

LISTING:9SYM FRIDAY SEPTEMBER 10, 1976 16:30:26
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SN	LC	BNCD	SOURCE
0000	00000	000000	ASMB,A,B,L
0002			* HP MEMORY MAP
0003			* (AS OF 4/1/75)
0004			*
0005			*
0006			*
0007			* HP RESIDENT OB - 3044B ³¹⁵⁴ 3070B
0008			* TAPE BUFFER 4000B - 11777B
0009			* PRINTER BUFFER 12000B - 17777B
0010			* (NOT CURRENTLY USED)
0011			* HP DDT 16000B - 17136B
0012			* MAG TAPE LOADER 17200B - 17356B
0013			* BASIC BINARY LOADER 17700B - 17776B
0014			*
0015			*
0016			*
0017			*
0018			* HP - M1 INTERFACE PROGRAM
0019			*
0020			* * * * *
0021			*
0022			* WRENWICK LEE
0023			* JUNE, 1972
0024			*
0025			* REVISED APRIL, 1975
0026			* VERSION 2.6
0027			* SOURCE - WKKL.SOURCE.HPRES.MOD10
0028			*
0029			* REVISED - FALL 74 FOR HYTYPER BY D. Y. YONAMINE
0030			*
0031			* REVISED 20 OCT 75
0032			* DDT BREAK-POINT POINTER MOVED TO LOC 3
0033			* IO ADDRESSES MODIFIED
0034			*
0035			* REVISED JULY 76 TO ADD HYTYPER PAUSE FEATURE
0036			*
0037			* * * * *
0038			*
0039	00177	000000	ORG 177B VERSION NUMBER STORAGE LOC
0040			*
0041	00177	000003	OCT 3 MAKE THIS ONE VERNON 3
0042			*
0043			*
0044	00003	000000	ORG 3 INTERFACE WITH DDT
0045	00003	000000	BSS 1 DDT BREAKPOINT CELL

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0047
0048 *
0049 *INTERRUPT CONTROL AND TRANSFER WORDS
0049 *THESE LOCATIONS ARE REWRITTEN BY ENTRY INTO INIT ROUTINE
0050 *
0051 00004 000000      ORG      4
0052 00004 114151      JSB      PWRIT,I      POWER FAIL INTERRUPT
0053 00005 114152      JSB      PARIT,I      PARITY ERROR INTERRUPT
0054 00006 106706      CLC      DMAD        LOC 6 DMA IO RETURN (IGNORE)
0055 00007 106707      CLC      DMAD2
0056 00010 102010      HLT      10B        LOC 10 DACONICS DATA CHANNEL
0057 00011 114112      JSB      TPIN,I      LOC 11 DACONICS CONTROL CHANNEL
0058 00012 114113      JSB      RSTIN,I     LOC 12 RESTART INTERRUPT
0059 00013 114114      JSB      CMDIN,I     LOC 13 COMMAND INTERRUPT
0060 00014 114120      JSB      PRIN,I     LOC 14 IOMEC PRINTER INTERRUPT
0061 00015 114121      JSB      HYINT,I    LOC 15 HYTYPE INTERRUPT
0062 00016 106716      CLC      TTY1       IGNORE TTY INTERRUPTS

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0064	00017	000000	ORG	17B	
0065			*		
0066			*		
0067	00017	000000	REP	100B-17B	SET LOC 17 TO 77 TO HALT SAFETY FIRST
0067	00017	102000	HLT	0	
0067	00020	102000	HLT	0	
0067	00021	102000	HLT	0	
0067	00022	102000	HLT	0	
0067	00023	102000	HLT	0	
0067	00024	102000	HLT	0	
0067	00025	102000	HLT	0	
0067	00026	102000	HLT	0	
0067	00027	102000	HLT	0	
0067	00030	102000	HLT	0	
0067	00031	102000	HLT	0	
0067	00032	102000	HLT	0	
0067	00033	102000	HLT	0	
0067	00034	102000	HLT	0	
0067	00035	102000	HLT	0	
0067	00036	102000	HLT	0	
0067	00037	102000	HLT	0	
0067	00040	102000	HLT	0	
0067	00041	102000	HLT	0	
0067	00042	102000	HLT	0	
0067	00043	102000	HLT	0	
0067	00044	102000	HLT	0	
0067	00045	102000	HLT	0	
0067	00046	102000	HLT	0	
0067	00047	102000	HLT	0	
0067	00050	102000	HLT	0	
0067	00051	102000	HLT	0	
0067	00052	102000	HLT	0	
0067	00053	102000	HLT	0	
0067	00054	102000	HLT	0	
0067	00055	102000	HLT	0	
0067	00056	102000	HLT	0	
0067	00057	102000	HLT	0	
0067	00060	102000	HLT	0	
0067	00061	102000	HLT	0	
0067	00062	102000	HLT	0	
0067	00063	102000	HLT	0	
0067	00064	102000	HLT	0	
0067	00065	102000	HLT	0	
0067	00066	102000	HLT	0	
0067	00067	102000	HLT	0	
0067	00070	102000	HLT	0	
0067	00071	102000	HLT	0	
0067	00072	102000	HLT	0	
0067	00073	102000	HLT	0	
0067	00074	102000	HLT	0	
0067	00075	102000	HLT	0	
0067	00076	102000	HLT	0	
0067	00077	102000	HLT	0	

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0069          *LOCATIONS 100 THRU 107 ARE RESERVED FOR HP SIO ROUTINE LINKAGES
0070          *
0071 00110 000000          ORG    110B
0072          *
0073          *      THE FOLLOWING ARE ADDRESSES FOR INTERRUPT JUMPS
0074          *      TAPE AND PRINT BUFFER LOCATIONS
0075          *
0076 00110 004000  TPBUF   OCT    4000          (30)
0077 00111 012000  PRBUF   OCT    12000        (31)
0078 00112 000601  TPIN    DEF    TPINX        (32) ADR OF TAPE COMPL ROUTINE
0079 00113 002125  RSTIN   DEF    XRST        (33) ADR OF RESTART ROUTINE
0080 00114 001165  CMDIN   DEF    COMND       (34) ADR OF M1 COMNDS ROUTINE
0081 00115 000007  TTYIN   OCT     7          (35) ADR OF TTY#1 ROUTINE (HALT)
0082 00116 000007  TTIN2   OCT     7          (36) ADR OF TTY#2 ROUTINE (HALT)
0083 00117 001165  CMIN2   DEF    COMND       (37) ADR OF M1 COMND ROUTINE
0084 00120 002357  PRIN    DEF    PRNXT
0085 00121 002725  HYINT   DEF    HINT          HYTYPER INTERRUPT ROUTINE
0086          *CMIN2 IS PERMANENT WHILE CMDIN IS DYNAMIC
0087 00122 001434  READC   DEF    XREAD        WILL CONTAIN ADR OF XREAD ROUTINE
0088 00123 001502  WRITE   DEF    XWRIT        ADR OF WRITE TO TAPE ROUTINE
0089 00124 001040  CNTRL   DEF    XCNTR        ADR OF XCNTR ROUTINE
0090 00125 002156  SETMD   DEF    XSETM        ETC...
0091 00126 002205  PRINT   DEF    XPRNT
0092 00127 002402  HTYPE   DEF    XHTYP
0093 00130 000722  SKPIT   DEF    SKPT
0094 00131 002000  HDRSR   DEF    XHDRS

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0096          * * * * *
0097          *      ADDRESSES OF VARIOUS UTILITY ROUTINES
0098          *
0099 00132 000377 RDSX      DEF  FRDSX      READ SIX BITS (FROM M1)
0100 00133 000414 RDTW      DEF  FRDTW      READ TWELVE BITS FROM M1
0101 00134 000437 SNDDA     DEF  FSNDA      SEND BYTES TO M1
0102 00135 000467 SNDM1     DEF  FSNM1
0103 00136 000474 REDY      DEF  FREDY     CHECK IF TAPE UNIT READY FOR ACTION
0104 00137 000547 RCM1      DEF  FRCM1     RECEIVE DATA FROM M1 ROUTINE
0105 00140 000554 TPSTT     DEF  FTPST     GET STATUS FROM DAC COMMAND CHNL
0106 00141 000557 OUTC      DEF  FOUTC     OUTPUT A COMMAND TO DAONICS CMND CH
0107 00142 000574 OUTF      DEF  FOUTF     SEND A CONTROL FUNCTION TO DAC CHNL
0108 00143 000606 EXIT      DEF  FEXIT     SET UP FOR TAPE IO AND RETURN
0109 00144 000620 WRING     DEF  FRING     CHECK FOR WRITE RING
0110 00145 000627 EOT       DEF  FEOT     CHECK FOR END OF TAPE
0111 00146 001313 DMAIO     DEF  FDMAI     DO DMA INPUT/OUTPUT
0112 00147 000636 RDTU      DEF  FRDTU     READ TAPE UNIT ADDRESS FROM M1
0113 00150 000705 XDVER     DEF  FDVER     DEVICE ERROR ROUTINE
0114 00151 003071 PWRIT     DEF  PWRFL     POWER FAILURE INTERRUPT POINTER
0115 00152 003152 PARIT     DEF  PARER     PARITY ERROR INTERRUPT POINTER
0116 00153 000751 START     DEF  BEGIN    REAL START OF PROGRAM
0117          * LABEL VARIABLES
0118 00154 000000 GFAIL     OCT  0        FAILURE RETURN ADDRESS FOR GCHR
0119 00155 003004 LABEL     DEF  FORCE     FORCE
0120 00156 002770 XGNC     DEF  GNCHR    GET NEXT CHARACTER
0121 00157 002611 XCHAR     DEF  CHAR     PRINT OUT CHAR
0122 00160 002660 XVERT     DEF  VERT    VERTICAL COMMAND
0123 00161 002625 XHOR     DEF  HORIZ    HORIZONTAL COMMAND
0124 00162 002710 XSHYT     DEF  SHYTY    SEND TO HYTYPE
0125 00163 002746 XHZAP     DEF  HINIT    INITIALIZE HYTYPE

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0127 00200 000000 ORG 200B
 0128 *
 0129 00200 124153 ENTER JMP START,I

0131 * * * * *
 0132 *
 0133 * OPERAND TABLE - FOR COMMANDS FROM M1
 0134 *
 0135 00201 000210 OPTAB OCT 210
 0136 00202 100122 DEF READC,I READ
 0137 00203 000202 OCT 202
 0138 00204 100123 DEF WRITE,I WRITE TAPE
 0139 00205 000213 OCT 213
 0140 00206 100124 DEF CNTRL,I TAPE CONTROL
 0141 00207 000204 OCT 204
 0142 00210 100125 DEF SETMD,I SET MODES FOR TAPE
 0143 00211 000205 OCT 205
 0144 00212 100127 DEF HTYPE,I HYTYPE IT OUT
 0145 00213 000207 OCT 207
 0146 00214 100126 DEF PRINT,I PRINT
 0147 00215 000264 OCT 264
 0148 00216 100130 DEF SKPIT,I SKIP IT
 0149 00217 000102 OCT 102
 0150 00220 100131 OPEND DEF HDRSR,I HEADER SEARCH
 0151 *
 0152 00221 000201 AOPTB DEF OPTAB
 0153 00222 000221 OPMAX DEF OPEND+1

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0155 *
0156 * * * * *
0157 *          DACONICS COMMANDS FOR TAPE UNIT
0158 00223 000011 REWDC   OCT   11          REWIND AND STANDBY (0)
0159 00224 000031 RWSDC   OCT   31          REWIND AND DESELECT (1)
0160 00225 000121 GAPDC   OCT  121          WRITE 3" BLANK TAPE (2)
0161 00226 000141 WFMDC   OCT  141          WRITE FILE MARK (3)
0162 00227 000005 BSRDC   OCT    5          BACKSPACE 1 RECORD (4)
0163 00230 000045 BSFDC   OCT   45          BACKSPACE 1 FILE (5)
0164 00231 000003 FSRDC   OCT    3          FORWARD SPACE 1 RECORD (6)
0165 00232 000043 FSFDC   OCT   43          FORWARD SPACE 1 FILE (7)
0166 *          NON-CONTROL COMMANDS
0167 00233 000203 RCCDC   OCT  203          READ 1 RECORD
0168 00234 000301 WCCDC   OCT  301          WRITE 1 RECORD
0169 00235 001400 SELDC   OCT 1400          SELECT UNIT #1
0170 00236 000110 CLRDC   OCT   10          CLEAR CONTROLLER
0171 00223 000000 CMDTB   EQU  REWDC
0172 00237 000223 ACMTB   DEF  REWDC          BEGINNING OF DAC COMMAND TABLE
0173 * * * * *
0174 *          RETURN FLAGS FIELDS
0175 00240 000000 RFLAG   OCT    0
0176 00241 000040 UNXCF   OCT   40          13 UNIT EXCEPTION FLAG
0177 00242 000020 BDCMF   OCT   20          23 BAD COMMUNICATIONS FLAG
0178 00243 000010 UNERF   OCT   10          33 UNIT ERROR FLAG
0179 00244 000004 BDCPF   OCT    4          43 BAD COMPARE FLAG.
0180 00245 000002 NTNUF   OCT    2          53 NOT ENOUGH FLAG
0181 00246 000020 ILF     OCT   20          63 INCORRECT LENGTH FLAG
0182 * * * * *
0183 *          HP => M1 RESPONSE CODES
0184 00247 000270 COMER   OCT  270          X'B8' COMMUNICATIONS ERROR
0185 00250 000261 DEVER   OCT  261          X'B1' DEVICE ERROR
0186 00251 000273 DEVNR   OCT  273          X'BB' DEVICE NOT READY
0187 00252 000264 WOKUE   OCT  264          X'B4' WRITE OK, UNIT EXCEPTION
0188 00253 000275 PFIN    OCT  275          X'BD' PRINT FINISHED
0189 00254 000276 ROK     OCT  276          X'BE' READ OK
0190 00255 000267 WOK     OCT  267          X'B7' WRITE OK
0191 00256 000277 DNBOT   OCT  277          X'BF' DISK NOT BOOTSTRAPPED
0192 * * * * *
0193 *          I/O CHANNEL DECLARATIONS (TAPE, AND M1)
0194 00000 000000 A       EQU    0
0195 00001 000000 B       EQU    1
0196 00001 000000 SR      EQU    1          SWITCH REGISTER
0197 00013 000000 M1IO    EQU  13B
0198 00011 000000 CMND    EQU  11B          START OFF WITH 9TRK (BUT CHANGES)
0199 00010 000000 DC9DC   EQU  10B
0200 00011 000000 DC9CC   EQU  11B
0201 00011 000000 DC7CC   EQU  11B          FOR FUTURE USE (NOW 9TRK DEFAULT)
0202 00012 000000 RSTRT   EQU  12B
0203 00014 000000 PR1CC   EQU  14B
0204 00015 000000 HYTCC   EQU  15B          HYTYPE CONTROL CHANNEL
0205 00016 000000 TTY1    EQU  16B          TELETYPE ADDRESS

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0207          * * * * *
0208          *          OTHER GLOBALS FOR ALL ROUTINES
0209          *
0210 00257 000000  FLAGS      OCT      0          STATE OF COMMAND VECTOR
0211 00260 077777  CPROC      OCT      77777       TURN OFF COMMAND ACTIVE BIT
0212 00261 100000  CPROS      OCT      100000      TURN ON COMMAND ACTIVE BIT
0213 00262 000000  PNTRX      OCT      0          (POINTER) ADDRESS FOR READ SIX INTO
0214 00263 000000  S1         BSS      1          FIRST OF TWO WORDS FOR SNDDA
0215 00264 000000  SEND       BSS      1          SECOND OF TWO WORDS FOR SNDDA
0216 00265 000263  PSNDA      DEF      S1         ADDRESS OF TWO WORD SNDDA BUFFER
0217 00266 000000  NUMDA      OCT      0          NUMBER OF WORDS TO SEND TO M1
0218 00267 000000  DASAV      BSS      1          SAVE CONTENTS OF A REGISTER
0219 00270 000000  TUNIT      OCT      0          TAPE UNIT ADDRESS
0220 00271 000270  ATUNT      DEF      TUNIT      ADDRESS POINTER
0221 00272 000000  RETRY      OCT      0          RETRY COUNTER IF TAPE GIVES HARD TIM
0222 00273 000000  BYTCN      OCT      0          NUMBER OF BYTES FOR READ OR WRITE
0223 00274 000273  ABYTC      DEF      BYTCN      ADR OF BYTCNT
0224          *          (8-BIT BYTES)
0225 00275 000000  PBUFF      OCT      0          ADDRESS OF PRINT OR TAPE BUFFER
0226          *
0227          *          PARAMETERS FOR DMA I/O
0228          *
0229 00002 000000  WCAD       EQU      2B
0230 00006 000000  DMAD       EQU      6B
0231 00007 000000  DMAD2      EQU      7B
0232 00276 020010  DMAC1      OCT      020010      FIRST DMA WORD
0233 00276 000000  DX118     EQU      DMAC1
0234 00277 004000  DMAC2      OCT      4000      2ND DMA CNTL WRD (TAPEBUFF EP)
0235          *
0236          * PRINTER DMA STUFF
0237          *
0238 00300 000000  PWCNT      BSS      1
0239 00301 000014  DMAP1      ABS      PR1CC
0240 00302 000000  DMAP2      BSS      1
0241 00003 000000  WCADP      EQU      3B
0242 00303 000000  PRTLM      BSS      1          PRINTER BYTE LIMIT
0243 00304 000000  PBI        BSS      1          PRINTER BYTE INDEX
0244 00305 000000  XPBUF      BSS      1          TO ALLOW USE OF EITHER TAPE OR
0245          *          PRINTER BUFFER
0246 00306 000200  NSLEW      OCT      200
0247 00307 000000  WPTR       BSS      1
0248 00310 017400  NULLE      OCT      17400      NULL CHARACTER=ASCII 37B
0249 00311 000000  NULLF      BSS      1
0250          *
0251          *          CONSTANTS
0252          *
0253 00312 000077  B77        OCT      77
0254 00313 000000  ZERO       OCT      0
0255 00314 000010  B10        OCT      10
0256 00315 000012  K10        DEC      10          DECIMAL TEN
0257 00316 000000  ODD        BSS      1

