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DECUS NO.	8-847
TITLE	A VC8E 'TV:' HANDLER FOR A STORAGE SCOPE
AUTHOR	Jim Van Zee
COMPANY	University Of Washington Department Of Chemistry Seattle, Washington 98195
DATE	31 July 1976
SOURCE LANGUAGE	PAL8-V9

GENERAL INFORMATION

Object Computer(s) **PDP8/E/F/M/A**   Source Computer (if different) _____

File Name   **VC8E - TV:**   Version No.   **A**

Title   **A VC8E 'TV:' HANDLER FOR A STORAGE SCOPE**

Author   **Jim Van Zee**

Submitter (if other than author) ___ **"**

Affiliation   **Department Of Chemistry**

Address   **University of Washington**

            Seattle, Washington 98195   Country   **USA**

Monitor/Operating System **OS/8 Or Equivalent**   DEC No. _____

Core Storage Required **Two Pages**   Starting Address _____

Peripherals Required **VC8E or VC8A POINT PLOT DISPLAY CONTROLLER**

Other Software Required _____   DEC or DECUS No. _____

Source Language **PAL8-V9**   Category **VIII DISPLAY XII HARDWARE CONTROL**

Restrictions, Deficiencies, Problems _____

Date of Planned or Possible Future Revisions _____

TAPES AVAILABLE

Paper Tapes   Object Binary ☐   Object ASCII ☐   Source ☐   Other _____

DECtape ☑ LINCtape ☐   Format **PDP8**   Magtape: 7 Track ☐   9 Track ☐   BPI _____

            Object Files ☐   Source Files ☐   Documentation Files ☐   Other _____

ABSTRACT

A VC8E 'TV' HANDLER FOR A STORAGE SCOPE

THIS IS A TWO-PAGE HANDLER FOR THE OS/8 OPERATING SYSTEM WHICH GENERATES AND DISPLAYS ALPHANUMERICS ON A STORAGE OSCILLOSCOPE USING A STANDARD VC8E CONTROLLER. KEYBOARD PAGING IS USED TO ERASE THE SCREEN WHEN IT FILLS UP, AND OPTIONALLY, TO RETURN TO THE MONITOR. BECAUSE OF VARIATIONS IN THE DESIGN OF THIS INTERFACE, SEVERAL VERSIONS OF THIS HANDLER HAVE BEEN DEVELOPED:

A: EARLY DESIGN WITH XYZ OUTPUTS & NON-STANDARD ERASE

B: LATER DESIGN USING THE ENABLE REGISTER FOR ERASING

C: OPTIONAL MODIFICATION TO A TO PERMIT CTRL/C CHECKS

D: OPTIONAL MODIFICATION TO B TO CHECK FOR READ CALLS

A VC8E 'TV' HANDLER FOR A STORAGE OSCILLOSCOPE

Programmers with a storage 'scope and a VC8E controller at their disposal can use this handler to quickly examine directories, check listings, or scan through data files using the CRT for output. The handler can also be used to add annotation to graphics displays or for interactive purposes in which queries are displayed on the screen rather than on the terminal. To be effective for the latter operation the calling program must have a mechanism similar to the OUTPUT BUFFER command in U/W-FOCAL which permits the screen to be updated on a line-at-a-time basis whenever necessary. The name 'TV:' was chosen in order to make this handler compatible with the CCL commands which recognize the '-S' option.

A 4x6 matrix is used to generate all 64 'displayable' characters and spaces are substituted for all control codes except 'linefeed'. Lower case letters will not display properly unless an appropriate pattern table just 'happens' to exist in the locations immediately following the handler. 'LF' rather than 'CR' is recognized as the start of a new line in order to make the handler compatible with the output of programs such as SRCCOM which generate multiple linefeeds as well as those which always use a CR/LF combination. Those who prefer to recognize a CR as the start of a new line can easily install the simple patch shown below for this option(1).

The handler will pause for keyboard input after the last line on the screen has been written. Striking any key will then erase the screen (see below), wait while it clears, and then continue with more output. Except for Version A, striking CTRL/C will return to the OS/8 keyboard monitor. Unfortunately there just isn't enough room in this version for this check.

Four different versions (designated A-D) have been developed for use with various revisions of the VC8E interface. Since the original design only provided XYZ outputs and had no provision for erasing the screen, Version A simply pauses so the operator can manually push the 'ERASE' botton. It is obviously nicer to let the computer perform this function, so each time the keyboard is struck a 'clear display flag' IOT is issued and the handler delays for half a second before continuing. Connecting the signal from the 'clear flag' line to the erase circuit of the scope will thus provide 'automatic' paging. Version B of the handler, on the other hand, was written for a later revision of the controller which uses bits 6-8 of the enable register for storage scope functions and which also has a hardware delay for the erase cycle. These features permit adding the 4 instructions necessary to check for CTRL/C.

Normally the D/A converters use coordinates ranging from -777 to +777. If the user is willing to reverse the 'sign bit' (bit 2) at the point where it enters the converter the full output range can be represented by 0-1777 instead, and the logic within the handler can be simplified. In the M855 module this bit is, in fact, already inverted so simply bypassing that gate (a 7404) produces the desired result. This hardware change then makes it possible to add a CTRL/C check to the handler. While such a feature is definately desirable, especially when examining a long listing for errors, those who have other programs which use the conventional display coordinates may wish to forego this modification. Versions C and D of the handler have been written for such an interface. Version C is, again, designed for the original VC8E controller and Version D for the later revisions. Due to space limitations, Version C does not include a check for erroneous 'read' calls.

Although this is a 2-page handler, only 1 page is actually available for the display and unpacking routines since the second page is filled by the pattern codes. Some clever coding(2) is thus required to pack things in and tradeoffs of the sort discussed above are unfortunately necessary. It would, of course, be nice to have the CTRL/C check in Version A and perhaps someone else will be able to figure out how to do it. Users should also note that the MQ register is used in the display loop and thus any information stored there will be destroyed when calling the handler.

To add this handler to your system, run the BUILD program as indicated in the summary guide below: (for more information see the OS/8 Handbook)

```
.RUN SYS:BUILD
$LOAD PTR:
$INSERT VC8F
$INSERT ...
$BOOT
.SAVE SYS:BUILD
```

NOTES:
------

(1) To change the 'new line' check from 'LF' to 'CR' only two patches are required. The first is to change the constant 'MLF' from -12 to -15 and the second is to replace the 'TAD M20' instruction with 'TAD MLF' (i.e. 'TAD M15'). This may be done either by editing the source file, or just as easily, by using the ALTER command in BUILD. Note that the addresses used by ALTER are 200 less than the addresses shown in the listings. Thus in Version A the changes would be:

```
$AL VC8E,61
7766/ 7763

$AL VC8E,116
1323/ 1261
```

With this change output from programs such as SQCCOM will not be displayed correctly since the LF's will be converted to spaces, but data files which might contain CR's without LF's -will- appear properly. Since there just isn't enough room to check for both CR and LF, the user must decide which convention is most useful on his system.

(2) The author would especially like to acknowledge the efforts of Daniel T. Brown and Craig R. Wyss of the Dept. of Physiology and Biophysics at th' University of Washington who initially developed the plan for this handl' several years ago. Their version (for a 'home-built' interface) was the revised and extended to work with a standard controller as described abov'

Jim van Zee, Dept. of Chemistry - U/W, Seattle, WA 98195 (31 July 1976)

