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DECUS NO.	12-109A, B, C
TITLE	QNANSWER, QANDATTY, SUPRSHUF
AUTHOR	Ronald W. Wood
COMPANY	University of Rochester School of Medicine Rochester, New York
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SOURCE LANGUAGE	DIAL-MS

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Abstract and Program Description.

QNANSWER retrieves information from the QANDA (DEC-12-FISA-D) answer buffer, ignoring terminal null values. The program accepts 8's and 9's as octal 10's and 11's. Each question field within a display is limited to a maximum of four characters. The program occupies 38_{10} memory locations, B16 and B17.

Operating Instructions

Subroutine calling format is as follows:

```
.          JMP  D1
.+1        ANSWER  BUFFER ADDRESS
.+2        ANSWER 1

.+N+1      ANSWER N
.+N+2      RETURNS HERE
```

```
0000                    *20
0001                    /QNANSWER
0002                    /
0003                    /DATA RETRIEVAL FROM QANDA
0004                    /DEC-12-FISR-D
0005                    /MUST BE IN SAME INSTRUCTION FIELD
0006                    /WITH CALLING JUMP
0007                    /
0010                    /SUBROUTINE CALLING FORMAT:
0011                    /       JMP D1
0012                    /.+1    ANSWER TEXT FIELD ADDRESS
0013                    /.+2    ANSWER 1
0014                    /.+N+1  ANSWER N
0015                    /.+N+2  RETURNS HERE
0016                    /
0017                    /USES B16,B17
0020                    /
0021                    /RONALD W. WOOD
0022                    /UNIVERSITY OF ROCHESTER
0023                    /9-1-72
0024                    /
0025        0020  1000  D1,       LDA
0026        0021  0000            0
0027        0022  1560            BCL I
0030        0023  6000            6000
0031        0024  1040            STR
0032        0025  0017            17        /ANS. ADD.  IN CALL
0033        0026  4030            STC .+2
0034        0027  1100            ADR
0035        0030  0000            0
0036        0031  4016            STC  16 /C(B16)=ANS. FIELD ADD.
0037        0032  0237            XSK I 17 /INCREMENT AND CLEAR ANSWER
0040        0033  0011            CLR
0041        0034  1057            STA  17
0042        0035  1020            LDA I
0043        0036  0034            34                /END OF ANSWER STRING
0044        0037  1436            SHD I 16
0045        0040  6060            JMP  .+20 /RETURN
0046        0041  1020            LDA I
0047        0042  0074            74  /END OF WORD CODE
0050        0043  1416            SHD  16
0051        0044  6032            JMP .-12
0052        0045  0011            CLR     /IGNORE TERMINAL NULL VALUES
0053        0046  1416            SHD 16
0054        0047  6035            JMP .-12
0055        0050  1017            LDA  17 /ROTATE AND ADD HALF WORD
0056        0051  0243            ROL 3
0057        0052  1057            STA  17
0060        0053  1316            LDH  16
0061        0054  1560            BCL I
0062        0055  7770            7770
0063        0056  1157            ADM  17
0064        0057  6035            JMP  .-22
0065        0060  1000            LDA  /RETURN
0066        0061  0017            17
0067        0062  1120            ADR I
0070        0063  6001            6001
0071        0064  4065            STC  .+1
0072        0065  0000            0
```

Program Description

QANDATTY prints QANDA (DEC-12-FISA-D) displays and user responses on the teletype. The program occupies 102_{10} memory locations and utilizes Beta registers 2 through 6. The program provides the user the option of printing several display lines to the teletype line.