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0259          * * * * *
0260          *          PART I - - - UTILITIES - - -
0261          *
0262 00317 000500 CMNDS   DEF   CX05          READY
0263 00320 000507          DEF   CX10          REDY
0264 00321 000561          DEF   CX90          OUTC
0265 00322 000562          DEF   CX92          OUTC
0266 00323 000567          DEF   CX93          OUTC
0267 00324 000614          DEF   CX99          EXIT
0268 00325 000615          DEF   CX100         EXIT
0269 00326 000603          DEF   CX110         TPIN
0270 00327 000555          DEF   CX115         TPSTT
0271 00330 000631          DEF   CX200         EOT
0272 00331 000622          DEF   CX210         WRING
0273 00332 000276          DEF   DX118         DMAC1
0274 00333 000011 CHNL9   DEF   DC9CC         9 TRACK COMMAND CHANNEL
0275 00334 000011 CHNL7   DEF   DC7CC         NOTHING HERE
0276 00335 000000 CHNL    BSS    1
0277 00336 000317 CMLST   DEF   CMNDS
0278 00337 000000 INCR    BSS    1
0279 00340 000000 KNT     OCT    0
0280 00341 000000 CBUFF   OCT    0          CHARACTER BUFFER
0281 00342 000341 ACBUF   DEF   CBUFF         RDTW SAVE AREA
0282 00343 000000 PTXSV   OCT    0          SAVE POINTER
0283 00344 000406 MSK1    OCT    406         BUSY OR REWIND MASK
0284 00345 000000 TRHRD   OCT    0          WAITING FOR DEVICE READY COUNTER
0285 00346 000000 SAVC    OCT    0          SAVE TAPE FUNCTION COMMAND
0286 00347 100002 KBGNG   OCT    100002
0287 00350 000017 B17     OCT    17
0288 00351 177700 MSK4    OCT    177700
0289 00352 000002 K2      OCT    2
0290 00353 000064 K100   OCT    64
0291 00354 177777 KM1     OCT    177777         MINUS 1
0292 00355 177766 KM10    OCT    177766         MINUS TEN
0293 00356 000000 NRFLG   BSS    1
0294 00357 177765 KM11    DEC    -11

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0296      * * * * *
0297      *
0298      *      DISPLAY COMMUNICATIONS WITH THE M1 IN WAIT LOOP
0299      *
0300      *      BITS(S)      SIGNIFICANCE
0301      *
0302      *      0-6      LAST COMMAND FROM M1
0303      *      7      M1 HAS OUTPUT CHARACTER READY
0304      *      8-14     LAST RESPONSE FROM HP
0305      *      15     HP HAS OUTPUT A CHARACTER
0306      *
0307      *      HP RESPONSE FIELD
0308      *
0309      *      61     DEVICE ERROR
0310      *      64     WRITE OK, BUT UNIT EXCEPTION
0311      *      67     WRITE OK
0312      *      70     COMMUNICATIONS ERROR
0313      *      75     PRINT FINISHED
0314      *      76     READ OK
0315      *
0316      *
0317      *      500 COMMAND FIELD
0318      *
0319      *      2      WRITE TAPE
0320      *      4      SET TAPE MODE
0321      *      5      HYTYPE
0322      *      7      PRINT
0323      *      10     READ
0324      *      13     TAPE CONTROL
0325      *      64     SKIP IT
0326      *      77     CLEAN UP
0327      *      102    HEADER SEARCH
0328      *
0329      * * * * *
0330      *
0331      00360 000000 ENTRY  NOP      SAVE THE CALLING ADDRESS TO SEE HOW
0332      *                                     WE ENDED UP AT THE DO-NOTHING LOOP.
0333      00361 060750 LOOP   LDA    ASAVE  READY THE HP
0334      00362 010725      AND    K177  RESPONSE FIELD
0335      00363 001727      ALF,ALF
0336      00364 102313      SFS    M110  IS A FLAG SET?
0337      00365 002001      RSS
0338      00366 030726      IOR    K200  NO.
0339      00367 102213      SFC    M110  YES. ADD BIT 7
0340      00370 030727      IOR    BIT15 IS B FLAG SET?
0341      00371 070001      STA    B     YES. ADD BIT 15
0342      00372 060746      LDA    SVCMD TEMPORARY STORAGE
0343      00373 010725      AND    K177 MASK LAST COMMAND TO 7 BITS.
0344      00374 030001      IOR    B     MERGES
0345      00375 102601      OTA    SR   DISPLAY IN SWITCH REGISTER
0346      00376 024361      JMP    LOOP  AND WAIT SOME MORE

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0348          * * * * * F R D S X * * * * *
0349          *
0350 00377 000000 FRDSX  NOP  O
0351          *          READ SIX BIT DATA
0352          *          CALL WITH ADDRESS FOR VALUE IN PNTRX
0353 00400 102313 SFS  M1IO
0354 00401 024400 JMP  *-1
0355 00402 106513 LIB M1IO          GET 6-BIT DATA (11XXXXXX)
0356 00403 005727 BLF, BLF
0357 00404 005200 RBL          GET ONE BIT INTO SIGN, OTHER BIT
0358 00405 006031 SSB, SLB, RSS INTO LOW ORDER, CHECK FOR TWO BITS S
0359 00406 025234 JMP BDDAT      NO, IN ERROR
0360 00407 005124 BRS, BLR      THIS CLEARS THE TWO BITS
0361 00410 005227 RBL, BLF
0362 00411 005222 RBL, RBL      PUTS INTO LOW ORDER PART OF WORD
0363 00412 174262 STB  PNTRX, I
0364 00413 124377 JMP  FRDSX, I
0365          *
0366          * * * * * F R D T W * * * * *
0367          *          READ TWELVE BIT DATA
0368          *          CALL WITH ADDRESS FOR VALUE IN PNTRX
0369 00414 000000 FRDTW  NOP  O
0370 00415 002400 CLA
0371 00416 064262 LDB  PNTRX      SAVE POINTER
0372 00417 074343 STB  PTXSV
0373 00420 064342 LDB  ACBUF      CHARACTER BUFFER ADDRESS
0374 00421 074262 STB  PNTRX
0375 00422 114132 JSB  RDSX, I     GET FIRST SIX
0376 00423 160262 LDA  PNTRX, I
0377 00424 010350 AND  B17        GET BOTTOM FOUR BITS
0378 00425 001700 ALF  A
0379 00426 001222 RAL, RAL
0380 00427 114132 JSB  RDSX, I
0381 00430 130262 IOR  PNTRX, I   GET NEXT SIX
0382 00431 001700 ALF
0383 00432 001222 RAL, RAL
0384 00433 114132 JSB  RDSX, I
0385 00434 130262 IOR  PNTRX, I   GET FINAL SIX
0386 00435 170343 STA  PTXSV, I   STORE AWAY
0387 00436 124414 JMP  FRDTW, I

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0389          * * * * * F S N D A * * * * *
0390          *          SEND N 6 BIT (N=6) WORDS TO M1
0391          *          IN NUMDA
0392          *          VALUE IN S1, SEND          TWO CONSECUTIVE LOCATIONS
0393 00437 000000  FSNDA  NOP      0
0394 00440 060266          LDA  NUMDA
0395 00441 050313          CPA  ZERO
0396 00442 124437          JMP  FSNDA,I
0397 00443 003004          CMA,INA
0398 00444 070266          STA  NUMDA          GET NEGATIVE NUMBER OF WORDS
0399 00445 064263          LDB  S1          GET CONTENTS INTO B
0400 00446 070453          STA  GT1
0401 00447 060264          LDA  SEND          GET SECOND HALF INTO A
0402 00450 034453  DARRQ  ISZ  GT1
0403 00451 024454          JMP  DARRR
0404 00452 024456          JMP  DARPT
0405 00453 000000  GT1   OCT  0          TEMPORARY STORAGE.
0406 00454 101106  DARRR  RRR   6
0407 00455 024450          JMP  DARRQ
0408 00456 070267  DARPT  STA  DASAV
0409 00457 010312          AND  B77          GET SIX BITS
0410 00460 114135          JSB  SNDM1,I
0411 00461 034266          ISZ  NUMDA
0412 00462 024464          JMP  *+2
0413 00463 124437          JMP  FSNDA,I          FINISH
0414 00464 060267          LDA  DASAV          CONTINUE
0415 00465 100106          RRL  6          GET NEXT SIX BITS
0416 00466 024456          JMP  DARPT
0417          *
0418          * * * * * F S N M 1 * * * * *
0419          *          ROUTINE TO CHECK IF M1 READY TO RECEIVE
0420          *          AND SENDS A 6-BIT WORD WHEN IT IS * * * * *
0421 00467 000000  FSNM1  NOP      0
0422 00470 102213          SFC  M1IO
0423 00471 024470          JMP  *-1
0424 00472 102613          OTA  M1IO
0425 00473 124467          JMP  FSNM1,I

```

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0427          * * * * * F R E D Y * * * * *
0428          *          CHECK TO SEE IF THE TAPE DEVICE IS READY
0429 00474 000000  FREDY  NOP      O
0430          * ERROR RETURN (FREDY), GOOD RETURN (FREDY)+1
0431 00475 060235          LDA  SELDC          SELECT COMMAND
0432 00476 006400          CLB
0433 00477 075275          STB  EOF LG          NOT READY FLAG
0434 00500 102611  CX05   OTA  CMND          SELECT COMMAND
0435 00501 006400          CLB
0436 00502 074356          STB  NRFLG          NOT READY FLAG
0437 00503 064315          LDB  K10
0438 00504 074272          STB  RETRY          10 RETRIES
0439 00505 064353          LDB  K100
0440 00506 074345          STB  TRHRD          FOR REPEATED ATTEMPTS AT DEVICE SELE
0441 00507 102511  CX10   LIA  CMND          GET STATUS
0442 00510 001727          ALF,ALF
0443 00511 002011          SLA,RSS          TAPE OFF LINE
0444 00512 024521          JMP  *+7
0445 00513 060270  NONO   LDA  TUNIT          YES NOTIFY VIA DEVICE ERROR
0446 00514 070264          STA  SEND          SEND TAPE UNIT ADDRESS
0447 00515 060352          LDA  K2          (TWO BYTES)
0448 00516 070266          STA  NUMDA
0449 00517 114150          JSB  XDVER,I          GO AND TATTLE
0450 00520 124474          JMP  FREDY,I          WANT TO ERROR RETURN
0451 00521 010344          AND  MSK1          BUSY OR REWIND?
0452 00522 002003          SZA,RSS
0453 00523 024545          JMP  OKNOW          ITS OK NOW
0454 00524 034345          ISZ  TRHRD
0455 00525 024507          JMP  CX10
0456 00526 060356          LDA  NRFLG          CHECK ON NOT READY FLAG.
0457 00527 002002          SZA
0458 00530 024542          JMP  GRIND          DEVNR ALREADY SENT, THEY KNOW.
0459 00531 002004          INA
0460 00532 070356          STA  NRFLG
0461 00533 060251          LDA  DEVNR
0462 00534 114135          JSB  SNDM1,I
0463 00535 060270          LDA  TUNIT
0464 00536 070264          STA  SEND
0465 00537 060352          LDA  K2
0466 00540 070266          STA  NUMDA
0467 00541 114134          JSB  SNDDA,I
0468 00542 064347  GRIND  LDB  KBGNG
0469 00543 074345          STB  TRHRD
0470 00544 024507          JMP  CX10
0471 00545 034474  OKNOW  ISZ  FREDY
0472 00546 124474          JMP  FREDY,I          GOTO NORMAL RETURN POINT

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```

0474      * * * * * F R C M 1 * * * * *
0475      *
0476 00547 000000  FRCM1  NOP  O
0477 00550 102313      SFS  M110
0478 00551 024550      JMP  *-1
0479 00552 102513      LIA  M110
0480 00553 124547      JMP  FRCM1,I
0481      *
0482      * * * * * F T P S T * * * * *
0483      *      GET TAPE STATUS (POSITION, WRITE RING, ETC)
0484 00554 000000  FTPST  NOP  O
0485 00555 102511  CX115  LIA  CMND
0486 00556 124554      JMP  FTPST,I
0487      *
0488      * * * * * F O U T C * * * * *
0489      *      ROUTINE TO OUTPUT A COMMAND TO DAONICS CMND CHNNEL
0490 00557 000000  FOUTC  NOP  O
0491 00560 070346      STA  SAVC          SAVE DAC COMMAND (FROM REG A)
0492 00561 102611  CX90   OTA  CMND          OUTPUT COMMAND
0493 00562 102511  CX92   LIA  CMND          GET TAPE STATUS
0494 00563 010314      AND  B10
0495 00564 002003      SZA,RSS          COMMAND REJECTED?
0496 00565 124557      JMP  FOUTC,I     NO
0497 00566 064236      LDB  CLRDC        YES
0498 00567 106611  CX93   OTB  CMND          CLEAR THE CONTROLLER
0499 00570 002404      CLA,INA
0500 00571 114143      JSB  EXIT,I
0501 00572 060346      LDA  SAVC          DO COMMAND AGAIN
0502 00573 024561      JMP  CX90
0503      *      RETRY COUNTER TO BE INSERTED HERE IF INFINITE LOOPS
0504      *      ARE A HAZARD
0505      *
0506      * * * * * F O U T F * * * * *
0507      *      OUTPUT A FUNCTION
0508 00574 000000  FOUTF  NOP  O
0509 00575 114141      JSB  OUTC,I
0510 00576 002404      CLA,INA
0511 00577 114143      JSB  EXIT,I
0512 00600 124574      JMP  FOUTF,I
0513      * RETURN POINT FROM TAPEIO VIA INTERRUPT CONTROL MECHANISM
0514 00601 000000  TPINX  NOP  O
0515 00602 103100      CLF  O            TURN OFF INTERRUPT SYSTEM
0516 00603 106711  CX110  CLC  CMND          CLEAR COMMAND CHANNEL CONTROL
0517 00604 102100      STF  O            TURN ON INTERRUPTS SYSTEM
0518 00605 124606      JMP  FEXIT,I     EXIT TO CORRECT ROUTINE

```

```

0520      * * * * * F E X I T * * * * *
0521      *      SET UP FOR RETURN VIA INTERRUPT PROCESS
0522 00606 000000 FEXIT  NOP   O
0523 00607 103100      CLF   O      DISABLE INTERRUPT SYSTEM
0524 00610 002011      SLA,RSS  SET COMMAND CONTROL F/F
0525 00611 024612      JMP  *+1  ALWAYS DO IT
0526 00612 001110      ARS,SLA  SET DMA CONTROL F/F?
0527 00613 103706      STC   DMAD,C  SET DMA INTERRUPT CONTROL
0528 00614 103111 CX99   CLF   CMND
0529 00615 102711 CX100  STC   CMND      SET CMND CHNL INT. CONTROL
0530 00616 102100      STF   O      ENABLE INTERRUPT SYSTEM
0531 00617 014360      JSB  LOOP-1  I/O WAIT
0532 00620 000000 FRING  NOP   O
0533 00621 074474      STB  FREDY   RETURN POINT FOR ERROR
0534 00622 102511 CX210  LIA  CMND
0535 00623 001727      ALF,ALF
0536 00624 002020      SSA      WRITE PROTECTED?
0537 00625 024513      JMP  NONO   YES, FLAG VIA DEVICE ERROR
0538 00626 124620      JMP  FRING,I  ITS OK
0539      *
0540      * * * * * F E O T * * * * *
0541      *      CHECK IF END OF TAPE ENCOUNTERED
0542 00627 000000 FEOT  NOP   O
0543 00630 074474      STB  FREDY   RETURN POINT FOR ERROR
0544 00631 102511 CX200  LIA  CMND
0545 00632 001727      ALF,ALF
0546 00633 001710      ALF,SLA   EOT?
0547 00634 024513      JMP  NONO   YES
0548 00635 124627      JMP  FEOT,I  ITS OK

```



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0550          * * * * * F R D T U * * * * *
0551          *      READS TAPE UNIT ADDRESS AND PUTS IN TUNIT
0552          *      ALSO PUTS 7 TRK OR 9 TRK CONTROLLER ADDRESS
0553          *      IN CHANNEL PART OF TAPE COMMANDS
0554 00636 000000 FRDTU  NOP    O
0555 00637 060271      LDA    ATUNT
0556 00640 070262      STA    PNTRX
0557 00641 114132      JSB    RDSX,I
0558 00642 002404      CLA,INA      A=1 MEANS 9 TRACK
0559 00643 024646      JMP    *+3      KLUDGE TO ACCEPT BOTH.
0560 00644 024646      JMP    *+2
0561 00645 025240      JMP    UNERR    WRONG TAPE UNIT NUMBER
0562 00646 060333      LDA    CHNL9    NOW ONLY 9 TRACK, EASY TO MODIFY
0563 00647 070335      STA    CHNL     TO DECIDE FOR 7 TRACK
0564 00650 064336      LDB    CMLST    LIST OF CHANNEL COMMAND ADDRESSES
0565 00651 074337      STB    INCR
0566 00652 164337      LDB    INCR,I   B=ADDR OF FIRST OF COMMANDS
0567 00653 160001      LDA    B,I     A=COMMAND
0568 00654 010312      AND    B77     CHECK IF SAME CONTROLLER
0569 00655 050335      CPA    CHNL
0570 00656 124636      JMP    FRDTU,I  YES
0571 00657 060357      LDA    KM11    (PARAMETER) COMMANDS PRESENT IS ELEV
0572 00660 070340      STA    KNT
0573 00661 160001 MORE  LDA    B,I     LOOP, AND PUT IN CHANNEL NUMBER
0574 00662 010351      AND    MSK4
0575 00663 030335      IOR    CHNL
0576 00664 170001      STA    B,I
0577 00665 034340      ISZ    KNT     ALL COMMANDS FINISHED?
0578 00666 024670      JMP    JM624   NO
0579 00667 024673      JMP    *+4     YES
0580 00670 034337 JM624 ISZ    INCR
0581 00671 164337      LDB    INCR,I  GET NEXT ADDRESS
0582 00672 024661      JMP    MORE
0583 00673 034337      ISZ    INCR
0584 00674 164337      LDB    INCR,I
0585 00675 060335      LDA    CHNL
0586 00676 040354      ADA    KM1
0587 00677 070335      STA    CHNL
0588 00700 160001      LDA    B,I
0589 00701 010351      AND    MSK4
0590 00702 030335      IOR    CHNL
0591 00703 170001      STA    B,I
0592 00704 124636      JMP    FRDTU,I
0593          *      A HAS COMMAND, B HAS ADDRESS

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```

0595      * * * * * F D V E R * * * * *
0596      *      RETURN POINT FOR DEVICE (IE TAPE OR PRINT)
0597      *      FOR THE CONDITION WHERE
0598      *      UNRECOVERABLE ERROR (EG RETRIES EXHAUSTED, UNABLE TO SELECT,
0599      *      OR TAPE UNIT OFF-LINE)
0600      *      INSERT CODE FOR POSSIBLE BRANCH TO RESTART HERE
0601      *      UPON ENTRY (TAPE) UNIT ADDRESS IN SEND
0602      *      COUNT IN NUMDA
0603 00705 000000 FDVER  NOP  O
0604 00706 103100      CLF  O          DISABLE INTERRUPT SYSTEM
0605 00707 060250      LDA  DEVER
0606 00710 070750      STA  ASAVE          SAVE HP RESPONSE TO M1 COMMANDS
0607 00711 114135      JSB  SNDM1,I      TELL M1 DEVERR
0608 00712 114134      JSB  SNDDA,I
0609 00713 060257      LDA  FLAGS
0610 00714 010260      AND  CPROC          FREE FOR A NEW COMMAND
0611 00715 070257      STA  FLAGS
0612 00716 060315      LDA  K10
0613 00717 070272      STA  RETRY          RESET RETRY COUNTER
0614 00720 102100      STF  O          ENABLE INTERRUPT SYSTEM
0615 00721 014360      JSB  LOOP-1        GO TO LOOP UNTIL ACKNOWLEDGEMENT
0616      *      SKIPIT OR REPEAT
0617 00722 000000 SKPT  NOP  O
0618      *      MAKE AS IF IO WAS DONE PROPERLY
0619 00723 124705      JMP  FDVER,I