2

```
   1                        / VC8E *TV* HANDLER FOR A STORAGE SCOPE (DTB, CK., JVZ)
   2
   3                        /THIS HANDLER USES A STANDARD VC8E INTERFACE TO PRODUCE
   4                        /OUTPUT ON A TEKTRONIX 611/613 STORAGE SCOPE.  THE RANGE
   5                        /OF THE X- AND Y-AXES IS ASSUMED TO BE FROM -777 TO +777.
   6                        /THIS REQUIRES ADDITIONAL INSTRUCTIONS, HENCE THE CTRL/C
   7                        /CHECK HAS BEEN OMITTED. THE INTERFACE IS ALSO ASSUMED TO
   8                        /-NOT- HAVE THE *ERASE* FUNCTION IN THE ENABLE REGISTER,
   9                        /BUT TO USE THE *DICD* INSTRUCTION TO ERASE THE SCREEN.
  10
  11                        /THE HANDLER OUTPUTS CHARACTERS UNTIL THE SCREEN IS FULL
  12                        /THEN WAITS FOR KEYBOARD INPUT BEFORE ERASING EVERYTHING
  13
  14                        /NOTE: THE *MQ* REGISTER IS USED BY THE DISPLAY ROUTINE.
  15
  16                        /ACKNOWLEDGEMENTS:   THIS HANDLER BENEFITS FROM THE MANY
  17                        /HOURS OF HARD WORK BY DANIEL T. BROWN ^ CRAIG R. WYSS
  18                        /OF THE DEPT. OF PHYSIOLOGY AND BIOPHYSICS AT THE UNIV.
  19                        /OF WASHINGTON.
  20
  21
  22            6051            DICD=6051
  23            6053            DILX=6053
  24            6054            DILY=6054
  25            6055            DIXY=6055
  26
  27            IFNDEF   DIER <DIER=DICD> /EQUATE *ERASE* WITH *CLEAR DONE*
  28
  29                        /PARAMETER BLOCK FOR *BUILD*:
  30
  31            0000            PAGE 0
  32    00000   7777            -1
  33    00001   2603            DEVICE VC8E
  34    00002   7005
  35    00003   2426            DEVICE TV
  36    00004   0000
  37    00005   1300            1300;4175
  38    00006   4175
  39    00007   0000            ZBLOCK 2
  40
  41            0200            PAGE 1
```

                        V E R S I O N   A

```
42   00200   0000   START,   0                  /POINTS TO THE NEXT PAGE
43   00201   7326            CLA STL RTL
44   00202   6214            RDF
45   00203   1307            TAD COFO           /COMPUTE THE RETURN *CDI*
46   00204   3245            DCA CDIX
47   00205   1775            TAD I CRT          /ARG1
48   00206   7500            SMA                /CHECK FOR A *READ*
49   00207   5241            JMP EXIT
50   00210   0377   K377,    AND (70
51   00211   1307            TAD COFO
52   00212   3332            DCA COFX           /BUFFER FIELD
53   00213   1775            TAD I CRT
54   00214   7004   C7004,   RAL                /MULTIPLY BY 2
55   00215   0241            AND EXIT           /GET WORD COUNT
56   00216   7170            STL CMA RAR        /NEGATE ^ DIVIDE BY 2
57   00217   3240            DCA WCNT
58   00220   2375            ISZ CRT
59   00221   1775            TAD I CRT          /ARG2
60   00222   3257            DCA BUFF           /BUFFER ADDRESS
61   00223   5235            JMP BEGIN
62   00224   0000   TEMP,    0
63
64   00225   4247   LOOP,    JMS GETC           /UNPACK THE BUFFER
65   00226   3224            DCA TEMP
66   00227   4247            JMS GETC           /FIRST 2 CHARACTERS ARE EASY
67   00230   7112            CLL RTR
68   00231   7012            RTR
69   00232   1224            TAD TEMP           /HERE*S HOW WE GET THE THIRD
70   00233   7012            RTR
71   00234   7012            RTR
72   00235   4306   BEGIN,   JMS PUTC           /SETS THE D.F. THE FIRST TIME
73   00236   2240            ISZ WCNT
74   00237   5225            JMP LOOP
75   00240   0000   WCNT,    0
76
77   00241   7600   EXIT,    7600               /*CLA*
78   00242   2375            ISZ CRT            /PASS THE BLOCK NUMBER
79   00243   2375            ISZ CRT            /AND THE ERROR RETURN
80   00244   2375            ISZ CRT
81   00245   6203   CDIX,    CDF CIF
82   00246   5775            JMP I CRT          /**RETURN**
83
84   00247   0000   GETC,    0                  /READ THE BUFFER
85   00250   1657            TAD I BUFF
86   00251   4306            JMS PUTC           /AND WRITE IT OUT
87   00252   1657            TAD I BUFF
88   00253   0255            AND .+2            /GET THE UPPER FOUR BITS
89   00254   2257            ISZ BUFF
90   00255   7400            7400               /= *NOP*
91   00256   5647            JMP I GETC
92   00257   0000   BUFF,    0
93
94   00260   7772   M6,      -6
95   00261   7766   MLF,     -12
96   00262   0177   K177,    177
```

```
 97   00263  6031   WAIT,   KSF                      /WAIT AT THE BOTTOM OF A PAGE
 98   00264  5263           JMP .-1
 99   00265  6051           DIER                     /PUSH THE *ERASE* BUTTON
100   00266  6032           KCC                      /CLEAR THE FLAG
101   00267  2334           ISZ CNTR                 /WAIT A WHILE...
102   00270  5267           JMP .-1
103   00271  2373           ISZ Y                    /WAIT A WHILE LONGER...
104   00272  5267           JMP .-3
105   00273  1337           TAD C1744
106   00274  5301           JMP LF+4                 /AND START FROM THE TOP AGAIN
107
108   00275  1371   LF,     TAD C1000                /RESET THE X POSITION
109   00276  3372           DCA X
110   00277  1373           TAD Y
111   00300  1305           TAD M40                  /MOVE DOWNWARD A LINE
112   00301  3373           DCA Y
113   00302  1373           TAD Y
114   00303  7750   M30,    SPA SNA CLA              /LAST LINE%
115   00304  5263           JMP WAIT
116   00305  7740   M40,    SMA SZA CLA              /EFFECTIVE *JMP CDFX*
117
118   00306  0000   PUTC,   0                        /CHARACTER CHECKS
119   00307  6201   CDFO,   CDF 0                    /FOR ACCESS TO PAGE 2
120   00310  0262           AND K177
121   00311  7450           SNA
122   00312  5332           JMP CDFX                 /IGNORE NULLS
123   00313  1261           TAD MLF
124   00314  7450           SNA                      /NEW LINE%
125   00315  5275           JMP LF                   /YES - *CR* IS IGNORED
126   00316  1323           TAD M20
127   00317  7450           SNA                      /END-OF-FILE%
128   00320  5241           JMP EXIT                 /YES
129   00321  1260           TAD M6
130   00322  7510           SPA                      /NON-PRINTING% USE A SPACE
131   00323  7760   M20,    SMA SZA SNL CLA /=212-232; EFFECTIVE *SKP*
132   00324  7104           CLL RAL                  /X2
133   00325  1200           TAD START                /PLUS BEGINNING
134   00326  3344           DCA ADDR                 /= PATTERN ADDRESS
135   00327  4335           JMS OUTC                 /WRITE THE BIT PATTERN
136   00330  4335           JMS OUTC
137   00331  4345           JMS PLTC                 /PLUS A LITTLE SPACE
138   00332  6201   CDFX,   CDF                      /FOR ACCESS TO THE BUFFER
139   00333  5706           JMP I PUTC
140   00334  0000   CNTR,   0
141
142   00335  0000   OUTC,   0                        /WRITE 2 VERTICAL LINES
143   00336  2344           ISZ ADDR
144   00337  1744   C1744,  TAD I ADDR               /FIELD 0, OF COURSE
145   00340  7421           MCL
146   00341  4345           JMS PLTC                 /PRINT THE DOTS
147   00342  4345           JMS PLTC
148   00343  5735           JMP I OUTC
149   00344  0000   ADDR,   0
```

V E R S I O N   A

```
150    00345    0000    PLTC,    0                /NOW FOR SOME ACTION+
151    00346    1260             TAD M6
152    00347    3334             DCA CNTR         /6 DOTS HIGH
153    00350    7125             STL IAC RAL      /=3
154    00351    1372             TAD X            /SET THE X-COORDINATE
155    00352    6053             DILX
156    00353    3372             DCA X            /SAVE FOR THE NEXT COLUMN
157
158    00354    1373             TAD Y
159    00355    1371    DOTS,    TAD C1000        /TOGGLE THE SIGN BIT
160    00356    6054             DILY             /SET THE Y-COORDINATE
161    00357    1214             TAD C7004        /ADVANCE AND SAVE
162    00360    7521             SWP
163    00361    7510             SPA              /READ THE PATTERN
164    00362    6055             DIXY             /INTENSIFY
165    00363    7104             CLL RAL
166    00364    7521             SWP              /SHIFT AND SAVE AGAIN
167    00365    2334             ISZ CNTR         /COUNT THE DOTS
168    00366    5355             JMP DOTS
169    00367    7200             CLA              /REMOVE VERTICAL VALUE
170    00370    5745             JMP I PLTC
171    00371    1000    C1000,   1000
172
173    00372    0000    X,       0                /INITIAL VALUES
174    00373    1744    Y,       TAD I ADDR       /PRACTICALLY FS
175
176             0375             *400-3
177    00375    0001    CRT,     =A^77            /HERE*S THE ENTRY POINT+
178    00376    4200             JMS START        /GET THE ADDRESS OF PAGE TWO
179    00377    0070
180             0400             PAGE 2
181
182    00400    0000             0000    /SPACE
183    00401    0000             0000
184    00402    5600             5600    /+
185    00403    0000             0000
186    00404    0303             0303    /=
187    00405    0000             0000
188    00406    1477             1477    /#
189    00407    7714             7714
190    00410    5652             5652    /$
191    00411    7772             7772
192    00412    2313             2313    /%
193    00413    6462             6462
194    00414    7652             7652    /^
195    00415    7752             7752
196    00416    0300             0300    /*
197    00417    0000             0000
198    00420    3641             3641    /(
199    00421    0000             0000
200    00422    4136             4136    /)
201    00423    0000             0000
202    00424    0005             0005    /*
203    00425    0205             0205
```

