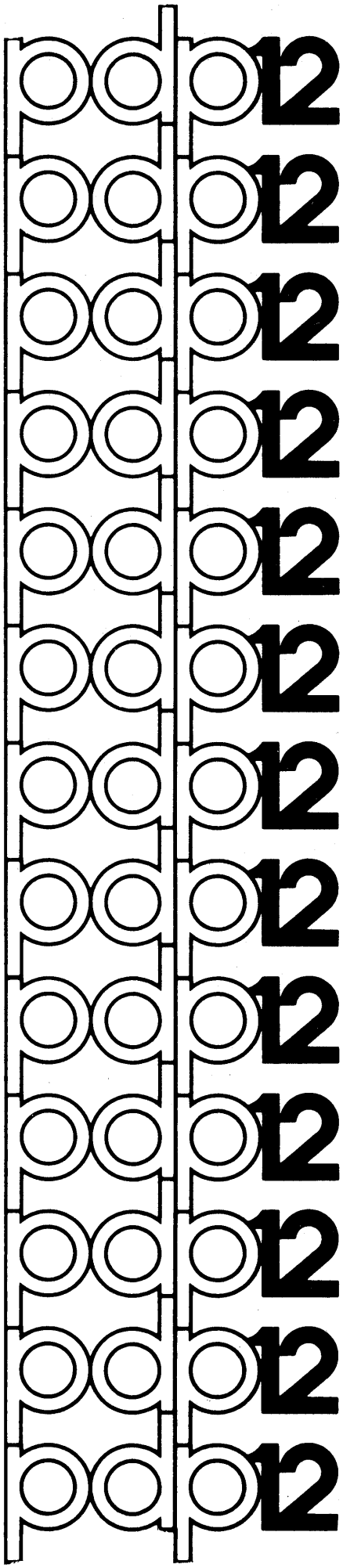
digital

MARK12



MARK12 A FORMATTING AND VERIFICATION PROGRAM FOR UNCERTIFIED TAPES

For additional copies order DEC-12-YITB-D from Program Library,
Digital Equipment Corporation, Maynard, Massachusetts 01754
Price $5.00

DEC-12-YITB-D

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1. ABSTRACT

MARK12 is used to format and verify uncertified tapes for use on the PDP-12. The formatting is LINCtape format. The option of standard LINCtape format for 512 or 896 blocks (256 words) or special 129 word block format is given. The program formats the tape, writes a pattern in each block, checks the checksum on all blocks, checks all backward block numbers and finally checks a ll data from the last data block.

2. REQUIREMENTS

2.1 Equipment

PDP-12/20

2.2 Storage

The program occupies most of core between 04000_8 and 07000_8 and uses the area 00000_8 and 02000_8 for data storage.

3. LOADING PROCEDURE

This program is loaded from a DIAL system tape by typing

→ LO MARK12,X ↵

where X is the unit number of the system tape.

4. STARTING PROCEDURE

If the version of DIAL used does not automatically start, then MARK12 is started by the following procedure:

a. Be sure processor is stopped; momentarily press the stop switch if necessary.

b. Press I/O Preset with the mode switch set to LINC.

c. Press START 20

5. USAGE AND OPTIONS

When MARK12 is started, the following display will appear on the console scope:

MARK12

```
THIS PROGRAM WILL FORMAT AND CHECK
LINC TAPES FOR THE PDP-12

SELECT OPTION AND PRESS LINE FEED
ON THE CONSOLE TELETYPE:

SELECT
  1            STD.LINC FORMAT
  P            129 WORD FORMAT
  B            896 STD. BLKS.
```

The user now presses 1, P, or B on the console Teletype. All other responses are rejected and a response can be changed by typing RUBOUT or the new response. After the type of tape is selected and LINE FEED is pressed, the following display will appear:

```
MOUNT TAPE TO BE
MARKED ON THE RIGHT
REEL OF UNIT 1

PLACE UNIT 1 IN
REMOTE WITH
WRITE ENABLED, THEN

PRESS THE MARK SWITCH
```

The user does as asked above. The program will examine unit 1 to be sure it is selected with write enabled. Then it will try to set the MARK flip-flop which requires the console switch to be depressed. When all is correct, the tape display will disappear and the tape will move. The process of checking the unit may cause the tape to move slightly; therefore, it is suggested unit 1 be placed in remote just prior to actually marking the tape. There are three complete passes down the tape and back. These are formatting, writing, and checking. When the checking process is complete and correct, the following display will appear:

```
GOOD TAPE

ALLOW MARKED TAPE TO REWIND
THEN SELECT OPTION AND TYPE
LINE FEED ON THE TELETYPE

SELECT
  1          MARK ANOTHER TAPE
  2          RESTART DIAL
```

This means that the tape is good and may be used as desired. Option 1 takes the user back to the first display. Option 2 returns to the DIAL system.

If the check was not correct, the following display will appear:

```
                    TAPE CHECK FAILED
SELECT
  1      MARK ANOTHER TAPE
  2      RESTART DIAL
```

This means the tape is not to be used. The return options are the same as for a good tape (see Section 6 for a discussion of check failures).

6. MECHANICAL CONSIDERATIONS AND FAILURES

The correct operation, as well as formatting of tape, requires that the tape travel and path be smooth, clean, and steady. The following items are suggested for most reliable operation:

a. Be sure heads and guides are cleaned.
b. Mount reels squarely on hubs.
c. Before marking a new tape, run it all the way onto the take-up reel and back to the supply reel to insure optimum alignment between guide and reel.
d. Observe tape motion and be sure the tape is not lifting off the head. If it is, the transports require service.

If there is a check failure and the above items are satisfactory, then the tape is most likely defective.

6.1 Formats

The standard LINC format (option 1) contains 512 data blocks each containing 256 data words. Option B generates 896 blocks each also containing 256 data words. The 129-word format (option P) will generate 1536 data blocks each containing 129 data words. Most all tape programming and usage is and will be with the standard LINC format tape. The PDP-12 Laboratory Data Processing (LDP) System requires 896_{10} block tapes. Some special applications that simulate PDP-8 DECtape will have use for 129-word formats.

Although it is not recommended that special formats be widely used, the MARK program is organized in such a way that by minor modification virtually any format can be written. The program listings give detailed information on how to do this.

STANDARD LINC FORMAT

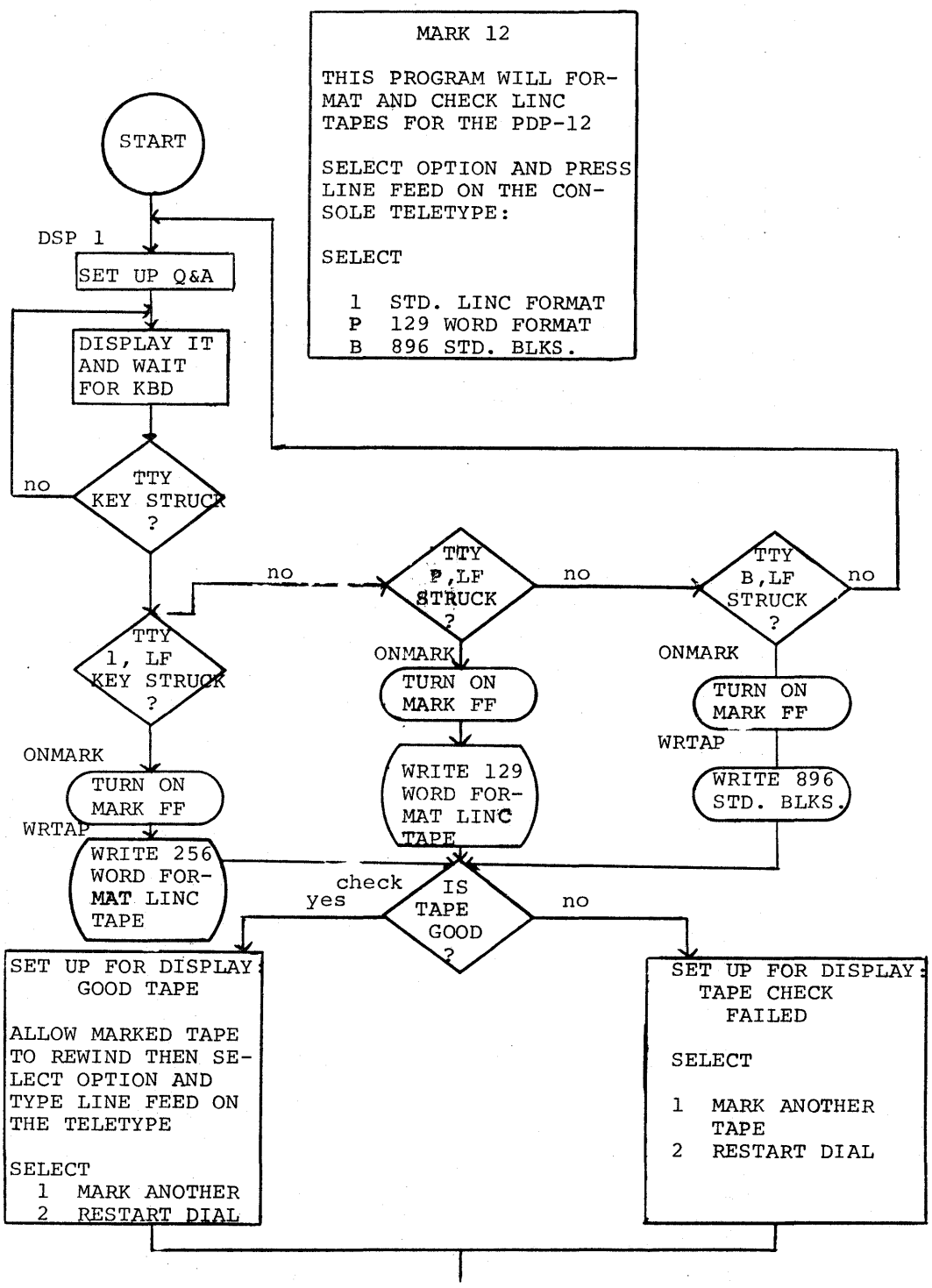
	1Ø24	WORDS	FRONT END ZONE (256 words for option B)
	4Ø95	WORDS	FRONT IM ZCNE
	1	WORD	FWD BLOCK NUMBER
Repeated	1	WORD	GUARD WORD
532	255	WORDS	DATA WORD
times	1	WORD	FINAL DATA WORD
(916 times	3	WORDS	CHECK WORD
for option B)	1	WORD	GUARD WORD
	1	WORD	BKWD BLOCK NUMBER
	5	WORDS	IM ZONE
	8	WORDS	FINAL IM ZONE
	2Ø48	WORDS	FINAL END ZONE (256 words for option B)