Operating Instructions

Subroutine calling Format is as follows:

```
.       JMP T8
.+1     Negative Number of Scopelines per teletype line
.+2     ADDRESS OF TEXT STRING
.+3     ADDRESS OF ANSWER BUFFER
.+4     RETURNS HERE
```

```
0000                    *20
0001                     /QANDATTY
0002                    /PRINTS QANDA DISPLAY
0003                    /ON TELETYPE
0004                    /CALLING ROUTINE:
0005                    /JMP T8 <START>
0006                    /NEG NUMBER SCOPE
0007                    / LINES PER TTY LINE
0010                    /ADDRESS OF QUESTION
0011                    /ADDRESS OF ANSWER
0012                    /RETURNS HERE
0013                    /USES REGISTERS 2TO6
0014                    /AND VARIOUS TAGS
0015                    /
0016                    /VERSION FOR MCDONALD Q+A
0017                    /MICHAEL I. GAGE
0020                    /1-29-71
0021                    /
0022                    /REVISION FOR QANDA
0023                    /DEC-12-FISA-D
0024                    /RONALD W. WOOD
0025                    /UNIVERSITY OF ROCHESTER
0026                    /9-1-72
0027                    /
0030        0020  1020  T8,       LDA I  /PICKUP ADDRESS OF CHARACTERS
0031        0021  1777            -6000
0032        0022  2000            ADD 0
0033        0023  4003            STC 3
0034        0024  1003            LDA 3
0035        0025  1060            STA 1
0036        0026  0000            0 /NEG Z SCOPE LINES PER TTY LINE
0037        0027  4004            STC 4
0040        0030  1023            LDA I 3
0041        0031  2122            ADD SPACE-3 /-4000
0042        0032  4005            STC 5 /QUESTION FIELD
0043        0033  1023            LDA I 3
0044        0034  4006            STC 6 /ANSWER FIELD
0045        0035  0062            SET I 2
0046        0036  7776            -1                  /SET F,H FLAG
0047        0037  2003            ADD 3 /SAVE RETURN
0050        0040  2121            ADD SPACE-4 /6001
0051        0041  4055            STC .+14
0052        0042  1325            LDH I 5 /PICKUP QUESTION
0053        0043  6056            JMP .+13 /CHECK CHARACTER
0054        0044  6046            JMP .+2 /74, GO TO ANSWER
0055        0045  6042            JMP .-3 /GET NEXT CHARACTER
0056        0046  1325            LDH I 5 /SKIP NO. IN STRING
0057        0047  6125            JMP SPACE
0060        0050  1326            LDH I 6 /PICKUP ANSWER
0061        0051  6056            JMP .+5 /CHECK CHARACTER
0062        0052  6042            JMP .-10 /74, GO TO QUESTION
0063        0053  6050            JMP .-3 /GET NEXT CHARACTER
0064                    /RETURN ROUTINE
0065                    /REPLACE NEXT REGISTER WITH NOP
0066                    /TO SUPPRESS CRLF AT END OF DISPLAY
0067        0054  6153            JMP LFCR
0070        0055  6000            JMP 0 /RETURN
0071                    /CHARACTER CHECK ROUTINE
0072        0056  0006            DJR                 /CHECK  F,H FLAG
0073        0057  0222            XSK I 2
0074        0060  6067            JMP .+7             /AROUND F,H TEST
```

```
0076    0062  0600          600              /F
0077    0063  6117          JMP SPACE-6
0100    0064  1420          SHD I
0101    0065  1000          1000             /H
0102    0066  6117          JMP SPACE-6
0103    0067  1420          SHD I
0104    0070  7400          7400
0105    0071  6000          JMP 0 /END OF FIELD
0106    0072  1420          SHD I
0107    0073  3400          3400
0110    0074  6054          JMP .-20 /END OF DISPLAY
0111    0075  0220          XSK I 0 /PREPARE RTN TO GET NEXT
0112    0076  0043          SET 3
0113    0077  0000          0 /SAVE RETURN
0114    0100  1460          SAE I
0115    0101  0043          43 /END OF DISPLAY LINE
0116    0102  6113          JMP .+11
0117    0103  0062          SET I 2
0120    0104  7776          -1               /SET F,H FLAG
0121    0105  0224          XSK I 4 /INCREMENT 2 SCOPE LINES
0122    0106  6115          JMP .+7
0123    0107  0044          SET 4
0124    0110  0026          T8+6 /RESET SCOPE LINES PER TTY LINE
0125    0111  6153          JMP LFCR
0126    0112  6003          JMP 3
0127    0113  6131          JMP TYP6 /TYPE CHARACTER
0130    0114  6003          JMP 3 /RETURN, GET NEXT CHARACTER
0131    0115  6125          JMP SPACE /SKIP SPACE INSTEAD OF NEW LINE
0132    0116  6003          JMP 3 /RETURN, GET NEXT CHARACTER
0133    0117  0220          XSK I 0
0134    0120  6000          JMP 0
0135    0121  6001          6001
0136    0122  3777          -4000
0137    0123  0100          100      /CONSTANTS FOR TYP6
0140    0124  0200          200
0141                  /
0142                  /
0143                  /TELETYPE
0144                  /PRINTS ASR33 TTY
0145                  /JMP TO SUBROUTINE
0146                  /RETURNS TO NEXT LOCATION
0147                  / D. A. OVERTON  2-2-70
0150                  /
0151                  /JMP SPACE: TO TYPE 1 SPACE
0152    0125  1020    SPACE,   LDA I
0153    0126  7757          -20
0154                  /JMP TYPDIG: WITH BINARY 0-9 IN AC
0155    0127  1120    TYPDIG,  ADA I
0156    0130  0060          60
0157                  /JMP TYP6: WITH 6-BIT ASCII IN AC
0160    0131  1060    TYP6,    STA I
0161    0132  0000          0        /SAVE ASCII
0162    0133  1560          BCL I
0163    0134  7737          7737
0164    0135  0470          AZE I    /ADD 200 OR 300?