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0621          * * * * *
0622          *          PART 2 -- LOCAL CONSTANTS
0623 00724 177770  TBITS   OCT   177770
0624 00725 000177  K177    OCT   177          7 BIT MASK
0625 00726 000200  K200    OCT   200
0626 00727 100000  BIT15   OCT  100000
0627 00730 000004  K4      DEC   4
0628 00731 177774  KM4     DEC  -4
0629          * XCNTR  VARIABLES:
0630 00732 000000  DUM     OCT   0
0631 00733 000000  CTRSV   OCT   0          SAVE CONTROL COMMAND
0632 00734 000000  CNTOP   OCT   0          CONTROL COMMAND FOR TAPE UNIT
0633 00735 000732  ADUM    DEF   DUM          ADDRESS FOR DUM
0634 00736 000734  ACNTP   DEF   CNTOP
0635          *
0636          * * * * * M1 COMMAND DECLARATIONS * * * * *
0637          *
0638 00737 000277  CNULL   OCT   277          SPECIAL CODE FROM M1 (KDF CLEANUP)
0639 00740 001265  ABD1    DEF   BADD1          ADDRESS OF BADD1
0640 00741 177400  HIHAF   OCT  177400
0641 00742 000000  TC1     OCT   0          SAVE REGISTER
0642 00743 000000  TC2     OCT   0          SAVE REGISTER
0643 00744 000000  TC3     OCT   0          SAVE REGISTER
0644 00745 000000  TC4     OCT   0          SAVE REGISTER
0645 00746 000000  SVCMD   OCT   0          SAVE COMMAND CODE
0646 00747 000000  CMDSV   OCT   0          SAVE M1 COMMAND
0647 00750 000000  ASAVE   OCT   0          SAVE HP RESPONSE

0649          *
0650          *          PROGRAM START ENTRY POINT
0651          *
0652 00751 103100  BEGIN   CLF   0          TURN OFF INTERRUPTS
0653          CLF,CLF          CLA,CLE          RESET START COUNTER
0654          STA   FLAGS          RESET FLAGS
0655 00754 002004  CLEAN   INA          INCREMENT COUNTER
0656 00755 102601  OTA    SR          DISPLAY COUNT
0657 00756 002040  SEZ          FINISHED ON OVERFLOW
0658 00757 024766  JMP    INIT          GIVE UP TRYING
0659 00760 102313  SFS    M1IO          TRY TO CLEAR OUT CHARACTERS FROM M1
0660 00761 024754  JMP    CLEAN          FOR ABOUT .5 SEC
0661 00762 106513  LIB    M1IO
0662 00763 054737  CPB    CNULL          UNTIL WE GET A 277 FROM KDF CLEANUP
0663 00764 024766  JMP    INIT
0664 00765 024754  JMP    CLEAN

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```
0666          *      INITIALIZE INTERRUPT SYSTEM
0667          *      MOST LOCATIONS INITIALIZED AT ASSEMBLE TIME
0668          *
0669 00766 103100  INIT      CLF      0          DISABLE INTERRUPT SYSTEM
0670 00767 061022          LDA      LEN
0671 00770 071023          STA      LIMIT
0672 00771 061024          LDA      AINIT
0673 00772 070266          STA      NUMDA      BEGINNING OF INTERRUPT COMNDS
0674 00773 064730          LDB      K4        BEGINNING OF INTERRUPT LOCATIONS
0675 00774 160266          LDA      NUMDA,I   GET INSTRUCTION
0676 00775 170001          STA      B,I      STORE IT IN LOCATION
0677 00776 006004          INB
0678 00777 034266          ISZ      NUMDA    GET NEXT INTERRUPT LOCATION
0679 01000 035023          ISZ      LIMIT    GET NEXT INSTRUCTION
0680 01001 024774          JMP      *-5     ARE WE THROUGH?
0681 01002 060117          LDA      CMIN2
0682 01003 070114          STA      CMDIN    NOPE
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0684      *      CLEAR TAPE CONTROLLER(S) AND OTHER DEVICES
0685 01004 060236      LDA      CLRDC
0686 01005 102611      OTA      DC9CC
0687 01006 102311      SFS      DC9CC
0688 01007 025006      JMP      *-1
0689      *      CLEAR DMAIO      ABORT, IF WAS DOING
0690 01010 106706      CLC      DMAD      DMA SET TO INACTIVE STATE
0691 01011 106707      CLC      DMAD2     DMA SET TO INACTIVE STATE
0692      *      FOLLOW SUIT FOR ALL OTHER DEVICES
0693 01012 106711      CLC      DC9CC
0694 01013 106710      CLC      DC9DC
0695 01014 106716      CLC      TTY1
0696 01015 114163      JSB      XHZAP,I      INITIALIZE THE HYTYPE
0697      *
0698      *      ALL INITIALIZED EXCEPT FOR M1IO AND RESTART
0699      *      WHICH WE WANT CONTROL TO BE ALWAYS SET
0700 01016 103712      STC      RSTRT,C
0701 01017 103713      STC      M1IO
0702      *      OK: WAIT
0703 01020 102100      STF      0
0704 01021 014360      JSB      LOOP-1
0705 01022 177765      LEN  ABS INITX-TAIL
0706 01023 000000      LIMIT BSS      1
0707 01024 001025      AINIT DEF      INITX
0708 01025 114151      INITX JSB      PWRIT,I      POWER FAIL INTERRUPT
0709 01026 114152      JSB      PARIT,I      PARITY ERROR INTERRUPT
0710 01027 106706      CLC      DMAD      LOC 6 DMAIO RETURN (IGNORE)
0711 01030 106707      CLC      DMAD2
0712 01031 102010      HLT      10B      LOC 10 DAONICS DATA CHANNEL
0713 01032 114112      JSB      TPIN,I      LOC 11 DAONICS CONTROL CHANNEL
0714 01033 114113      JSB      RSTIN,I      LOC 12 RESTART INTERRUPT
0715 01034 114114      JSB      CMDIN,I      LOC 13 COMMAND INTERRUPT
0716 01035 114120      JSB      PRIN,I      LOC 14 PRINTER CHNL 1 INTERRUPT
0717 01036 114121      JSB      HYINT,I      LOC 15 HYTYPE INTERRUPT
0718 01037 106716      CLC      TTY1      IGNORE TTY INTERRUPTS
0719 01040 000000      TAIL  EQU      *

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102713

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0721          * * * * * X C N T R * * * * *
0722 01040 000000 XCNTR  NOP  O
0723          *          TAPE MOTION CONTROL IS HANDLED HERE
0724          *
0725 01041 114147      JSB  RDTU,I          GET TAPE UNIT # AND INITIALIZE
0726          *          FOR COMMANDS IF NECESSARY
0727          *          PUT COMMAND (TAPE CONTROL) IN CNTOP, COUNT IN DUM
0728 01042 060735      LDA  ADUM          COUNT ADDRESS
0729 01043 070262      STA  PNTRX         GET COUNT
0730 01044 114132      JSB  RDSX,I          GET NUMBER OF OPERATIONS
0731 01045 060736      LDA  ACNTP         COMMAND OPERATOR ADDRESS
0732 01046 070262      STA  PNTRX
0733 01047 114132      JSB  RDSX,I          GET COMMAND
0734 01050 060724      LDA  TBITS         COMMAND MASK
0735 01051 010734      AND  CNTOP         IF .NE. 0, THEN CNTOP TOO LARGE.
0736 01052 002002      SZA  A
0737 01053 025242      JMP  BDCOP
0738 01054 114136      JSB  REDY,I
0739          *          CHECK TO SEE IF DEVICE IS READY, FOR EXAMPLE
0740          *          THE TAPE MIGHT BE OFF LINE, BUSY OR UNAVAILABLE
0741          *          FOR SOME REASON OR ANOTHER
0742          *          FIRST LOCATION AFTER IS AN ERROR RETURN
0743 01055 025156      JMP  XCNTF         WELL, TOO BAD.
0744 01056 060734      ONWRD LDA  CNTOP         CONTROL OPCODE
0745 01057 002003      SZA,RSS
0746 01060 025071      JMP  REWC         =0 GO TO REWIND COMMAND
0747 01061 003004      CMA,INA         NEGATE CONTROL OPCODE
0748 01062 002007      INA,SZA,RSS
0749 01063 025073      JMP  REWS         =1 REWIND AND DESELECT
0750 01064 002007      INA,SZA,RSS
0751 01065 025075      JMP  GAPC         =2 GAP
0752 01066 002007      INA,SZA,RSS
0753 01067 025103      JMP  WFMC         =3 WRITE FILE MARK
0754 01070 025111      JMP  POSIT        >3 MUST BE POSITION COMMAND
0755 01071 060223      REWC  LDA  REWDC        REWIND
0756 01072 025147      JMP  REW          GO
0757 01073 060224      REWS  LDA  RWSDC        REWIND AND DESELCT
0758 01074 025147      JMP  REW
0759 01075 065146      GAPC  LDB  AXCNT
0760 01076 114144      JSB  WRING,I
0761 01077 114145      JSB  EOT,I          CHECK ON END OF TAPE
0762 01100 060225      LDA  GAPDC        GAP IT
0763 01101 114142      JSB  OUTF,I
0764 01102 025156      JMP  XCNTF
0765 01103 065146      WFMC  LDB  AXCNT
0766 01104 114144      JSB  WRING,I          CHECK IF WRITE PROTECTED
0767 01105 114145      JSB  EOT,I          END OF TAPE?
0768 01106 060226      LDA  WFMDC        WRITE FILE MARK
0769 01107 114142      JSB  OUTF,I          GO
0770 01110 025156      JMP  XCNTF

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		*	CONTROL OPERATIONS TO PERFORM	
0772				
0773	01111 064732	POSIT	LDB DUM	NEGATE COUNT FOR NUMBER OF
0774	01112 007004		CMB,INB	
0775	01113 074732		STB DUM	
0776	01114 006021		SSB,RSS	BAD COUNT
0777	01115 025156		JMP XCNTF	SO IGNORE IT.
0778	01116 060237		LDA ACMTB	BEGINNING OF DAC COMMAND TABLE
0779	01117 040734		ADA CNTOP	
0780	01120 160000		LDA A,I	
0781	01121 070733		STA CTRSV	
0782	01122 114140	LP1	JSB TPSTT,I	
0783	01123 070001		STA B	
0784	01124 060733		LDA CTRSV	
0785	01125 001310		RAR,SLA	CHECK IF FORWARD OR BACKWARD
0786	01126 025133		JMP *+5	
0787	01127 005727		BLF,BLF	BACKWARDS
0788	01130 005723		BLF,RBR	POSITION 4 => POSITION 0
0789	01131 004010		SLB	
0790	01132 025156		JMP XCNTF	BOT? YES, FINISH.
0791	01133 025137		JMP SENDC	
0792	01134 005727		BLF,BLF	FORWARD
0793	01135 005700		BLF	POSITION 3 => POSITION 0
0794	01136 025156		JMP XCNTF	
0795	01137 001200	SENDC	RAL	RESTORE COMMAND (MOVE BITS BACK)
0796	01140 114142		JSB OUTF,I	ORDER IT DONE
0797	01141 034732		ISZ DUM	ENOUGH TIMES, FINSHED?
0798	01142 025144		JMP *+2	
0799	01143 025156		JMP XCNTF	YES
0800	01144 060733		LDA CTRSV	NO,DO MORE
0801	01145 025122		JMP LP1	
0802	01146 001156	AXCNT	DEF XCNTF	
0803	01147 071163	REW	STA KEEP	
0804	01150 114140		JSB TPSTT,I	
0805	01151 011164		AND BOT	ALREADY AT BOT?
0806	01152 002002		SZA	
0807	01153 025156		JMP XCNTF	YES
0808	01154 061163		LDA KEEP	NO
0809	01155 114142		JSB OUTF,I	REWIND
0810	01156 061040	XCNTF	LDA XCNTR	FIXUP FOR RETURN THRU WRITE ROUTINE
0811	01157 170123		STA WRITE,I	
0812	01160 002400		CLA	
0813	01161 071275		STA EOFLG	
0814	01162 025526		JMP BYPAS	
0815	01163 000000	KEEP	BSS 1	
0816	01164 000040	BOT	OCT 40	BOTTOM OF TAPE CODE.

```

0818          * * * * * C O M N D * * * * *
0819          *      ENTRY POINT FOR RECEIVING M1 COMMANDS
0820 01165 000000  COMND  NOP   0      COMMAND ENTRY ROUTINE
0821 01166 103100          CLF   0      DISABLE INTERRUPTS
0822 01167 070742          STA  TC1
0823 01170 074743          STB  TC2      SAVE REGISTERS
0824 01171 060257          LDA  FLAGS  CHECK THAT NO COMMAND ALREADY IN PRO
0825 01172 002020          SSA
                                UNACCEPTABLE
0826 01173 025232          JMP  UNXCC
0827 01174 103513          LIA  M1IO,C  GET COMMAND
0828 01175 070746  MEG    STA  SVCMD  SAVE COMMAND
0829 01176 050737          CPA  CNULL  IS IT A CLEAN UP/RESTART
0830 01177 024766          JMP  INIT   YES
0831 01200 064221          LDB  AOPTB  NO. SET A AS A POINTER TO OP TABLE
0832 01201 150001  CHOCH  CPA  B,I    TRY TO MATCH COMMAND NAME
0833 01202 025207          JMP  MATCH  OK
0834 01203 044352          ADB  K2    NO. TRY NEXT ENTRY
0835 01204 054222          CPB  OPMAX  HAVE WE GONE TOO FAR?
0836 01205 025236          JMP  BDCOM  YES. GIVE UP TRYING
0837 01206 025201          JMP  CHOCH  NO. TRY AGAIN
0838          *
0839 01207 006004  MATCH  INB
                                BUMP A TO SUBROUTINE ERROR
0840 01210 164001          LDB  B,I    GET ADDRESS INTO B
0841 01211 060257          LDA  FLAGS  SET COMMAND IN PROGRESS FLAGS
0842 01212 030261          IOR  CPROS
0843 01213 070257          STA  FLAGS
0844          * SAVE STATE
0845 01214 061165          LDA  COMND
0846 01215 070747          STA  CMDSV
0847 01216 060742          LDA  TC1
0848 01217 070744          STA  TC3
0849 01220 060743          LDA  TC2
0850 01221 070745          STA  TC4
0851 01222 102100          STF  0      ENABLE INTERRUPTS
0852 01223 114001          JSB  B,I

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0854	C1224	060257	RETRN	LDA	FLAGS	GET COMMAND MASK
0855	01225	010260		AND	CPROC	READY TO OBTAIN NEW COMMAND
0856	01226	070257		STA	FLAGS	
0857	C1227	060744		LDA	TC3	
0858	01230	064745		LDB	TC4	
0859	01231	124747		JMP	CMDSV, I	
0860	01232	064241	UNXCC	LDB	UNXCF	UNIT EXCEPTION
0861	01233	025245		JMP	BADD	
0862	01234	102027	BDDAT	HLT	27B	
0863	01235	025234		JMP	BDDAT	TRAP THE ERROR.
0864	01236	064242	BDCOM	LDB	BDCMF	BAD COMMUNICATIONS
0865	01237	025245		JMP	BADD	
0866	01240	064243	UNERR	LDB	UNERF	UNIT ERROR
0867	C1241	025245		JMP	BADD	
0868	C1242	064244	BDCOP	LDB	BDCPF	BAD TAPE CONTROL OPERATOR
0869	01243	025245		JMP	BADD	
0870	01244	064245	NTENU	LDB	NTNUF	NOT ENOUGH
0871	01245	103100	BADD	CLF	O	DISABLE INTERRUPT SYSTEM
0872	01246	060247		LDA	COMER	COMMUNICATION ERROR
0873	01247	070750		STA	ASAVE	SAVE HP RESPONSE TO M1 COMMANDS
0874	01250	114135		JSB	SNDM1, I	
0875	01251	060001		LDA	B	ERROR TYPE
0876	01252	114135		JSB	SNDM1, I	
0877			*			
0878	01253	060257	GRACE	LDA	FLAGS	CLEAR COMMAND IN PROGRESS FLAG
0879	01254	010260		AND	CPROC	
0880	01255	070257		STA	FLAGS	
0881	01256	102100		STF	O	ENABLE INTERRUPTS
0882	01257	102313	SANDY	SFS	M1IO	
0883	01260	025257		JMP	*-1	
0884	01261	107513		LIB	M1IO, C	
0885	01262	054737		CPB	CNULL	
0886	01263	024766		JMP	INIT	
0887	01264	025257		JMP	SANDY	
0888	01265	103100	BADD1	CLF	O	DISABLE INTERRUPTS
0889	01266	060117		LDA	CMIN2	
0890	01267	070114		STA	CMDIN	
0891	01270	060747		LDA	CMDSV	
0892	01271	071165		STA	COMND	
0893	C1272	102100		STF	O	
0894	01273	025175		JMP	MEG	

```

0896          * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
0897          *          PART 3 LOCAL VARIABLES
0898 01274 000000 SAVC2   OCT    0          FOR SAVING READ OR WRITE COMMAND
0899 01275 000000 EOFLG   BSS    1          END OF FILE FLAG
0900 01276 000000 ILFLG   BSS    1          INCORRECT LENGTH FLAG
0901 01277 000000 SHPSV   BSS    1 BUFFER FOR PUT ROUTINE
0902 01300 000000 RDWRT   BSS    1          READ OR WRITE TAPE FLAG
0903 C1301 000000 SVKNT   BSS    1
0904 01302 000120 B120    OCT   120
0905 01303 000003 B3      OCT    3
0906 01304 000006 B6      OCT    6
0907 01305 100000 DMAIN   OCT  100000          DMA INPUT FLAG
0908 01306 077777 DMAOT   OCT   77777          OUTPUT FLAG SET
0909 01307 000006 K6      DEC    6
0910 01310 177772 KM6    DEC   -6
0911 01311 001526 APASS   DEF   BYPAS
0912 01312 001371 ABRET   DEF   BRET