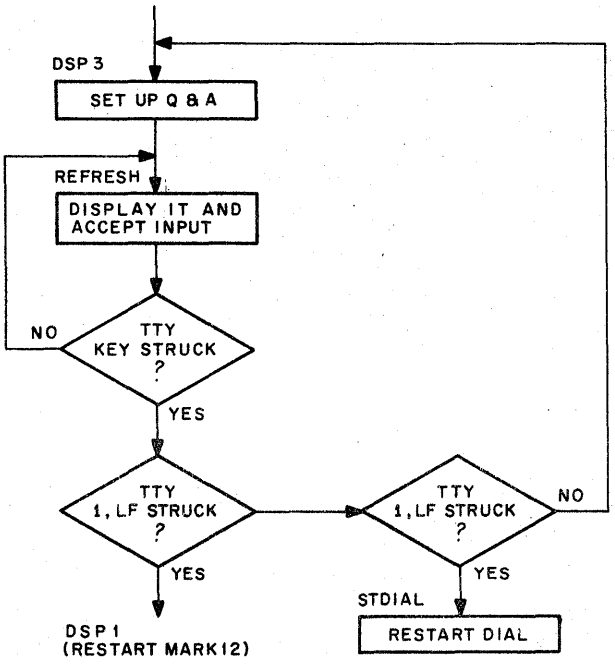
129 WORD FORMAT

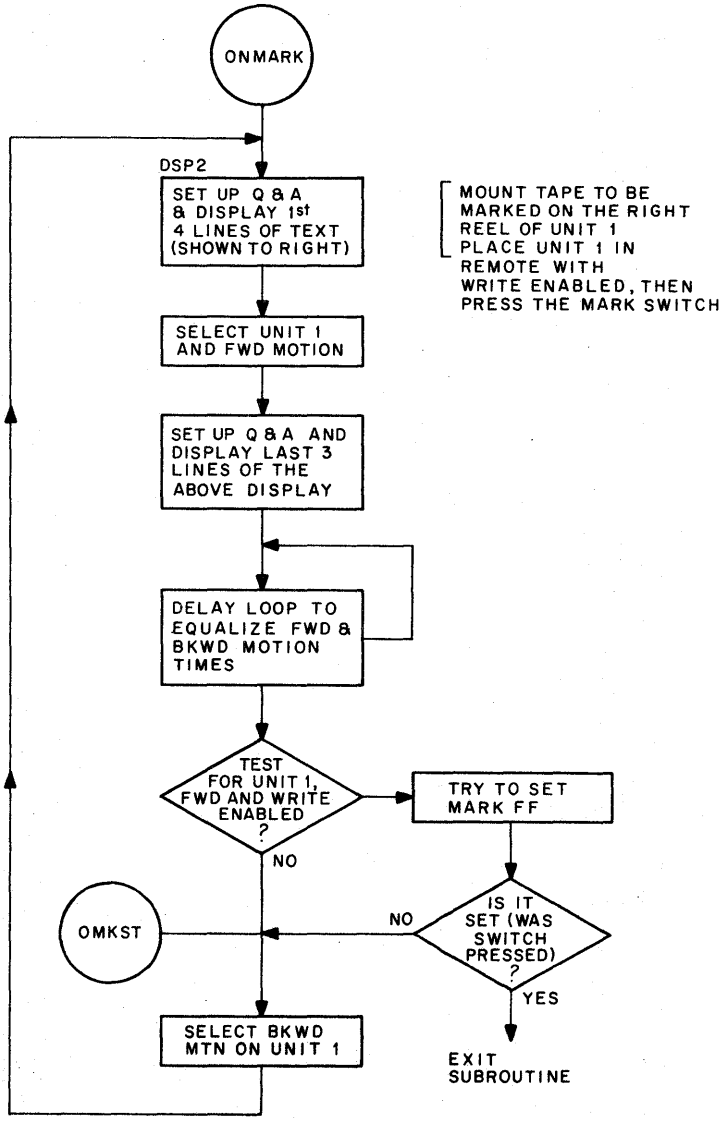
	1Ø24	WORDS	FRONT END ZONE
	4Ø95	WORDS	FRONT IM ZONE
	1	WORD	FWD BLOCK NUMBER
	1	WORD	GUARD WORD
Repeated	128	WORDS	DATA WORDS
1568	1	WORD	FINAL DATA WORD
times	3	WORDS	CHECK WORDS
	1	WORD	GUARD WORD
	1	WORD	BKWD BLOCK NUMBER
	5	WORDS	IM ZONE
	1Ø23	WORDS	FINAL IM ZONE
	1Ø24	WORDS	FINAL EM ZONE

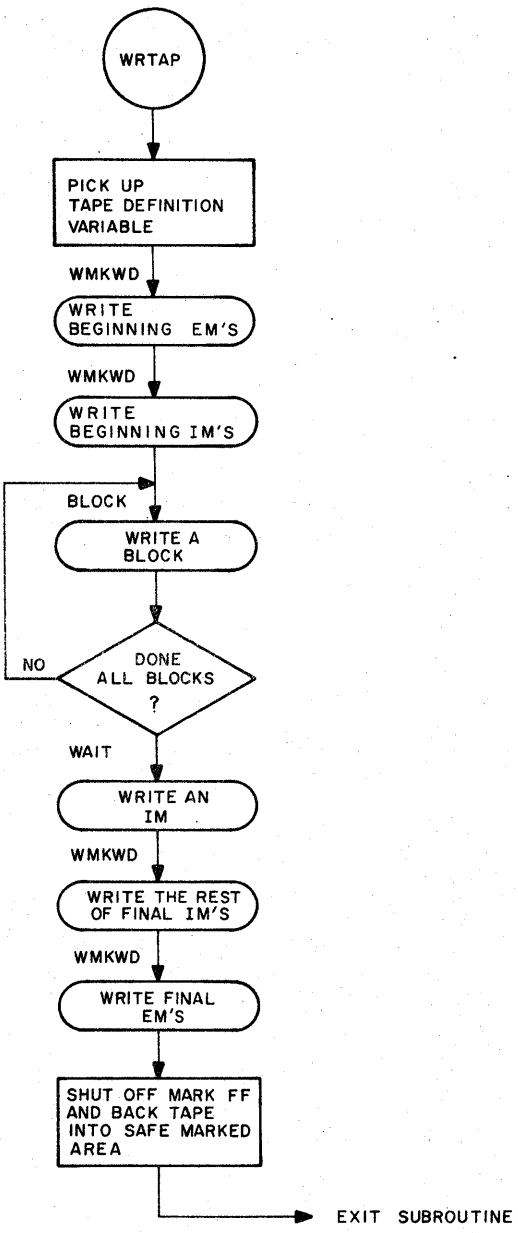
Note there are eight and fifteen data blocks respectively for each format at the front and end of the tape. These allow smooth searching and turn around. They are not used for data.

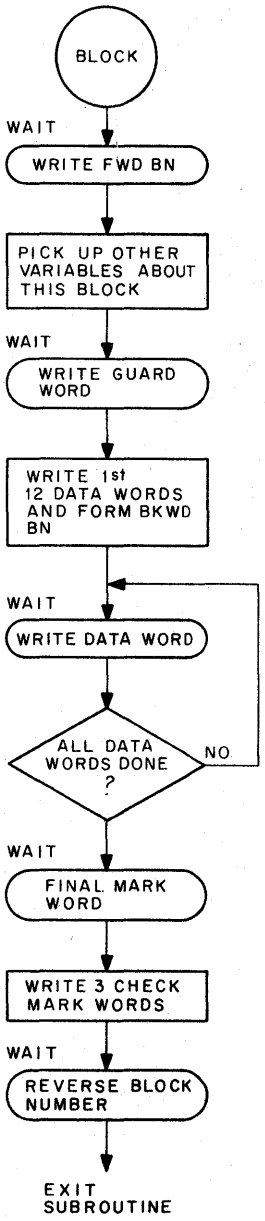
7. FLOWCHARTS

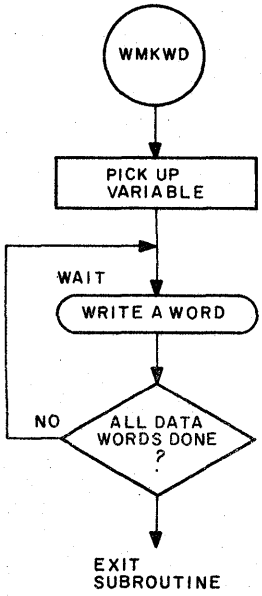


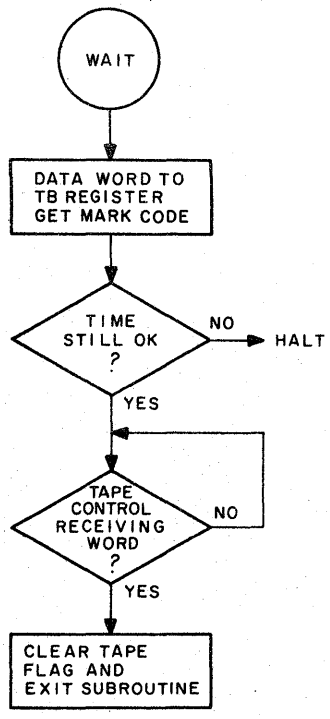

DSP 3
SET UP Q & A
REFRESH
DISPLAY IT AND ACCEPT INPUT
NO
TTY KEY STRUCK ?
YES
TTY 1, LF STRUCK ?
YES
DSP 1 (RESTART MARK12)
TTY 1, LF STRUCK ?
NO
YES
STDIAL
RESTART DIAL


ONMARK
DSP2
SET UP Q & A & DISPLAY 1st 4 LINES OF TEXT (SHOWN TO RIGHT)
MOUNT TAPE TO BE MARKED ON THE RIGHT REEL OF UNIT 1
PLACE UNIT 1 IN REMOTE WITH WRITE ENABLED, THEN PRESS THE MARK SWITCH
SELECT UNIT 1 AND FWD MOTION
SET UP Q & A AND DISPLAY LAST 3 LINES OF THE ABOVE DISPLAY
DELAY LOOP TO EQUALIZE FWD & BKWD MOTION TIMES
TEST FOR UNIT 1, FWD AND WRITE ENABLED ?
NO
TRY TO SET MARK FF
IS IT SET (WAS SWITCH PRESSED) ?
NO
YES
OMKST
SELECT BKWD MTN ON UNIT 1
EXIT SUBROUTINE


WRTAP
PICK UP TAPE DEFINITION VARIABLE
WMKWD
WRITE BEGINNING EM'S
WMKWD
WRITE BEGINNING IM'S
BLOCK
WRITE A BLOCK
NO
DONE ALL BLOCKS ?
WAIT
WRITE AN IM
WMKWD
WRITE THE REST OF FINAL IM'S
WMKWD
WRITE FINAL EM'S
SHUT OFF MARK FF AND BACK TAPE INTO SAFE MARKED AREA
EXIT SUBROUTINE


BLOCK
WAIT
WRITE FWD BN
PICK UP OTHER VARIABLES ABOUT THIS BLOCK
WAIT
WRITE GUARD WORD
WRITE 1st 12 DATA WORDS AND FORM BKWD BN
WAIT
WRITE DATA WORD
ALL DATA WORDS DONE ?
NO
WAIT
FINAL MARK WORD
WRITE 3 CHECK MARK WORDS
WAIT
REVERSE BLOCK NUMBER
EXIT SUBROUTINE