0165    0136  2123          ADD .-13
0166    0137  2124          ADD .-13
0167    0140  1560          BCL I    /CLEAR BIT 6
0170    0141  0040          40
0171    0142  2132          ADD .-10  /ADD IN BITS 6-11
0172                  /JMP TYP8: WITH 8-BIT ASCII IN AC.
0173    0143  0500    TYP8,    IOB
```

```
0175      0145  0006          DJR
0176      0146  0500          IOB
0177      0147  6041          6041    /TSF
0200      0150  6145          JMP .-3 /WAIT FOR FLAG
0201      0151  0011          CLR
0202      0152  6000          JMP 0   /RTN
0203                    /
0204                    /JMP LFCR: LINE FEED & CARRIAGE RETURN
0205      0153  1000  LFCR,    LDA     /SAVE RTN
0206      0154  0000          0
0207      0155  4165          STC .+10
0210      0156  1020          LDA I   /CR
0211      0157  0215          215
0212      0160  6143          JMP TYP8
0213      0161  6143          JMP TYP8 /EXTRA CHAR FOR SLOW TTYS
0214      0162  1020          LDA I   /LF
0215      0163  0212          212
0216      0164  6143          JMP TYP8
0217      0165  6000          JMP 0   /RTN
0220                          /END TELETYPE
0221                    /END QANDATTY

NO ERRORS

LFCR   4153
SPACE  4125
TYPDIG 4127
TYP6   4131
TYP8   4143
T8     4020
```

Program Description and operating instructions.

SUPRSHUF was devised to facilitate the examination of sequential dependencies in time series by comparing shuffled and unshuffled data. A pseudo-random number generating algorithm was selected which repeats every 512 iterations after having produced a rectangular frequency distribution of random numbers (HAMMING, 1962). Non-zero data only is included in the shuffle; zeros are packed out of the input string and onto the tail of the output string to the nearest block boundary. The program requests the first and last blocks of the input string on unit zero, and the first block of the output string on unit one. The program prints the input and output string boundaries on the teletype in the display format. The program can be modified easily to run on the LINC 8.

Reference: R. W. Hamming, Numerical Methods for Scientists and Engineers, McGraw Hill, New York, 1962, pp.384-388.