V E R S I O N   A

6

```
204    00426    1034        1034     /+
205    00427    1000        100C
206    00430    0040        0040     /,
207    00431    3000        3CCC
208    00432    1010        1010     /-
209    00433    1000        1000
210    00434    4000        400C     /.
211    00435    0000        0000
212    00436    2010        2010     //
213    00437    0402        04C2
214    00440    3641        3641     /0
215    00441    4136        4136
216    00442    4442        4442     /1
217    00443    7740        7740
218    00444    4261        4261     /2
219    00445    5146        5146
220    00446    2145        2145     /3
221    00447    5321        5321
222    00450    1710        1710     /4
223    00451    1077        1077
224    00452    4745        4745     /5
225    00453    4531        4531
226    00454    7750        7750     /6
227    00455    5070        5070
228    00456    6111        6111     /7
229    00457    0503        0503
230    00460    2255        2255     /8
231    00461    5522        5522
232    00462    0705        0705     /9
233    00463    0577        0577
234    00464    2400        2400     /:
235    00455    0000        0000
236    00466    0040        0040     /;
237    00467    3200        32C0
238    00470    1024        1024     />
239    00471    4200        4200
240    00472    1212        1212     /=
241    00473    1200        1200
242    00474    4224        4224     /<
243    00475    1000        1000
244    00476    0255        0255     /%
245    00477    0300        0300
246
247    00500    7775        7775     /$
248    00501    4577        4577
249    00502    7611        7611     /A
250    00503    1176        1176
251    00504    7745        7745     /B
252    00505    4532        4532
253    00506    3641        3641     /C
254    00507    4122        4122
255    00510    7741        7741     /D
256    00511    4136        4136
257    00512    7745        7745     /E
258    00513    4541        4541
```

```
259    00514   7705        7705    /F
260    00515   0501        0501
261    00516   7741        7741    /G
262    00517   5173        5173
263    00520   7710        7710    /H
264    00521   1077        1077
265    00522   4177        4177    /I
266    00523   4100        4100
267    00524   2040        2040    /J
268    00525   4037        4037
269    00526   7714        7714    /K
270    00527   2241        2241
271    00530   7740        7740    /L
272    00531   4040        4040
273    00532   7702        7702    /M
274    00533   0277        0277
275    00534   7706        7706    /N
276    00535   3077        3077
277    00536   7741        7741    /O
278    00537   4177        4177
279    00540   7705        7705    /P
280    00541   0502        0502
281    00542   3641        3641    /Q
282    00543   6176        6176
283    00544   7715        7715    /R
284    00545   2542        2542
285    00546   2245        2245    /S
286    00547   5122        5122
287    00550   0177        0177    /T
288    00551   0100        0100
289    00552   3740        3740    /U
290    00553   4037        4037
291    00554   1720        1720    /V
292    00555   4037        4037
293    00556   7730        7730    /W
294    00557   3077        3077
295    00560   4136        4136    /X
296    00561   3641        3641
297    00562   0374        0374    /Y
298    00563   7403        7403
299    00564   6151        6151    /Z
300    00565   4543        4543
301    00566   7741        7741    /[
302    00567   0000        0000
303    00570   0204        0204    />
304    00571   1020        1020
305    00572   4177        4177    /]
306    00573   0000        0000
307    00574   0436        0436    /↑
308    00575   0400        0400
309    00576   0416        0416    /←
310    00577   3704        3704
311
312                        $
```