WMKWD
PICK UP VARIABLE
WAIT
WRITE A WORD
NO
ALL DATA WORDS DONE ?
EXIT SUBROUTINE


WAIT
DATA WORD TO TB REGISTER GET MARK CODE
TIME STILL OK ?
NO
HALT
YES
TAPE CONTROL RECEIVING WORD ?
NO
YES
CLEAR TAPE FLAG AND EXIT SUBROUTINE

```
0000                    *20
0001
0002
0003                    /MARK PROGRAM FOR PDP-12
0004                    /BY R.J.CLAYTON
0005                    /5-30-69
0006                    /COPYRIGHT 1969, DIGITAL EQUIPMENT CORP,
0007                    /MAYNARD MASS.
0010
0011                    /VERSION MARK12-1,1970
0012
0013                    SEGMNT 2
0014
0015                    LMODE
0016                    *16
0017        0016  0701  STDIAL, 701             /READ A GROUP INST.
0020        0017  7300          7300            /THIS WILL OVERLAY DIAL
0021                                            /WHICH STARTS AT 4020
0022
0023
0024                    DT=2000           /THIS IS A CONSTANT USED
0025                                      /FOR REFERENCING CHAR TABLES
0026                                      /IN THE DATA FIELD
0027
0030                    /THIS IS THE STARTING POINT OF
0031                    /THE MARK PROGRAM.  DSP1 IS THE
0032                    /FIRST DISPLAY WHERE THE USER
0033                    /PICKS THE TYPE OF TAPE TO
0034                    /FORMAT
0035
0036        0020  0643  DSP1,    LDF 3           /JUST IN CASE
0037        0021  7000          JMP QAINIT      /GO TO Q AND A SUBROUT.
0040        0022  2001          DT DS1          /FIRST FRAME
0041        0023  0762          ANS             /LOCATION FOR ANS.
0042        0024  7053          JMP REFRESH     /COME HERE TO REFRESH
0043
0044        0025  1000          LDA             /HERE AFTER LINE FEED
0045        0026  0762          ANS
0046        0027  1420          SHD I
0047        0030  6100          6100
0050        0031  6041          JMP LTAPE       /GOOD SELECTION
0051        0032  1420          SHD I
0052        0033  2000          2000
0053        0034  6061          JMP PTAPE/      /ALSO GOOD SELECTION
0054        0035  1420          SHD I
0055        0036  0200          0200
0056        0037  6514          JMP BIGTAP      /ALSO GOOD SELECTION
0057        0040  6020          JMP DSP1        /GO BACK FOR A GOOD
0060                                            /SELECTION
0061
0062                                            /BEEN GIVEN
0063
0064
0065
0066
0067                    /PROGRAM TO WRITE A
0070                    /STANDARD LINC FORMAT TAPE
0071
0072        0041  0002  LTAPE,  PDP
0073                    PMODE
0074        4042  4302          JMS ONMARK      /GET MARK TURNED ON
0075        4043  4701          JMS I KWRTAP    /GO WRITE THE TAPE
```

```
0076    4044  2000          2000     /BEGINING EM
0077    4045  7777          7777     /BEGINING IM
0100    4046  0400          0400     /256 WORDS PER BLOCK
0101    4047  7770          -10      /FIRST FWD BLK NUMB
0102    4050  7770          -10      /FIRST BKWD BLK NUMB
0103    4051  1024          1024     /TOTAL NUMBER OF BLOCKS
0104                                 /INCLUDES A FEW AT FRONT
0105                                 /AND BACK FOR TURN AROUND
0106    4052  0005          0005     /NO OF IM BETWEEN BLOCKS
0107    4053  0010          0010     /NUMBER OF FINAL IM CODES
0110    4054  4000          4000     /NUMBER OF FINAL EM CODES
0111
0112    4055  6141          LINC              /TO LINC MODE
0113                LMODE
0114    0056  1020          LDA I
0115    0057  1000          1000              /NO OF BLOCKS TO CHECK
0116    0060  6635          JMP CHECK         /CHECK WILL FINISH
0117                                          /THE JOB
0120
0121
0122
0123                /PROGRAM TO WRITE 129 WORD
0124                /LINC FORMAT TAPE FOR TC01
0125                /SIMULATION
0126
0127    0061  0002  PTAPE,  PDP
0130                PMODE
0131    4062  4302          JMS ONMARK
0132    4063  4701          JMS I KWRTAP
0133    4064  2000          2000
0134    4065  7777          7777
0135    4066  0201          0201
0136    4067  7760          -20
0137    4070  7763          -15               /THE OFFSET HELPS SEARCH
0140                                          /ON TAPE WITH SHORT BLOCKS
0141    4071  3040          3040
0142    4072  0005          005
0143    4073  1777          1777
0144    4074  2000          2000
0145
0146    4075  6141          LINC
0147                LMODE
0150    0076  1020          LDA I
0151    0077  3000          3000              /NUMBER OF DATA BLOCKS
0152    0100  6635          JMP CHECK
0153                /
0154                /PROGRAM TO WRITE 1600 STD BLKS
0155                /IS LOCATED AT BIGTAP
0156                /
0157
0160
0161
0162
0163
0164
0165    0101  4231  KWRTAP, WRTAP    /CROSS PAGE REF.
0166
0167
0170
0171
0172
0173                /SUBROUTINE TO TEST TAPE TRANSPORTS
0174                /AND MARK SWITCH TO DETERMINE THAT
-
```

```
0175                    /IT IS OK TO MARK TAPE.
0176                    /MUST HAVE UNIT 1 SELECTED
0177                    /MUST HAVE UNIT 1 WRITE ENABLED
0200                    /MUST THEN PRESS MARK SWITCH
0201                    /SUBROUTINE WILL PREVENT BASHING
0202                    /TAPE ON UNIT 0
0203
0204
0205                    PMODE
0206      4102  0000    ONMARK, 0000
0207      4103  6141            LINC
0210                    LMODE
0211
0212
0213      0104  7000    DSP2,   JMP QAINIT      /USE Q AND A ROUTINE
0214      0105  2172    DT DS2A         /AS A DISPLAY ROUTINE
0215                                            /THIS WILL BE THE FIRST
0216                                            /HALF OF THE DISPLAY, IT
0217                                            /IS DONE WITH THE TAPE
0220                                            /GOING BACKWARD.
0221      0106  0762            ANS
0222      0107  0016            NOP
0223      0110  1020            LDA I
0224      0111  0144            0144            /SET UP FOR UNIT 1 AND
0225                                            /FORWARD MOTION
0226      0112  0500            IOB
0227      0113  6152            6152
0230
0231      0114  7000            JMP QAINIT      /DO SECOND HALF OF THIS
0232      0115  2243            DT DS2B         /DISPLAY
0233      0116  0762            ANS
0234      0117  0016            NOP
0235
0236
0237      0120  0064            SET I 4         /THIS LOOP EQUALIZES
0240      0121  7677            -100
0241      0122  0224            XSK I 4         /THE FWD AND BKWD
0242      0123  6122            JMP .-1         /MOTION TIMES
0243
0244      0124  1020            LDA I
0245      0125  5000            5000    /SELECT MAINT REG TO
0246      0126  0500            IOB     /LOOK AT UNITS AND MTN
0247      0127  6151            6151
0250      0130  0011            CLR
0251      0131  0500            IOB
0252      0132  6154            6154    /SHOULD HAVE UNIT 1,
0253      0133  1460            SAE I   /WRITE ENABLED, AND
0254      0134  5777            5777    /FWD MOTION
0255      0135  6137            JMP .+2 /NOT YET
0256      0136  6144            JMP MARKSW
0257
0260      0137  1020    OMKST,  LDA I
0261      0140  0024            0024            /START BACKWARD MOTION
0262      0141  0500            IOB
0263      0142  6152            6152
0264      0143  6104            JMP DSP2        /GO BACK AND TRY AGAIN
0265
0266      0144  1020    MARKSW, LDA I
0267      0145  0200            0200
0270      0146  0001            AXO             /TRY TO SET MARK FLOP
0271      0147  0011            CLR
0272      0150  0021            MSC I 1         /READ IT BACK
0273      0151  0265            ROL I 5
-
```

```
0274    0152  0472          LZE I
0275    0153  6137          JMP OMKST       /NOT YET PRESSED
0276
0277    0154  0002  RET2,   PDP             /TO PDP8 MODE
0300                                        /MARK FLIP FLOP IS ON
0301                                        /AND TAPE IS FWD MTN.
0302                PMODE
0303    4155  7200          CLA
0304    4156  6151          6151            /SET TAPE MAINT REG.
0305                                        /SO IOT 6154 WILL
0306                                        /TRANSFER AC TO TB
0307    4157  5702          JMP I ONMARK
0310
0311
0312
0313                *4200
0314
0315                /DSP3
0316                /THIS ROUTINE IS USED AFTER CHECKING
0317                /A TAPE THAT THIS PROGRAM MARKED
0320                /FROM HERE THE USER CALLS DIAL OR
0321                /MARKS ANOTHER TAPE
0322
0323                LMODE
0324    0200  7000  DSP3,   JMP QAINIT      /TO DISPLAY ROUTINE
0325    0201  2311  DT DS3          /CHECKING ROUTINE SETS
0326                                        /THIS LOCATION FOR FRAME
0327                                        /3 OR FRAME 4
0330    0202  0762          ANS
0331    0203  6215          JMP DSP3R       /REFRESH RETURN
0332    0204  1000          LDA             /RETURN FROM LINE FEED
0333    0205  0762          ANS
0334    0206  1420          SHD I           /NOW TEST THE ANSWER
0335    0207  6100          6100
0336    0210  6020          JMP DSP1
0337    0211  1420          SHD I
0340    0212  6200          6200
0341    0213  6016          JMP STDIAL
0342    0214  6200          JMP DSP3
0343
0344    0215  1000  DSP3R,  LDA             /REJECT WRONG ANSWERS
0345    0216  0762          ANS
0346    0217  1420          SHD I
0347    0220  6100          6100
0350    0221  7053          JMP REFRESH
0351    0222  1420          SHD I
0352    0223  6200          6200
0353    0224  7053          JMP REFRESH
0354    0225  1420          SHD I
0355    0226  0000          0000
0356    0227  7053          JMP REFRESH
0357    0230  6200          JMP DSP3        /A BAD ANSWER WAS GIVEN
0360
0361
0362
0363
0364                PMODE
0365
0366                /SUBROUTINE TO WRITE TAPE
0367                /CALLING SEQUENCE:
0370                /JMS WRTAP
0371                /NO OF BEGINING END MARKS
0372                /NO OF BEGINING IM
```

```
0373                    /NUMBER OF WORDS OF DATA
0374                    /FIRST FWD BLOCK NUMBER
0375                    /FIRST BKWD BLOCK NUMBER
0376                    /NUMBER OF BLOCKS
0377                    /NO OF IM BETWEEN BLOCKS
0400                    /NO OF FINAL IM
0401                    /NO OF FINAL EM
0402                    /RETURN 10TH WORD AFTER JMS
0403
0404    4231  0000  WRTAP,  0000
0405    4232  7200          CLA
0406    4233  1631          TAD I WRTAP
0407    4234  2231          ISZ WRTAP
0410    4235  3345          DCA KIEM          /SAVE NO OF END MARKS
0411    4236  1631          TAD I WRTAP
0412    4237  2231          ISZ WRTAP
0413    4240  3346          DCA KIIM