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0914          * * * * * F D M A I * * * * *
0915          *      THIS DOES DMA IO FOR READ AND WRITE AND HDRSRCH
0916          *      GOOD RETURN (FDMAI) +1
0917          *      ERROR RETURN (FDMAI)
0918 01313 000000  FDMAI  NOP
0919 01314 071274          STA  SAVC2
0920 01315 064273          LDB  BYTCN
0921 01316 005100          BRS
0922 01317 002404          CLA,INA
0923 01320 010273          AND  BYTCN
0924 01321 070316          STA  ODD
0925 01322 044000          ADB  A
0926 01323 074273          STB  BYTCN
0927 01324 025374          JMP  BRET+3
0928 01325 064276  DMAEN  LDB  DMAC1          FIRST DMA WORD
0929 01326 106606          OTB  DMAD          ASSIGNS IO CHANNEL
0930 01327 064277          LDB  DMAC2
0931 01330 106702          CLC  WCAD          SECOND DMA WORD
0932 01331 106602          OTB  WCAD          BUFFER ADDRESS
0933 01332 064273          LDB  BYTCN
0934 01333 007004          CMB,INB
0935 01334 102702          STC  WCAD          THIRD DMA WORD
0936 01335 106602          OTB  WCAD          BUFFER LENGTH
0937 01336 114141          JSB  OUTC,I
0938 01337 061303          LDA  B3          SET UP FOR RETURN VIA INTERRUPT
0939 01340 114143          JSB  EXIT,I
0940 01341 114140          JSB  TPSTT,I          GET TAPE STATUS (E.G. EOF)
0941 01342 011302          AND  B120
0942 01343 002002          SZA          EOF OR EOT?
0943 01344 025376          JMP  EOFL          YES
0944 01345 071275          STA  EOFLG          NO EOFLG=0
0945 01346 114140          JSB  TPSTT,I          CHECK FOR P.E., TIMING ERROR
0946 01347 010730          AND  K4          ACTUAL LONGER THAN REQUESTED?
0947 01350 002003          SZA,RSS
0948 01351 025360          JMP  BACK          IT'S OK.
0949 01352 060277          LDA  DMAC2
0950 01353 002021          SSA,RSS
0951 01354 025360          JMP  BACK
0952 01355 060273          LDA  BYTCN
0953 01356 006400          CLB
0954 01357 025406          JMP  UGH
0955 01360 114140  BACK  JSB  TPSTT,I
0956 01361 011304          AND  B6
0957 01362 002003          SZA,RSS
0958 01363 025400          JMP  CLNUP          NO
0959 01364 034272          ISZ  RETRY          YES, RETRY AT LEAST 10 TIMES
0960 01365 025372          JMP  *+5
0961 01366 061312          LDA  ABRET          'NO WAY'
0962 01367 070474          STA  FREDY
0963 01370 024513          JMP  NONO

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0965 01371 025412 BRET JMP CONVB ERROR RETURN
0966 01372 060227 LDA BSRDC BACKSPACE OVER BAD RECORD
0967 01373 114142 JSB OUTF,I
0968 C1374 061274 LDA SAVC2
0969 01375 025325 JMP DMAEN
0970 01376 002404 EOFL CLA,INA WAS EOF,EOT SO SET EOF LG=1
0971 01377 071275 STA EOF LG
0972 01400 102702 CLNUP STC WCAD
0973 01401 102502 LIA WCAD
0974 01402 006400 CLB
0975 01403 040273 ADA BYTCN GET ACTUAL
0976 C1404 050273 CPA BYTCN SAME AS REQUESTED?
0977 01405 025407 JMP *+2 YES
0978 01406 006004 UGH INB NO
0979 01407 075276 STB ILFLG ILFLG=0, CORRECT LENGTH
0980 01410 070273 STA BYTCN ILFLG=1, INCORRECT LENGTH
0981 01411 035313 ISZ FDMAI
0982 01412 064273 CONVB LDB BYTCN
0983 01413 005000 BLS
0984 01414 060316 LDA ODD
0985 01415 000010 SLA
0986 01416 044354 ADB KM1
0987 01417 074273 STB BYTCN
0988 01420 125313 JMP FDMAI,I
0989 *
0990 * * * * * * * * * * * * * * * * SHPIT UTILITIES * * * * * * * * * * * * * * * *
0991 *
0992 01421 000000 GET NOP 0
0993 01422 114137 JSB RCM1,I
0994 01423 010312 AND B77
0995 C1424 125421 JMP GET,I
0996 01425 000000 PUT NOP 0 WSHP IN SHIPIT
0997 01426 100106 RRL 6
0998 01427 071277 STA SHPSV
0999 01430 010312 AND B77
1000 01431 114135 JSB SNDM1,I
1001 01432 061277 LDA SHPSV
1002 01433 125425 JMP PUT,I

```

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1004          * * * * * X R E A D * * * * *
1005          *      READ FROM TAPE ROUTINE
1006  C1434 000000 XREAD  NOP      O
1007  01435 114147          JSB  RDTU,I      GET UNIT #, INITIALIZE IF NECESSARY
1008  01436 060274          LDA  ABYTC      GET WORD COUNT
1009  01437 070262          STA  PNTRX
1010  01440 114133          JSB  RDTW,I
1011          *      NOW READ TAPE BUT FIRST CHECK IF READ
1012  01441 114136          JSB  REDY,I
1013  01442 025457          JMP  PASS      ERROR RETURN
1014          *      AT THIS POINT THE DEVICE IS READY
1015  01443 060277          LDA  DMAC2      SET UP FOR INPUT
1016  01444 031305          IOR  DMAIN      INPUT FLAG SET
1017  01445 070277          STA  DMAC2
1018  01446 060233          LDA  RCCDC
1019  01447 114146          JSB  DMAIO,I
1020  01450 025457          JMP  PASS      ERROR RETURN
1021          *      SEND BACK TO M1
1022  01451 060110 HDREP  LDA  TPBUF
1023  01452 070275          STA  PBUFF      TAPE BUFFER
1024  01453 002400          CLA
1025  01454 071300          STA  RDWRT      A=0 READ TAPE=> HP => M1
1026  01455 170265          STA  PSNDA,I    CLEAR OUT BUFFER
1027  01456 015535          JSB  SHPIT
1028  01457 060254          LDA  ROK
1029  01460 070750          STA  ASAVE      SAVE HP RESPONSE TO M1 COMMANDS
1030  01461 114135          JSB  SNDM1,I
1031  01462 061303          LDA  B3
1032  01463 070266          STA  NUMDA
1033  01464 064273          LDB  BYTCN
1034  01465 074264          STB  SEND      SEND BACK BYTE COUNT
1035  01466 114134          JSB  SNDDA,I
1036          * NOW SEND BACK FLAGS
1037  01467 002400          CLA
1038  01470 006404          CLB,INB
1039  01471 055275          CPB  EOFLG      SET?
1040  01472 030241          IOR  UNXCF      YES
1041  01473 055276          CPB  ILFLG      SET?
1042  01474 030246          IOR  ILF        YES
1043  01475 070264          STA  SEND
1044  01476 002404          CLA,INA
1045  01477 070266          STA  NUMDA
1046  01500 114134          JSB  SNDDA,I
1047  01501 125434          JMP  XREAD,I

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1049          * * * * * X W R I T * * * * *
1050          * THIS IS THE WRITE TO TAPE ROUTINE
1051 01502 000000 XWRIT  NOP      O
1052 01503 114147      JSB  RDTU,I      GET UNIT # INITIALIZE IF NECESSARY
1053 01504 060274      LDA  ABYTC
1054 01505 070262      STA  PNTRX
1055 01506 114133      JSB  RDTW,I      GET WORD COUNT
1056 01507 060110      LDA  TPBUF
1057 01510 070275      STA  PBUFF      TAPEBUFF ADDR
1058 01511 002404      CLA,INA      A=1 WRITE M1=> HP => TAPE
1059 01512 071300      STA  RDWRT
1060 01513 015535      JSB  SHPIT
1061          * NOW DO DMA IO BUT FIRST
1062          * MAKE SURE TAPE UNIT IS READY
1063 01514 114136      JSB  REDY,I
1064 01515 025526      JMP  BYPAS      ERROR RETURN
1065          * NOW ITS READY
1066 01516 060277      LDA  DMAC2
1067 01517 011306      AND  DMAOT      SET UP FOR OUTPUT TO DMA
1068 01520 070277      STA  DMAC2      OUTPUT FLAG NOW SET
1069 01521 065311      LDB  APASS      B HAS ERROR RETURN FOR WRING
1070 01522 114144      JSB  WRING,I      CHECK FOR WRITE RING
1071 01523 060234      LDA  WCCDC
1072 01524 114146      JSB  DMAIO,I
1073 01525 000000      NOP      O      ERROR RETURN
1074 01526 060255      BYPAS LDA  WOK      SEND WRITE OK
1075 01527 065275      LDB  EOFLG
1076 01530 006002      SZB      WOKUE?
1077 01531 060252      LDA  WOKUE      YES
1078 01532 070750      STA  ASAVE      SAVE HP RESPONSE TO M1 COMMANDS
1079 01533 114135      JSB  SNDM1,I
1080 01534 125502      JMP  XWRIT,I

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1082          * * * * * S H P I T * * * * *
1083          * THIS IS THE MAIN TRANSFER ROUTINE BETWEEN
1084          * THE HP AND THE M1
1085          * BYTE COUNT IN BYTCN
1086          * READ=0, WRITE=1 IN RDWRT
1087          * PBUFF POINTER TO BUFFER
1088          * 'X' SGINIFIES A BIT TO CARE ABOUT
1089          * 'N' SIGNIFIES BIT NOT TO WORRY ABOUT
1090 01535 000000 SHPIT  NOP      O
1091 01536 060273      LDA  BYTCN
1092 01537 071301      STA  SVKNT
1093 01540 002400      CLA      A,B=0
1094 01541 006400      CLB
1095 01542 051300      CPA  RDWRT
1096 01543 025623      JMP  WSHP      HP => M1

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```

1098      *      THE FOLLOWING IS M1 => HP
1099 01544 015421 RDSHP JSB GET          1 /XXXXXXXXXXXXXXXXXXXX/
1100 01545 001727     ALF,ALF
1101 01546 001222     RAL,RAL
1102 01547 170275     STA PBUFF,I
1103 01550 015421     JSB GET
1104 01551 001700     ALF          2 /NNNNNNXXXXXXXXXXXX/
1105 01552 130275     IOR PBUFF,I
1106 01553 170275     STA PBUFF,I
1107 01554 015421     JSB GET
1108 01555 101102     RRR 2          ROTATE B,A RIGHT 2 PLACES
1109 01556 130275     IOR PBUFF,I          3 /NNNNNNNNNNNNXXXX/
1110 01557 170275     STA PBUFF,I
1111 01560 034275     ISZ PBUFF
1112 01561 174275     STB PBUFF,I          3 /XXNNNNNNNNNNNNNN/
1113 01562 015421     JSB GET
1114 01563 001727     ALF,ALF
1115 01564 130275     IOR PBUFF,I          4 /NNXXXXXXXXXXXXXXXX/
1116 01565 170275     STA PBUFF,I
1117 01566 015421     JSB GET
1118 01567 001222     RAL,RAL          5 /NNNNNNNNXXXXXXXX/
1119 01570 130275     IOR PBUFF,I
1120 01571 170275     STA PBUFF,I
1121 01572 015421     JSB GET          6 /NNNNNNNNNNNNNNXX/
1122 01573 006400     CLB
1123 01574 101104     RRR 4
1124 01575 130275     IOR PBUFF,I
1125 01576 170275     STA PBUFF,I
1126 01577 034275     ISZ PBUFF          6 /XXXXNNNNNNNNNNNN/
1127 01600 174275     STB PBUFF,I
1128 01601 015421     JSB GET
1129 01602 001700     ALF          7 /NNNNXXXXXXXXXXXX/
1130 01603 001222     RAL,RAL          7 /NNNNXXXXXXXXXXXX/
1131 01604 130275     IOR PBUFF,I
1132 01605 170275     STA PBUFF,I
1133 01606 015421     JSB GET
1134 01607 130275     IOR PBUFF,I          8 /NNNNNNNNNNXXXXXX/
1135 01610 170275     STA PBUFF,I
1136 01611 034275     ISZ PBUFF
1137 01612 061301     LDA SVKNT          SIX 8-BIT BYTES LESS TO GO
1138 01613 041310     ADA KM6
1139 01614 002020     SSA
1140 01615 125535     JMP SHPIT,I
1141 01616 002003     SZA,RSS
1142 01617 125535     JMP SHPIT,I          PAU IF ZERO
1143 01620 071301     STA SVKNT
1144 01621 006400     CLB
1145 01622 025544     JMP RDSHP

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1147          * * * * * W S H P * * * * *
1148          *      MUST BE MORE CAREFUL WITH BYTE COUNT FOR WRITE
1149          *      DON'T OVERRUN
1150 01623 060273 WSHP   LDA   BYTCN
1151 01624 002003        SZA,RSS          BYTCNT ZERO?
1152 01625 125535        JMP   SHPIT,I     RETURN IF ZERO.
1153          *      GO TO APPROPRIATE PLACE
1154 01626 041310 WRON   ADA   KM6          IF NEG, SEND LAST BYTES
1155 01627 071301        STA   SVKNT
1156 01630 002020        SSA
1157 01631 025656        JMP   LFOVR
1158 01632 164275        LDB   PBUFF,I
1159 01633 034275        ISZ   PBUFF          GET FIRST TWO WORDS
1160 01634 160275        LDA   PBUFF,I
1161 01635 015425        JSB   PUT
1162 01636 015425        JSB   PUT
1163 01637 015425        JSB   PUT
1164 01640 015425        JSB   PUT
1165 01641 015425        JSB   PUT
1166          *      30 BITS NOW SENT
1167 01642 005222        RBL,RBL          TWO BITS INTO LOW-ORDER OF B
1168 01643 034275        ISZ   PBUFF
1169 01644 160275        LDA   PBUFF,I
1170 01645 100116        RRL   14          OK, LETS GO
1171 01646 015425        JSB   PUT
1172 01647 015425        JSB   PUT          48 BITS SENT
1173 01650 015425        JSB   PUT
1174 01651 061301        LDA   SVKNT
1175 01652 002003        SZA,RSS
1176 01653 125535        JMP   SHPIT,I     PAU
1177 01654 034275        ISZ   PBUFF
1178 01655 025626        JMP   WRON          GO DO MORE

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1180 01656 041307 LFOVR  ADA K6
1181 01657 003004      CMA,INA
1182 01660 071301      STA SVKNT GET NEGATIVE OF BYTES LEFT (<6)
1183 01661 164275      LDB PBUFF,I
1184 01662 034275      ISZ PBUFF
1185 01663 160275      LDA PBUFF,I LOAD UP REGISTERS.
1186 01664 015425 OVR2  JSB PUT
1187 01665 015425      JSB PUT
1188 01666 035301      ISZ SVKNT
1189 01667 015704      JSB LSTLG
1190 01670 125535      JMP SHPIT,I 1 OR 4 BYTES FINISHED
1191 01671 035301      ISZ SVKNT
1192 01672 015704      JSB LSTLG
1193 01673 125535      JMP SHPIT,I
1194 01674 035301      ISZ SVKNT
1195 01675 025677      JMP *+2
1196 01676 125535      JMP SHPIT,I 3 BYTES FINISHED
1197 01677 005727      BLF,BLF ALIGN B
1198 01700 034275      ISZ PBUFF
1199 01701 160275      LDA PBUFF,I 1 => 2 PUTS
1200 01702 100110      RRL 8 2 => 3 PUTS
1201 01703 025664      JMP OVR2 3 => 4, 4 => 6, 5 => 7 PUTS

```

```

1203      * * * * * * * * * * * * * * L S T L G * * * * * * * * * * * * * *
1204      *
1205 01704 000000 LSTLG  NOP
1206 01705 015425      JSB  PUT
1207 01706 035704      ISZ  LSTLG
1208 01707 125704      JMP  LSTLG,I

```

1210 02000 000000 ORG 2000B FORCE NEW PAGE NOW

```

1212                   * * * * * * * * * * * * * * X H D R S * * * * * * * * * * * * * * *
1213                   *XHDRS-HEADER SEARCH
1214 02000 000000   XHDRS   NOP
1215 02001 062000   LDA    XHDRS                   EXIT VIA
1216 02002 170122   STA   READC,I                READ ROUTINE
1217 02003 114147   JSB   RDTU,I                 TAPE UNIT NO.
1218 02004 060274   LDA   ABYTC
1219 02005 070262   STA   PNTRX
1220 02006 114133   JSB   RDTW,I                 GET WORD COUNT
1221 02007 062116   LDA   ACMSV                 COMPARE COUNT
1222 02010 070262   STA   PNTRX
1223 02011 114132   JSB   RDSX,I
1224 02012 060273   LDA   BYTCN                 SAVE BYTE COUNT
1225 02013 072124   STA   SAV1
1226 02014 062117   LDA   CMPSV
1227 02015 070273   STA   BYTCN
1228 02016 060111   LDA   PRBUF                 GET COMPARE
1229 02017 070275   STA   PBUFF                 FIELD FROM M1
1230 02020 002404   CLA,INA
1231 02021 071300   STA   RDWRT
1232 02022 015535   JSB   SHPIT
1233 02023 062124   LDA   SAV1                 RESTORE BYTE COUNT.
1234 02024 006400   CLB                         ODD NUMBER OF BYTES?
1235 02025 000010   SLA                         NO     B=0
1236 02026 006004   INB                         YES    B=1
1237 02027 040001   ADA   B
1238 02030 076123   STB   ODDC                 IF ODD, ODDC=1
1239 02031 070273   STA   BYTCN                 BYTCN ALWAYS EVEN.
1240 02032 114136   JSB   REDY,I                TAPE UNIT READY.
1241 02033 026101   JMP   FAILS
1242 02034 060277   LDA   DMAC2                 SET-UP DMA.
1243 02035 031305   IOR   DMAIN
1244 02036 070277   STA   DMAC2
    
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1246	02037	060233	HDRLP	LDA	RCCDC	
1247	02040	114146		JSB	DMAIO,I	
1248	02041	026101		JMP	FAILS	
1249	02042	006404		CLB,INB		
1250	02043	055275		CPB	EOFLG	EOF?
1251	02044	026101		JMP	FAILS	YES
1252	02045	062117		LDA	CMPSV	NO
1253	02046	003004		CMA,INA		NEGATE COMPARE COUNT
1254	02047	072120		STA	COMPR	WORKING VERSION OF COMPARE COUNT
1255	02050	060110		LDA	TPBUF	
1256	02051	072121		STA	TPPNT	TAPE BUFFER POINT
1257	02052	060111		LDA	PRBUF	
1258	02053	072122		STA	PRPNT	PRINT BUFFER POINTER
1259	02054	162121	CMPLP	LDA	TPPNT,I	
1260	02055	064354		LDB	KM1	ODD NUMBER OF BYTES.
1261	02056	056120		CPB	COMPR	KLUDGE SO DON'T COMPARE.
1262	02057	010741		AND	HIHAF	WHOLE WORD.
1263	02060	152122		CPA	PRPNT,I	COMPARE WORDS.
1264	02061	026063		JMP	*+2	
1265	02062	026037		JMP	HDRLP	NO MATCH
1266	02063	036121		ISZ	TPPNT	MATCH, BUMP POINTERS.
1267	02064	036122		ISZ	PRPNT	
1268	02065	036120		ISZ	COMPR	FINIS?
1269	02066	026070		JMP	*+2	NO - CHECK 2ND BYTE.
1270	02067	026072		JMP	HDOUT	FINISHED?
1271	02070	036120		ISZ	COMPR	FINIS?
1272	02071	026054		JMP	CMPLP	NO, GET MORE.
1273	02072	062123	HDOUT	LDA	ODDC	WHETHER TO SUBTRACT
1274	02073	002011		SLA,RSS		
1275	02074	025451		JMP	HDREP	ONE BYTE
1276	02075	003004		CMA,INA		OR NOT
1277	02076	040273		ADA	BYTCN	IF ODDC SET TO 1.
1278	02077	070273		STA	BYTCN	SUBTRACT ELSE.
1279	02100	025451		JMP	HDREP	DON'T

1281	02101	060254	FAILS	LDA	ROK	
1282	02102	070750		STA	ASAVE	SAVE HP RESPONSE TO M1 COMMANDS
1283	02103	114135		JSB	SNDM1,I	
1284	02104	061303		LDA	B3	
1285	02105	070266		STA	NUMDA	
1286	02106	006400		CLB		
1287	02107	074264		STB	SEND	
1288	02110	114134		JSB	SNDDA,I	
1289	02111	002400		CLA		
1290	02112	030244		IOR	BDCPF	
1291	02113	030243		IOR	UNERF	
1292	02114	006404		CLB,INB		
1293	02115	025473		JMP	HFLEP	
1294			*			
1295	02116	002117	ACMSV	DEF	CMPSV	
1296	02117	000000	CMPSV	BSS	1	
1297	02120	000000	COMPR	BSS	1	
1298	02121	000000	TPPNT	BSS	1	
1299	02122	000000	PRPNT	BSS	1	
1300	02123	000000	ODDC	BSS	1	
1301	02124	000000	SAV1	BSS	1	