```
0000                    *20
0001                            SEGMNT 3
0002                            *1000
0003        1000  0620
0003        1001  2305
0003        1002  2504
0003        1003  1722
0003        1004  0116
0003        1005  0417
0003        1006  1540
0003        1007  2310
0003        1010  2506
0003        1011  0614
0003                    TXTSTR, TEXT XPPSEUDORANDOM SHUFFLE
0004        1012  0543
0004
0005        1013  4043
0005        1014  1116
0005        1015  2025
0005        1016  2440
0005        1017  0214
0005        1020  1703
0005        1021  1323
0005        1022  4017
0005        1023  1640
0005        1024  2516
0005        1025  1124
0005        1026  4032
0005        1027  0522
0005                    INPUT BLOCKS ON UNIT ZERO
0006        1030  1743
0006        1031  4040
0006        1032  4040
0006        1033  4040
0006        1034  0611
0006        1035  2223
0006        1036  2440
0006        1037  0214
0006        1040  1703
0006        1041  1340
0006                            FIRST BLOCK <3
0007        1042  7463
0007        1043  4340
0007        1044  4040
0007        1045  4040
0007        1046  4014
0007        1047  0123
0007        1050  2440
0007        1051  0214
0007        1052  1703
0007        1053  1340
0007        1054  4074
0007                            LAST BLOCK  <3
0010        1055  6343
0010
0011        1056  4043
0011        1057  1725
0011        1060  2420
0011        1061  2524
```

```
0011      1064  0313
-
0011      1065  2340
0011      1066  1716
0011      1067  4025
0011      1070  1611
0011      1071  2440
0011      1072  1716
0011                  OUTPUT BLOCKS ON UNIT ONE
0012      1073  0543
0012      1074  4040
0012      1075  4040
0012      1076  4040
0012      1077  0611
0012      1100  2223
0012      1101  2440
0012      1102  0214
0012      1103  1703
0012      1104  1340
0012                        FIRST BLOCK <3
0013      1105  7463
0013
0014      1106  4340
0014      1107  4340
0014      1110  4040
0014      1111  4040
0014      1112  4040
0014      1113  4040
0014      1114  4027
0014      1115  2211
0014      1116  2405
0014      1117  4005
0014      1120  1601
0014      1121  0214
0014      1122  0540
0014      1123  2516
0014      1124  1124
0014      1125  4017
0014                     WRITE ENABLE UNIT ONE
0015      1126  1605
0015      1127  4306
0015      1130  4040
0015      1131  4040
0015      1132  4040
0015      1133  4003
0015      1134  0125
0015      1135  2411
0015      1136  1716
0015      1137  3400
0015                  F        CAUTION\X
0016      1140  4040
0016      1141  4040
0016      1142  4040
0016      1143  1401
0016      1144  2324
0016      1145  4002
0016      1146  1417
0016      1147  0313
0016      1150  4040
0016      1151  7463
0016      1152  3400
0016                  TEXT2,  TEXT 2      LAST BLOCK  <3\7
```

```
0022    0020  0643          LDF 3
0023    0021  7000          JMP QAINIT
0024    0022  3000          2\TXTSTR
0025    0023  3153          2\ANSWER
0026    0024  7053          JMP QARFSH
0027    0025  6342          JMP D1       /QNANSWER
0030    0026  3153          2\ANSWER
0031    0027  0000  FIRST,   0
0032    0030  0000  LAST,    0
0033    0031  0000  OUT,     0
0034    0032  6410          JMP T8           /QANDATTY
0035    0033  7776          -1
0036    0034  3000          2\TXTSTR
0037    0035  3153          2\ANSWER
0040                        /READ TWO BLOCKS INTO BUFFER AFTER INITIALIZING RE
                            AD SUBROUTINE
0041    0036  1020          LDA I
0042    0037  7456          7456
0043    0040  4156          STC QN
0044    0041  1020          LDA I
0045    0042  5454          5454
0046    0043  4320          STC QN1
0047    0044  1020          LDA I
0050    0045  0002          2
0051    0046  1140          ADM
0052    0047  0030          LAST
0053    0050  6153          JMP READ
0054    0051  6153          JMP READ
0055    0052  0061          SET I 1
0056    0053  7000          -777
0057    0054  0062          SET I 2
0060    0055  3777          3777
0061                        /ZERO SHUFFLE BUFFER AND INITIALIZE RANDOM NUMBER
                            GENERATOR EVERY TWO BLOCKS
0062    0056  0643  DONE2,   LDF 3
0063    0057  0064          SET I 4
0064    0060  6777          -1000
0065    0061  0065          SET I 5
0066    0062  3777          3777
0067    0063  0011          CLR
0070    0064  1065          STA I 5