0414    4241  1631          TAD I WRTAP
0415    4242  2231          ISZ WRTAP
0416    4243  3274          DCA WRLOOP+2      /SET UP NO OF WRDS.
0417    4244  1631          TAD I WRTAP
0420    4245  2231          ISZ WRTAP
0421    4246  3343          DCA FBLK          /SET FWD BLOCK NO.
0422    4247  1631          TAD I WRTAP
0423    4250  2231          ISZ WRTAP
0424    4251  3275          DCA WRLOOP+3      /SET BKWD BLOCK NO.
0425    4252  1631          TAD I WRTAP
0426    4253  2231          ISZ WRTAP
0427    4254  7040          CMA
0430    4255  3344          DCA BLKCNT
0431
0432    4256  1350          TAD KHERE         /GO SYNC WITH TAPE WORD
0433    4257  3747          DCA I KWAIT1
0434    4260  1351          TAD K0200         /CLEAR TAPE WORD FLAG
0435    4261  6152          6152              /IOT TO CLEAR
0436    4262  6141          LINC
0437    4263  6607          6000 FRSTGO       /THIS IS LINC JMP INST.
0440                                          /RETURN WILL BE IN 8 MODE
0441
0442    4264  1345  HERE,   TAD KIEM          /NOW WRITE FIRST END MKS.
0443    4265  4753          JMS I KWMKD       /ACTUALLY GO WRITE IT
0444    4266  0000          0000              /CODE FOR EM
0445    4267  1346          TAD KIIM          /NOW WRITE THE BEGINING
0446    4270  4753          JMS I KWMKD       /IM MARKS
0447    4271  0017          0017              /CODE FOR IM
0450
0451    4272  1343  WRLOOP, TAD FBLK
0452    4273  4752          JMS I KBLOCK      /GO WRITE IT
0453    4274  0000          0000              /NUMBER OF WORDS
0454    4275  0000          0000              /BKWD BLOCK NUMBER
0455    4276  1631          TAD I WRTAP
0456    4277  4753          JMS I KWMKD
0457    4300  0017          0017              /WRITE IM BETWEEN BLOCKS
0460    4301  2343          ISZ FBLK          /INCREMENT BLOCK NUMB.
0461    4302  7000          NOP
0462    4303  2275          ISZ WRLOOP+3
0463    4304  7000          NOP
0464    4305  2344          ISZ BLKCNT        /DONE ALL BLOCKS YET?
0465    4306  5272          JMP WRLOOP        /NO
0466    4307  2231          ISZ WRTAP
0467
0470    4310  4747          JMS I KWAIT1      /WRITE FIRST OF THE
0471    4311  0017          0017              /THE FINAL IM, CALLED THIS
-
```

```
0472                                        /WAY TO CUT DOWN ON TIME,
0473                                        /THINGS ARE A BIT PRESSED
0474                                        /AT THIS POINT
0475
0476    4312  7240          CLA CMA
0477    4313  1631          TAD I WRTAP
0500    4314  2231          ISZ WRTAP
0501    4315  4753          JMS I KWMKD
0502    4316  0017          0017            /WRITE FINAL 1M MARKS
0503    4317  1631          TAD I WRTAP
0504    4320  2231          ISZ WRTAP
0505    4321  4753          JMS I KWMKD
0506    4322  0000          0000            /WRITE FINAL END MARKS
0507    4323  6141          LINC
0510                  LMODE
0511    0324  0011          CLR
0512    0325  0001          AXO             /CLEAR MARK FLOP
0513    0326  0064          SET I 4
0514    0327  7727          -50             /DELAY A WHILE AND
0515    0330  1020          LDA I           /BACK UP THE TAPE ON
0516    0331  0024          0024            /UNIT 1 SO THAT CHECK
0517    0332  0500          IOB             /PROGRAM CAN TEST THE
0520    0333  6152          6152            /TAPE
0521    0334  0225          XSK I 5
0522    0335  6330          JMP .-5
0523    0336  0224          XSK I 4
0524    0337  6330          JMP .-7
0525    0340  0002          PDP
0526                  PMODE
0527    4341  7200          CLA
0530    4342  5631          JMP I WRTAP     /ALL DONE GO BACK
0531
0532
0533    4343  0000  FBLK,   0000            /VARIABLES
0534    4344  0000  BLKCNT, 0000
0535    4345  0000  KIEM,   0000
0536    4346  0000  KIIM,   000
0537    4347  4600  KWAIT1, WAIT
0540    4350  4263  KHERE,  HERE-1          /WILL BE INCREMENTED
0541    4351  0200  K0200,  0200
0542
0543    4352  4400  KBLOCK, BLOCK           /CROSS PAGE REF.
0544    4353  4620  KWMKD,  WMKWD
0545
0546
0547                *4400
0550
0551
0552                /SUBROUTINE TO WRITE A BLOCK
0553                /OF TAPE
0554                /CALLING SEQUENCES:
0555                /JMS BLOCK WITH FWD BLOCK NO IN
0556                /THE AC.
0557                /FIRST LOCATION AFTER JMS CONTAINS
0560                /NUMBER OF DATA WRDS IN BLOCK
0561                /SECOND LOCATION AFTER JMS CONTAINS
0562                /BACKWARD BLOCK NUMBER
0563                / THIS ROUTINE WILL WRITE:
0564                /       BM  (FWD)
0565                /       GM
0566                /       DM  (MIN. 14, MAX. 4096)
0567                /       FM
0570                /       CM  (THREE WORDS)
-
```

```
0571                    /       GM
0572                    /       BN  (BKWD)
0573                    /
0574
0575
0576    4400    0000    BLOCK,  0000
0577    4401    7040            CMA             /USED IN COMP. FORM
0600    4402    4711            JMS I KWAIT     /WRITE FWD BM
0601    4403    0016            0016            /BLOCK NO CODE WORD
0602    4404    1600            TAD I BLOCK     /GET NO OF DATA WORDS
0603    4405    7140            CMA CLL
0604    4406    1306            TAD K0016
0605    4407    7430            SZL             /LESS THAN 14 WORDS
0606    4410    7402            HLT
0607    4411    7450            SNA
0610    4412    7402            HLT             /SPECIFIED 14 WORDS
0611    4413    3265            DCA COUNTA      /SAVE NUMBER OF WORDS
0612    4414    2200            ISZ BLOCK       /MOVE POINTER
0613    4415    1600            TAD I BLOCK     /GET BKWD BLOCK NO
0614    4416    3270            DCA BKBNS       /SAVE IT
0615    4417    3271            DCA BKBNA       /CLEAR BKWRD BLK
0616                                            /ASSEMBLY REGISTER
0617    4420    4711            JMS I KWAIT     /WRITE GUARD WORD
0620    4421    0002            0002            /GUARD MARK CODE
0621    4422    1307            TAD K7764
0622    4423    3266            DCA COUNTB      /COUNT OF 12
0623    4424    1310            TAD KB1TAB      /SET UP BIT TABLE POINTER
0624    4425    3267            DCA TEMPA
0625    4426    1313    BLKLP1, TAD K5252       /WRITE 1ST 12
0626    4427    4711            JMS I KWAIT     /WORDS AND FORM
0627    4430    0011            0011            /BKWRD BLK NO FOR
0630    4431    1270            TAD BKBNS       /WRITING ON TAPE
0631    4432    7004            RAL
0632    4433    3270            DCA BKBNS
0633    4434    7430            SZL
0634    4435    1667            TAD I TEMPA     /GET A BIT
0635    4436    1271            TAD BKBNA       /COMBINE WITH OTHER
0636    4437    3271            DCA BKBNA       /BITS AND SAVE THEM
0637    4440    2267            ISZ TEMPA       /MOVE POINTER
0640    4441    2266            ISZ COUNTB      /DONE 12 YET
0641    4442    5226            JMP BLKLP1      /NO
0642    4443    1313    BLKLP2, TAD K5252       /WRITE REST OF DATA WORDS
0643    4444    4711            JMS I KWAIT     /WRITE DATA WORD
0644    4445    0011            0011            /DATA MARK CODE
0545    4446    2265            ISZ COUNTA      /DONE YET
0646    4447    5243            JMP BLKLP2      /NO
0647    4450    1313            TAD K5252
0650    4451    4711            JMS I KWAIT     /WRITE FINAL MARK
0651    4452    0013            0013            /FINAL MARK CODE
0652    4453    7325            CLA IAC STL RAL /WRITE 3 CHECK WORDS
0653    4454    4712            JMS I KWMKWD
0654    4455    0001            0001            /CHECKMARK CODE
0655    4456    4711            JMS I KWAIT     /WRITE GUARD MARK
0656    4457    0002            0002            /GUARD MARK CODE
0657    4460    1271            TAD BKBNA
0660    4461    4711            JMS I KWAIT     /WRITE BKWD BLOCK NO.
0661    4462    0007            0007            /BACKWARD BLK NO CODE
0662    4463    2200            ISZ BLOCK       /INCREMENT RETURN
0663    4464    5600            JMP I BLOCK     /OR BACK
0664    4465    0000    COUNTA, 0               /COUNTER NO OF DATA WRDS
0665    4466    0000    COUNTB, 0               /COUNTER 1ST 12 WORDS
0666    4467    0000    TEMPA,  0               /RANDOM USAGE
0667    4470    0000    BKBNS,  0000            /SAVE BKWD BN AS CALLED
```

```
0670    4471  0000  BKBNA,  0000            /FORM BKBWD BN THAT
0671                                        /WILL BE WRITTEN ON TAPE
0672    4472  0400  B1TAB,  0400            /TABLE USED TO FORM
0673    4473  1000          1000            /BACKWARD BLOCK NO.
0674    4474  2000          2000
0675    4475  4000          4000
0676    4476  0020          0020
0677    4477  0040          0040
0700    4500  0100          0100
0701    4501  0200          0200
0702    4502  0001          0001
0703    4503  0002          0002
0704    4504  0004          0004
0705    4505  0010          0010
0706
0707
0710    4506  0016  K0016,  0016            /CONSTANTS
0711    4507  7764  K7764,  7764
0712    4510  4472  KB1TAB, B1TAB
0713    4511  4600  KWAIT,  WAIT
0714    4512  4620  KWMKWD, WMKWD
0715    4513  5252  K5252,  5252
0716                /
0717                /WRITES 1600 STD BLKS
0720                /SEE LTAPE FOR COMMENTS
0721                /
0722                      LMODE
0723    0514  0002  BIGTAP, PDP
0724                      PMODE
0725    4515  4734        JMS I PONMARK
0726    4516  4735        JMS I PWRTAP
0727    4517  1000        1000
0730    4520  7777        7777
0731    4521  0400        0400
0732    4522  7770        -10
0733    4523  7770        -10
0734    4524  1624        1624
0735    4525  0005        5
0736    4526  0010        10
0737    4527  0400        0400
0740    4530  6141        LINC
0741                      LMODE
0742    0531  1020        LDA I
0743    0532  1600        1600
0744    0533  6635        JMP CHECK
0745    0534  4102  PONMARK,       ONMARK
0746    0535  4231  PWRTAP, WRTAP
0747
0750
0751
0752
0753                *4600
0754
0755                /SUBROUTINE TO WAIT FOR COMPLETION
0756                /OF CURRENT TAPE WORD
0757                /AND THEN TRANSFER DATA TO TAPE
0760                /CONTROL FOR THE NEXT WORD
0761                /(4 LINES)
0762
0763                /CALLING SEQUENCE:
0764                /JMS WAIT FOLLOWED BY MARK CODE
0765                /TO BE GENERATED.  THE AC
0766                /CONTAINS THE DATA WORD TO
-
```

```
0767                    /BE WRITTEN WITH THE ABOVE
0770                    /MARK CODE.
0771
0772                    /PROGRAM MUST RETURN WITH THE
0773                    /NEXT WORD TO BE WRITTEN WITHIN
0774                    /42 MICROSECONDS
0775                    /THIS SUBROUTINE TAKES UP TO