```

1303      * * * * * X R S T * * * * *
1304      *XRST - RESTART INTERRUPTED ENTRY POINT.
1305      *
1306 02125 000000 XRST      NOP          RESTART INTERRUPTED ENTRY POINT.
1307 02126 103100          CLF          O          TURN OFF INTERRUPTS
1308 02127 060257          LDA          FLAGS
1309 02130 010260          AND          CPROC        KILL COMMAND IN PROGRESS.
1310 02131 070257          STA          FLAGS
1311 02132 062154          LDA          CONTA
1312 02133 070114          STA          CMDIN        NEW COMMAND INTERRUPT E.P.
1313 02134 103112          CLF          RSTRT        TURN OFF RESTART FLAG.
1314 02135 062155          LDA          NEWC
1315 02136 070013          STA          M110        INTERCEPT COMMANDS
1316 02137 102100 WTRS      STF          OO
1317 02140 014360          JSB          LOOP-1
1318 02141 103100 CONT      CLF          OO          INTERRUPT COMMAND EP
1319 02142 103513          LIA          M110,C        GET
1320 02143 052152          CPA          DRSTR
1321 02144 026150          JMP          FAILP
1322 02145 052153          CPA          TRSTR
1323 02146 026150          JMP          FAILP
1324 02147 026137          JMP          WTRS
1325      *
1326      * * * * * F A I L P * * * * *
1327 02150 000000 FAILP     NOP
1328 02151 024766          JMP          INIT
1329      *
1330 02152 000276 DRSTR     OCT          276
1331 02153 000277 TRSTR     OCT          277
1332 02154 002141 CONTA     DEF          CONT
1333 02155 124114 NEWC      JMP          CMDIN,I
1334      *
1335      * * * * * X S E T M * * * * *
1336      *XSETM - SET MODES.
1337      *
1338 02156 000000 XSETM     NOP
1339 02157 060271          LDA          ATUNT
1340 02160 070262          STA          PNTRX
1341 02161 114132          JSB          RDSX,I        GET UNIT #
1342 02162 114132          JSB          RDSX,I        GET MODE BITS.
1343 02163 060255          LDA          WOK          BOT - IGNORE
1344 02164 070750          STA          ASAVE        SAVE HP RESPONSE TO M1 COMMANDS
1345 02165 114135          JSB          SNDM1,I        FINISHED
1346 02166 126156          JMP          XSETM,I

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1348
1349 02167 000000 PGET NOP O USED BY IOMEC AND HYTYPE ROUTINES
1350 02170 060274 LDA ABYTC GET THE NUMBER OF BYTES
1351 02171 070262 STA PNTRX TO BE PRINTED IN THIS BLOCK
1352 02172 114133 JSB RDTW,I
1353 02173 060110 LDA TPBUF USE TAPE BUFFER NOW,
1354 02174 070275 STA PBUFF LATER USE PRINTER BUFFER
1355 02175 070305 STA XPBUF
1356 02176 002404 CLA,INA PRINTING IS LIKE A WRITE
1357 02177 071300 STA RDWRT M1=>HP=>PRINTER
1358 02200 015535 JSB SHPIT
1359 02201 060255 LDA WOK
1360 02202 070750 STA ASAVE SAVE HP RESPONSE TO M1 COMMANDS
1361 02203 114135 JSB SNDM1,I
1362 02204 126167 JMP PGET,I
1363
1364 * * * * * X P R N T * * * * *
1365
1366 02205 000000 XPRNT NOP O
1367 02206 016167 JSB PGET
1368
1369 * NOW THE DATA IS IN THE BUFFER. UNPACK IT AND SEND IT TO PRINTER
1370
1371 02207 060273 LDA BYTCN
1372 02210 003000 CMA
1373 02211 070303 STA PRTLM PRINTER BYTE LIMIT, WHEN PBI REACHES
1374
1375 02212 060273 LDA BYTCN THIS, WE ARE FINISHED
1376
1377 02213 006400 CLB
1378 02214 074304 STB PBI PRINTER BYTE INDEX(PBI) IS ZERO
1379
1380 * STORE A NULL SLEW IN THE BYTE AFTER THE LAST LINE
1381
1382 02215 064306 LDB NSLEW NULL SLEW
1383 02216 000010 SLA IS BYTCN ODD?
1384 02217 026221 JMP *+2
1385 02220 005727 BLF,BLF SLEW GOES ON EVEN BOUNDARY
1386 02221 001100 ARS MAKE BYTE INTO WORD INDEX
1387 02222 040305 ADA XPBUF
1388 02223 070307 STA WPTR
1389 02224 160000 LDA A,I GET CONTENTS
1390 02225 006020 SSB
1391 02226 026231 JMP *+3
1392 02227 010741 AND HIHAF ODD BOUNDARY
1393 02230 026232 JMP *+2
1394 02231 002400 CLA EVEN BOUNDARY
1395 02232 030001 IOR B GET NSLEW IN
1396 02233 170307 STA WPTR,I AND GET IT INTO MEMORY

```

1398		* NOW SEND FIRST SLEW		
1399		* FIRST CHECK STATUS		
1400		*		
1401	02234 102514		LIA PR1CC	PRINTER 1 COMMAND CHANNEL
1402	02235 000010		SLA	
1403	02236 026244		JMP *+6	
1404	02237 060352	PNA	LDA K2	PRINTER NOT AVAILABLE
1405	02240 070266		STA NUMDA	
1406	02241 060352		LDA K2	PRINTER DEVICE NUMBER IS NOW #2
1407	02242 070264		STA SEND	BY DECREE OF LEE
1408	02243 114150		JSB XDVER,I	
1409	02244 160305	FSLEW	LDA XPBUF,I	PRINTER IS READY, SEND FIRST SLEW
1410	02245 010741		AND HIHAF	
1411	02246 103100		CLF 0	
1412	02247 102614		OTA PR1CC	
1413	02250 103714		STC PR1CC,C	
1414	02251 102314		SFS PR1CC	WAIT FOR RESPONSE
1415	02252 026251		JMP *-1	
1416	02253 106714		CLC PR1CC	
1417	02254 102100		STF 0	
1418	02255 102514		LIA PR1CC	
1419	02256 002020		SSA	
1420	02257 026237		JMP PNA	SHOULD MODIFY THIS TO TRY TEN TIMES
1421	02260 034304		ISZ PBI	PARITY ERROR NOW GIVES PTR NOT AVAIL
1422	02261 060304	LLOOP	LDA PBI	CHECK IF BYTE COUNT BEGINS ON
1423		*		EVEN/ODD BOUNDARY
1424	02262 006400		CLB	
1425	02263 074311		STB NULLF	
1426	02264 000010		SLA	
1427	02265 026274		JMP *+7	
1428	02266 001100		ARS	EVEN, SIMPLE
1429	02267 040305		ADA XPBUF	
1430	02270 164000		LDB A,I	
1431	02271 070307		STA WPTR	
1432	02272 034307		ISZ WPTR	
1433	02273 026310		JMP SAME	
1434	02274 001100		ARS	ODD, MUST PACK TWO HALVES
1435	02275 040305		ADA XPBUF	
1436	02276 070307		STA WPTR	POINTS TO FIRST
1437	02277 160307		LDA WPTR,I	
1438	02300 034307		ISZ WPTR	
1439	02301 164307		LDB WPTR,I	POINTS TO SECOND
1440	02302 101110		RRR 8	TEXT COUNT IS ALL IN B
1441	02303 010741		AND HIHAF	TAKE CARE OF DATA BYTE FOLLOWING
1442		*		TEXT COUNT
1443	02304 001727		ALF,ALF	GET FIRST PART OF REMAINDER
1444	02305 030310		IOR NULLE	GET INTO LOW ORDER
1445	02306 034311		ISZ NULLF	FLAG FOR NULL CHARACTER
1446	02307 170307		STA WPTR,I	PUT IN NULL C

1448	02310	060304	SAME	LDA	PBI	
1449	02311	040001		ADA	B	ADD TEST COUNT
1450	02312	041303		ADA	B3	ADD 2 BYTES FOR TEXT COUNT HEADER
1451			*			ONE FOR BYTE SLEW,
1452	02313	070304		STA	PBI	PBI=BYTE INDEX OF NEXT TEXT COUNT
1453			*			HEADER
1454	02314	076400		STB	TEMP	SAVE TEXT COUNT
1455	02315	060307		LDA	WPTR	
1456	02316	072401		STA	OFSET	SAVE FOR DMA
1457	02317	006003		SZB, RSS		DO WE ADD LF MARGIN BLANKS?
1458	02320	026333		JMP	PRNZ	NO
1459	02321	042376		ADA	KM3	MOVE WPTR BACK 3 WORDS
1460	02322	072401		STA	OFSET	AND POST IT FOR DMA
1461	02323	066377		LDB	BLNKS	GET ASCII PACKED SPACES
1462	02324	174000		STB	A, I	OVERWRITE AT HEAD OF TEXT LINE
1463	02325	002004		INA		
1464	02326	174000		STB	A, I	AGAIN
1465	02327	002004		INA		
1466	02330	174000		STB	A, I	AGAIN
1467	02331	066400		LDB	TEMP	RESTORE B
1468	02332	045307		ADB	K6	ADD 6 BYTES OF SPACES TO TEXT COUNT
1469			* NOW SET UP FOR DMA			
1470			*			
1471	02333	044311	PRNZ	ADB	NULLF	ADD 1 FOR NULL CHARACTER
1472	02334	006004		INB		ADD 1 FOR SLEW
1473	02335	004010		SLB		ADD 1 IF COUNT IS NOW ODD
1474	02336	006004		INB		
1475	02337	005100		BRS		B HAS WORD COUNT
1476	02340	074300		STB	PWCNT	PRINTER WORD COUNT
1477	02341	007004		CMB, INB		
1478	02342	102703		STC	WCADP	THIRD DMA WORD
1479	02343	106603		OTB	WCADP	BUFFER LENGTH
1480	02344	106703		CLC	WCADP	
1481	02345	066401		LDB	OFSET	
1482	02346	106603		OTB	WCADP	BUFFER ADDRESS
1483	02347	064301		LDB	DMAPI	FIRST DMA WORD
1484	02350	106607		OTB	DMAD2	ASSIGN I/O CHANNEL
1485	02351	103100		CLF	O	DISABLE INTERRUPTS
1486	02352	103707		STC	DMAD2, C	SEND IT
1487	02353	103714		STC	PR1CC, C	
1488	02354	102100		STF	O	ENABLE INTERRUPTS
1489	02355	014360		JSB	LOOP-1	NOW WAIT FOR FINISH
1490	02356	102033		HLT	33B	SHOULDN'T COME HERE


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1492          * * * * * P R N X T * * * * *
1493          *
1494 02357 000000 PRNXT  NOP  O          COMES HERE WHEN FINISHED PRINTING
1495          *                               LINE
1496 02360 103100          CLF  O
1497 02361 106714          CLC  PR1CC      DISABLE STREAM OF PRINTER INTERRUPTS
1498 02362 103514          LIA  PR1CC,C    READ STATUS WORD
1499 02363 002020          SSA
1500 02364 026237          JMP  PNA      SKIP IF NO PARITY TROUBLE
1501          *                               PARITY ERROR, LATER TO BE FIXED FOR
1502          *                               CLEANER
1503          *
1504          *                               HARDWARE RETRIES DONE OK, CHECK FOR
1505          *                               END OF LINE, ELSE GO TO NEXT LINE.
1506          *                               IF RUN IN PARALLEL WITH TAPE UNIT,
1507          *                               THEN MUST CONTROL INTERRUPTS MORE
1508          *                               CAREFULLY
1509 02365 060304          LDA  PBI
1510 02366 040303          ADA  PRTL M    WHEN GOES POSITIVE, THROUGH
1511 02367 002020          SSA
1512 02370 026261          JMP  LLOOP
1513 02371 060253          LDA  PFIN
1514 02372 070750          STA  ASAVE      SAVE HP RESPONSE TO M1 COMMANDS
1515 02373 114135          JSB  SNDM1,I
1516 02374 102100          STF  O
1517 02375 126205          JMP  XPRNT,I

1519          * LOCAL STORAGE
1520          *
1521 02376 177775          KM3   OCT   -3
1522 02377 020040          BLNKS OCT   20040
1523 02400 000000          TEMP  BSS   1
1524 02401 000000          OFSET  BSS   1

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1526
1527 * PRINT OUT ON HYTYPE
1528 *
1529 02402 000000 XHTYP NOP
1530 02403 102515 LIA HYTCC IS HYTYPE TURNED ON?
1531 02404 053036 CPA HOFF
1532 02405 002001 RSS NO, WOA
1533 02406 026413 JMP P1 YES, CONTINUE
1534 02407 102515 LIA HYTCC WAIT TIL SOMEBODY TURNS IT ON
1535 02410 053036 CPA HOFF
1536 02411 026407 JMP *-2
1537 02412 114163 JSB XHZAP,I PRIME IT, AND TRUCK ON
1539 *
1540 02413 016167 P1 JSB PGET GET PRINT BUFFER
1541 02414 060305 LDA XPBUF ADDRESS OF BUFFER
1542 02415 001000 ALS MAKE INTO A BYTE ADDRESS
1543 02416 073067 STA RP
1544 02417 040273 ADA BYTCN PLUS NUMBER OF CHARACTERS
1545 02420 073070 STA WP GIVES THE FIRST LOCATION OUT OF BUFF
1546 02421 060155 LDA LABEL SET UP FRETURN
1547 02422 070154 STA GFAIL
1548 02423 006400 CLB INITIALIZE VARIABLES
1549 02424 077063 STB HNFT
1550 02425 077060 STB BLKCT
1551 02426 077062 STB CTYPE
1554 * MAIN LOOP TO PICK OFF THE NEXT CHARACTER FROM THE BUFFER
1555 02427 114156 NCHR JSB XGNC,I
1556 02430 073061 STA CCHAR
1557 02431 053054 CHKLB CPA DROP CONTROL-D FOR DROPPING?
1558 02432 026434 JMP *+2
1559 02433 026442 JMP CHKRB
1560 02434 063014 LDA VCMD VERTICAL COMMAND
1561 02435 073062 STA CTYPE
1562 02436 063021 LDA HLUP
1563 02437 114162 JSB XSHYT,I MOVE HALF LINE UP
1564 02440 037060 ISZ BLKCT JMP NCHR PUT IN A SPACE INSTEAD
1565 02441 026427 JMP NCHR AND GET THE NEXT CHARACTER
1566 *
1567 02442 053055 CHKRB CPA RAISE CONTROL-R FOR RAISING?
1568 02443 026445 JMP *+2
1569 02444 026453 JMP NCHR1 LOOK FOR OTHER THINGS
1570 02445 063014 LDA VCMD VERTICAL COMMAND
1571 02446 073062 STA CTYPE
1572 02447 063020 LDA HLDWN YES, SKIP DOWN HALF A LINE
1573 02450 114162 JSB XSHYT,I
1574 02451 037060 ISZ BLKCT JMP NCHR1 AND PRINT A SPACE INSTEAD
1575 02452 026427 JMP NCHR

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1578
1579 02453 043024 NCHR1  ADA  CM41  WANT SOMETHING > 40B
1580 02454 002020      SSA
1581 02455 026471      JMP  CHKSC  CHECK FOR SPECIAL CHARACTERS
1582 02456 053034      CPA  C77    IS IT AN UNDERSCORE?
1583 02457 026530      JMP  PRCUS  WELL THEN, PROCESS IT
1584 02460 043023      ADA  CM100  AND = 140B
1585 02461 002020      SSA
1586 02462 026526      JMP  APC    FOUND A PRINTABLE CHAR
1587 02463 043026      ADA  CM37   OR WANT SOMETHING > 140B AND = 200B
1588 02464 002020      SSA        SKIP IF > 200B
1589 02465 026526      JMP  APC    FOUND A PRINTABLE CHAR
1590 02466 043023      ADA  CM100  IS IT = 300B?
1591 02467 002020      SSA
1592 02470 026544      JMP  PTRCC  FOUND A PRINTER CONTROL CHARACTER
1593
1594 02471 063061      * START LOOKING FOR SPECIAL CHARACTERS
1595 02472 053052      CHKSC  LDA  CCHAR
1596 02473 026475      CPA  BLANK
1597 02474 026477      JMP  *+2    FOUND ONE
1598 02475 037060      JMP  CHKLF  NO. TRY SOMETHING ELSE
1599 02476 026427      ISZ  BLKCT  INCREMENT BLANK COUNT
1600 02477 053047      JMP  NCHR   AND GET ANOTHER CHARACTER
1601 02500 026502      CHKLF  CPA  LF    NEXT LINE?
1602 02501 026505      JMP  *+2
1603 02502 002404      JMP  CHKCR
1604 02503 114160      CLA,INA
1605 02504 026427      JSB  XVERT,I  ADVANCE ONE LINE
1606 02505 053051      JMP  NCHR
1607 02506 026510      CHKCR  CPA  CR    BACK TO THE BEGINNING?
1608 02507 026516      JMP  *+2
1609 02510 063065      JMP  CHKEJ
1610 02511 003004      LDA  LLEN   THIS COMMAND DOESN'T AFFECT WHERE
1611 02512 114161      CMA,INA    WE ARE ON A PAGE
1612 02513 002400      JSB  XHOR,I
1613 02514 073060      CLA
1614 02515 026427      STA  BLKCT  RESET COUNTER FOR MULTIPLE BLANKS
1615 02516 053050      JMP  NCHR
1616 02517 026521      CHKEJ  CPA  EJECT  TOP OF FORM?
1617 02520 026605      JMP  *+2
1618 02521 063064      JMP  GARBG  NO, GARBAGE
1619 02522 003004      LDA  LCNT  DETERMINE THE AMOUNT TO SPACE DOWN
1620 02523 043035      CMA,INA
1621 02524 114160      ADA  C102  TO THE NEXT PAGE
1622 02525 026427      JSB  XVERT,I
1623 02525 026427      JMP  NCHR
1624
1625
1626 02526 114157      * COMES HERE IF WE FOUND SOMETHING WE CAN PRINT
1627 02527 026427      *
1628 02526 114157      APC      JSB  XCHAR,I  PRINT THE CHAR
1629 02527 026427      JMP  NCHR  GET NEXT CHAR.
1630
1631 02530 063014      * PROCESS CHARACTER UNDERSCORE
1632 02531 073062      PRCUS  LDA  VCMD  SET UP FOR VERTICAL COMMAND
1633 02531 073062      STA  CTYPE

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1631	02532	063020	LDA	HLDWN	WHICH SKIPS DOWN HALF A LINE
1632	02533	114162	JSB	XSHYT,I	
1633	02534	063057	LDA	DASH	THEN PRINT A DASH
1634	02535	073061	STA	CCHAR	
1635	02536	114157	JSB	XCHAR,I	
1636	02537	063014	LDA	VCMD	AND THEN GIVE IT ANOTHER COMMAND TO
1637	02540	073062	STA	CTYPE	SKIP UP HALF A LINE TO GET BACK TO
1638	02541	063021	LDA	HLUP	THE CORRECT POSITION
1639	02542	114162	JSB	XSHYT,I	
1640	02543	026427	JMP	NCHR	HOPE IT ISN'T ANOTHER ONE

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1642          * COMES HERE IF IT FOUND A PRINTER CONTROL CHARACTER.
1643          * 200B V' X - SKIP X LINES (X CAN BE UP TO 7)
1644          * 210B V' X - SKIP TO CHANNEL X.
1645 02544 013034 PTRCC   AND   C77           ONLY CONCERNED WITH BITS 0-5
1646 02545 073061          STA   CCHAR
1647 02546 114156          JSB   XGNC,I
1648 02547 114156          JSB   XGNC,I           MAY USE THIS TO PRINT BACKWARDS
1649 02550 063065          LDA   LLEN           THIS IS WHERE WE ARE
1650 02551 003004          CMA,INA
1651 02552 114161          JSB   XHOR,I           MOVE BACK THAT FAR
1652 02553 002400          CLA
1653 02554 073060          STA   BLKCT           RESET MB COUNT FOR NEXT LINE
1654 02555 063061          LDA   CCHAR
1655 02556 002002          SZA
1656 02557 026561          JMP   SCCHR           CHECK IF VALID SKIP CONTROL CHARACTE
1657 02560 026427          JMP   NCHR
1658          * SKIP COMMAND CHARACTER
1659 02561 043027 SCCHR   ADA   CM10           IS IT LESS THAN 10B
1660 02562 002021          SSA,RSS           SKIP IF NEGATIVE
1661 02563 026567          JMP   CCCHR           ELSE IT IS A SKIP TO CHAN COMMAND
1662 02564 043032          ADA   C10           RESTORE THE NUMBER
1663 02565 114160          JSB   XVERT,I           SKIP THE APPROPRIATE NUMBER OF LINES
1664 02566 026427          JMP   NCHR
1665          * CHANNEL COMMAND CHARACTER
1666          * ONLY CHAN1 AND CHAN2 ARE RECOGNIZED
1667 02567 002011 CCCHR   SLA,RSS           SKIP IF ODD
1668 02570 026576          JMP   CHAN2
1669 02571 063064          LDA   LCNT
1670 02572 003004          CMA,INA
1671 02573 043035          ADA   C102
1672 02574 114160          JSB   XVERT,I           SPACE DOWN TO NEXT PAGE
1673 02575 026427          JMP   NCHR
1674 02576 063064 CHAN2  LDA   LCNT           WHAT LINE ARE WE ON?
1675 02577 003004          CMA,INA
1676 02600 043033          ADA   C74           SKIP DOWN TO LINE 61
1677 02601 002020          SSA           ALREADY TOO FAR?
1678 02602 043035          ADA   C102           YES, GO TO NEXT PAGE
1679 02603 114160          JSB   XVERT,I
1680 02604 026427          JMP   NCHR

1682          *
1683          * SHOULD NEVER GET HERE--WE HAVE GARBAGE
1684 02605 063053 GARBG  LDA   CENT
1685 02606 073061          STA   CCHAR
1686 02607 114157          JSB   XCHAR,I
1687 02610 026427          JMP   NCHR

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1689
1690
1691
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1695 02611 000000 CHAR NOP
1696 02612 063060 LDA BLKCT
1697 02613 002004 INA
1698 02614 114161 JSB XHOR,I SPACE OVER
1699 02615 063012 LDA CCMD
1700 02616 073062 STA CTYPE CHAR STROBE
1701 02617 006400 CLB
1702 02620 077060 STB BLKCT RESET COUNTER
1703 02621 100033 ASL STROB MOVE TO STROBE POSITION
1704 02622 033061 IOR CCHAR PUT IN CURRENT CHARACTER
1705 02623 114162 JSB XSHYT,I OUTPUT THE CHAR
1706 02624 126611 JMP CHAR,I

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1708
1709
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1712
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1715
1716 02625 000000 HORIZ NOP
1717 02626 064000 LDB A COPY A TO B
1718 02627 047065 ADB LLEN
1719 02630 047043 ADB CMXLP ADD -MAXLP
1720 02631 006021 SSB,RSS SKIP IF MAXLP NOT EXCEEDED
1721 02632 126625 JMP HORIZ,I IGNORE COMMAND
1722 02633 047044 ADB COMP CHECK LEFT MARGIN (MAXLP-MINLP)
1723 02634 006020 SSB SKIP IF MINLP EXCEEDED
1724 02635 126625 JMP HORIZ,I IGNORE COMMAND
1725 02636 047040 ADB MINLP COMPENSATE FOR CHECKING
1726 02637 077065 STB LLEN CMD OK, UPDATE COUNT
1727 02640 002120 CLE,SSA CLEAR E, CHECK SIGN OF A
1728 02641 003204 CMA,CME,INA COMPLEMENT E, A
1729 02642 001000 ALS MULTIPLY BY 6
1730 02643 072400 STA TEMP
1731 02644 001000 ALS
1732 02645 042400 ADA TEMP
1733 02646 002040 SEZ CHECK ON THE DIRECTION
1734 02647 033046 IOR BIT10 FOR LEFT MOVES
1735 02650 072400 STA TEMP
1736 02651 063013 LDA HCMD
1737 02652 073062 STA CTYPE
1738 02653 006400 CLB
1739 02654 100033 ASL STROB MOVE TO STROBE POSITION
1740 02655 032400 IOR TEMP PUT IN INCREMENTS
1741 02656 114162 JSB XSHYT,I OUTPUT THE COMMAND
1742 02657 126625 JMP HORIZ,I

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1744
1745
1746
1747
1748 02660 000000 VERT NOP
1749 02661 064000 LDB A COPY A TO B
1750 02662 047064 ADB LCNT
1751 02663 047022 ADB CM102 SUBTRACT 102B
1752 02664 006021 SSB,RSS AS LONG AS B IS POSITIVE
1753 02665 026663 JMP *-2
1754 02666 047035 ADB C102 ADD 102B BACK (0 <= B <= 65)
1755 02667 077064 STB LCNT UPDATE LINE COUNT
1756 02670 006400 CLB
1757 02671 002021 SSA,RSS IF NEGATIVE
1758 02672 026675 JMP *+3
1759 02673 003004 CMA,INA MAKE IT POSITIVE
1760 02674 006004 INB AND SET THE FLAG
1761 02675 001020 ALS,ALS
1762 02676 001000 ALS MULT BY 8 TO CALCULATE VERT INCR.
1763 02677 004010 SLB IF ARGUMENT WAS NEGATIVE
1764 02700 033046 IOR BIT10 MAKE IT MOVE THE PAPER DOWN
1765 02701 072400 STA TEMP
1766 02702 063014 LDA VCMD VERT COMMAND
1767 02703 073062 STA CTYPE
1768 02704 100033 ASL STROB SET STROBE
1769 02705 032400 IOR TEMP PUT BACK INCREMENTS
1770 02706 114162 JSB XSHYT,I OUTPUT THE COMMAND
1771 02707 126660 JMP VERT,I

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1773
1774 * SHYTY(SEND TO HYTYPE) THIS IS THE ACTUAL FUNCTION WHICH OUTPUTS A
1775 * COMMAND TO THE HYTYPE. IT MUST TAKE CARE OF ENABLING THE INTER-
1776 * RUPTS FOR THE NEXT INSTRUCTION. THUS, EACH TIME IT IS CALLED, IT
1777 * OUTPUTS THE DATA FROM THE PREVIOUS CALL. THIS IS INVISIBLE, SO
1779 * WHEN THIS FUNCTION IS CALLED, "A" CONTAINS THE DATA TO BE OUTPUT
1780 * THE NEXT TIME WITH THE CORRESPONDING STROBE SELECT BIT SET.
1781 *
1782 02710 000000 SHYTY NOP
1783 02711 101100 RRR 16 EXCHANGE REGISTERS
1784 02712 063062 LDA CTYPE GET NEXT INSTRUCTION TYPE AND SET UP
1785 02713 002004 INA (BECAUSE INT-ENABLE=STROBE SEL.+1)
1786 02714 001323 RAR,RAR THE INTERRUPT-ENABLE FOR IT
1787 * (BY LEFT SHIFTING A 14 PLACES)
1788 02715 033066 IOR ODATA ADD IN THE OLD DATA
1789 02716 037063 ISZ HNFT TEST FOR FIRST TIME THRU
1790 02717 033015 IOR RUP YES, OLD DATA IS JUNK, FORCE A NOP
1791 02720 077066 STB ODATA AND SAVE THE DATA FOR THE NEXT TIME
1792 02721 007400 CCB
1793 02722 077063 STB HNFT A MINUS ONE TO YOU(1)
1794 02723 103615 OTA HYTCC,C SEND OLD DATA TO BUFFER
1795 02724 014360 JSB LOOP-1 PUT US IN LITES
1797 * HYTYPE INTERRUPT
1798 02725 000000 HINT NOP
1799 02726 103515 LIA HYTCC,C GET STATUS WORD
1800 02727 002020 SSA
1801 02730 102015 HLT HYTCC
1802 02731 070001 STA B SAVE THE STATUS WORD
1803 02732 007000 CMB IN COMPLEMENT FORM
1804 02733 001727 H1 ALF,ALF MOVE RUN/PAUSE BIT UP
1805 02734 002021 SSA,RSS SHOULD WE WAIT?
1806 02735 026740 JMP H2 NO, OK TO PROCEED
1807 02736 102515 LIA HYTCC GET NEW STATUS WORD
1808 02737 026733 JMP H1 TEST SAME FOR PAUSE BIT
1809 *
1810 02740 102515 H2 LIA HYTCC STATUS WORD AGAIN
1811 02741 010001 AND B WANT TO SEE IF ANY NEW BITS ON
1812 02742 013031 AND C7 IN THE 'READY BITS' AREA
1813 02743 002002 SZA NO CHANGE, GO ON
1814 02744 102115 STF HYTCC SOMETHING ELSE DONE - FORCE INTERRUPT
1815 02745 126710 JMP SHYTY,I CONTINUE WHERE WE HOPE WE LEFT OFF
1816 *
1817 * CODE TO INITIALIZE THE HYTYPER
1818 *
1819 02746 000000 HINIT NOP
1820 02747 102515 LIA HYTCC CHECK HYTYPE STATUS
1821 02750 053036 CPA HOFF IS IT TURNED ON?
1822 02751 126746 JMP HINIT,I NO, GIVE UP FOR NOW.
1823 02752 006400 CLB
1824 02753 077064 STB LCNT RESET PAGE LINE COUNT TO ZERO
1825 02754 077065 STB LLEN RESET LINE POSITION
1826 02755 067015 LDB RUP RAISE THE RIBBON, REALLY A NOP
1827 02756 107615 OTB HYTCC,C TO GET THE INTERRUPTS TURNED OFF
1828 02757 103715 STC HYTCC,C INITIALIZE (RESET) THE HYTYPE
1829 02760 107615 OTB HYTCC,C RAISE THE RIBBON FOR REAL

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1830	02761	107515	LIB	HYTCC,C	READY FOR HORIZONTAL?
1831	02762	005300	RBR		
1832	02763	006011	SLB,RSS		
1833	02764	026761	JMP	*-3	NOT YET.
1834	02765	067037	LDB	MARGN	SKIP OVER THE HOLES
1835	02766	107615	OTB	HYTCC,C	
1836	02767	126746	JMP	HINIT,I	