0071    0065  0224          XSK I 4
0072    0066  6064          JMP .-2
0073    0067  0075          SET I 15
0074    0070  0001          1
0075    0071  1020          LDA I
0076    0072  0004          4
0077    0073  1260          MUL I
0100    0074  0010          10
0101    0075  1120          ADA I
0102    0076  7774          -3
0103    0077  4016          STC 16
0104    0100  0065          SET I 5
0105    0101  6777          -1000
0106    0102  0641          LDF 1
0107                        /PROCESSING LOOP
0110    0103  0221  LOOP,    XSK I 1
0111    0104  0456          SKP
0112    0105  6153          JMP READ
0113    0106  1022          LDA I 2
```

```
0111  1060           STA I
```



```
0112  0000  POINT,   0
0113  6304           JMP GENER8
0114  0342           SCR 2
0115  1120           ADA I
0116  2000           2000
0117  4003           STC 3
0120  2112           ADD POINT
0121  0643           LDF 3
0122  1043           STA 3
0123  6125           JMP NOW
0124  6143           JMP NOW1
0125  0044  NOW,     SET 4
0126  0000           0
0127  1000           LDA
0130  0001           1
0131  1460           SAE I
0132  7400           -377
0133  6143           JMP NOW1
0134  1000           LDA
0135  0027           FIRST
0136  1440           SAE
0137  0030           LAST                 /+2
0140  0456           SKP
0141  6201           JMP YES
0142  6004           JMP 4
0143  0225  NOW1,    XSK I 5
0144  0456           SKP
0145  6150           JMP .+3
0146  0641           LDF 1
0147  6103           JMP LOOP
0150  6315           JMP WRITE
0151  6315           JMP WRITE
0152  6056           JMP DONE2
            /READ A BLOCK SUBROUTINE
0153  0044  READ,    SET 4
0154  0000           0
0155  1020           LDA I
0156  7456  QN,      7456
0157  0243           ROL 3
0160  1040           STA
0161  0156           QN
0162  1560           BCL I
0163  0777           777
0164  1100           ADA
0165  0027           FIRST
0166  4171           STC .+3
0167  0641           LDF 1
0170  0700           RDC
0171  0000           0
0172  1020           LDA I
0173  0001           1
0174  1140           ADM
0175  0027           FIRST
0176  0061           SET I 1
0177  7377           -400
0200  6004           JMP 4
0201  0643  YES,     LDF 3                /PACK OUT ZEROES
0202  0064           SET I 4
0203  3777           3777
0204  0065           SET I 5
```

```
0216    0210  1024  PACK,   LDA I 4
0217    0211  0450          AZE
0220    0212  1065          STA I 5
0221    0213  0226          XSK I 6
0222    0214  6210          JMP PACK
0223    0215  1000          LDA
0224    0216  0005          5
0225    0217  1060          STA I
0226    0220  0000          0
0227    0221  1460  PACK1,  SAE I
0230    0222  2777          2777
0231    0223  0456          SKP
0232    0224  6232          JMP PACK2
0233    0225  0011          CLR
0234    0226  1065          STA I 5
0235    0227  1000          LDA
0236    0230  0005          5
0237    0231  6221          JMP PACK1
0240    0232  6315  PACK2,  JMP WRITE                    /WRITE LAST BLOCK(
                    5)
0241    0233  1000          LDA
0242    0234  0220          PACK1-1
0243    0235  1120          ADA I
0244    0236  5400          -2377
0245    0237  0471          APO I
0246    0240  6315          JMP WRITE
0247                  /GENERATE, PRINT [illegible] TERMINAL DISPLAY
0250    0241  1020          LDA I
0251    0242  7776          -1
0252    0243  1140          ADM
0253    0244  0031          OUT
0254    0245  0346          SCR 6
0255    0246  1620          BSE I
0256    0247  7460          7460
0257    0250  1040          STA
0260    0251  3153          2\ANSWER
0261    0252  1000          LDA
0262    0253  0031          OUT
0263    0254  0243          ROL 3
0264    0255  1560          BCL I
0265    0256  7077          7077
0266    0257  1120          ADA I
0267    0260  6060          6060
0270    0261  1060          STA I
0271    0262  0000          0
0272    0263  1000          LDA
0273    0264  0031          OUT
0274    0265  1560          BCL I
0275    0266  7770          7770
0276    0267  2262          ADD .-5
0277    0270  1040          STA
0300    0271  3154          2\ANSWER+1
0301    0272  1020          LDA I
0302    0273  3400          3400
0303    0274  1040          STA
0304    0275  3155          2\ANSWER+2
0305    0276  6410          JMP T8
0306    0277  7776          -1
0307    0300  3140          2\TEXT2