0776                    /52 MICROSECONDS IF SYSTEM CYCLE
0777                    /TIME WERE TO GET AS SLOW AS
1000                    /1.9 MICROSEC.
1001
1002
1003
1004                            PMODE
1005    4600    0000    WAIT,   0000
1006    4601    6154            6154
1007                    /PUT DATA WORD IN TB THE ACTUAL WORD
1010                    /WRITTEN ON THE TAPE WILL BE THE COMP OF THE NO. JUST
1011                    /PLACED IN THE TB REG
1012    4602    7300            CLA CLL
1013    4603    1600            TAD I WAIT      /GET MARK CODE
1014    4604    6141            LINC            /GO TO LINC MODE
1015                    LMODE
1016    0605    0437            SXL I 17        /TEST TO SEE IF TAPE
1017    0606    0000            HLT             /WORD FF IS UP, IF SO
1020                                            /THEN WE HAVE DELAYED
1021                                            /AND ALL IS LOST.
1022    0607    0417    FRSTGO, SXL 17          /NOW WAIT FOR TAPE WORD
1023    0610    6607            JMP .-1         /FLIP FLOP
1024    0611    1020            LDA I
1025    0612    0200            0200
1026    0613    0002            PDP             /TO PDP 8 MODE
1027                    PMODE
1030    4614    6152            6152            /CLEAR TAPE FLAG
1031    4615    2200            ISZ WAIT        /INCREMENT RETURN
1032    4616    7200            CLA
1033    4617    5600            JMP I WAIT      /GO BACK
1034
1035
1036
1037
1040
1041                    /SUBROUTINE TO WRITE A NUMBER
1042                    /WORDS OF A GIVEN MARK CODE
1043                    /CALLING SEQUENCE:
1044                    / IS JMS MKWRD FOLLOWED BY CODE WORD.
1045                    / AC CONTAINS NO OF WORDS TO BE WRITTEN
1046                    /THIS SUBROUTINE ADDS 17 CYCLES TO THE
1047                    /WAIT ROUTINE AND MUST BE CALLED WITHIN
1050                    /20 MICROSEC.OF THE LAST WAIT EXIT.
1051                    /THIS ADDS 10 MICROSEC. TO THE WAIT
1052                    /EXIT TIME
1053
1054
1055
1056    4620    0000    WMKWD,  0000
1057    4621    7041            CMA IAC
1060    4622    3234            DCA WMCNT       /SET UP NO OF WRDS.
1061    4623    1620            TAD I WMKWD     /PICK UP MARK CODE
1062    4624    3226            DCA WMCODE
1063    4625    4200            JMS WAIT        /GO WRITE A WORD
1064    4626    0000    WMCODE, 0000            /HOLDS MARK CODE
1065    4627    2234            ISZ WMCNT               /DONE ALL WORDS YET
```

```
1066    4630  5225          JMP .-3          /NO
1067    4631  7200          CLA              /YES GO BACK
1070    4632  2220          ISZ WMKWD        /INCREMENT RETURN
1071    4633  5620          JMP I WMKWD
1072
1073
1074    4634  0000  WMCNT,   0000
1075
1076
1077
1100
1101
1102                        /SUBROUTINE TO CHECK THE TAPE THAT HAS
1103                        /JUST BEEN WRITTEN. ENTER CHECK WITH THE
1104                        /TOTAL NUMBER OF POSITIVE DATA BLOCKS
1105                        /IN THE AC.THE SUBROUTINE WILL WRITE
1106                        /A PATTERN OF 11+11+11 ETC. IN EACH BLOCK
1107                        /THEN BACKWARD BLOCK NUMBERS ARE CHECKED
1110                        /THEN ALL BLOCKS ARE READ INTO CORE AND
1111                        /THEIR CHECKSUMS VERIFIED.  THEN THE LAST
1112                        /DATA BLOCK IS CHECKED TO BE SURE ALL
1113                        /DATA IS CORRECT.
1114
1115                        /EXIT IS TO DSP3 ROUTINE WHICH TELLS
1116                        /THE USER IF THE TAPE IS GOOD OR BAD
1117                        /AND ALLOWS MORE MARKING OR RETURN TO
1120                        /DIAL
1121
1122                        LMODE
1123    0635  4666  CHECK,   STC CFBLK       /SAVE NUMBER OF BLOCKS
1124    0636  0640          LDF 0
1125    0637  0061          SET I 1          /GENERATE TEST PATTERN
1126    0640  3777          3777
1127    0641  1020          LDA I
1130    0642  0011          11
1131    0643  1061          STA I 1
1132    0644  2642          ADD .-2
1133    0645  0201          XSK 1
1134    0646  6643          JMP .-3          /NOT DONE YET
1135
1136
1137    0647  0011          CLR
1140    0650  4660          STC WBLKNO
1141    0651  1020          LDA I
1142    0652  0020          0020             /SET UP EXTENDED ADDRESS
1143    0653  0001          AXO              /FORMAT FOR TAPE
1144    0654  1020  WLOOP,   LDA I
1145    0655  0000          0000
1146    0656  0023          TMA              /LOAD TMA SETUP REG.
1147    0657  0736          WRI I U          /WRITE ON TAPE
1150    0660  0000  WBLKNO,  0000
1151    0661  1020          LDA I
1152    0662  0001          1
1153    0663  1140          ADM
1154    0664  0660          WBLKNO
1155    0665  1460          SAE I            /WRITTEN LAST BLK YET
1156    0666  0000  CFBLK,   0000           /HOLDS FINAL BLOCK NO
1157    0667  6654          JMP WLOOP
1160
1161
1162    0670  0733          MTB I U          /NOW TEST BKWD BLK NO.
1163    0671  0000          0000
1164    0672  0733          MTB I U
```

```
1165    0673  0000          0000
1166    0674  1120          ADA I
1167    0675  0001          0001
1170    0676  1060          STA I
1171    0677  0000  BTEST,   0000
1172    0700  0733          MTB I U
1173    0701  0000          0000
1174    0702  1440          SAE
1175    0703  0677          BTEST
1176    0704  6747          JMP RERROR      /BKWN BN WRONG
1177    0705  0450          AZE
1200    0706  6674          JMP BTEST-3     /NOT DONE YET
1201
1202
1203    0707  1020          LDA I           /NOW CHECK WRITTEN TAPE
1204    0710  0020          0020
1205    0711  0001          AXO             /EX ADD FORMAT
1206    0712  0011          CLR
1207    0713  4720          STC RBLKNO
1210    0714  1020  RLOOP,   LDA I
1211    0715  0000          0000
1212    0716  0023          TMA
1213    0717  0732          RDE I U
1214    0720  0000  RBLKNO,  0000
1215    0721  1460          SAE I
1216    0722  7777          7777            /CHECKSUM OK
1217    0723  6747          JMP RERROR      /NO
1220    0724  1020          LDA I           /YES
1221    0725  0001          0001
1222    0726  1140          ADM
1223    0727  0720          RBLKNO
1224    0730  1440          SAE
1225    0731  0666          CFBLK
1226    0732  6714          JMP RLOOP
1227
1230    0733  0061          SET I 1         /DONE NOW CHECK LAST
1231    0734  3777          3777            /BLOCK
1232    0735  1020          LDA I           /THIS IS DATA TEST
1233    0736  0011          0011
1234    0737  1461  DLOOP,   SAE I 1
1235    0740  6747          JMP RERROR
1236    0741  2736          ADD .-3
1237    0742  0201          XSK 1
1240    0743  6737          JMP DLOOP
1241
1242    0744  1020          LDA I
1243    0745  2311          DT DS3          /SET UP FOR GOOD TAPE
1244                                        /DISPLAY FRAME
1245    0746  6751          JMP .+3
1246
1247    0747  1020  RERROR,  LDA I           /COME HERE ON CHECKING
1250    0750  2436          DT DS4          /ERROR, SET UP FOR ERROR
1251                                        /DISPLAY FRAME
1252
1253    0751  4201          STC DSP3+1
1254    0752  0643          LDF 3
1255    0753  0011          CLR
1256    0754  0001          AXO             /CLEAR EXTENDED ADD.
1257                                        /FORMAT AND HEAD THE
1260    0755  0733          MTB I U         /TAPE FOR THE FRONT
1261    0756  0000          0000            /END
1262    0757  0733          MTB I U
1263    0760  0000          0000
-
```

```
1264
1265    0761  6200          JMP DSP3
1266
1267    0762  0000  ANS,     0000     /LOCATION FOR ANSWERS
1270    0763  0000          0000     /FROM Q AND A
1271
1272                /QANDA SUBROUTINE FOR THE
1273                /PDP-12
1274                /REMOVE *1000 BELOW IF
1275                /INSERTING SOURCE DIRECTLY
1276                /INTO YOUR PROGRAM SOURCE
1277                *1000 /REMOVE,IF DESIRED
1300                /
1301                /TO HERE TO INITIALIZE THE ROUTINE
1302                /
1303    1000  1020  QAINIT, LDA I            /SAVE JMP RETURN
1304    1001  0002          2
1305    1002  2000          ADD 0
1306    1003  1060          STA I
1307    1004  0000  QAB,     0              /JMP    +3
1310    1005  3200          ADD QAL+3
1311    1006  4001          STC 1          /PTR TO FIRST PARAM
1312    1007  1001          LDA 1          /GET FIRST PARAM
1313    1010  3264          ADD QAQ+1      /PTR TO HALFWORD-1
1314    1011  5057          STC QAG-3
1315    1012  1021          LDA I 1
1316    1013  5052          STC QARFSH-1
1317    1014  4006          STC 6          /XR6 USED AS A SWITCH, =0 IF NO AN
                SWER FIELD, =1777 IF YES
1320    1015  0043  QACA,    SET 3   /XR3 TO PTR TO ANSWERS
1321    1016  1052          QARFSH-1
1322    1017  0044          SET 4          /XR4 TO PTR TO QUESTIONS
1323    1020  1057          QAG-3
1324                                       /TO HERE IF FIRST TIME THROUGH OR
                FOLLOWING A CR
1325    1021  0041          SET 1
1326    1022  0004          4
1327    1023  7270          JMP QAT
1330    1024  0016          NOP            /F
1331    1025  1324          LDH I 4        /H, BUMP PTR IF H OR F
1332    1026  7231  QAD,     JMP QAO
1333    1027  7035          JMP .+6        /74
1334    1030  7050          JMP QAE        /34
1335    1031  1460          SAE I          /CR?
1336    1032  0043          43
1337    1033  7026          JMP QAD        /NO
1340    1034  7021          JMP QACA+4 /EXAMINE NEXT CHAR
1341                                       /INITIALIZE ANSWER BUFR
1342    1035  1343          STH 3          /74 TO ANSWERS
1343    1036  1324          LDH I 4        /NEXT HALFWORD
1344    1037  1120          ADA I
1345    1040  7717          -60
1346    1041  0017          COM
1347    1042  4006          STC 6
1350    1043  1363          STH I 3        /0 IN AC
1351    1044  0226          XSK I 6
1352    1045  7043          JMP .-2
1353    1046  1323          LDH I 3        /BUMP PTR TO ANSWERS
1354    1047  7026          JMP QAD
1355                                       /ANSWER BUFR IS INITIATED
1356    1050  1343  QAE,     STH 3
1357    1051  0064          SET I 4        /XR4 TO PTR TO LAST TYPED CHAR IN
                ANSWER BUFR
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```
1360    1052  0000          0
1361                                    /----RE-ENTER HERE TO REFRESH----
1362    1053  1020  QARFSH, LDA I       /INITIAL Y POSITION
1363    1054  0377          377         /NOTE VERT IS SET HIGH
1364    1055  5113          STC QAH-1
1365    1056  0063          SET I 3     /XR3 TO PTR TO HALFWORD QUESTIONS-
                  1
