

SIX VERSIONS OF THE SAME PROGRAM

1. Program Description (with flowchart)
2. Source-program listing
3. Source-program on paper tape *
4. Source-program on magnetic tape
5. Assembly listing
6. Binary ("object") program on magnetic tape

* This step is not necessary if one's computer has a magnetic tape-oriented assembler (e.g., DIAL). The other five steps are generally necessary, and are in their logical order. Other forms are: (a) "Quick Listing" (an abbreviated version of 5. above), (b) Dump listing, (c) Binary paper tape

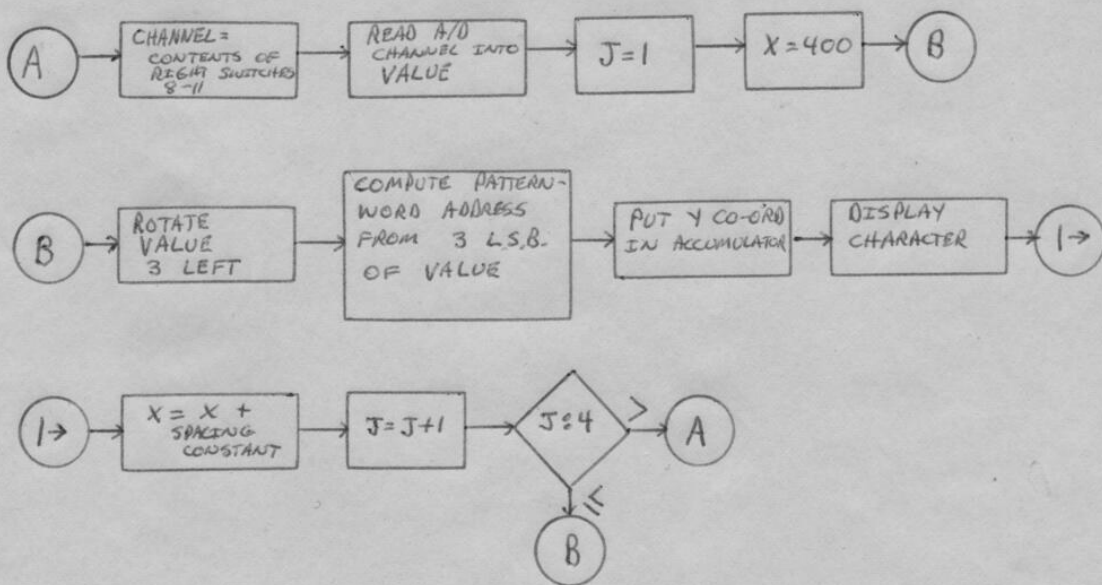
PROGRAM DESCRIPTION

Abstract: This is a short PDP-12 program which continuously samples the A/D channel specified in Right Switches 8-11, and displays the digital representation (in octal) of the sampled voltage on the middle of the oscilloscope screen.

Characteristics:

1. Programming mode: LINC
2. Language: Assembly, using DIAL system
3. Character size: Full
4. A/D sampling rate: Normal
5. Starting address: 4020₈

Flowchart:



Variables:

- J Counts digit number
- VALUE Contains A/D sample originally, and subsequently the rotated sample
- X Horizontal coordinate

SOURCE LISTING

2.