V E R S I O N   A

8

```
   1                         / VC8E *TV* HANDLER FOR A STORAGE SCOPE (DTB, CRW, JVZ)
   2
   3                         /THIS HANDLER USES A STANDARD VC8E INTERFACE TO PRODUCE
   4                         /OUTPUT ON A TEKTRONIX 611/613 STORAGE SCOPE.  THE RANGE
   5                         /OF THE X- AND Y-AXES IS ASSUMED TO BE FROM -777 TO +777.
   6                         /THE INTERFACE IS ASSUMED TO HAVE BITS 6-8 OF THE ENABLE
   7                         /REGISTER ASSIGNED TO THE STORAGE SCOPE FUNCTIONS AS IS
   8                         /TRUE OF LATER VERSIONS.
   9
  10                         /THE HANDLER OUTPUTS CHARACTERS UNTIL THE SCREEN IS FULL
  11                         /THEN WAITS FOR KEYBOARD INPUT BEFORE ERASING EVERYTHING
  12                         /TYPING *CTRL/C* WILL CAUSE AN IMMEDIATE RETURN TO THE
  13                         /OS/8 KEYBOARD MONITOR.
  14
  15                         /NOTE: THE *MQ* REGISTER IS USED BY THE DISPLAY ROUTINE.
  16
  17                         /ACKNOWLEDGEMENTS:  THIS HANDLER BENEFITS FROM THE MANY
  18                         /HOURS OF HARD WORK BY DANIEL T. BROWN ^ CRAIG R. WYSS
  19                         /OF THE DEPT. OF PHYSIOLOGY AND BIOPHYSICS AT THE UNIV.
  20                         /OF WASHINGTON.
  21
  22
  23            6052         DISO=6052
  24            6053         DILX=6053
  25            6054         DILY=6054
  26            6055         DIXY=6055
  27            6056         DILE=6056
  28
  29                         /PARAMETER BLOCK FOR *BUILD*:
  30
  31            0000            PAGE 0
  32    00000   7777            -1
  33    00001   2603            DEVICE VC8E
  34    00002   7005
  35    00003   2426            DEVICE TV
  36    00004   0000
  37    00005   1300            1300;4175
  38    00006   4175
  39    00007   0000            ZBLOCK 2
  40
  41            0200            PAGE 1


                              V E R S I O N    8
```

```
42    002C0   0000    START,   0                    /POINTS TO THE NEXT PAGE
43    00201   7326             CLA STL RTL
44    00202   6214             RDF
45    00203   1307             TAD CDF0             /COMPUTE THE RETURN *CDI*
46    00204   3243             DCA CDIX
47    00205   1775             TAD I CRT            /ARG1
48                     /       SMA                  /CHECK FOR A *READ*
49                     /       JMP EXIT             /(CMIT THIS NICETY)
50    002C6   0377    K377,    AND (70
51    00207   1307             TAD CDF0
52    00210   3332             DCA CDFX             /BUFFER FIELD
53    00211   1775             TAD I CRT
54    00212   7004    C7004,   RAL                  /MULTIPLY BY 2
55    00213   0237             AND EXIT             /GET WORD COUNT
56    00214   717C             STL CMA RAR          /NEGATE ^ DIVIDE BY 2
57    00215   3236             DCA WCNT
58    0C216   2375             ISZ CRT
59    00217   1775             TAD I CRT            /ARG2
60    00220   3255             DCA BUFF             /BUFFER ADDRESS
61    00221   5233             JMP BEGIN
62    00222   0000    TEMP,    0
63
64    00223   4245    LOOP,    JMS GETC            /UNPACK THE BUFFER
65    00224   3222             DCA TEMP
66    00225   4245             JMS GETC            /FIRST 2 CHARACTERS ARE EASY
67    00226   7112             CLL RTR
68    00227   7012             RTR
69    0C230   1222             TAD TEMP            /HERE*S HOW WE GET THE THIRD
70    00231   7012             RTR
71    00232   7012             RTR
72    00233   4306    BEGIN,   JMS PUTC            /SETS THE D.F. THE FIRST TIME
73    00234   2236             ISZ WCNT
74    00235   5223             JMP LOOP
75    00236   0000    WCNT,    0
76
77    00237   7600    EXIT,    7600                /*CLA*
78    00240   2375             ISZ CRT             /PASS THE BLOCK NUMBER
79    00241   2375             ISZ CRT             /AND THE ERROR RETURN
80    00242   2375             ISZ CRT
81    00243   6203    CDIX,    CDF CIF
82    00244   5775             JMP I CRT           /**RETURN**
83
84    00245   0000    GETC,    0                   /READ THE BUFFER
85    00246   1655             TAD I BUFF
86    00247   4306             JMS PUTC            /AND WRITE IT OUT
87    00250   1655             TAD I BUFF
88    00251   0253             AND .+2             /GET THE UPPER FOUR BITS
89    00252   2255             ISZ BUFF
90    00253   7400             7400                / = *NOP*
91    00254   5645             JMP I GETC
92    00255   0000    BUFF,    0
93
94    00256   7772    M6,      -6
95    00257   7766    MLF,     -12
96    00260   0177    K177,    177
```

```
 97    00261  6031   WAIT,    KSF                      /WAIT AT THE BOTTOM OF A PAGE
 98    00262  5261            JMP .-1
 99    00263  7041            CIA                      /GET *34*
100    00264  6056            DILE                     /PUSH THE *ERASE* BUTTON
101    00265  6036            KRB                      /CLEAR THE FLAG
102    00266  0260            AND K177                 /REMOVE PARITY
103    00267  1371            TAD MCC
104    00270  7650            SNA CLA                  /CTRL/C%
105    00271  5637            JMP I EXIT               /-> 7600
106    00272  6052            DISD                     /WAIT A WHILE...
107    00273  5272            JMP .-1
108    00274  1337            TAD C1744
109    00275  5304            JMP LF+6                 /AND START FROM THE TOP AGAIN
110
111    00276  1372   LF,      TAD C1000                /RESET THE X POSITION
112    00277  3373            DCA X
113    00300  1374            TAD Y
114    00301  1305            TAD M40                  /MOVE DOWNWARD A LINE
115    00302  7510            SPA
116    00303  5261            JMP WAIT                 /AC=XX34
117    00304  3374            DCA Y
118    00305  7740   M40,     SMA SZA CLA              /EFFECTIVE *JMP CDFX*
119
120    00306  0000   PUTC,    0                        /CHARACTER CHECKS
121    00307  6201   CDF0,    CDF 0                    /FOR ACCESS TO PAGE 2
122    00310  0260            AND K177
123    00311  7450            SNA
124    00312  5332            JMP CDFX                 /IGNORE NULLS
125    00313  1257            TAD MLF
126    00314  7450            SNA                      /NEW LINE%
127    00315  5276            JMP LF                   /YES - *CR* IS IGNORED
128    00316  1323            TAD M20
129    00317  7450            SNA                      /END-OF-FILE%
130    00320  5237            JMP EXIT                 /YES
131    00321  1256            TAD M6
132    00322  7510            SPA                      /NON-PRINTING% USE A SPACE
133    00323  7760   M20,     SMA SZA SNL CLA          /=212-232; EFFECTIVE *SKP*
134    00324  7104            CLL RAL                  /X2
135    00325  1200            TAD START                /PLUS BEGINNING
136    00326  3344            DCA ADDR                 /= PATTERN ADDRESS
137    00327  4335            JMS OUTC                 /WRITE THE BIT PATTERN
138    00330  4335            JMS OUTC
139    00331  4345            JMS PLTC                 /PLUS A LITTLE SPACE
140    00332  6201   CDFX,    CDF                      /FOR ACCESS TO THE BUFFER
141    00333  5706            JMP I PUTC
142    00334  0000   CNTR,    0
143
144    00335  0000   OUTC,    0                        /WRITE 2 VERTICAL LINES
145    00336  2344            ISZ ADDR
146    00337  1744   C1744,   TAD I ADDR               /FIELD 0, OF COURSE
147    00340  7421            MQL
148    00341  4345            JMS PLTC                 /PRINT THE DOTS
149    00342  4345            JMS PLTC
150    00343  5735            JMP I OUTC
151    00344  0000   ADDR,    0
```

```
152    00345  0000   PLTC,    0                      /NOW FOR SOME ACTION↓
153    00346  1256            TAD M6
154    00347  3334            DCA CNTR               /6 DOTS HIGH
155    00350  7125            STL IAC RAL            /=3
156    00351  1373            TAD X                  /SET THE X-COORDINATE
157    00352  6053            DILX
158    00353  3373            DCA X                  /SAVE FOR THE NEXT COLUMN
159
160    00354  1374            TAD Y
161    00355  1372   DOTS,    TAD C1000              /TOGGLE THE SIGN BIT
162    00356  6054            DILY                   /SET THE Y-COORDINATE
163    00357  1212            TAD C7004              /ADVANCE AND SAVE
164    00360  7521            SWP
165    00361  7510            SPA                    /READ THE PATTERN
166    00362  6055            DIXY                   /INTENSIFY
167    00363  7104            CLL RAL
168    00364  7521            SWP                    /SHIFT AND SAVE AGAIN
169    00365  2334            ISZ CNTR               /COUNT THE DOTS
170    00366  5355            JMP DOTS
171    00367  7200            CLA                    /REMOVE THE VERTICAL VALUE
172    00370  5745            JMP I PLTC
173    00371  7775   MCC,     -3
174    00372  1000   C1000,   1000
175
176    00373  0000   X,       0                      /INITIAL VALUES
177    00374  1744   Y,       TAD I ADDR             /PRACTICALLY FS
178
179           0375            *400-3
180    00375  0001   CRT,     ≡A^77                  /HERE*S THE ENTRY POINT↓
181    00376  4200            JMS START              /GET THE ADDRESS OF PAGE TWO
182    00377  0070
183           0400            PAGE 2
184
185    00400  0000            0000      /SPACE
186    00401  0000            0000
187    00402  5600            5600      /↓
188    00403  0000            0000
189    00404  0303            0303      /≡
190    00405  0000            0000
191    00406  1477            1477      /≠
192    00407  7714            7714
193    00410  5652            5652      /$
194    00411  7772            7772
195    00412  2313            2313      /%
196    00413  6462            6462
197    00414  7652            7652      /^
198    00415  7752            7752
199    00416  0300            0300      /*
200    00417  0000            0000
201    00420  3641            3641      /(
202    00421  0000            0CC0
203    00422  4136            4136      /)
204    00423  0000            0000
205    00424  0005            0005      /*
206    00425  0205            0205
```

```
207    00426    1034              1034       /+
208    00427    1000              10C0
209    00430    0040              0040       /.
210    00431    3000              3000
211    00432    1010              1010       /-
212    00433    100C              1000
213    00434    4000              4000       /.
214    00435    0000              0CC0
215    00436    2010              2010       //
216    00437    0402              0402
217    00440    3641              3641       /0
218    00441    4136              4136
219    00442    4442              4442       /1
220    00443    7740              7740
221    00444    4261              4261       /2
222    00445    5146              5146
223    00446    2145              2145       /3
224    00447    5321              5321
225    00450    1710              1710       /4
226    00451    1077              1077
227    00452    4745              4745       /5
228    00453    4531              4531
229    00454    7750              7750       /6
230    00455    5070              5070
231    00456    6111              6111       /7
232    00457    C503              0503
233    004E0    2255              2255       /8
234    00461    5522              5522
235    00462    0705              0705       /9
236    004E3    0577              0577
237    00464    2400              2400       /:
238    00465    0000              0000
239    00466    0040              0040       /;
240    00467    3200              3200
241    00470    1024              1C24       />
242    00471    4200              4200
243    00472    1212              1212       /=
244    00473    1200              1200
245    00474    4224              4224       /<
246    00475    100C              1000
247    00476    0255              0255       /%
248    00477    0300              0300
249
250    005C0    7775              7775       /S
251    00501    4577              4577
252    00502    7611              7611       /A
253    00503    1176              1176
254    00504    7745              7745       /B
255    005C5    4532              4532
256    00506    3641              3641       /C
257    00507    4122              4122
258    00510    7741              7741       /D
259    00511    4136              4136
260    00512    7745              7745       /E
261    00513    4541              4541
```