1366    1057  0000          0
1367    1060  0045          SET 5       /XR5 TO PTR TO LAST DISPLAYED CHAR
                 IN ANSWER BUFR
1370    1061  1052          QARFSH-1
1371    1062  0041  QAG,     SET 1
1372    1063  0003          3
1373    1064  7270          JMP QAT
1374    1065  7074          JMP .+7     /F
1375    1066  1323          LDH I 3     /H, BUMP PTR
1376    1067  1020          LDA I       /NEITHER, ASSUME HALF SIZE
1377    1070  1560          BCL I
1400    1071  5103          STC QAM+2   /SET INSTR TO CLEAR FF FOR HALF SI
                 ZE
1401    1072  3512          ADD QAW     /NOP IN AC
1402    1073  7101          JMP QAM
1403    1074  1323          LDH I 3     /BUMP PTR
1404    1075  1020          LDA I
1405    1076  1620          BSE I
1406    1077  5103          STC QAM+2   /SET INSTR TO SET FF FOR FULL SIZE
1407    1100  3513          ADD QAW+1   /ADD 9U IN AC
1410    1101  5245  QAM,     STC QAP+3
1411    1102  0024          MSC I 4     /EAD CONTROL REGISTER
1412    1103  1620          BSE I       /THIS INSTR CHANGES, EITHER BSE &
                 OR BCL &
1413    1104  0200          200
1414    1105  0004          MSC 4       /AC TO CONTROL REGISTER
1415    1106  0061          SET I 1     /XR1 TO INITIAL X POSITION
1416    1107  0100          100
1417    1110  1020          LDA I       /Y COORDINATE MULTIPLE
1420    1111  7737          -40
1421    1112  1160          ADM I       /Y COORDINATE
1422    1113  0000          0
1423    1114  1323  QAH,     LDH I 3
1424    1115  7232          JMP QAO+1
1425    1116  7301          JMP QAZ     /74 BUMP PTR TO NEXT CHAR, PUT 40
                 IN AC
1426    1117  7136          JMP QAJ     /34
1427    1120  1420          SHD I       /NEITHER
1430    1121  4300          4300
1431    1122  7062          JMP QAG     /CR, MOVE X AND Y COORDINATE
1432    1123  7242          JMP QAP     /ISPLAY CHAR
1433    1124  7114          JMP QAH     /PICK UP NEXT CHAR
1434    1125  7242          JMP QAP     /TO HERE IF DISPLAYING ANSWER BUFR
1435    1126  1520          SRO I   /SWITCH TO DISPLAY CURSOR, EITHER 0000 OR
                 7777
1436    1127  0000          0           /IFXR4=XR5, THEN SWITCH=7777
1437    1130  7516          JMP QAF
1440                                    /QUESTION MODE
1441    1131  1325  QAI,     LDH I 5
1442    1132  7232          JMP QAO+1
1443    1133  7114          JMP QAH     /74
1444    1134  7114          JMP QAH     /34
1445    1135  7125          JMP QAI-4   /NEITHER, DISPLAY IT
1446    1136  7521  QAJ,     JMP GETKBD  /TO HERE IF DISPLAYED BUFFER
1447    1137  0470          AZE I
1450    1140  7004          JMP QAB /NOTHING TYPED , EXIT
-
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```
1451    1141  0062          SET I 2
1452    1142  1412          QAY
1453    1143  1402          SHD 2             /LF?
1454    1144  7311          JMP QAK+4         /YES, EXIT
1455    1145  1422          SHD I 2           /CR?
1456    1146  7223          JMP QAN
1457    1147  0206          XSK 6             /IS THERE AN ANSWER FIELD?
1460    1150  7053          JMP QARFSH
1461    1151  1422          SHD I 2           /<?
1462    1152  7175          JMP QAL
1463    1153  1422          SHD I 2           />?
1464    1154  7305          JMP QAK
1465    1155  1422          SHD I 2           /ALT?
1466    1156  7015          JMP QACA /REINITIALIZE
1467    1157  1422          SHD I 2           /BACK SLASH?
1470    1160  7053          JMP QARFSH        /IGNORE
1471    1161  1422          SHD I 2           /RUBOUT?
1472    1162  7175          JMP QAL           /IGNORE
1473    1163  1422          SHD I 2           /TAB?
1474    1164  7053          JMP QARFSH        /IGNORE
1475    1165  5172          STC .+5           /ACCEPTABLE CHAR
1476    1166  7231          JMP QAO           /TEST NEXT CHAR
1477    1167  7263          JMP QAQ           /74 BACK PTR UP BY 1
1500    1170  7263          JMP QAQ           /34 ^
1501    1171  1020          LDA I             /OK, STORE IT
1502    1172  0000          0
1503    1173  1344          STH 4
1504    1174  7053          JMP QARFSH        /REDISPLAY
1505    1175  1304  QAL,    LDH 4             /TO HERE IF RUBBOUT OR <
1506    1176  7232          JMP QAO+1
1507    1177  7053          JMP QARFSH        /74 IGNORE
1510    1200  1775          -6002
1511    1201  1302          LDH 2             /TEST THE CHAR
1512    1202  1460          SAE I             /RUBOUT?
1513    1203  0037          37
1514    1204  7263          JMP QAQ           /NO, BACK PTR UP BY 1
1515    1205  0045          SET 5
1516    1206  0004          4
1517    1207  0043          SET 3
1520    1210  0004          4
1521    1211  7213          JMP .+2
1522    1212  1325          LDH I 5           /BUMP PTR
1523    1213  1323          LDH I 3           /GET NEXT CHAR
1524    1214  7232          JMP QAO+1
1525    1215  0016          NOP               /IF 74 OR 34, REPLACE CURRENT CHAR
                  WITH 0
1526    1216  0011          CLR
1527    1217  1345          STH 5
1530    1220  0450          AZE               /WAS IT 74 OR 34?
1531    1221  7212          JMP .-7           /NO, CONTINUE
1532    1222  7263          JMP QAQ           /BACK PTR UP BY 1
1533                                          /TO HERE IF CR
1534    1223  0206  QAN,    XSK 6
1535    1224  7311          JMP QAK+4         /EXIT ROUTINE IF NO ANSWER FIELD
1536    1225  7231          JMP QAO
1537    1226  7053          JMP QARFSH        /74 MOVE PTR TO NEXT QUESTION FIEL
                  D
1540    1227  7051          JMP QAE+1         /34 END OF BUFR, MOVE PTR TO FIRST
                   QUESTION FIELD
1541    1230  7225          JMP QAN+2
1542
1543    1231  1324  QAO,    LDH I 4           /SOR
1544    1232  1420          SHD I             /       +1 74 BEGIN FIELD
```

```
1545    1233  7400          7400              /       +2 34 END BUFR
1546    1234  6000          JMP 0             /       +3 NEITHER 74 NOR 34
1547    1235  1460          SAE I
1550    1236  0034          34
1551    1237  0220          XSK I 0
1552    1240  0220          XSK I 0
1553    1241  6000          JMP 0
1554                                          /SOR TO DISP LINC CHAR IN AC
1555    1242  0241  QAP,     ROL 1             /MULT BY 2 FOR INDEX TO ADDRESS OF
                             TABLE
1556    1243  3430          ADD QAX+4
1557    1244  4002          STC 2             /ADDRESS OF CHAR TO DISP IN XR2
1560    1245  3506          ADD QAU           /THIS INSTR CHANGES, EITHER OP OR
                      ADD 9U
1561    1246  3506          ADD QAU
1562    1247  2001          ADD 1             /ADD 4 TO XR1 TO SPACE CHAR
1563    1250  4001          STC 1
1564    1251  2005          ADD 5             /GET ADDRESS OF ANSWER BUFR
1565    1252  0017          COM
1566    1253  2004          ADD 4
1567    1254  0450          AZE
1570    1255  0011          CLR
1571    1256  5127          STC QAI-2         /SWITCH=0 OR 7777
1572    1257  3113          ADD QAH-1         /Y COORDINATE IN AC
1573    1260  1742          DSC 2
1574    1261  1762          DSC I 2           /DISPLAY CHAR
1575    1262  6000          JMP 0
1576    1263  1020  QAQ,     LDA I             /BACK UP PTR BY 1
1577    1264  3777          -4000
1600    1265  1140          ADM
1601    1266  0004          4
1602    1267  7053          JMP QARFSH        /REDISPLAY
1603                                          /
1604    1270  1321  QAT,     LDH I 1           /SOR
1605    1271  1420          SHD I             /       +1 F
1606    1272  0600          0600              /       +2 H
1607    1273  6000          JMP 0             /       +3 NEITHER
1610    1274  1460          SAE I
1611    1275  0010          10
1612    1276  0220          XSK I 0
1613    1277  0220          XSK I 0
1614    1300  6000          JMP 0
1615                                          /
1616    1301  1323  QAZ,     LDH I 3
1617    1302  1020          LDA I
1620    1303  0040          40
1621    1304  7125          JMP QAI-4
1622                                          /TO HERE IF >
1623    1305  1324  QAK,     LDH I 4
1624    1306  0470          AZE I             /IS CURRENT CHAR BLANK?
1625    1307  7263          JMP QAQ           /YES, IGNORE
1626    1310  7424          JMP QAX           /MOVE DOT FORWARD
1627                                          /TO HERE TO EXIT WITH SKIP
1630    1311  1020          LDA I
1631    1312  0001          1
1632    1313  1140          ADM
1633    1314  1004          QAB
1634    1315  7004          JMP QAB
1635                                          /CHARACTER PATTERNS
1636    1316  0101  QAV,     0101              /KBD 0, ILLEGAL, USED AS MARKER
1637    1317  0101          0101
1640    1320  4477          4477              /1:A
1641    1321  7744          7744
-
```

```
1642    1322  5177          5177          /2:B
1643    1323  2651          2651
1644    1324  4136          4136          /3:C
1645    1325  2241          2241
1646    1326  4177          4177          /4:D
1647    1327  3641          3641
1650    1330  4577          4577          /5:E
1651    1331  4145          4145
1652    1332  4477          4477          /6:F
1653    1333  4044          4044
1654    1334  4136          4136          /7:G
1655    1335  2645          2645
1656    1336  1077          1077          /10:H
1657    1337  7710          7710
1660    1340  7741          7741          /11:I
1661    1341  0041          0041
1662    1342  4142          4142          /12:J
1663    1343  4076          4076
1664    1344  1077          1077          /13:K
1665    1345  4324          4324
1666    1346  0177          0177          /14:L
1667    1347  0301          0301
1670    1350  3077          3077          /15:M
1671    1351  7730          7730
1672    1352  3077          3077          /16:N
1673    1353  7706          7706
1674    1354  4177          4177          /17:O
1675    1355  7741          7741
1676    1356  4477          4477          /20:P
1677    1357  3044          3044
1700    1360  4276          4276          /21:Q
1701    1361  0376          0376
1702    1362  4477          4477          /22:R
1703    1363  3146          3146
1704    1364  5121          5121          /23:S
1705    1365  4651          4651
1706    1366  4040          4040          /24:T
1707    1367  4077          4077
1710    1370  0177          0177          /25:U
1711    1371  7701          7701
1712    1372  0176          0176          /26:V
1713    1373  7402          7402
1714    1374  0677          0677          /27:W
1715    1375  7701          7701
1716    1376  1463          1463          /30:X
1717    1377  6314          6314
1720    1400  0770          0770          /31:Y
1721    1401  7007          7007