0310    0301  3153          2\ANSWER
```

```
0314                    /GENERATE A RANDOM NUMBER
0315      0304  0044    GENER8, SET 4
0316      0305  0000            0
0317      0306  1000            LDA
0320      0307  0016            16
0321      0310  1240            MUL
0322      0311  0015            15
0323      0312  1040            STA
0324      0313  0015            15
0325      0314  6004            JMP 4
0326      0315  0046    WRITE,  SET 6
0327      0316  0000            0
0330      0317  1020            LDA I
0331      0320  5454    QN1,    5454
0332      0321  0243            ROL 3
0333      0322  1040            STA
0334      0323  0320            QN1
0335      0324  1560            BCL I
0336      0325  0777            777
0337      0326  1100            ADA
0340      0327  0031            OUT
0341      0330  4333            STC .+3
0342      0331  0643            LDF 3
0343      0332  0714            WRC U
0344      0333  0000            0
0345      0334  1020            LDA I
0346      0335  0001            1
0347      0336  1140            ADM
0350      0337  0031            OUT
0351      0340  0011            CLR
0352      0341  6006            JMP 6
0353                    /
0354                    /QNANSWER
0355                    /
0356                    /DATA RETRIEVAL FROM QANDA
0357                    /DEC-12-FISA-D
0360                    /MUST BE IN SAME INSTRUCTION FIELD
0361                    /WITH CALLING JUMP
0362                    /
0363                    /SUBROUTINE CALLING FORMAT:
0364                    /       JMP D1
0365                    /.+1    ANSWER TEXT FIELD ADDRESS
0366                    /.+2    ANSWER 1
0367                    /.+N+1  ANSWER N
0370                    /.+N+2  RETURNS HERE
0371                    /
0372                    /USES B16,B17
0373                    /
0374                    /RONALD W. WOOD
0375                    /UNIVERSITY OF ROCHESTER
0376                    /9-1-72
0377                    /
0400      0342  1000  D1,       LDA
0401      0343  0000            0
0402      0344  1560            BCL I
0403      0345  6000            6000
0404      0346  1040            STA
0405      0347  0017            17      /ANS. ADD. IN CALL
0406      0350  4352            STC .+2
0407      0351  1100            ADA
```

```
0412        4   0237            XSK I 17 /INCREMENT AND CLEAR ANSWER
-
                                                                    14
0413        0355  0011          CLR
0414        0356  1057          STA  17
0415        0357  1020          LDA I
0416-       0360  0034          34                  /END OF ANSWER STRING
0417-       0361  1436          SHD I 16
0420        0362  6402          JMP  .+20 /RETURN
0421        0363  1020          LDA I
0422        0364  0074          74  /END OF WORD CODE
0423        0365  1416          SHD  16
0424        0366  6354          JMP .-12
0425        0367  0011          CLR     /IGNORE TERMINAL NULL VALUES
0426        0370  1416          SHD 16
0427        0371  6357          JMP .-12
0430-       0372  1017          LDA  17 /ROTATE AND ADD HALF WORD
0431        0373  0243          ROL 3
0432        0374  1057          STA  17
0433        0375  1316          LDH  16
0434        0376  1560          BCL I
0435        0377  7770          7770
0436        0400  1157          ADM  17
0437        0401  6357          JMP  .-22
0440        0402  1000          LDA  /RETURN
0441        0403  0017          17
0442        0404  1120          ADA I
0443        0405  6001          6001
0444        0406  4407          STC  .+1
0445        0407  0000          0
0446                        /END QNANSWER
0447                        /
0450                         /QANDATTY
0451                        /PRINTS QANDA DISPLAY
0452                        /ON TELETYPE
0453                        /CALLING ROUTINE:
0454                        /JMP 18 <START>
0455                        /NEG NUMBER SCOPE
0456                        / LINES PER TTY LINE
0457-                       /ADDRESS OF QUESTION
0460                        /ADDRESS OF ANSWER
0461                        /RETURNS HERE
0462                        /USES REGISTERS 2TO6
0463                        /AND VARIOUS TAGS
0464                        /
0465                        /VERSION FOR MCDONALD Q+A
0466                        /MICHAEL I. GAGE
0467-                       /1-29-71
0470                        /