```

1838      *
1839      * FUNCTION GNCHR, GETS THE NEXT CHARACTER THE HYTYPE IS SUPPOSED TO
1840      * PRINT.  THE CONTENTS OF THE REGISTERS WHEN CALLED ARE MEANINGLESS.
1841      * HOWEVER, THIS FUNCTION RETURNS THE NEXT CHARACTER TO BE HYTYPED IN A.
1842      * IF ALL THE CHARACTERS OF THE BUFFER HAVE BEEN READ, THIS FUNCTION
1843      * FAILS BY BRANCHING TO THE ADDRESS SPECIFIED IN THE LABEL VARIABLE
1844      * GFAIL INSTEAD OF RETURNING.
1845      * THIS FUNCTION SHOULD BE CHANGED LATER TO ALLOW LINES TO BE HYTYPED
1846      * BACKWARDS.
1847      *
1848 02770 000000 GNCHR  NOP
1849 02771 067067      LDB  RP          POINTS TO NEXT CHARACTER TO READ
1850 02772 057070      CPB  WP
1851 02773 124154      JMP  GFAIL,I      FINISHED READING
1852 02774 063067      LDA  RP
1853 02775 001100      ARS
1854 02776 160000      LDA  A,I      DETERMINE WORD ADDRESS
1855 02777 006011      SLB,RSS    AND PICK UP THE WORD
1856 03000 001727      ALF,ALF   IF WE'RE TRYING TO REF THE LEFT BYTE
1857 03001 037067      ISZ  RP      SWAP BYTES
1858 03002 013045      AND  BYTE0    FOR NEXT CHAR
1859 03003 126770      JMP  GNCHR,I    GIVES US ONE CHAR
1860      *
1861      *
1862      *

1864      * FORCE  LAST COMMAND TO BE SENT TO HYTYPE
1865      *
1866 03004 063066 FORCE  LDA  ODATA      OUTPUT LAST BYTE
1867 03005 103615      OTA  HYTCC,C    AND TURN OFF INTERRUPTS.
1868 03006 060253      LDA  PFIN      PRINT FINISHED
1869 03007 070750      STA  ASAVE
1870 03010 114135      JSB  SNDM1,I    SEND TO M1
1871 03011 126402      JMP  XHTYP,I    WAIT FOR SOMETHING

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1873		*				
1874		* PARAMETERS				
1875	03012	000000	CCMD	OCT	0	CHARACTER COMMAND
1876	03013	000001	HCMD	OCT	1	HORIZONTAL COMMAND
1877	03014	000002	VCMD	OCT	2	VERTICAL COMMAND
1878	03015	034000	RUP	OCT	34000	RIBBON LIFT COMMAND
1879	03016	000001	RIBUP	OCT	1	RIBBON UP INDICATION
1880	03017	000000	RIBDN	OCT	0	RIBBON DOWN INDICATION
1881	00013	000000	STROB	EQU	11	STROBE FIELD FROM RIGHTMOST BIT
1882			* FIXED HYTYPE	COMMANDS TO PROCESS		UNDERSCORE
1883	03020	010004	HLDWN	OCT	10004	HALF LINE DOWN
1884	03021	012004	HLUP	OCT	12004	HALF LINE UP
1885			* CONSTANTS			
1886	03022	177676	CM102	OCT	-102	
1887	03023	177700	CM100	OCT	-100	
1888	03024	177737	CM41	OCT	-41	
1889	03025	177740	CM40	OCT	-40	
1890	03026	177741	CM37	OCT	-37	
1891	03027	177770	CM10	OCT	-10	
1892	03030	000006	C6	OCT	6	
1893	03031	000007	C7	OCT	7	
1894	03032	000010	C10	OCT	10	
1895	03033	000074	C74	OCT	74	
1896	03034	000077	C77	OCT	77	
1897	03035	000102	C102	OCT	102	
1898	03036	100240	HOFF	OCT	100240	HYTYPE "OFF" STATUS WORD
1899	03037	004036	MARGN	OCT	4036	SPACE 5 RIGHT
1900	00177	000000	MXLPV	EQU	127	MAXIMUM LINE POSITION-5
1901	00000	000000	MNLPV	EQU	0	MINIMUM LINE POSITION
1902	03040	000000	MINLP	ABS	MNLPV	
1903	03041	000177	MAXLP	ABS	MXLPV	
1904	03042	000000	CMNLP	ABS	-MNLPV	
1905	03043	177601	CMXLP	ABS	-MXLPV	
1906	03044	000177	COMP	ABS	MXLPV-MNLPV	
1907	03045	000377	BYTEO	OCT	377	MASK FOR LOW ORDER BYTE
1908	03046	002000	BIT10	OCT	2000	CONTROLS DIRECTION OF MOVEMENT
1909	03047	000012	LF	OCT	12	CHAR. LINE FEED
1910	03050	000014	EJECT	OCT	14	PAGE EJECT
1911	03051	000015	CR	OCT	15	CHAR. CARRIAGE RETURN
1912	03052	000040	BLANK	OCT	40	CHAR. BLANK
1913	03053	000040	CENT	OCT	40	CHAR. CENT SIGN
1914	03054	000004	DROP	OCT	4	ASCII CONTROL-D
1915	03055	000022	RAISE	OCT	22	ASCII CONTROL-R
1916	03056	000140	UNDER	OCT	140	CHAR. UNDERSCORE
1917	03057	000140	DASH	OCT	140	CHAR. DASH
1918			* VARIABLES			
1919	03060	000000	BLKCT	OCT	0	COUNT OF SUCCESSIVE BLANKS IN LINE
1920	03061	000000	CCHAR	OCT	0	CURRENT CHARACTER
1921	03062	000000	CTYPE	OCT	0	COMMAND TYPE
1922	03063	000000	HNFT	OCT	0	HYTYPE NOT FIRST TIME (FROM BUFFER)
1923	03064	000000	LCNT	OCT	0	LINE COUNT (LAST LINE PRINTED)
1924	03065	000000	LLEN	OCT	0	LENGTH OF CURRENT LINE (POSITION OF LAST CHARACTER PRINTED)
1925			*			
1926	03066	000000	ODATA	OCT	0	OLD DATA
1927	03067	000000	RP	OCT	0	READ POINTER OF BUFFER