1722    1402  4543          4543          /32:Z
1723    1403  6151          6151
1724    1404  4177          4177          /33:/
1725    1405  0000          0000
1726                                      /34:BACKSLASH IGNORED ON INPUT
1727    1406  0000          0             /NOT USED
1730    1407  0000          0             /NOT USED
1731    1410  0000          0000          /35:]
1732    1411  7741          7741
1733                                      /CODES 36:ALT, 37:RUBOUT NOT DISPL
                      AYED
1734    1412  4543  QAY,    4543          /LF,CR
1735    1413  7476          7476          /<,>
1736    1414  3634          3634          /ALT, BACKSLASH
1737    1415  3747          3747          /RUBOUT, TAB
-
```

```
1740      1416  0000          0000            /40:SPACE
1741      1417  0000          0000
1742      1420  7500          7500            /41:X!
1743      1421  0000          0000
1744      1422  7000          7000            /42:"
1745      1423  0070          0070
1746                                          /CODES 43:, 44:, 45:LF NOT DISPLAY
                          ED
1747      1424  7232  QAX,    JMP QAO+1
1750      1425  7263          JMP QAQ
1751      1426  7263          JMP QAQ
1752      1427  7053          JMP QARFSH
1753      1430  1316          QAV
1754      1431  0000          0               /NOT USED
1755      1432  5166          5166            /46: &
1756      1433  0526          0526
1757                                          /CODE 47:TAB NOT DISPLAYED
1760      1434  0000          0               /NOT USED
1761      1435  0000          0               /NOT USED
1762      1436  3600          3600            /50:(
1763      1437  0041          0041
1764      1440  4100          4100            /51:)
1765      1441  0036          0036
1766      1442  2050          2050            /52:*
1767      1443  0050          0050
1770      1444  0404          0404            /53:+
1771      1445  0437          0437
1772      1446  0500          0500            /54:,
1773      1447  0006          0006
1774      1450  0404          0404            /55:-
1775      1451  0404          0404
1776      1452  0001          0001            /56:.
1777      1453  0000          0000
2000      1454  0601          0601            /57:/
2001      1455  4030          4030
2002      1456  4536          4536    /60:0
2003      1457  3651          3651
2004      1460  2101          2101            /61:1
2005      1461  0177          0177
2006      1462  4523          4523            /62:2
2007      1463  2151          2151
2010      1464  4122          4122            /63:3
2011      1465  2651          2651
2012      1466  2414          2414            /64:4
2013      1467  0477          0477
2014      1470  5172          5172            /65:5
2015      1471  0651          0651
2016      1472  1506          1506            /66:6
2017      1473  4225          4225
2020      1474  4443          4443            /67:7
2021      1475  6050          6050
2022      1476  5126          5126    /70:8
2023      1477  2651          2651
2024      1500  5122          5122            /71:9
2025      1501  3651          3651
2026      1502  2200          2200            /72::
2027      1503  0000          0000
2030      1504  4601          4601            /73:;
2031      1505  0000          0000
2032                                          /CODE 74:<NOT DISPLAYED
2033      1506  0002  QAU,    2               /CONSTANT
2034      1507  0000          0       /NOT USED
2035      1510  1212          1212            /75:=
-
```

```
2036    1511  1212          1212
2037                                      /CODE 76:> NOT DISPLAYED
2040    1512  0016  QAW,     NOP
2041    1513  3506          ADD QAU
2042    1514  4020          4020          /77:?
2043    1515  2055          2055
2044                /
2045    1516  1760  QAF,     DSC I
2046    1517  6000          6000
2047    1520  7131          JMP QAI
2050                /
2051                                      /END Q+A
2052                /
2053                /
2054                /
2055                /
2056                /KEYBOARD INPUT ROUTINE
2057                /
2060                QAKRB=6036        /PDP-8 IOT KBD
2061                QATSF=6041        /TSF
2062                QATLS=6046        /TLS
2063                /
2064    1521  1000  GETKBD, LDA
2065    1522  0000          0
2066    1523  5643          STC QAEXIT+6      /SAVE RETURN
2067    1524  2001          ADD 1             /SAVE XRS 1 AND 2
2070    1525  5640          STC QAEXIT+3
2071    1526  2002          ADD 2
2072    1527  5642          STC QAEXIT+5
2073    1530  5636          STC QAEXIT+1
2074    1531  0415          KST       /WAS SOMETHING TYPED?
2075    1532  6000          JMP 0             /NO: EXIT
2076    1533  0500          IOB
2077    1534  6036          QAKRB     /GET TTY CHAR, CLEAR FLAG
2100    1535  1060          STA I             /SAVE IT
2101    1536  0000  QATY,    0
2102    1537  1120          ADA I
2103    1540  7540          -237
2104    1541  0451          APO               /BETWEEN 200 AND 237?
2105    1542  7604          JMP QACNTR        /CONTROL CHAR. CHECK FOR CR,LF,TAB
2106                /
2107    1543  0061          SET I 1           /NO
2110    1544  1654          QACHAR-1
2111    1545  0062          SET I 2
2112    1546  7770          -7
2113    1547  1000          LDA
2114    1550  1536          QATY
2115    1551  1461          SAE I 1
2116    1552  7554          JMP .+2
2117    1553  7635          JMP QAEXIT        /ILLEGAL CHAR. DONT ECHO
2120    1554  0222          XSK I 2 /CHECKED THEM ALL?
2121    1555  7551          JMP .-4
2122                /
2123    1556  1120          ADA I
2124    1557  7440          -337
2125    1560  0451          APO               /BETWEEN 240 AND 337?
2126    1561  7575          JMP QALEGL        /YES. LEGAL CHAR
2127                /
2130    1562  1461          SAE I 1           /NO. CHECK FURTHER.
2131    1563  7572          JMP .+7
2132    1564  1020          LDA I             /RUBOUT
2133    1565  0334          334
2134    1566  7644          JMP QATPE         /ECHO BACKSLASH
```

```
2135    1567  1020          LDA I
2136    1570  0037          37
2137    1571  7637          JMP QAEXIT+2     /LEGAL EXIT
2140                  /
2141    1572  1461          SAE I 1
2142    1573  7635          JMP QAEXIT       /ILLEGAL
2143                                         /ALT
2144    1574  7637          JMP QAEXIT+2     /EXIT, DONT ECHO
2145                  /
2146    1575  1000  QALEGL, LDA
2147    1576  1536          QATY
2150    1577  7644          JMP QATPE        /ECHO CHAR
2151    1600  3536          ADD QATY
2152    1601  1560          BCL I            /STRIP IT TO 6-BIT
2153    1602  7700          7700
2154    1603  7637          JMP QAEXIT+2
2155                  /TO HERE IF CONTROL CHAR
2156    1604  1460  QACNTR, SAE I
2157    1605  7755          7755
2160    1606  7621          JMP QACKLF
2161    1607  1020          LDA I            /CR
2162    1610  0043          43
2163    1611  5636          STC QAEXIT+1
2164    1612  1020          LDA I
2165    1613  0215          215
2166    1614  7644          JMP QATPE
2167    1615  1020          LDA I
2170    1616  0212          212
2171    1617  7644          JMP QATPE
2172    1620  7635          JMP QAEXIT
2173                  /
2174    1621  1460  QACKLF, SAE I
2175    1622  7752          7752
2176    1623  7627          JMP .+4
2177    1624  1020          LDA I            /LF
2200    1625  0045          45
2201    1626  7611          JMP QACNTR+5
2202    1627  1460          SAE I
2203    1630  7751          7751
2204    1631  7635          JMP QAEXIT       /ILLEGAL
2205    1632  1020          LDA I
2206    1633  0047          47
2207    1634  7637          JMP QAEXIT+2     /EXIT, DONT ECHO
2210                  /
2211    1635  1020  QAEXIT, LDA I   /GET 6-BIT ASCII
2212    1636  0000          0
2213    1637  0061          SET I 1          /RESTORE XRS
2214    1640  0000          0
2215    1641  0062          SET I 2
2216    1642  0000          0
2217    1643  6000          JMP              /EXIR S0R GETKBD
2220                  /S0R TO PRINT C(AC)
2221    1644  0500  QATPE,  IOB
2222    1645  6046          QATLS   /PDP-8 IOT TLS
2223    1646  1000          LDA
2224    1647  0000          0
2225    1650  5654          STC .+4 /SAVE RETURN
2226    1651  0500          IOB
2227    1652  6041          QATSF   /WAIT FOR FLAG
2230    1653  7651          JMP .-2
2231    1654  6000          JMP     /EXIT
2232                  /
2233    1655  0243  QACHAR, 243     /HASH
-
```

```
2234      1656  0244          244     /DOLLAR SIGN
2235      1657  0245          245     /PER CENT
2236      1660  0247          247     /APOSTROPHE
2237      1661  0300          300     /AT SIGN
2240      1662  0336          336     /UP ARROW
2241      1663  0337          337     /BACK ARROW
2242      1664  0040          40      /RUBOUT
2243      1665  0036          36      /ALT
2244                  /END OF SOR GETKBD
2245
2246
2247
2250
2251
2252                  REFRESH=QAINIT+53
2253
2254
2255
2256                  SEGMNT3
2257                  *0001
2260
2261
2262                  /FRAME 1
2263                  /   MARK12
2264                  /THIS PROGRAM WILL FORMAT AND CHECK
2265                  /LINC TAPES FOR THE PDP-12
2266
2267                  /SELECT OPTION AND PRESS LINE FEED
2270                  /ON THE CONSOLE TELETYPE
2271
2272                  /SELECT -
2273
2274                  / 1 STD LINC FORMAT
2275
2276                  / P 129 WORD FORMAT
2277
2300                  / B 1600 STD BLKS
2301
2302                  /FRAME 2
2303
2304                  /MOUNT TAPE TO BE
2305                  /MARKED ON THE RIGHT
2306                  /REEL OF UNIT 1
2307
2310                  /PLACE UNIT 1 IN
2311                  /REMOTE WITH
2312                  /WRITE ENABLED, THEN
2313
2314                  /PRESS THE MARK SWITCH
2315
2316
2317                  /FRAME 3
2320
2321                  /   GOOD TAPE
2322
2323                  /ALLOW MARKED TAPE TO REWIND
2324                  /THEN SELECT OPTION AND TYPE
2325                  /LINE FEED ON THE TELETYPE
2326
2327                  /SELECT -
2330
2331                  / 1 MARK ANOTHER TAPE
2332
-
```

```
2333                    / 2 RESTART DIAL
2334
2335
2336
2337                    /FRAME 4
2340
2341                    /TAPE CHECK FAILED
2342
2343                    /SELECT -
2344
2345                    / 1 MARK ANOTHER TAPE
2346
2347                    / 2 RESTART DIAL
2350
2351
2352    0001  0640
2352    0002  4040
2352    0003  4015
2352    0004  0122
2352    0005  1340