0471                        /REVISION FOR QANDA
0472                        /DEC-12-FISA-D
0473                        /RONALD W. WOOD
0474                        /UNIVERSITY OF ROCHESTER
0475                        /9-1-72
0476                        /
0477        0410  1020  18,        LDA 1  /PICKUP ADDRESS OF CHARACTERS
0500        0411  1777          -6000
0501        0412  2000          ADD 0
0502        0413  4003          STC 3
0503        0414  1003          LDA 3
0504        0415  1060          STA 1
0505        0416  0000          0 /NEG 2 SCOPE LINES PER TTY LINE
0506        0417  4004          STC 4
```

```
0512    0423  1023          LDA I 3
0513    0424  4006          STC 6 /ANSWER FIELD
0514    0425  0062          SET I 2
0515    0426  7776          -1                  /SET F,H FLAG
0516    0427  2003          ADD 3 /SAVE RETURN
0517    0430  2511          ADD SPACE-4 /6001
0520    0431  4445          STC .+14
0521    0432  1325          LDH I 5 /PICKUP QUESTION
0522    0433  6446          JMP .+13 /CHECK CHARACTER
0523    0434  6436          JMP .+2 /74, GO TO ANSWER
0524    0435  6432          JMP .-3 /GET NEXT CHARACTER
0525    0436  1325          LDH I 5 /SKIP NO. IN STRING
0526    0437  6515          JMP SPACE
0527    0440  1326          LDH I 6 /PICKUP ANSWER
0530    0441  6446          JMP .+5 /CHECK CHARACTER
0531    0442  6432          JMP .-10 /74, GO TO QUESTION
0532    0443  6440          JMP .-3 /GET NEXT CHARACTER
0533                  /RETURN ROUTINE
0534                  /REPLACE NEXT REGISTER WITH NOP
0535                  /TO SUPPRESS CRLF AT END OF DISPLAY
0536    0444  6543          JMP LFCR
0537    0445  6000          JMP 0 /RETURN
0540                  /CHARACTER CHECK ROUTINE
0541    0446  0006          DJR                 /CHECK  F,H FLAG
0542    0447  0222          XSK I 2
0543    0450  6457          JMP .+7             /AROUND F,H TEST
0544    0451  1420          SHD I
0545    0452  0600          600                 /F
0546    0453  6507          JMP SPACE-6
0547    0454  1420          SHD I
0550    0455  1000          1000                /H
0551    0456  6507          JMP SPACE-6
0552    0457  1420          SHD I
0553    0460  7400          /400
0554    0461  6000          JMP 0 /END OF FIELD
0555    0462  1420          SHD I
0556    0463  3400          3400
0557    0464  6444          JMP .-20 /END OF DISPLAY
0560    0465  0220          XSK I 0 /PREPARE RTN TO GET NEXT
0561    0466  0043          SET 3
0562    0467  0000          0 /SAVE RETURN
0563    0470  1460          SAE I
0564    0471  0043          43 /END OF DISPLAY LINE
0565    0472  6503          JMP .+11
0566    0473  0062          SET I 2
0567    0474  7776          -1                  /SET F,H FLAG
0570    0475  0224          XSK I 4 /INCREMENT 2 SCOPE LINES
0571    0476  6505          JMP .+7
0572    0477  0044          SET 4
0573    0500  0416          1846 /RESET SCOPE LINES PER TTY LINE
0574    0501  6543          JMP LFCR
0575    0502  6003          JMP 3
0576    0503  6521          JMP TYPE6 /TYPE CHARACTER
0577    0504  6003          JMP 3 /RETURN, GET NEXT CHARACTER
0600    0505  6515          JMP SPACE /SKIP SPACE INSTEAD OF NEW LINE
0601    0506  6003          JMP 3 /RETURN, GET NEXT CHARACTER
0602    0507  0220          XSK I 0
0603    0510  6000          JMP 0
0604    0511  6001          6001
0605    0512  7777          -4000
```

```
0610                    /
0611                    /
0612                    /TELETYPE
0613                    /PRINTS ASR33 TTY
0614                    /JMP TO SUBROUTINE
0615                    /RETURNS TO NEXT LOCATION
0616                    / D.A.OVERTON  2-2-70
0617                    /
0620                    /JMP SPACE: TO TYPE 1 SPACE
0621    0515  1020  SPACE, LDA I
0622    0516  7757        -20
0623                    /JMP TYPDIG: WITH BINARY 0-9 IN AC
0624    0517  1120  TYPDIG, ADA I
0625    0520  0060        60
0626                    /JMP TYP6: WITH 6-BIT ASCII IN AC
0627    0521  1060  TYP6,  STA I
0630    0522  0000        0       /SAVE ASCII
0631    0523  1560        BCL I
0632    0524  7737        7737
0633    0525  0470        AZE I   /ADD 200 OF 7700
0634    0526  2513        ADD .-13
0635    0527  2514        ADD .-13
0636    0530  1560        BCL I   /CLEAR BIT 6
0637    0531  0040        40
0640    0532  2522        ADD  -10  /ADD IN BITS 6-11
0641                    /JMP TYP8: WITH 8-BIT ASCII IN AC.