262	00514	7705	7705	/F
263	00515	0501	0501	
264	00516	7741	7741	/G
265	00517	5173	5173	
266	00520	7710	7710	/H
267	00521	1077	1077	
268	00522	4177	4177	/I
269	00523	4100	4100	
270	00524	2040	2040	/J
271	00525	4037	4037	
272	00526	7714	7714	/K
273	00527	2241	2241	
274	00530	7740	7740	/L
275	00531	4040	4040	
276	00532	7702	7702	/M
277	00533	0277	0277	
278	00534	7706	7706	/N
279	00535	3077	3077	
280	00536	7741	7741	/O
281	00537	4177	4177	
282	00540	7705	7705	/P
283	00541	0502	0502	
284	00542	3641	3641	/Q
285	00543	6176	6176	
286	00544	7715	7715	/R
287	00545	2542	2542	
288	00546	2245	2245	/S
289	00547	5122	5122	
290	00550	0177	0177	/T
291	00551	0100	0100	
292	00552	3740	3740	/U
293	00553	4037	4037	
294	00554	1720	1720	/V
295	00555	4037	4037	
296	00556	7730	7730	/W
297	00557	3077	3077	
298	00560	4136	4136	/X
299	00561	3641	3641	
300	00562	0374	0374	/Y
301	00563	7403	7403	
302	00564	6151	6151	/Z
303	00565	4543	4543	
304	00566	7741	7741	/[
305	00567	0000	0000	
306	00570	0204	0204	/\
307	00571	1020	1020	
308	00572	4177	4177	/]
309	00573	0000	0000	
310	00574	0436	0436	/↑
311	00575	0400	0400	
312	00576	0416	0416	/←
313	00577	3704	3704	
314				
315			$	

V E R S I O N   R

```
ADDR    0344
BEGIN   0233
PUFF    0255
CDFX    0332
CDFO    0307
CDIX    0243
CNTR    0334
CRT     0375
C1000   0372
C1744   0337
C7004   0212
DILE    6056
DILX    6053
DILY    6054
DISD    6052
DIXY    6055
DOTS    0355
EXIT    0237
GETC    0245
K177    0260
K377    0206
LF      0276
LOOP    0223
MCC     0371
PLF     0257
M20     0323
M40     0305
M6      0256
OUTC    0335
PLTC    0345
PUTC    0306
START   0200
TEMP    0222
WAIT    0261
WCNT    0236
X       0373
Y       0374
```

ERRORS DETECTED: 0
LINKS GENERATED: 0

V E R S I O N   B

```
ADDR        136    145    146    151*   177
BEGIN        61     72*
BUFF         60     85     87     89     92*
CDFX         52    124    140*
CDFO         45     51    121*
CDIX         46     81*
CNTR        142*   154    169
CRT          47     53     58     59     78     79     80     82     180*
C1000       111    161    174*
C1744       108    146*
C7004        54*   163
DILE         27*   1CC
DILX         24*   157
DILY         25*   162
DISD         23*   1C6
DIXY         26*   166
DOTS        161*   170
EXIT         55     77*   105    130
GETC         64     66     84*    91
K177         96*   102    122
K377         50*
LF          109    111*   127
LOOP         64*    74
MCC         103    173*
PLF          95*   125
P20         128    133*
M40         114    118*
P6           94*   131    153
CUTC        137    138    144*   150
PLTC        139    148    149    152*   172
PUTC         72     86    120*   141
START        42*   135    181
TEMP         62*    65     69
TV           35
VC8E         33
WAIT         97*   116
WCNT         57     73     75*
X           112    156    158    176*
Y           113    117    160    177*
-00377       50
```

V3F

                    V E R S I O N   R
```
```

```
 1                      / VCBE *TV* HANDLER FOR A STORAGE SCOPE (DTB, CRB, JVZ)
 2
 3                      /THIS HANDLER USES A MODIFIED VCBE INTERFACE TO PRODUCE
 4                      /OUTPUT ON A TEKTRONIX 611/613 STORAGE SCOPE.  THE MODI-
 5                      /FICATION IS TO CHANGE THE X- AND Y-AXES TO RUN FROM 0-
 6                      /1777 RATHER THAN -777 TO +777.  THIS REQUIRES REVERSING
 7                      /THE SIGN BIT (BIT 2).  THE INTERFACE IS ALSO ASSUMED TO
 8                      /-NOT- HAVE THE *ERASE* FUNCTION IN THE ENABLE REGISTER,
 9                      /BUT TO USE THE *DICD* INSTRUCTION TO ERASE THE SCREEN.
10
11                      /THE HANDLER OUTPUTS CHARACTERS UNTIL THE SCREEN IS FULL
12                      /THEN WAITS FOR KEYBOARD INPUT BEFORE ERASING EVERYTHING
13                      /TYPING *CTRL/C* WILL CAUSE AN IMMEDIATE RETURN TO THE
14                      /OS/8 KEYBOARD MONITOR.
15
16                      /NOTE: THE *MQ* REGISTER IS USED BY THE DISPLAY ROUTINE.
17
18                      /ACKNOWLEDGEMENTS:  THIS HANDLER BENEFITS FROM THE MANY
19                      /HOURS OF HARD WORK BY DANIEL T. BROWN & CRAIG R. WYSS
20                      /OF THE DEPT. OF PHYSIOLOGY AND BIOPHYSICS AT THE UNIV.
21                      /OF WASHINGTON.
22
23
24           6051               DICD=6051
25           6053               DILX=6053
26           6054               DILY=6054
27           6055               DIXY=6055
28
29                      IFNDEF  DIER <DIER=DICD> /EQUATE *ERASE* WITH *CLEAR DONE*
30
31                      /PARAMETER BLOCK FOR *BUILD*:
32
33           0000               PAGE 0
34    00000  7777               -1
35    00001  2603               DEVICE VCBE
36    00002  7005
37    00003  2426               DEVICE TV
38    00004  0000
39    00005  1300               1300;4175
40    00006  4175
41    00007  0000               ZBLOCK 2
42
43           0200               PAGE 1


                        V E R S I O N   C
```

```
44   00200   0000   START,   0                    /POINTS TO THE NEXT PAGE
45   00201   7326            CLA STL PTL
46   00202   6214            RDF
47   00203   1310            TAD CDFO              /COMPUTE THE RETURN *CLI*
48   00204   3243            DCA CDIX
49   00205   1775            TAD I CRT             /ARG1
50                      /    SMA                   /CHECK FOR A *READ*
51                      /    JMP EXIT              /OMIT THIS NICETY
52   00206   0377   K377,    AND (70
53   00207   1310            TAD CDFO
54   00210   3333            DCA CDFX              /BUFFER FIELD
55   00211   1775            TAD I CRT
56   00212   7004            RAL                   /MULTIPLY BY 2
57   00213   0237            AND EXIT              /GET WORD COUNT
58   00214   7170            STL CMA RAR           /NEGATE ^ DIVIDE BY 2
59   00215   3236            DCA WCNT
60   00216   2375            ISZ CRT
61   00217   1775            TAD I CRT             /ARG2
62   00220   3255            DCA BUFF              /BUFFER ADDRESS
63   00221   5233            JMP BEGIN
64   00222   0000   TEMP,    0
65
66   00223   4245   LOOP,    JMS GETC              /UNPACK THE BUFFER
67   00224   3222            DCA TEMP
68   00225   4245            JMS GETC              /FIRST 2 CHARACTERS ARE EASY
69   00226   7112            CLL RTR
70   00227   7012            RTR
71   00230   1222            TAD TEMP              /HERE*S HOW WE GET THE THIRD
72   00231   7012            RTR
73   00232   7012            RTR
74   00233   4307   BEGIN,   JMS PUTC              /SETS THE D.F. THE FIRST TIME
75   00234   2236            ISZ WCNT
76   00235   5223            JMP LOOP
77   00236   0000   WCNT,    0
78
79   00237   7600   EXIT,    7600                  /*CLA*
80   00240   2375            ISZ CRT               /PASS THE BLOCK NUMBER
81   00241   2375            ISZ CRT               /AND THE ERROR RETURN
82   00242   2375            ISZ CRT
83   00243   6203   CDIX,    CDF CIF
84   00244   5775            JMP I CRT             /**RETURN**
85
86   00245   0000   GETC,    0                     /READ THE BUFFER
87   00246   1655            TAD I BUFF
88   00247   4307            JMS PUTC              /AND WRITE IT OUT
89   00250   1655            TAD I BUFF
90   00251   0253            AND .+2               /GET THE UPPER FOUR BITS
91   00252   2255            ISZ BUFF
92   00253   7400            7400                  /= *NOP*
93   00254   5645            JMP I GETC
94   00255   0000   BUFF,    0
95
96   00256   7772   M6,      -6
97   00257   7766   M12,     -12
98   00260   0177   K177,    177
```

```
 99    00261   6031   WAIT,   KSF                   /WAIT AT THE BOTTOM OF A PAGE
100    00262   5261           JMP .-1
101    00263   6051           DIEF                  /PUSH THE *ERASE* BUTTON
102    00264   6036           KKB                   /CLEAR THE FLAG
103    00265   0260           AND K177              /REMOVE PARITY
104    00266   1372           TAD MCC
105    00267   7650           SNA CLA               /CTRL/C%
106    00270   5637           JMP I EXIT            /-> 7600
107    00271   2345           ISZ CNTR              /WAIT A WHILE...
108    00272   5271           JMP .-1
109    00273   2374           ISZ Y                 /WAIT A WHILE LONGER...
110    00274   5271           JMP .-3
111    00275   1337           TAD C1744
112    00276   5302           JMP LF+3              /AND START FROM THE TOP AGAIN
113    00277   3373   LF,     DCA X                 /RESET THE X POSITION
114    00300   1374           TAD Y
115    00301   1306           TAD M40               /MOVE DOWNWARD A LINE
116    00302   3374           DCA Y
117    00303   1374           TAD Y
118    00304   7750   M30,    SPA SNA CLA           /LAST LINE%
119    00305   5261           JMP WAIT
120    00306   7740   M40,    SMA SZA CLA           /EFFECTIVE *JMP CDFX*
121
122    00307   0000   PUTC,   0                     /CHARACTER CHECKS
123    00310   6201   CDFO,   CDF 0                 /FOR ACCESS TO PAGE 2
124    00311   0260           AND K177
125    00312   7450           SNA
126    00313   5333           JMP CDFX              /IGNORE NULLS
127    00314   1257           TAD MLF
128    00315   7450           SNA                   /NEW LINE%
129    00316   5277           JMP LF                /YES - *CP* IS IGNORED
130    00317   1324           TAD M20
131    00320   7450           SNA                   /END-OF-FILE%
132    00321   5237           JMP EXIT              /YES
133    00322   1256           TAD M6
134    00323   7510           SPA                   /NON-PRINTING% USE A SPACE
135    00324   7760   M20,    SMA SZA SNL CLA /=212-232: EFFECTIVE *SKP*
136    00325   7104           CLL RAL               /X2
137    00326   1200           TAD START             /PLUS BEGINNING
138    00327   3344           DCA ADDR              /= PATTERN ADDRESS
139    00330   4335           JMS OUTC              /WRITE THE BIT PATTERN
140    00331   4335           JMS OUTC
141    00332   4346           JMS PLTC              /PLUS A LITTLE SPACE
142    00333   6201   CDFX,   CDF                   /FOR ACCESS TO THE BUFFER
143    00334   5707           JMP I PUTC
144
145    00335   0000   OUTC,   0                     /WRITE 2 VERTICAL LINES
146    00336   2344           ISZ ADDR
147    00337   1744   C1744,  TAD I ADDR            /FIELD 0, OF COURSE
148    00340   7421           MCL
149    00341   4346           JMS PLTC              /PRINT THE DOTS
150    00342   4346           JMS PLTC
151    00343   5735           JMP I OUTC
152    00344   0000   ADDR,   0
153    00345   0000   CNTR,   0
```