2352                    DS1,    TEXT ZF    MARK 12
2353    0006  6162
2353                    H
2354    0007  4310
2354    0010  4310
2354    0011  4040
2354    0012  4040
2354    0013  2410
2354    0014  1123
2354    0015  4020
2354    0016  2217
2354    0017  0722
2354    0020  0115
2354    0021  4027
2354    0022  1114
2354    0023  1440
2354    0024  0617
2354    0025  2215
2354    0026  0124
2354    0027  4001
2354    0030  1604
2354    0031  4003
2354    0032  1005
2354                    H    THIS PROGRAM WILL FORMAT AND CHECK
2355    0033  0313
2355    0034  4310
2355    0035  4040
2355    0036  4040
2355    0037  1411
2355    0040  1603
2355    0041  4024
2355    0042  0120
2355    0043  0523
2355    0044  4006
2355    0045  1722
2355    0046  4024
2355    0047  1005
2355    0050  4020
2355    0051  0420
2355    0052  5561
2355                    H    LINC TAPES FOR THE PDP-12
2356    0053  6243
2356                    H
-
```

```
2357       0054  1043
2357       0055  1040
2357       0056  4040
2357       0057  4023
2357       0060  0514
2357       0061  0503
2357       0062  2440
2357       0063  1720
2357       0064  2411
2357       0065  1716
2357       0066  4001
2357       0067  1604
2357       0070  4020
2357       0071  2205
2357       0072  2323
2357       0073  4014
2357       0074  1116
2357       0075  0540
2357       0076  0605
2357                     H    SELECT OPTION AND PRESS LINE FEED
2360       0077  0504
2360       0100  4310
2360       0101  4040
2360       0102  4040
2360       0103  1716
2360       0104  4024
2360       0105  1005
2360       0106  4003
2360       0107  1716
2360       0110  2317
2360       0111  1405
2360       0112  4024
2360       0113  0514
2360       0114  0524
2360       0115  3120
2360                     H    ON THE CONSOLE TELETYPE
2361       0116  0543
2361
2362       0117  4043
2362       0120  0623
2362       0121  0514
2362       0122  0503
2362       0123  2440
2362       0124  4074
2362                     FSELECT  <1
2363       0125  6143
2363
2364       0126  4043
2364       0127  0640
2364       0130  4061
2364       0131  4040
2364       0132  2324
2364       0133  0440
2364       0134  1411
2364       0135  1603
2364       0136  4006
2364       0137  1722
2364       0140  1501
2364                     F  1  STD LINC FORMAT
2365       0141  2443
2365                     F
2366       0142  0643
2366       0143  0640
-
```

```
2366       0144   4020
2366       0145   4040
2366       0146   6162
2366       0147   7140
2366       0150   2717
2366       0151   2204
2366       0152   4006
2366       0153   1722
2366       0154   1501
2366                      F  P  129 WORD FORMAT
2367       0155   2443
2367                      F
2370       0156   0643
2370       0157   0640
2370       0160   4002
2370       0161   4040
2370       0162   7071
2370       0163   6640
2370       0164   2324
2370       0165   0440
2370       0166   4002
2370       0167   1413
2370                      F  B  896 STD  BLKS
2371       0170   2343
2371       0171   3400
2371                      0Z
2372
2373
2374                      DS2A,   TEXT Z
2375       0172   4306
2375       0173   4015
2375       0174   1725
2375       0175   1624
2375       0176   4024
2375       0177   0120
2375       0200   0540
2375       0201   2417
2375       0202   4002
2375                      F MOUNT TAPE TO BE
2376       0203   0543
2376       0204   0640
2376       0205   1501
2376       0206   2213
2376       0207   0504
2376       0210   4017
2376       0211   1640
2376       0212   2410
2376       0213   0540
2376       0214   2211
2376       0215   0710
2376                      F MARKED ON THE RIGHT
2377       0216   2443
2377       0217   0640
2377       0220   2205
2377       0221   0514
2377       0222   4017
2377       0223   0640
2377       0224   2516
2377       0225   1124
2377       0226   4061
2377                      F REEL OF UNIT 1.
2400       0227   5643
2400                      F
-
```

```
2401        0230  0643
2401        0231  0640
2401        0232  2014
2401        0233  0103
2401        0234  0540
2401        0235  2516
2401        0236  1124
2401        0237  4061
2401        0240  4011
2401                    F PLACE UNIT 1 IN
2402        0241  1643
2402        0242  3400
2402                    ◊Z
2403                    DS2B,   TEXT Z
2404
2405        0243  4340
2405
2406        0244  4340
2406
2407        0245  4340
2407
2410        0246  4340
2410
2411        0247  4340
2411        0250  4306
2411        0251  4022
2411        0252  0515
2411        0253  1724
2411        0254  0540
2411        0255  2711
2411        0256  2410
2411                    F REMOTE WITH
2412        0257  4043
2412        0260  0640
2412        0261  2722
2412        0262  1124
2412        0263  0540
2412        0264  0516
2412        0265  0102
2412        0266  1405
2412        0267  0454
2412        0270  4024
2412        0271  1005
2412                    F WRITE ENABLED, THEN
2413        0272  1643
2413                    F
2414        0273  0640
2414        0274  4306
2414        0275  4020
2414        0276  2205
2414        0277  2323
2414        0300  4024
2414        0301  1005
2414        0302  4015
2414        0303  0122
2414        0304  1340
2414        0305  2327
2414        0306  1124
2414                    F PRESS THE MARK SWITCH
2415        0307  0310
2415        0310  4334
2415                    ◊Z
2416
```

```
2417
2420                        DS3,    TEXT ZF
2421        0311    0643
2421        0312    0640
2421        0313    4040
2421        0314    0717
2421        0315    1704
2421        0316    4024
2421        0317    0120
2421                        F   GOOD TAPE
2422        0320    0543
2422                        F
2423        0321    0643
2423        0322    1040
2423        0323    4040
2423        0324    0114
2423        0325    1417
2423        0326    2740
2423        0327    1501
2423        0330    2213
2423        0331    0504
2423        0332    4024
2423        0333    0120
2423        0334    0540
2423        0335    2417
2423        0336    4022
2423        0337    0527
2423        0340    1116
2423                        H   ALLOW MARKED TAPE TO REWIND
2424        0341    0443
2424        0342    1040
2424        0343    4040
2424        0344    2410
2424        0345    0516
2424        0346    4023
2424        0347    0514
2424        0350    0503
2424        0351    2440
2424        0352    1720
2424        0353    2411
2424        0354    1716
2424        0355    4001
2424        0356    1604
2424        0357    4024
2424        0360    3120
2424                        H   THEN SELECT OPTION AND TYPE
2425        0361    0543
2425        0362    1040
2425        0363    4040
2425        0364    1411
2425        0365    1605
2425        0366    4006
2425        0367    0505
2425        0370    0440
2425        0371    1716
2425        0372    4024
2425        0373    1005
2425        0374    4024
2425        0375    0514
2425        0376    0524
2425        0377    3120
2425                        H   LINE FEED ON THE TELETYPE
2426        0400    0543
-
```

```
2426                    F
2427    0401    0643
2427    0402    0623
2427    0403    0514
2427    0404    0503
2427    0405    2440
2427    0406    4074
2427                    FSELECT  <1
2430    0407    6143
2430                    F
2431    0410    0643
2431    0411    0640
2431    0412    6140
2431    0413    1501
2431    0414    2213
2431    0415    4001
2431    0416    1617
2431    0417    2410
2431    0420    0522
2431    0421    4024
2431    0422    0120
2431                    F 1 MARK ANOTHER TAPE
2432    0423    0543
2432                    F
2433    0424    0643
2433    0425    0640
2433    0426    6240
2433    0427    2205
2433    0430    2324
2433    0431    0122
2433    0432    2440
2433    0433    0411
2433                    F 2 RESTART DIAL
2434    0434    0114
2434    0435    4334
2434                    0Z
2435
2436
2437                    DS4,    TEXT ZF
2440    0436    0643
2440    0437    0640
2440    0440    4040
2440    0441    2401
2440    0442    2005
2440    0443    4003
2440    0444    1005
2440    0445    0313
2440    0446    4006
2440    0447    0111
2440    0450    1405
2440                    F   TAPE CHECK FAILED
2441    0451    0443
2441                    F
2442    0452    0643
2442                    F
2443    0453    0643
2443                    F
2444    0454    0643
2444    0455    0623
2444    0456    0514
2444    0457    0503
2444    0460    2440
2444                    FSELECT <1
-
```

```
2445        0461   7461
2445                      F
2446        0462   4306
2446        0463   4306
2446        0464   4061
2446        0465   4015
2446        0466   0122
2446        0467   1340
2446        0470   0116
2446        0471   1724
2446        0472   1005
2446        0473   2240
2446        0474   2401
2446                      F 1 MARK ANOTHER TAPE
2447        0475   2005
2447                      F
2450        0476   4306
2450        0477   4306
2450        0500   4062
2450        0501   4040
2450        0502   2205
2450        0503   2324
2450        0504   0122
2450        0505   2440
2450        0506   0411
2450                      F 2  RESTART DIAL
2451        0507   0114
2451                      F
2452        0510   4306
2452        0511   4334
2452                      0Z
2453
2454
```

```
4 GTAR  5
BKBNA  4471
BKBNS  4470
BLKCNT 4344
BLKLP1 4426
BLKLP2 4443
BLOCK  4400
BTEST  4677
B1TAB  4472
CFBLK  4666
CHECK  4635
COUNTA 4465
COUNTB 4466
DLOOP  4737
DSP1   4020
DSP2   4104
DSP3   4200
DSP3R  4215
DS1    6001
DS2A   6172
DS2B   6243
DS3    6311
DS4    6436
DT     2000
FBLK   4343
FRSTGO 4607
GETKBD 5521
HERE   4264
KBLOCK 4352
KB1TAB 4510
KHERE  4350
KIEM   4345
KIIM   4346
KWAIT  4511
KWAIT1 4347
KWMKD  4353
KWMKWD 4512
KWRTAP 4101
K0016  4506
K0200  4351
K5252  4513
K7764  4507
LTAPE  4041
MARKSW 4144
OMKST  4137
ONMARK 4102
PONMAR 4534
PTAPE  4061
PWRTAP 4535
QAB    5004
QACA   5015
QACHAR 5655
QACKLF 5621
QACNTR 5604
QAD    5026
QAE    5050
QAEXIT 5635
QAF    5516
QAG    5062
QAH    5114
QAI    5131
QAINIT 5000
```

```
QAJ     5136
QAK     5305
QAKRB   6036
QAL     5175
QALEGL  5575
QAM     5101
QAN     5223
QAO     5231
QAP     5242
QAQ     5263
QARFSH  5053
QAT     5270
QATLS   6046
QATPE   5644
QATSF   6041
QATY    5536
QAU     5506
QAV     5316
QAW     5512
QAX     5424
QAY     5412
QAZ     5301
RBLKNO  4720
REFRES  1053
RERROR  4747
RET2    4154
RLOOP   4714
STDIAL  4016
TEMPA   4467
WAIT    4600
WBLKNO  4660
WLOOP   4654
WMCNT   4634
WMCODE  4626
WMKWD   4620
WRLOOP  4272
WRTAP   4231
```

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