1928 03070 000000 WP OCT 0

WRITE POINTER OF BUFFER

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1930          * * * * * P W R F L * * * * *
1931          *          POWER FAIL INTERRUPT SAVE/RESTORE ROUTINE
1932          *
1933 03071 000000 PWRFL  NOP    NORMAL ENTRY
1934 03072 102204          SFC     4          SKIP ON POWER FAIL INTERRUPT
1935 03073 027114          JMP     UP
1936 03074 073144 DOWN   STA    SAVEA          SAVE A REGISTER
1937 03075 003400          CCA
1938 03076 073150          STA    SAVER          SET 'RUN' SWITCH
1939 03077 077145          STB    SAVEB          SAVE B
1940 03100 102300          SFS     0          ARE INTERRUPTS ARMED?
1941 03101 002400          CLA
1942 03102 001520          ERA,ALS        MOVE EXTEND BIT INTO A
1943 03103 102201          SOC
1944 03104 002004          INA
1945 03105 073146          STA    SAVEO          SAVE E AND O AND IO STATUS.
1946 03106 063071          LDA    PWRFL          SAVE P-COUNTER
1947 03107 073147          STA    SAVEP
1948 03110 102501          LIA    SR
1949 03111 073151          STA    SAVSW          SAVE SWITCH REGISTER
1950 03112 106704          CLC     4          SET FOR RESTART ROUTINE
1951 03113 102050          HLT    50B          ALL HALT
1952          *
1953 03114 063150 UP     LDA    SAVER          WAS COMPUTER RUNNING WHEN POWER
1954          *          DROPPED
1955 03115 002003          SZA,RSS
1956 03116 027143          JMP    HALT          NO
1957 03117 002400          CLA
1958 03120 073150          STA    SAVER          YES.  RESET RUN SWITCH
1959 03121 060236          LDA    CLRDC          CLEAR TAPE DECK/CONTROLLER
1960 03122 102611          OTA    CMND
1961 03123 060727          LDA    BIT15          OUTPUT A NOP
1962 03124 102614          OTA    PR1CC          TO THE PRINTER
1963 03125 063146          LDA    SAVEO          RESTORE E AND O
1964 03126 103101          CLO
1965 03127 000036          SLA,ELA          WAS OVERFLOW ON BEFORE
1966 03130 102101          STF     1          YES.  RESET IT.
1967 03131 102712          STC    RSTRT          REARM LINK FOR INTERRUPTS
1968 03132 102713          STC    M1IO
1969 03133 002020          SSA
1970 03134 102100          STF     0          WERE INTERRUPTS ENABLED
1971 03135 063151          LDA    SAVSW          YES
1972 03136 102601          OTA    SR          RESTORE SWITCH REGISTER
1973 03137 063144          LDA    SAVEA          RESTORE A
1974 03140 067145          LDB    SAVEB          RESTORE B
1975 03141 102704          STC     4          RESET POWERFAIL LOGIC
1976 03142 127147          JMP    SAVEP,I          NORMAL EXIT

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1978	03143	102000	HALT	HLT	0	
1979			*			
1980	03144	000000	SAVEA	OCT	0	
1981	03145	000000	SAVEB	OCT	0	
1982	03146	000000	SAVEO	OCT	0	
1983	03147	000000	SAVEP	OCT	0	
1984	03150	000000	SAVER	OCT	0	
1985	03151	000000	SAVSW	OCT	0	
1986			*			
1987			* * * * * P A R E R * * * * *			
1988			*			
1989			*	PARITY ERROR HALT ROUTINE		
1990			*			
1991	03152	000000	PARER	NOP		NORMAL ENTRY-ADDRESS OF THE INSTR.
1992	03153	102505		LIA	5	GET ADDRESS OF FAILED LOCATION
1993	03154	102060		HLT	60B	DIE WITH ADR OF BAD LOC IN A REG
1994			*			
1995			*			
1996	00000	000000		END		

PAGE 0001

0001

ASMB,A,B,L

** NO ERRORS*


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0001          ASMB,A,B,L
0003          *
0004 00003          ORG 3B
0005          *
0006 00003 016440  BRKGO ABS BKST1      COMMUNICATIONS CELL FOR BREAKPOINTS

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0008          *
0009 16000          ORG 16000B
0010          *
0011 00016          TTY EQU 16B
0012 00000          A EQU 0
0013 00001          B EQU 1

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0015 16000 016002          JSB GO
0016 16001 026034          JMP LOOP
0017 16002 000000          GO  NOP
0018 16003 103100          CLF 0      TURN OFF I/O
0019 16004 063034          LDA BINDR  RESTORE POINTER FOR BREAKPOINT REENTRY TO DDT
0020 16005 070003          STA BRKGO  STORE ON ZERO PAGE
0021 16006 002400          CLA
0022 16007 073024          STA PRCDF  RESET PROCEED FLAG
0023 16010 073056          STA EXTND  RESET INDICATOR IMAGES
0024 16011 073057          STA OVRFW
0025 16012 073060          STA INT
0026 16013 106700          CLC 0      RESET INDICATORS
0027 16014 103101          CLO
0028 16015 000040          CLE
0029          *WAS THERE A BREAKPOINT SET IN A PREVIOUS INCARNATION
0030 16016 053037          CPA BREAK
0031 16017 026022          JMP SALUT  PROCEED
0032 16020 063040          LDA BKCEL  YES. RESTORE ORIGINAL CONTENTS
0033 16021 173037          STA BREAK,I
0034 16022 063115          SALUT LDA CR
0035 16023 016775          JSB TYPE
0036 16024 063111          LDA LF
0037 16025 016775          JSB TYPE
0038 16026 063127          LDA DDD
0039 16027 016775          JSB TYPE
0040 16030 063127          LDA DDD
0041 16031 016775          JSB TYPE
0042 16032 063134          LDA TTT
0043 16033 016775          JSB TYPE

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0045	16034	017005	LOOP	JSB	CRLF	BEGIN NEW LINE
0046	16035	016523	LOOP1	JSB	RE	LOOK FOR EXPRESSION
0047	16036	026052		JMP	LOOP2	IF NOT FOUND
0048	16037	016676		JSB	IC	INTERPRET TERMINAL CHAR
0049	16040	026065		JMP	OPEN	/ OR <BACKSLASH> OR <LEFT ARROW>
0050	16041	026166		JMP	LFEED	CR
0051	16042	026171		JMP	START	LF OR <UP ARROW>
0052	16043	026222		JMP	EQU1	=
0053	16044	026240		JMP	SETBP	<EXCLAMATION POINT>
0054	16045	026247		JMP	LDAB	<SEMI-COLON>A OR <SEMI-COLON>B
0055	16046	026260		JMP	GOTO	<SEMI-COLON>G
0056	16047	026315		JMP	STIND	<SEMI-COLON>I
0057	16050	026334		JMP	ERROR	<SEMI-COLON>P
0058	16051	026334		JMP	ERROR	OTHER
0059	16052	016676	LOOP2	JSB	IC	INTERPRET TERMINAL CHAR, NO EXPR
0060	16053	026334		JMP	ERROR	/ OR <BACKSLASH> OR <LEFT ARROW>
0061	16054	026166		JMP	LFEED	CR
0062	16055	026171		JMP	START	LF OR <UP ARROW>
0063	16056	026334		JMP	ERROR	=
0064	16057	026244		JMP	CLRBP	<EXCLAMATION POINT>
0065	16060	026334		JMP	ERROR	<SEMI-COLON>A OR <SEMI-COLON>B
0066	16061	026334		JMP	ERROR	<SEMI-COLON>G
0067	16062	026334		JMP	ERROR	<SEMI-COLON>I
0068	16063	026340		JMP	PROCD	<SEMI-COLON>P
0069	16064	026334		JMP	ERROR	OTHER

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0071	16065	063025	OPEN	LDA VALUE	UPDATE VALUE OF DOT
0072	16066	073026		STA DOT	
0073	16067	073027		STA CELL	KEEP FOR POSSIBLE PEEKING
0074	16070	063030	OPENO	LDA CHAR	
0075	16071	073031		STA MODE	SET DISPLAY MODE TO / OR <BACKSLASH> OR
0076			*		<LEFT ARROW>
0077	16072	017015	OPEN1	JSB TAB	TABULATE (3 SPACES)
0078	16073	063031		LDA MODE	
0079	16074	053110		CPA BSLSH	<BACKSLASH>
0080	16075	026107		JMP OPEN2	DO NOT SHOW CONTENTS OF CELL IF MODE
0081	16076	053114		CPA LARO	<LEFT ARROW>
0082	16077	026144		JMP OPEN4	INTERPRET AS Z/C PAGE
0083	16100	163027	OPN1A	LDA CELL,I	ASSUMING WE ARE IN / MODE
0084	16101	073023		STA CNTNT	TEMPORARILY FOR LATER DISPLAY
0085	16102	013066		AND ADMSK	STRIP TO FULL ADDRESS
0086	16103	073027		STA CELL	FOR PEEKING
0087	16104	063023		LDA CNTNT	NOW DISPLAY IT
0088	16105	016464		JSB PRINT	
0089	16106	017015		JSB TAB	
0090	16107	016523	OPEN2	JSB RE	LOOK FOR REPLACEMENT EXPR
0091	16110	026131		JMP OPEN3	IF NONE FOUND
0092	16111	016676		JSB IC	INTERPRET TERMINAL CHAR
0093	16112	026065		JMP OPEN	/ OR <BACKSLASH> OR <LEFT ARROW>
0094	16113	026456		JMP CLOSE	CR
0095	16114	026461		JMP CONT	LF OR <UP ARROW>
0096	16115	026227		JMP EQU2	=
0097	16116	026240		JMP SETBP	<EXCLAMATION POINT>
0098	16117	026247		JMP LDAB	<SEMI-COLON>A OR <SEMI-COLON>B
0099	16120	026260		JMP GOTO	<SEMI-COLON>G
0100	16121	026315		JMP STIND	<SEMI-COLON>I
0101	16122	026334		JMP ERROR	<SEMI-COLON>P
0102	16123	063030		LDA CHAR	ELSE OK IF A
0103	16124	053117		CPA QUEST	
0104	16125	026127		JMP *+2	
0105	16126	026334		JMP ERROR	NO. OH WELL
0106	16127	017015		JSB TAB	YES. ABORT AND TRY AGAIN
0107	16130	026107		JMP OPEN2	LOOK FOR REPLACEMENT EXPRESSION
0108	16131	016676	OPEN3	JSB IC	INTERPRET TERMINAL CHAR, NO REPLACEMENT EXPR
0109	16132	026070		JMP OPENO	/ OR <BACKSLASH> OR <LEFT ARROW>
0110	16133	026166		JMP LFEEED	CR
0111	16134	026173		JMP STRT1	LF OR <UP ARROW>
0112	16135	026233		JMP EQU3	=
0113	16136	026244		JMP CLRBP	<EXCLAMATION POINT>
0114	16137	026334		JMP ERROR	<SEMI-COLON>A OR <SEMI-COLON>B
0115	16140	026334		JMP ERROR	<SEMI-COLON>G
0116	16141	026334		JMP ERROR	<SEMI-COLON>I
0117	16142	026340		JMP PROCD	<SEMI-COLON>P
0118	16143	026334		JMP ERROR	OTHER

0120	16144	063112	OPEN4	LDA SLASH	INITIALIZE MODE
0121	16145	073031		STA MODE	
0122	16146	063027		LDA CELL	INTERPRET BIT 10 AS ZERO OR CURRENT
0123	16147	013065		AND BIT10	
0124	16150	002002		SZA	SKIP IF 0 (ON PAGE 0)
0125	16151	026156		JMP OPENS5	
0126	16152	063027		LDA CELL	ZERO PAGE
0127	16153	013067		AND SMASK	
0128	16154	073027		STA CELL	
0129	16155	026100		JMP OPN1A	
0130	16156	063026	OPENS5	LDA DOT	GET CURRENT PAGE BITS
0131	16157	013070		AND NSMSK	
0132	16160	070001		STA B	
0133	16161	063027		LDA CELL	NOW GET PAGE ADDRESS
0134	16162	013067		AND SMASK	
0135	16163	030001		IOR B	MERGE IN HIGH BITS
0136	16164	073027		STA CELL	
0137	16165	026100		JMP OPN1A	
0138	16166	063111	LFEED	LDA LF	TYPE LF & START NEW LINE
0139	16167	016775		JSB TYPE	
0140	16170	126002		JMP GO,I	
0141	16171	063112	START	LDA SLASH	INITIALIZE TO / MODE
0142	16172	073031		STA MODE	
0143	16173	063030	STRT1	LDA CHAR	LOOK AT TERMINAL CHAR
0144	16174	053113		CPA UPARO	SKIP IF NOT <UP ARROW>
0145	16175	026203		JMP STRT2	GIVE CRLF
0146	16176	063115		LDA CR	GIVE 2 LFS
0147	16177	016775		JSB TYPE	
0148	16200	063115		LDA CR	
0149	16201	016775		JSB TYPE	
0150	16202	026204		JMP *+2	
0151	16203	017005	STRT2	JSB CRLF	
0152	16204	063030		LDA CHAR	CHECK TERMINAL CHAR AGAIN
0153	16205	053113		CPA UPARO	SKIP IF NOT <UP ARROW>
0154	16206	026220		JMP STRT4	& DECREMENT DOT
0155	16207	063063		LDA ONE	
0156	16210	043026	STRT3	ADA DOT	
0157	16211	013066		AND ADMSK	PREVENT OVERFLOW OF DOT
0158	16212	073026		STA DOT	
0159	16213	073027		STA CELL	FOR PEEKING
0160	16214	016464		JSB PRINT	TYPE VALUE OF DOT
0161	16215	063031		LDA MODE	
0162	16216	016775		JSB TYPE	INDICATE / OR =BACKSLASH> OR <LEFT ARROW> MODE
0163	16217	026072		JMP OPEN1	
0164	16220	003400	STRT4	CCA	
0165	16221	026210		JMP STRT3	
0166	16222	017015	EQU1	JSB TAB	
0167	16223	063025		LDA VALUE	
0168	16224	016464		JSB PRINT	SHOW VALUE OF EXPR
0169	16225	017015		JSB TAB	
0170	16226	126002		JMP GO,I	

0172	16227	017015	EQU2	JSB	TAB	
0173	16230	063025		LDA	VALUE	
0174	16231	016464		JSB	PRINT	SHOW VALUE OF EXPR
0175	16232	126002		JMP	GO,I	PAU
0176	16233	017015	EQU3	JSB	TAB	
0177	16234	063023		LDA	CNTNT	
0178	16235	016464		JSB	PRINT	RETYPE CONTENTS OF DISPLAYED CELL
0179	16236	017015		JSB	TAB	
0180	16237	026107		JMP	OPEN2	
0181	16240	063025	SETBP	LDA	VALUE	GET ADDRESS WHERE WE ARE TO PUT THE BREAKPOINT
0182	16241	013066		AND	ADMSK	MASK IT DOWN FOR SAFETY
0183	16242	073037		STA	BREAK	SET NEW BREAK ADDRESS
0184	16243	126002		JMP	GO,I	PAU
0185	16244	002400	CLRBP	CLA		
0186	16245	073037		STA	BREAK	SET BREAK ADDRESS TO 0
0187	16246	126002		JMP	GO,I	PAU
0188	16247	063030	LDAB	LDA	CHAR	
0189	16250	053126		CPA	BBB	SKIP IF NOT B
0190	16251	026255		JMP	LDAB1	
0191	16252	063025		LDA	VALUE	MUST BE A
0192	16253	073032		STA	AA	
0193	16254	126002		JMP	GO,I	PAU
0194	16255	063025	LDAB1	LDA	VALUE	
0195	16256	073033		STA	BB	
0196	16257	126002		JMP	GO,I	PAU
0197	16260	063037	GOTO	LDA	BREAK	TEST BREAK FOR ZERO VALUE (NO BREAKPOINT)
0198	16261	002002		SZA		
0199	16262	026270		JMP	GOTO2	BREAKPOINT: DO FUNNY STUFF
0200	16263	063025	GOTO1	LDA	VALUE	
0201	16264	013066		AND	ADMSK	
0202	16265	073025		STA	VALUE	
0203	16266	016276		JSB	GOTO3	RESTORE STATE
0204	16267	127025		JMP	VALUE,I	LEAVE DDT--BEGIN EXECUTION OF PGM
0205	16270	163037	GOTO2	LDA	BREAK,I	SAVE INST AT BKPT
0206	16271	073040		STA	BKCEL	
0207	16272	073036		STA	BKSAV	
0208	16273	063035		LDA	BKIST	PLANT BKPT
0209	16274	173037		STA	BREAK,I	
0210	16275	026263		JMP	GOTO1	
0211	16276	000000	GOTO3	NOP		
0212	16277	017005		JSB	CRLF	
0213	16300	063056		LDA	EXTND	RESTORE MACHINE STATE
0214	16301	001500		ERA		ROTATES 0 BACK INTO E
0215	16302	103101		CLO		CLEAR OVERFLOW
0216	16303	063057		LDA	OVRFW	
0217	16304	002020		SSA		
0218	16305	102101		STO		SET OVERFLOW
0219	16306	103100		CLF	0	DISABLE I/O
0220	16307	063060		LDA	INT	
0221	16310	002020		SSA		
0222	16311	102100		STF	0	TURN ON I/O AGAIN
0223	16312	063032		LDA	AA	LOAD ACTIVE REGISTERS
0224	16313	067033		LDB	BB	
0225	16314	126276		JMP	GOTO3,I	

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0227	16315	067025	STIND	LDB VALUE	SET INDICATOR IMAGES
0228	16316	002400		CLA	
0229	16317	101041		LSR 1	
0230	16320	073057		STA OVRFW	
0231	16321	101043		LSR 3	
0232	16322	073056		STA EXTND	
0233	16323	101042		LSR 2	
0234	16324	002400		CLA	
0235	16325	101041		LSR 1	
0236	16326	073060		STA INT	
0237	16327	063056		LDA EXTND	
0238	16330	006400		CLB	
0239	16331	100041		LSL 1	
0240	16332	077056		STB EXTND	
0241	16333	126002		JMP GO,I	PAU
0242	16334	017015	ERROR	JSB TAB	?
0243	16335	063117		LDA QUEST	
0244	16336	016775		JSB TYPE	
0245	16337	026034		JMP LOOP	
0246	16340	063024	PROCD	LDA PRCDF	<SEMI-COLON>P IS LEGAL ONLY IF A BREAK HAS OCCUR
0247	16341	002021		SSA,RSS	
0001	16342	026334		JMP ERROR	
0002	16343	002400		CLA	
0003	16344	073024		STA PRCDF	NEW BREAK MUST OCCUR ;P IS OK
0004	16345	063037		LDA BREAK	TEST TO SEE IF BKPT HAS BEEN MOVED
0005	16346	053046		CPA L	SKIP IF BKPT HAS NOT BEEN MOVED
0006	16347	026411		JMP PRCDF	
0007	16350	063046		LDA L	
0008	16351	073025		STA VALUE	
0009	16352	063040		LDA BKCEL	GET INSTRUCTION AT BROKEN POINT
0010	16353	013106		AND MMSK	DOES IT REFERENCE MEMORY
0011	16354	002003		SZA,RSS	
0012	16355	026260		JMP GOTO	NO. PAU
0013	16356	063040		LDA BKCEL	YES
0014	16357	013101		AND OPMSK	WHAT IS THE OP CODE?
0015	16360	070001		STA B	COPY INTO B
0016	16361	063100		LDA JDINS	
0017	16362	013102		AND NPMSK	
0018	16363	030001		IOR B	
0019	16364	073040		STA BKCEL	
0020	16365	063036		LDA BKSAV	
0021	16366	013067		AND SMASK	GET ADDRESS WITHIN THE PAGE
0022	16367	073107		STA USERQ	
0023	16370	063036		LDA BKSAV	
0024	16371	013105		AND PMSK	MASK FOR Z/C BIT
0025	16372	053105		CPA PMSK	IS IT ON CURRENT PAGE?
0026	16373	026404		JMP GETPG	YES