V E R S I O N   C

```
154   00346   0000   PLTC,   0                    /NOW FOR SOME ACTION↓
155   00347   1256           TAD M6
156   00350   3345           DCA CNTR             /6 DOTS HIGH
157
158   00351   7125           STL IAC RAL          /*3
159   00352   1373           TAD X                /SET THE X-COORDINATE
160   00353   6053           DILX
161   00354   3373           DCA X                /SAVE FOR THE NEXT COLUMN
162
163   00355   1374           TAD Y
164   00356   6054   DOTS,   DILY                 /SET THE Y-COORDINATE
165   00357   1371           TAD C4               /ADVANCE AND SAVE
166   00360   7521           SWP
167   00361   7510           SPA                  /READ THE PATTERN
168   00362   6055           DIXY                 /INTENSIFY
169   00363   7104           CLL RAL
170   00364   7521           SWP                  /SHIFT AND SAVE AGAIN
171   00365   2345           ISZ CNTR             /COUNT THE DOTS
172   00366   5356           JMP DOTS
173   00367   7200           CLA                  /REMOVE VERTICAL VALUE
174   00370   5746           JMP 1 PLTC
175
176   00371   0004   C4,     4
177   00372   7775   MCC,    -3
178
179   00373   0000   X,      0                    /INITIAL VALUES
180   00374   1744   Y,      TAD 1 ADDR           /PRACTICALLY FS
181
182           0375           *400-3
183   00375   0001   CRT,    =A^77                /HERE*S THE ENTRY POINT↓
184   00376   4200           JMS START            /GET THE ADDRESS OF PAGE TWO
185   00377   0070
186           0400           PAGE 2
187
188   00400   0000           0000       /SPACE
189   00401   0000           0000
190   00402   5600           5600       /↓
191   00403   0000           0000
192   00404   0303           0303       /≡
193   00405   0000           0000
194   00406   1477           1477       /*
195   00407   7714           7714
196   00410   5652           5652       /$
197   00411   7772           7772
198   00412   2313           2313       /%
199   00413   6462           6462
200   00414   7652           7652       /^
201   00415   7752           7752
202   00416   0300           0300       /*
203   00417   0000           0000
204   00420   3641           3641       /(
205   00421   0000           0000
206   00422   4136           4136       /)
207   00423   0000           0000
208   00424   0005           0005       /*
209   00425   0205           0205
```

210	00426	1034	1034	/+
211	00427	1000	1000	
212	00430	0040	0040	/.
213	00431	3000	3000	
214	00432	1010	1010	/-
215	00433	1000	1000	
216	00434	4000	4000	/.
217	00435	0000	0000	
218	00436	2010	2010	//
219	00437	0402	0402	
220	00440	3641	3641	/0
221	00441	4136	4136	
222	00442	4442	4442	/1
223	00443	7740	7740	
224	00444	4261	4261	/2
225	00445	5146	5146	
226	00446	2145	2145	/3
227	00447	5321	5321	
228	00450	1710	1710	/4
229	00451	1077	1077	
230	00452	4745	4745	/5
231	00453	4531	4531	
232	00454	7750	7750	/6
233	00455	5070	5070	
234	00456	6111	6111	/7
235	00457	0503	0503	
236	00460	2255	2255	/8
237	00461	5522	5522	
238	00462	0705	0705	/9
239	00463	0577	0577	
240	00464	2400	2400	/:
241	00465	0000	0000	
242	00466	0040	0040	/;
243	00467	3200	3200	
244	00470	1024	1024	/>
245	00471	4200	4200	
246	00472	1212	1212	/=
247	00473	1200	1200	
248	00474	4224	4224	/<
249	00475	1000	1000	
250	00476	0255	0255	/%
251	00477	0300	0300	
252				
253	00500	7775	7775	/S
254	00501	4577	4577	
255	00502	7611	7611	/A
256	00503	1176	1176	
257	00504	7745	7745	/B
258	00505	4532	4532	
259	00506	3641	3641	/C
260	00507	4122	4122	
261	00510	7741	7741	/D
262	00511	4136	4136	
263	00512	7745	7745	/E
264	00513	4541	4541	