1 LN=1

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/ A PROGRAM WHICH DISPLAYS THE OCTAL
/ REPRESENTATION OF THE VOLTAGE AT THE
/ CHANNEL SPECIFIED BY RIGHT SWITCHES 8-11
/
/ OPERATING INSTRUCTIONS:
/ LOAD "ADSAMP";
/ SET MODE SWITCH TO "LINC";
/ PRESS "START 20".
/
/
//VARIABLES:
      *1                /ORIGIN=0001
X,      0                /HORIZONTAL CO-ORDINATE
PWADDR, 0                /PATTERN-WORD ADDRESS
/(FOR GENERATING AN OSCILLOSCOPE
/ IMAGE OF A DIGIT)
J,      0                /COUNTS DIGITS DISPLAYED
/
      *20               /ORIGIN=00020
LDF 2    /SET DATA FIELD SAME AS INSTRUCTION
FIELD
A,      CLR              /ACC=0
/READ RIGHT SWITCHES:
      PDP
      PMODE
      OSR
      LINC
      LMODE
/
      BCL I              /TAKE BITS 8-11 ONLY
      7760
      BSE I              /OR WITH "SAM" INS
      SAM
      STC SAMPLE
SAMPLE, 0                /APPROPRIATE "SAM" INS IS PLACED
HERE
/
      STC VALUE          /STORE A/D SAMPLE
/
/DIGIT NO =FIRST
      SET I J
      1
/
/HORIZ CO-ORD=MIDDLE OF SCREEN
      SET I X
      400
/
/LOAD VALUE INTO ACC&
/ROTATE 3 BITS LEFT:
B,      LDA I
VALUE,  0
      ROL 3
/
      STC VALUE
      ADD VALUE
/MASK OUT ALL BUT THE
/THREE LEAST SIGNIFICANT

```

SOURCE LISTING (cont.)

2 LN=70

/BITS:

ECL I
7770

/GET PATTERN-WORD ADDRESS,

/AND STORE IT IN BETA

/REGISTER "PWADDR":

ROL I
ADA I
PWTABL
STC PWADDR

/

/PUT Y-COORD IN ACC:

LDA I
0

Y,

/

DSC PWADDR /DISPLAY LEFT HALF OF CHARACTER
DSC I PWADDR /DISPLAY RIGHT " "

/

/ADD SPACING-CONSTANT TO X

LDA I
10 /SPACING CONSTANT
ADM
X

/

/J=J+1:

LDA I
1
ADD J
STA
J

/

/HAVE ALL FOUR DIGITS

/BEEN DISPLAYED?

SAE I
5
JMP B /NO
JMP A /YES

//

//TABLE OF PATTERN WORDS:

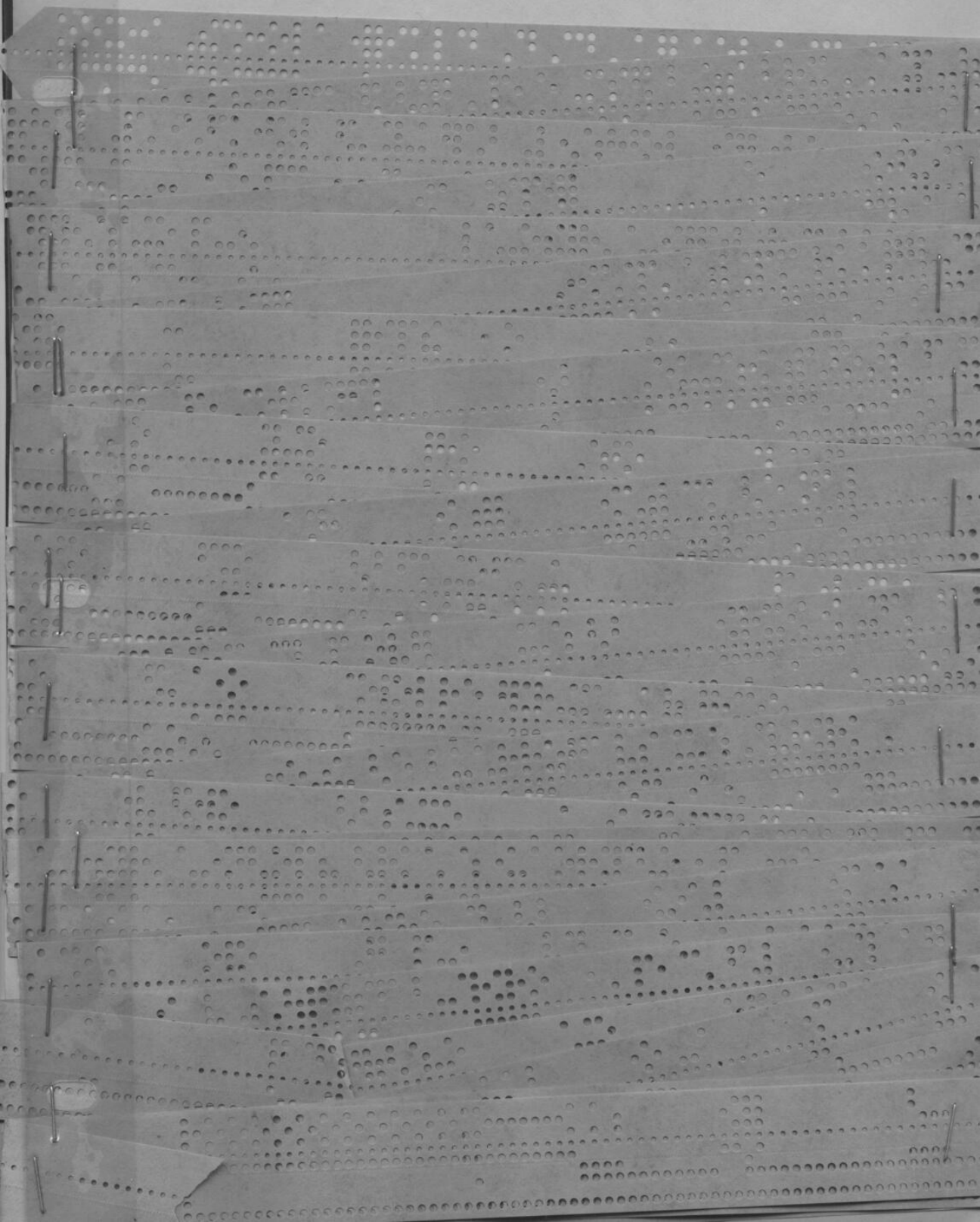
PWTABL, 4136 /0
3641
2101 /1
0177
4523 /2
2151
4122 /3
2651
2414 /4
0477
5172 /5
0651
1506 /6
4255
4443 /7
6050

SOURCE PROGRAM ON MAGNETIC TAPE :



CHELLENNHAM BOND

SOURCE PROGRAM ON PAPER TAPE:



ASSEMBLY LISTING

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0000          *20
0001          / A PROGRAM WHICH DISPLAYS THE OCTAL
0002          / REPRESENTATION OF THE VOLTAGE AT THE
0003          / CHANNEL SPECIFIED BY RIGHT SWITCHES 8-11
0004          /
0005          / OPERATING INSTRUCTIONS:
0006          / LOAD "ADSAMP";
0007          / SET MODE SWITCH TO "LINC";
0010          / PRESS "START 20".
0011          /
0012          /
0013          //VARIABLES:
0014          *1          /ORIGIN=0001
0015          0001 0000 X, 0          /HORIZONTAL CO-ORDINA
TE
0016          0002 0000 PWADDR, 0          /PATTERN-WORD ADDRESS
0017          / (FOR GENERATING AN OSCILLOSCOPE
0020          / IMAGE OF A DIGIT)
0021          0003 0000 J, 0          /COUNTS DIGITS DISPLA
YED
0022          /
0023          *20          /ORIGIN=00020
0024          0020 0642 LDF 2          /SET DATA FIELD SAME
AS INSTRUCTION FIELD
0025          0021 0011 A, CLR          /ACC=0
0026          /READ RIGHT SWITCHES:
0027          0022 0002 PDP
0030          PMODE
0031          4023 7404 OSR
0032          4024 6141 LINC
0033          LMODE
0034          /
0035          0025 1560 BCL I          /TAKE BITS 8-11 ONLY
0036          0026 7760 7760
0037          0027 1620 BSE I          /OR WITH "SAM" INS
0040          0030 0100 SAM
0041          0031 4032 STC SAMPLE
0042          0032 0000 SAMPLE, 0          /APPROPRIATE "SAM" IN
S IS PLACED HERE
0043          /
0044          0033 4041 STC VALUE          /STORE A/D SAMPLE
0045          /
0046          /DIGIT NO =FIRST
0047          0034 0063 SET I J
0050          0035 0001 1
0051          /
0052          /HORIZ CO-ORD=MIDDLE OF SCREEN
0053          0036 0061 SET I X
0054          0037 0400 400
0055          /
0056          /LOAD VALUE INTO ACC&
0057          /ROTATE 3 BITS LEFT:
0060          0040 1020 B, LDA I
0061          0041 0000 VALUE, 0
0062          0042 0243 ROL 3
0063          /
0064          0043 4041 STC VALUE
0065          0044 2041 ADD VALUE
0066          /MASK OUT ALL BUT THE
0067          /THREE LEAST SIGNIFICANT
0070          /BITS:

```

ASSEMBLY LISTING (CONT.)

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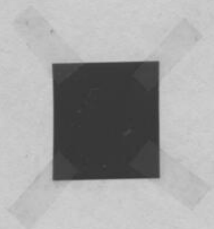
0072      0046  7770      7770
0073      /GET PATTERN-WORD ADDRESS,
0074      /AND STORE IT IN BETA
0075      /REGISTER "PWADDR":
0076      0047  0241      ROL 1
0077      0050  1120      ADA I
0100      0051  0074      PWTABL
0101      0052  4002      STC PWADDR
0102      /
0103      /PUT Y-COORD IN ACC:
0104      0053  1020      LDA I
0105      0054  0000  Y,   0
0106      /
0107      0055  1742      DSC PWADDR      /DISPLAY LEFT HALF OF
CHARACTER
0110      0056  1762      DSC I PWADDR      /DISPLAY RIGHT "  "
0111      /
0112      /ADD SPACING-CONSTANT TO X
0113      0057  1020      LDA I
0114      0060  0010      10      /SPACING CONSTANT
0115      0061  1140      ADM
0116      0062  0001      X
0117      /
0120      /J=J+1:
0121      0063  1020      LDA I
0122      0064  0001      1
0123      0065  2003      ADD J
0124      0066  1040      STA
0125      0067  0003      J
0126      /
0127      /HAVE ALL FOUR DIGITS
0130      /BEEN DISPLAYED?
0131      0070  1460      SAE I
0132      0071  0005      5
0133      0072  6040      JMP B      /NO
0134      0073  6021      JMP A      /YES
0135      //
0136      //TABLE OF PATTERN WORDS:
0137      0074  4136  PWTABL, 4136      /0
0140      0075  3641      3641
0141      0076  2101      2101      /1
0142      0077  0177      0177
0143      0100  4523      4523      /2
0144      0101  2151      2151
0145      0102  4122      4122      /3
0146      0103  2651      2651
0147      0104  2414      2414      /4
0150      0105  0477      0477
0151      0106  5172      5172      /5
0152      0107  0651      0651
0153      0110  1506      1506      /6
0154      0111  4255      4255
0155      0112  4443      4443      /7
0156      0113  6050      6050

```

0000 ERRORS

A	4021		
B	4040		
J	4003	VALUE	4041
PWADDR	4002	X	4001
PWTABL	4074	Y	4054
SAMPLE	4032		

BINARY ("OBJECT") PROGRAM ON MAGNETIC TAPE :



CHESTERMAN BOND