CLL
```

```
0247   1034   LAD TEMP
0250   0035   AND MASK
0251   6021   PSF
0252   5251   JMP.-1
0253   6026   PLS
0254   7300   CLA CLL
0255   5634   JMP I FUNCH
                *30
0030   0171   CONST,0171
0031   0000   NEW,0000
0032   0000   HIGH,0000
0035   0000   LOW,0000
0034   0000   TEMP,0000
0035   0077   MASK,0077
0036   0001   NUMB,0001
0037   0170   SWEEP,0170
                *11
0011   1777   LOCA,1777
```

```
CONST    0030
HIGH     0032
LOCA     0011
LOOP     0213
LOW      0033
MASK     0035
NEW      0031
NUMB     0036
PUNCH    0234
START    0200
SWEEP    0037
TEMP     0034
```

```
                /THIS IS A PROGRAM WRITTEN BY DK 1/15/72
                /THE PROGRAM IS USED TO READ DATA INTO THE
                /ADVANCED AVERAGE PROGRAM FOR THE PURPOSE OF
                /PLOTTING.  THIS PROGRAM WILL ACCEPT PUNCHED DATA
                /OBTAINED FROM THE DIGITAL HIGH SPEED PUNCH AND
                /ALSO DATA FROM THE APE TT PUNCH PROGRAM
                *6000
6000  7300      START, CLA CLL
6001  6014      RFC  /GET TAPE CHARACTER   6036
6002  6011      RSF  /SKIP IF FLAG=1       6031
6003  5202      JMP.-1
6004  7200      CLA
6005  6012      RRB /LOAD AC FROM BR       6034
6006  7440      SZA /SKIP IF NO PUNCHES
6007  5211      JMP GOGO /INFORMATION IN AC
6010  5201      JMP START+1 /NO DATA YET
6011  3352      GOGO, DCA AVNA /DEPOSIT FIRST ROW OF DATA
6012  7300      CLA CLL
6013  6014      RFC /GET CHARACTER 6036
6014  6011      RSF                        6031
6015  5214      JMP.-1
6016  7200      CLA
6017  6012      RRB 6034
6020  3354      DCA PINF /STORE HALF NUMBER OF POINTS
6021  7300      CLA CLL
6022  6014      RFC  6036
6023  6011      RSF  6031
6024  5223      JMP.-1
6025  7200      CLA
6026  6012      RRB  6034
6027  3353      DCA PINA /STORE OTHER HALF OF POINTS
6030  7300      CLA CLL
6031  6014      RFC  6036
6032  6011      RSF  6031
6033  5232      JMP.-1
6034  7200      CLA
6035  6012      RRB 6034
6036  3352      DCA AVNA /NO OF SWEEPS
6037  7300      CLA CLL
6040  6014      RFC  6036
6041  6011      RSF  6031
6042  5241      JMP.-1
6043  7200      CLA
6044  6012      RRB 6034
6045  3352      DCA AVNA /NO. OF SWEEPS
6046  7300      CLA CLL
6047  1353      TAD PINA
6050  0355      AND MSKR
6051  3357      DCA PSTORE /POINT COUNTER
6052  1354      TAD PINF
6053  7106      CLL RTL
```

```
6054  7006  RTL
6055  7006  RTL
6056  0356  AND MSKA
6057  1357  TAD PSTORE
6060  3357  DCA PSTORE /COMPLETE POINT COUNTER
6061  7300  CLA CLL
6062  1763  TAD I CHECK
6063  1364  TAD ADD /GET NO PCOI
6064  3016  DCA LOCA /AUTO-INDEX
6065  7300  BEGIN, CLA CLL
6066  6014  RFC) 6036
6067  6011  RSF) 6031
6070  5267  JMP.-1
6071  7200  CLA
6072  6012  RRB) 6034
6073  7106  CLL RTL /ROTATE DATA LEFT
6074  7006  RTL
6075  7006  RTL
6076  0356  AND MSKA
6077  3360  DCA LOCC /TEMPORARY STORE LEFT HALF LO-ORDER WORD
6100  7300  CLA CLL
6101  6014  RFC) 6036
6102  6011  RSF) 6031
6103  5302  JMP.-1
6104  7200  CLA
6105  6012  RRB) 6034
6106  0355  AND MSKB
6107  1360  TAD LOCC /ALL LEAST AND MOST SINIFICANT BITS
6110  3361  DCA LOW /STORE OF LO-ORDER WORD
6111  7300  CLA CLL
6112  6014  RFC) 6036
6113  6011  RSF) 6031
6114  5313  JMP.-1
6115  7200  CLA
6116  6012  RRB) 6034
6117  7106  CLL RTL
6120  7006  RTL
6121  7006  RTL
6122  0356  AND MSKA
6123  3360  DCA LOCC /HALF OF HIGH ORDER WORD
6124  7300  CLA CLL
6125  6014  RFC) 6036
6126  6011  RSF) 6031
6127  5326  JMP.-1
6130  7200  CLA
```

```
6131   6012)  ERR  6034
6132   0355   AND MSKB
6133   1360   TAD LOCC /PUT BOTH TOGETHER
6134   3368   DCA HIGH /STORE IN "HIGH ORDER WORD
6135   7300   CLA CLL
6136   1361   TAD LOW
6137   3416   DCA I LOCA /AUTO-INDEX 0016
6140   1362   TAD HIGH
6141   3416   DCA I LOCA
6142   7300   CLA CLL
6143   1357   TAD PSTORE
6144   7001   IAC /INCREMENT COUNTER
6145   3357   DCA PSTORE
6146   1357   TAD PSTORE
6147   7440   SZA  /SKIP ON 0 AC
6150   5065   JMP BEGIN
6151   7402   HLT
6152   0000   AVNA,0000
6153   0000   PINA,0000
6154   0000   PINB,0000
6155   0077   MSKB,0077
6156   7700   MSKA,7700
6157   0060   PSTORE,0000
6160   0000   LOCC,0000
6161   0000   LOW,0000
6162   0000   HIGH,0000
6163   0234   CHECK,0234
6164   0001   ADD,0001
              *0016
0016   0000   LOCA,0000
```

```
ADD      6164
AVNA     6152
BEGIN    6065
CHECK    6163
DONE     6011
HIGH     6162
LOCA     0016
LOCC     6160
LOW      6161
MSKA     6156
MSKB     6155
PSTORE   6157
PINA     6153
PINB     6154
START    6000
```