V E R S I O N   C

21

265	00514	7705	7705	/F
266	00515	0501	0501	
267	00516	7741	7741	/G
268	00517	5173	5173	
269	00520	7710	7710	/H
270	00521	1077	1077	
271	00522	4177	4177	/I
272	00523	4100	4100	
273	00524	2040	2040	/J
274	00525	4037	4037	
275	00526	7714	7714	/K
276	00527	2241	2241	
277	00530	7740	7740	/L
278	00531	4040	4040	
279	00532	7702	7702	/M
280	00533	0277	0277	
281	00534	7706	7706	/N
282	00535	3077	3077	
283	00536	7741	7741	/O
284	00537	4177	4177	
285	00540	7705	7705	/P
286	00541	0502	0502	
287	00542	3641	3641	/Q
288	00543	6176	6176	
289	00544	7715	7715	/R
290	00545	2542	2542	
291	00546	2245	2245	/S
292	00547	5122	5122	
293	00550	0177	0177	/T
294	00551	0100	0100	
295	00552	3740	3740	/U
296	00553	4037	4037	
297	00554	1720	1720	/V
298	00555	4037	4037	
299	00556	7730	7730	/W
300	00557	3077	3077	
301	00560	4136	4136	/X
302	00561	3641	3641	
303	00562	0374	0374	/Y
304	00563	7403	7403	
305	00564	6151	6151	/Z
306	00565	4543	4543	
307	00566	7741	7741	/[
308	00567	0000	0000	
309	00570	0204	0204	/?
310	00571	1020	1020	
311	00572	4177	4177	/]
312	00573	0000	0000	
313	00574	0436	0436	/↑
314	00575	0400	0400	
315	00576	0416	0416	/→
316	00577	3704	3704	
317				
318			$	

VERSION   C

```
     1                        / VC8E *TV* HANDLER FCR A STORAGE SCOPE (DTB, CRW, JVZ)
     2
     3                        /THIS HANDLER USES A MODIFIED VC8E INTERFACE TO PRODUCE
     4                        /OUTPUT ON A TEKTRONIX 611/613 STORAGE SCOPE.  THE MODI-
     5                        /FICATICN IS TO CHANGE THE X- ANP Y-AXES TG RUN FROM O-
     6                        /1777 RATHER THAN -777 TO +777.  THIS REQUIRES REVERSING
     7                        /THE SIGN BIT (BIT 2).  THE INTERFACE IS ASSUMED TO HAVE
     8                        /BITS 6-8 OF THE ENABLE REGISTEP ASSIGNED TO THE STORAGE
     9                        /SCOPE FUNCTIONS AS IS TRUE OF LATER VERSIONS.
    10
    11                        /THE HANDLER OUTPUTS CHARACTERS UNTIL THE SCREEN IS FULL
    12                        /THEN WAITS FOR KEYBOARD INPUT PEFORE ERASING EVERYTHING
    13                        /TYPING *CTRL/C* WILL CAUSE AN IMMEDIATE RETURN TO THE
    14                        /OS/8 KEYBOARD MONITOR.
    15
    16                        /NOTE: THE *MQ* REGISTER IS USFC PY THE DISPLAY ROUTINE.
    17
    18                        /ACKNOWLEDGEMENTS:  THIS HANDLER BENEFITS FROM THE MANY
    19                        /HOURS OF HARD WORK BY DANIEL T. BROWN ^ CRAIG R. WYSS
    20                        /OF THE DEPT. OF PHYSIOLOGY AND RIOPHYSICS AT THE UNIV.
    21                        /OF WASHINGTON.
    22
    23
    24          6052          DISD=6052
    25          6053          DILX=6053
    26          6054          DILY=6054
    27          6055          DIXY=6055
    28          6056          DILE=6056
    29
    30                        /PARAMETER BLOCK FOR *BUILD*:
    31
    32          0000          PAGE C
    33   00000  7777          -1
    34   00001  2603          DEVICE VC8E
    35   00002  7005
    36   00003  2426          DEVICE TV
    37   00004  0000
    38   00005  1300          1300;4175
    39   00006  4175
    40   00007  0000          ZBLOCK 2
    41
    42          0200          PAGE 1


                        V E R S I O N    D
```

```
43    00200    0000    START,    0                    /POINTS TC THE NEXT PAGE
44    00201    7326              CLA STL RTL
45    00202    6214              RDF
46    00203    1310              TAD CDFO              /CCMPUTE THE RETLRN *CDI*
47    00204    3245              DCA CDIX
48    00205    1775              TAD I CRT             /ARG1
49    00206    7500              SMA                   /CHECK FOR A *READ*
50    00207    5241              JMP EXIT
51    00210    0377    K377,     AND (70
52    00211    1310              TAD CDFO
53    00212    3333              DCA CDFX              /BUFFER FIELD
54    00213    1775              TAD I CRT
55    00214    7004              RAL                   /MULTIPLY BY 2
56    00215    0241              AND EXIT              /GET WORD COUNT
57    00216    7170              STL CMA RAR           /NEGATE - DIVIDE BY 2
58    00217    3240              DCA WCNT
59    00220    2375              ISZ CRT
60    00221    1775              TAD I CRT             /ARG2
61    00222    3257              DCA BUFF              /BUFFER ADDRESS
62    00223    5235              JMP BEGIN
63    00224    0000    TEMP,     0
64
65    00225    4247    LOOP,     JMS GETC             /UNPACK THE BUFFER
66    00226    3224              DCA TEMP
67    00227    4247              JMS GETC             /FIRST 2 CHARACTERS ARE EASY
68    00230    7112              CLL RTR
69    00231    7012              RTR
70    00232    1224              TAD TEMP             /HERE*S HOW WE GET THE THIRD
71    00233    7012              RTR
72    00234    7012              RTR
73    00235    4307    BEGIN,    JMS PUTC             /SETS THE D.F. THE FIRST TIME
74    00236    2240              ISZ WCNT
75    00237    5225              JMP LOOP
76    00240    0000    WCNT,     0
77
78    00241    7600    EXIT,     7600                 /*CLA*
79    00242    2375              ISZ CRT              /PASS THE BLOCK NUMBER
80    00243    2375              ISZ CRT              /AND THE ERROR RETURN
81    00244    2375              ISZ CRT
82    00245    6203    CDIX,     CDF CIF
83    00246    5775              JMP I CRT            /**RETURN**
84
85    00247    0000    GETC,     0                    /READ THE BUFFER
86    00250    1657              TAD I BUFF
87    00251    4307              JMS PUTC             /AND WRITE IT OUT
88    00252    1657              TAD I BUFF
89    00253    0255              AND .+2              /GET THE UPPER FOUR BITS
90    00254    2257              ISZ BUFF
91    00255    7400              7400                 /= *NOP*
92    00256    5647              JMP I GETC
93    00257    0000    BUFF,     0
94
95    00260    7772    M6,       -6
96    00261    7766    MLF,      -12
97    00262    0177    K177,     177
```

```
 98   00263   6031   WAIT,    KSF              /WAIT AT THE BOTTOM OF A PAGE
 99   00264   5263            JMP .-1
100   00265   7041            CIA              /GET *34*
101   00266   6056            DILE             /PUSH THE *ERASE* BUTTON
102   00267   6036            KRB              /CLEAR THE FLAG
103   00270   0262            AND K177         /REMOVE PARITY
104   00271   1372            TAD MCC
105   00272   7650            SNA CLA          /CTRL /C?
106   00273   5641            JMP I EXIT       /-> 7600
107   00274   6052            DISD             /WAIT A WHILE...
108   00275   5274            JMP .-1
109   00276   1337            TAD C1744
110   00277   5305            JMP LF+5         /AND START FROM THE TOP AGAIN
111
112   00300   3373   LF,      DCA X            /RESET THE X POSITION
113   00301   1374            TAD Y
114   00302   1306            TAD M40          /MOVE DOWNWARD A LINE
115   00303   7510            SPA
116   00304   5263            JMP WAIT         /AC=XX34
117   00305   3374            DCA Y
118   00306   7740   M40,     SMA SZA CLA      /EFFECTIVE *JMP CDFX*
119
120   00307   0000   PUTC,    0                /CHARACTER CHECKS
121   00310   6201   CDF0,    CDF 0            /FOR ACCESS TO PAGE 2
122   00311   0262            AND K177
123   00312   7450            SNA
124   00313   5333            JMP CDFX         /IGNORE NULLS
125   00314   1261            TAD MLF
126   00315   7450            SNA              /NEW LINE?
127   00316   5300            JMP LF           /YES - *CR* IS IGNORED
128   00317   1324            TAD M20
129   00320   7450            SNA              /END-OF-FILE?
130   00321   5241            JMP EXIT         /YES
131   00322   1260            TAD M6
132   00323   7510            SPA              /NON-PRINTING? USE A SPACE
133   00324   7760   M20,     SMA SZA SNL CLA  /=212-232: EFFECTIVE *SKP*
134   00325   7104            CLL RAL          /X2
135   00326   1200            TAD START        /PLUS BEGINNING
136   00327   3344            DCA ADDR         /= PATTERN ADDRESS
137   00330   4335            JMS OUTC         /WRITE THE BIT PATTERN
138   00331   4335            JMS OUTC
139   00332   4346            JMS PLTC         /PLUS A LITTLE SPACE
140   00333   6201   CDFX,    CDF              /FOR ACCESS TO THE BUFFER
141   00334   5707            JMP I PUTC
142
143   00335   0000   OUTC,    0                /WRITE 2 VERTICAL LINES
144   00336   2344            ISZ ADDR
145   00337   1744   C1744,   TAD I ADDR       /FIELD 0, OF COURSE
146   00340   7421            MQL
147   00341   4346            JMS PLTC         /PRINT THE DOTS
148   00342   4346            JMS PLTC
149   00343   5735            JMP I OUTC
150   00344   0000   ADDR,    0
151   00345   0000   CNTR,    0
```