0642    0533  0500  TYP8,  IOB
0643    0534  6046        6046    /TLS - TYPE CHARACTER
0644    0535  0006        DJR
0645    0536  0500        IOB
0646    0537  6041        6041    /TSF
0647    0540  6535        JMP .-3 /WAIT FOR FLAG
0650    0541  0011        CLR
0651    0542  6000        JMP 0   /RTN
0652                    /
0653                    /JMP LFCR: LINE FEED & CARRIAGE RETURN
0654    0543  1000  LFCR,  LDA     /SAVE RTN
0655    0544  0000        0
0656    0545  4555        STC .+10
0657    0546  1020        LDA I   /CR
0660    0547  0215        215
0661    0550  6533        JMP TYP8
0662    0551  6533        JMP TYP8 /EXTRA CHAR FOR SLOW TTYS
0663    0552  1020        LDA I   /LF
0664    0553  0212        212
0665    0554  6533        JMP TYP8
0666    0555  6000        JMP 0   /RTN
0667                    /END TELETYPE
0670                    /END OANDATTY
0671                    /OANDAS
0672                    /OANDA WITH NO COMMENTS
0673                    /CALL BY
0674                    /       JMP OAINIT
0675                    /       OATEXT  <POINTER>
0676                    /       ANSWER  <POINTER>
0677                    /       JMP OAREFSH
0700                    /       CONTROL RTNS TO CALLING PGM HERE
0701                    /
0702                    +1000
0703                    /INITIALIZE
0704    1000  1020  OAINIT, LDA I
```

```
1555        1645  6000          JMP 0

1556        1646  0243  QACHAR, 243
1557        1647  0244  244
1560        1650  0245  245
1561        1651  0247  247
1562        1652  0300  300
1563        1653  0336  336
1564        1654  0337  337
1565        1655  0040  40
1566        1656  0036  36
1567                    /END QANDAS
1570                    /
1571                    /END SUPPSHOP
1572                    /RONALD WOOD
1573                    /EARLY SEPTEMBER 1972
1574                    /I SHOULD BE AT THESIS
1575                    /
1576                    /
1577                    /
1600                    /

NO ERRORS

ANSWER 7152
DONE2  4056
D1     4140
FIRST  4027
GENER8 4004
GETKBD 5521
LAST   4070
LOOP   4540
LOOP   4107
NOW    4125
NOW1   4143
OUT    4031
PACK   4210
PACK1  4221
PACK2  4232
POINT  4112
QAB    5004
QACA   5015
QACHAR 5646
QACKLF 5621
QACNTR 5604
QAD    5026
QAE    5050
QAEXIT 5625
QAF    5516
QAG    5062
QAH    5114
QAI    5131
QAINIT 5000
QAJ    5136
QAK    5205
QAL    5175
QALEGL 5575
QAM    5101
QAN    5223
QAO    5231
QAP    5242
QAQ    5263
```

```
QA PE  5644
-
```



```
QATY    5526
QAU     5506
QAV     5516
QAW     5512
QA:     5404
QAY     5412
QAZ     52A1
QN      4156
QN1     4120
READ    4153
SPACE   4515
TEXT2   7140
TXTSTP  7003
TYPE46  4517
TYP6    4531
TYP?    4511
TS      4410
WRITE   4115
YES     4001
```