V E R S I O N   D

```
152   00346   0000   PLTC,   0              /NOW FOR SOME ACTION+
153   00347   1260           TAD M6
154   00350   3345           DCA CNTR       /6 DOTS HIGH
155
156   00351   7125           STL IAC RAL    /=3
157   00352   1373           TAD X          /SET THE Y-COORDINATE
158   00353   6053           DILX
159   00354   3373           DCA X          /SAVE FOR THE NEXT COLUMN
160
161   00355   1374           TAD Y
162   00356   6054   DOTS,   DILY           /SET THE Y-COORDINATE
163   00357   1371           TAD C4         /ADVANCE AND SAVE
164   00360   7521           SWP
165   00361   7510           SPA            /READ THE PATTERN
166   00362   6055           DIXY           /INTENSIFY
167   00363   7104           CLL RAL
168   00364   7521           SWP            /SHIFT AND SAVE AGAIN
169   00365   2345           ISZ CNTR       /COUNT THE DOTS
170   00366   5356           JMP DOTS
171   00367   7200           CLA            /REMOVE THE VERTICAL VALUE
172   00370   5746           JMP I PLTC
173   00371   0004   C4,     +4
174   0C372   7775   MCC,    -3
175
176   00373   0000   X,      0              /INITIAL VALUES
177   00374   1744   Y,      TAD I ADDR     /PRACTICALLY FS
178
179           0375           +400-3
180   00375   0001   CRT,    ≡A^77          /HERE*S THE ENTRY POINT+
181   00376   4200           JMS START      /GET THE ADDRESS OF PAGE TWO
182   00377   007C
183           0400           PAGE 2
184
185   00400   0000           00C0    /SPACE
186   00401   0000           0000
187   00402   5600           5600    /+
188   00403   000C           0000
189   00404   0303           0303    /≡
190   00405   0000           00C0
191   00406   1477           1477    /*
192   00407   7714           7714
193   00410   5652           5652    /$
194   00411   7772           7772
195   00412   2313           2313    /%
196   00413   6462           6462
197   00414   7652           7652    /^
198   00415   7752           7752
199   00416   030C           0300    /+
200   00417   0000           0000
201   00420   3641           3641    /(
202   0C421   0000           0000
203   00422   4136           4136    /)
204   00423   0000           0000
205   00424   0005           0005    /+
206   00425   0205           0205
```

```
207    00426    1034         1034      /+
208    C0427    1000         1000
209    00430    0040         0040      /.
210    00431    3000         3CCO
211    00432    101C         1010      /-
212    00433    1000         10CO
213    00434    4000         4CCO      /.
214    00435    0000         0000
215    00436    2010         2010      //
216    C0437    0402         0402
217    00440    3641         3641      /0
218    00441    4136         4136
219    00442    4442         4442      /1
220    00443    7740         7740
221    00444    4261         4261      /2
222    00445    5146         5146
223    00446    2145         2145      /3
224    00447    5321         5321
225    00450    1710         171C      /4
226    00451    1077         1077
227    00452    4745         4745      /5
228    00453    4531         4531
229    00454    7750         7750      /6
230    00455    5070         5070
231    00456    6111         6111      /7
232    00457    0503         0503
233    00460    2255         2255      /8
234    00461    5522         5522
235    00462    0705         0705      /9
236    00463    0577         0577
237    004E4    2400         24C0      /:
238    00465    0000         0000
239    00466    004C         0040      /;
240    00467    320C         3200
241    00470    1024         1024      />
242    00471    4200         42C0
243    00472    1212         1212      /=
244    00473    1200         1200
245    C0474    4224         4224      /<
246    C0475    100C         1000
247    00476    0255         0255      /%
248    00477    0300         0300
249
250    005C0    7775         7775      /<
251    00501    4577         4577
252    00502    7611         7611      /A
253    00503    1176         1176
254    00504    7745         7745      /B
255    00505    4532         4532
256    005C6    3641         3641      /C
257    00507    4122         4122
258    00510    7741         7741      /D
259    00511    4136         413E
260    00512    7745         7745      /E
261    00513    4541         4541
```

V E R S I O N   D

262	00514	7705	7705	/F
263	00515	0501	0501	
264	00516	7741	7741	/G
265	00517	5173	5173	
266	C0520	7710	7710	/H
267	00521	1077	1077	
268	00522	4177	4177	/I
269	00523	410C	4100	
270	00524	2040	2040	/J
271	00525	4037	4C37	
272	00526	7714	7714	/K
273	00527	2241	2241	
274	00530	7740	7740	/L
275	00531	4040	4040	
276	00532	7702	7702	/M
277	00533	0277	0277	
278	00534	7706	7706	/N
279	00535	3077	3077	
280	00536	7741	7741	/O
281	00537	4177	4177	
282	00540	7705	77C5	/P
283	00541	0502	0502	
284	00542	3641	3641	/Q
285	00543	6176	6176	
286	00544	7715	7715	/P
287	00545	2542	2542	
288	00546	2245	2245	/S
289	00547	5122	5122	
290	00550	0177	0177	/T
291	00551	010C	0100	
292	00552	374C	3740	/U
293	00553	4037	4037	
294	00554	1720	1720	/V
295	00555	4037	4037	
296	00556	7730	7730	/W
297	00557	3077	3077	
298	00560	4136	4136	/X
299	00561	3641	3641	
300	00562	0374	0374	/Y
301	00563	7403	7403	
302	00564	6151	6151	/Z
303	00565	4543	4543	
304	00566	7741	7741	/[
305	00567	0000	0000	
306	00570	0204	02C4	/≥
307	00571	102C	1020	
308	00572	4177	4177	/]
309	00573	0000	0000	
310	00574	0436	0436	/↑
311	00575	0400	0400	
312	00576	0416	0416	/→
313	00577	3704	3704	
314				
315			$	

V E R S I O N   D

```
ACDR    0344
BEGIN   0235
BUFF    0257
CDFX    0333
CCFO    0310
CDIX    0245
CNTR    0345
CRT     0375
C1744   0337
C4      0371
DILE    6056
DILX    6053
CILY    6054
CISD    6052
DIXY    6055
COTS    0356
EXIT    0241
GETC    0247
K177    0262
K377    0210
LF      0300
LOOP    0225
MCC     0372
MLF     0261
M20     0324
M40     0306
M6      0260
CLTC    0335
PLTC    0346
PUTC    0307
START   0200
TEMP    0224
WAIT    0263
WCNT    0240
X       0373
Y       0374
```

ERRORS DETECTED: 0
LINKS GENERATED: C

V E R S I O N   D

```
ADDR     136   144   145   150*  177
BEGIN     62    73*
BUFF      61    86    88    90    93*
CDFX      53   124   140*
CDFO      46    52   121*
CDIX      47    82*
CNTR     151*  154   169
CRT       48    54    59    60    79    80    81    83   180*
C1744    109   145*
C4       163   173*
CILE      28*  101
DILX      25*  158
DILY      26*  162
CISD      24*  107
DIXY      27*  166
DCTS     162*  170
EXIT      50    56    78*  106   130
GETC      65    67    85*   92
K177      97*  103   122
K377      51*
LF       110   112*  127
LOOP      65*   75
PCC      104   174*
PLF       96*  125
P20      128   133*
P40      114   118*
P6        95*  131   153
OUTC     137   138   143*  149
PLTC     139   147   148   152*  172
PUTC      73    87   120*  141
START     43*  135   181
TEMP      63*   66    70
TV        36
VC8E      34
WAIT      98*  116
WCNT      58    74    76*
X        112   157   159   176*
Y        113   117   161   177*
¬00377    51
```

V3F