0028	16374	063036	DOIT	LDA	BKSAV	NO
0029	16375	002020		SSA		IT IT AN INDIRECT REFERENCE?
0030	16376	026400		JMP	ADD1	NO. MORE WORK
0031	16377	026260		JMP	GOTO	YES
0032	16400	063107	ADD1	LDA	USERQ	GET INSTRUCTION
0033	16401	033104		IOR	IMSK	TURN ON THE INDIRECT BIT
0034	16402	073107		STA	USERQ	
0035	16403	026260		JMP	GOTO	CONTINUE
0036	16404	063037	GETPG	LDA	BREAK	GET ADDRESS OF BREAK LOCATION
0037	16405	013103		AND	ABMSK	MASK OUT TO GET THE PAGE NUMBER
0038	16406	033107		IOR	USERQ	MERGE IN THE ADDRESS WITHIN THE PAGE
0039	16407	073107		STA	USERQ	
0040	16410	026374		JMP	DOIT	
0041	16411	034000	PRCD1	ISZ	A	MAKE PTR TO BREAK ADDR+1
0042	16412	073043		STA	BKCL3	
0043	16413	034000		ISZ	A	MAKE PTR TO BREAK ADDR + 2
0044	16414	073044		STA	BKCL4	
0045	16415	063045		LDA	BKPTR	
0046	16416	073025		STA	VALUE	
0047	16417	026260		JMP	GOTO	

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0049      *SAVE MACHINE STATE
0050 16420 000000  SAVE  NOP
0051 16421 073032      STA AA      SAVE MACHINE STATE
0052 16422 077033      STB BB
0053 16423 002400      CLA
0054 16424 102200      SFC O      SKIP ON INTERRUPT DISABLED
0055 16425 003400      CCA          NO--SET A=-1
0056 16426 073060      STA INT     SAVE I/O STATE
0057 16427 103100      CLF O      TURN OFF INTERRUPTS
0058 16430 002400      CLA
0059 16431 103201      SOC C      SKIP IF OV IS CLEAR & CLEAR OV
0060 16432 003400      CCA          NO--SET A=-1
0061 16433 073057      STA OVRFW
0062 16434 002400      CLA
0063 16435 001600      ELA          ROTATES E INTO BIT 0 OF A
0064 16436 073056      STA EXTND
0065 16437 126420      JMP SAVE,I
0066      *
0067      *      RE-ENTRY PT AFTER BREAK
0068      *
0069 16440 016420  BKST1 JSB SAVE
0070 16441 063037      LDA BREAK
0071 16442 073046      STA L      SAVE PLACE FOR <SEMI-COLON>P
0072 16443 073026      STA DOT   NICE THING FOR DOT TO START OUT WITH
0073 16444 063036      LDA BKSAV  GET THE CONTENTS OF THE CELL WHERE THE BREAK-
0074      *          POINT WAS
0075 16445 173037      STA BREAK,I  AND PUT THEM BACK
0076 16446 003400      CCA          ENABLE ;P
0077 16447 073024      STA PRCDF
0078 16450 063032      LDA AA     TYPE OUT A
0079 16451 016464      JSB PRINT
0080 16452 017015      JSB TAB
0081 16453 063033      LDA BB     TYPE OUT B
0082 16454 016464      JSB PRINT
0083 16455 026034      JMP LOOP
0084 16456 063025  CLOSE LDA VALUE  CHANGE CONTENTS OF CELL
0085 16457 173026      STA DOT,I
0086 16460 026166      JMP LFEEED
0087 16461 063025  CONT  LDA VALUE
0088 16462 173026      STA DOT,I
0089 16463 026173      JMP STRT1

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0091		*		
0092	16464	000000	PRINT NOP	ENTRY POINT: HOLDS VALUE TO BE TYPED
0093	16465	073047	STA NUM	
0094	16466	063072	LDA M5	SET CNTR FOR 6 DIGITS
0095	16467	073050	STA CNTR	
0096	16470	002400	CLA	
0097	16471	073051	STA TPFLG	RESET LEADING ZERO FLAG
0098	16472	067047	LDB NUM	GET LEADING DIGIT
0099	16473	100101	RRL 1	
0100	16474	026500	JMP PRNT2	
0101	16475	067047	PRNT1 LDB NUM	GET DIGIT
0102	16476	002400	CLA	
0103	16477	100103	RRL 3	
0104	16500	077047	PRNT2 STB NUM	SAVE NUMBER RESIDUE
0105	16501	043071	ADA SIXTY	MAKE AN ASCII CHAR.
0106	16502	053071	CPA SIXTY	IS IT A ZERO?
0107	16503	053051	CPA TPFLG	YES, BUT IS IT THE FIRST?
0108	16504	026517	JMP PRNT4	
0109	16505	063120	LDA BLANK	YES. LEAVE A SPACE TO RIGHT JUSTIFY
0110	16506	016775	JSB TYPE	
0111	16507	037050	PRNT3 ISZ CNTR	IS THIS THE LAST CHAR?
0112	16510	026475	JMP PRNT1	NO. CONTINUE
0113	16511	002400	CLA	
0114	16512	067047	LDB NUM	YES. GET IT
0115	16513	100103	RRL 3	AND MAKE IT
0116	16514	043071	ADA SIXTY	AN ASCII CHAR
0117	16515	016775	JSB TYPE	AND PRINT IT
0118	16516	126464	JMP PRINT,I	
0119	16517	067071	PRNT4 LDB SIXTY	
0120	16520	077051	STB TPFLG	SET TO NON-LEADING ZERO
0121	16521	016775	JSB TYPE	TYPE IT
0122	16522	026507	JMP PRNT3	
0123	16523	000000	RE NOP	ENTRY: ROUTINE TO RECOGNIZE EXPRESSIONS
0124	16524	002400	CLA	
0125	16525	073025	STA VALUE	INITIALLY
0126	16526	063120	LDA BLANK	
0127	16527	073052	RE1 STA OP	
0128	16530	016566	JSB RT	RECOGNIZE TERM
0129	16531	026556	JMP RE5	NOT A TERM--LOOK FOR UNARY OPERATOR
0130	16532	063052	LDA OP	INSPECT THE OPERATOR
0131	16533	053120	CPA BLANK	TREAT BLANK LIKE +
0132	16534	026537	JMP RE2	
0133	16535	053121	CPA MINUS	DETERMINE WHETHER + OR -
0134	16536	026553	JMP RE4	IF -

0136	16537	063053	RE2	LDA NUMBR	COMPUTE NEW VALUE
0137	16540	043025	RE3	ADA VALUE	
0138	16541	073025		STA VALUE	
0139	16542	063030		LDA CHAR	
0140	16543	053121		CPA MINUS	SKIP IF NOT -
0141	16544	026527		JMP RE1	CONTINUE WITH EXPR
0142	16545	053120		CPA BLANK	SKIP IF NOT BLANK
0143	16546	026527		JMP RE1	CONT
0144	16547	053122		CPA PLUS	SKIP IF NOT +
0145	16550	026527		JMP RE1	
0146	16551	036523		ISZ RE	EXPR DONE--BUMP RETURN & EXIT
0147	16552	126523		JMP RE,I	
0148	16553	063053	RE4	LDA NUMBR	
0149	16554	003104		CMA,CLE,INA	CAN YOU BELIEVE THIS?
0150	16555	026540		JMP RE3	
0151	16556	063030	RE5	LDA CHAR	LOOK FOR UNARY OPERATOR
0152	16557	053121		CPA MINUS	
0153	16560	026527		JMP RE1	
0154	16561	053120		CPA BLANK	
0155	16562	026527		JMP RE1	
0156	16563	053122		CPA PLUS	
0157	16564	026527		JMP RE1	
0158	16565	126523		JMP RE,I	GIVE UP--TAKE FAILURE EXIT
0159	16566	000000	RT	NOP	ENTRY: TERM RECOGNIZER. SKIPS IF SUCCESSFUL
0160	16567	002400		CLA	
0161	16570	073054		STA RTF1	DOT ENCOUNTERED FLAG
0162	16571	073055		STA RTF2	DIGIT ENCOUNTERED FLAG
0163	16572	073053		STA NUMBR	
0164	16573	016761	RT1	JSB READ	IN A CHARACTER
0165	16574	043073		ADA M60	
0166	16575	002020		SSA	SKIP IF POSSIBLY A DIGIT
0167	16576	026615		JMP RT2	IF NOT
0168	16577	043074		ADA M10	
0169	16600	002021		SSA,RSS	SKIP IF DIGIT
0170	16601	026615		JMP RT2	IF NOT
0171	16602	063054		LDA RTF1	DIGIT FOUND. NOW...
0172	16603	002020		SSA	SKIP IF DOT HAS NOT BEEN ENCOUNTERED
0173	16604	126566		JMP RT,I	DOT ENCOUNTERED--SYNTAX ERROR
0174	16605	067030		LDB CHAR	ACCUMULATE NUMBER
0175	16606	101043		LSR 3	
0176	16607	067053		LDB NUMBR	
0177	16610	100043		LSL 3	
0178	16611	077053		STB NUMBR	
0179	16612	003400		CCA	
0180	16613	073055		STA RTF2	SET DIGIT ENCOUNTERED FLAG
0181	16614	026573		JMP RT1	

0183	16615	063055	RT2	LDA RTF2	TEST DIGIT ENCOUNTERED FLAG
0184	16616	002021		SSA,RSS	
0185	16617	026622		JMP RT3	DIGIT NOT YET ENCOUNTERED
0186	16620	036566		ISZ RT	DIGIT HAS BEEN ENCOUNTERED--BUMP & RETURN
0187	16621	126566		JMP RT,I	
0188	16622	063030	RT3	LDA CHAR	
0189	16623	053123		CPA DOTT	
0190	16624	026642		JMP RT4	IF .
0191	16625	053124		CPA SEMIC	
0192	16626	002001		RSS	
0193	16627	126566		JMP RT,I	NOT A <SEMI-COLON> ERROR EXIT
0194	16630	016761		JSB READ	<SEMI-COLON> GET ANOTHER CHARACTER
0195	16631	053125		CPA AAA	
0196	16632	026650		JMP RT6	A FOUND
0197	16633	053126		CPA BBB	
0198	16634	026652		JMP RT7	B FOUND
0199	16635	053132		CPA LLL	
0200	16636	026654		JMP RT8	L FOUND
0201	16637	053131		CPA III	
0202	16640	026656		JMP RT9	I FOUND
0203	16641	126566		JMP RT,I	NONE OF THE ABOVE: ERROR EXIT
0204	16642	063026	RT4	LDA DOT	
0205	16643	073053	RT5	STA NUMBR	
0206	16644	003400		CCA	
0207	16645	073054		STA RTF1	SET FLAGS
0208	16646	073055		STA RTF2	
0209	16647	026573		JMP RT1	
0210	16650	063032	RT6	LDA AA	
0211	16651	026643		JMP RT5	
0212	16652	063033	RT7	LDA BB	
0213	16653	026643		JMP RT5	
0214	16654	063046	RT8	LDA L	
0215	16655	026643		JMP RT5	
0216	16656	067056	RT9	LDB EXTND	SET UP INDICATOR IMAGES FOR DISPLAY
0217	16657	101041		LSR 1	
0218	16660	073062		STA TEMP1	
0219	16661	063060		LDA INT	
0220	16662	006400		CLB	
0221	16663	100041		LSL 1	
0222	16664	002400		CLA	
0223	16665	100042		LSL 2	
0224	16666	063062		LDA TEMP1	
0225	16667	100041		LSL 1	
0226	16670	002400		CLA	
0227	16671	100042		LSL 2	
0228	16672	063057		LDA OVRFW	
0229	16673	100041		LSL 1	
0230	16674	060001		LDA B	
0231	16675	026643		JMP RT5	

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0233	16676	000000	IC	NOP	ENTRY: CATEGORIZE TERMINAL CHARACTERS
0234	16677	063030		LDA CHAR	
0235	16700	053112		CPA SLASH	
0236	16701	126676		JMP IC,I	/ 1
0237	16702	053110		CPA BSLSH	
0238	16703	126676		JMP IC,I	<BACKSLASH> 1
0239	16704	053114		CPA LARO	
0240	16705	126676		JMP IC,I	<LEFT ARROW> 1
0241	16706	036676		ISZ IC	
0242	16707	053115		CPA CR	
0243	16710	126676		JMP IC,I	CR 2
0244	16711	036676		ISZ IC	
0245	16712	053111		CPA LF	
0246	16713	126676		JMP IC,I	LF 3
0247	16714	053113		CPA UPARO	
0248	16715	126676		JMP IC,I	<UP ARROW> 3
0249	16716	036676		ISZ IC	
0250	16717	053135		CPA EQL	
0251	16720	126676		JMP IC,I	= 4
0252	16721	036676		ISZ IC	
0253	16722	053136		CPA EXCL	
0254	16723	126676		JMP IC,I	<EXCLAMATION POINT> 5
0255	16724	036676		ISZ IC	
0256	16725	053124		CPA SEMIC	
0257	16726	026737		JMP IC1	TO CHECK FURTHER
0258	16727	063061		LDA PVCHR	TRY BACKING UP
0259	16730	053124		CPA SEMIC	
0260	16731	026757		JMP IC3	
0261	16732	036676		ISZ IC	
0262	16733	036676		ISZ IC	
0263	16734	036676		ISZ IC	
0264	16735	036676		ISZ IC	
0265	16736	126676		JMP IC,I	OTHER 10
0266	16737	016761	IC1	JSB READ	GET ANOTHER CHARACTER
0267	16740	053125	IC2	CPA AAA	
0268	16741	126676		JMP IC,I	A 6
0269	16742	053126		CPA BBB	
0270	16743	126676		JMP IC,I	B 6
0271	16744	036676		ISZ IC	
0272	16745	053130		CPA GGG	
0273	16746	126676		JMP IC,I	G 7
0274	16747	036676		ISZ IC	
0275	16750	053131		CPA III	
0276	16751	126676		JMP IC,I	I 8
0277	16752	036676		ISZ IC	
0278	16753	053133		CPA PPP	
0279	16754	126676		JMP IC,I	P 9
0280	16755	036676		ISZ IC	
0281	16756	126676		JMP IC,I	OTHER 10

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0283	16757	063030	IC3	LDA CHAR	
0284	16760	026740		JMP IC2	
0285	16761	000000	READ	NOP	ENTRY: READ A CHAR FROM TTY
0286	16762	063030		LDA CHAR	
0287	16763	073061		STA PVCHR	FOR POSSIBLE BACKING UP
0288	16764	063075		LDA DINPR	
0289	16765	102616		OTA TTY	SELECT TTY RDR
0290	16766	103716		STC TTY,C	START IT & WAIT FOR CHAR TO APPEAR
0291	16767	102316		SFS TTY	
0292	16770	026767		JMP *-1	
0293	16771	102516		LIA TTY	READ IT INTO A
0294	16772	013077		AND CHMSK	CONVERT TO H-P CODE
0295	16773	073030		STA CHAR	
0296	16774	126761		JMP READ,I	EXIT
0297	16775	000000	TYPE	NOP	ENTRY: TYPE OUT A CHAR TO TTY
0298	16776	067076		LDB DOPR	
0299	16777	106616		OTB TTY	SELECT TTY PRINTER
0300	17000	102616		OTA TTY	LOAD TTY BUFFER
0301	17001	103716		STC TTY,C	TYPE IT & WAIT FOR DONE
0302	17002	102316		SFS TTY	
0303	17003	027002		JMP *-1	
0304	17004	126775		JMP TYPE,I	EXIT
0305	17005	000000	CRLF	NOP	
0306	17006	063115		LDA CR	
0307	17007	016775		JSB TYPE	
0308	17010	063111		LDA LF	
0309	17011	016775		JSB TYPE	
0310	17012	063116		LDA LB	
0311	17013	016775		JSB TYPE	TYPE HERALD
0312	17014	127005		JMP CRLF,I	
0313	17015	000000	TAB	NOP	
0314	17016	063120		LDA BLANK	
0315	17017	016775		JSB TYPE	
0316	17020	016775		JSB TYPE	
0317	17021	016775		JSB TYPE	
0318	17022	127015		JMP TAB,I	

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0320	17023	000000	CNTNT	BSS	1	
0321	17024	000000	PRCDF	BSS	1	PROCEED FLAG
0322	17025	000000	VALUE	BSS	1	
0323	17026	000000	DOT	BSS	1	
0324	17027	000000	CELL	BSS	1	
0325	17030	000000	CHAR	BSS	1	
0326	17031	000000	MODE	BSS	1	
0327	17032	000000	AA	BSS	1	
0328	17033	000000	BB	BSS	1	
0329	17034	016440	BINDR	ABS	BKST1	
0330	17035	124003	BKIST	JMP	BRKGO,I	
0331	17036	000000	BKSAV	BSS	1	
0332	17037	000000	BREAK	OCT	0	PRESET BREAK ADDRESS AT 'NONE'
0333	17040	000000	BKCEL	BSS	1	WHERE BREAKPOINTS ARE STORED AND HANDLED
0334	17041	127043		JMP	BKCL3,I	<PATCH>
0335	17042	127044		JMP	BKCL4,I	<PATCH>
0336	17043	000000	BKCL3	BSS	1	
0337	17044	000000	BKCL4	BSS	1	
0338	17045	017040	BKPTR	ABS	BKCEL	
0339	17046	000000	L	BSS	1	LAST PLACE WHERE BREAK OCCURRED
0340	17047	000000	NUM	BSS	1	
0341	17050	000000	CNTR	BSS	1	
0342	17051	000000	TPFLG	BSS	1	
0343	17052	000000	OP	BSS	1	
0344	17053	000000	NUMBR	BSS	1	
0345	17054	000000	RTF1	BSS	1	
0346	17055	000000	RTF2	BSS	1	
0347	17056	000000	EXTND	BSS	1	
0348	17057	000000	OVRFW	BSS	1	
0349	17060	000000	INT	BSS	1	
0350	17061	000000	PVCHR	BSS	1	
0351	17062	000000	TEMP1	BSS	1	
0352	17063	000001	ONE	DEC	1	
0353	17064	000005	FIVE	DEC	5	
0354	17065	002000	EIT10	OCT	2000	
0355	17066	017777	ADMSK	OCT	17777	
0356	17067	001777	SMASK	OCT	1777	
0357	17070	016000	NSMSK	OCT	16000	
0358	17071	000060	SIXTY	OCT	60	
0359	17072	177773	M5	OCT	-5	
0360	17073	177720	M60	OCT	177720	
0361	17074	177770	M10	OCT	177770	
0362	17075	160000	DINPR	OCT	160000	
0363	17076	120000	DOPR	OCT	120000	
0364	17077	000177	CHMSK	OCT	177	
0365	17100	153107	JDINS	CPA	USERQ,I	
0366	17101	074000	OPMSK	OCT	74000	OP CODE MASK
0367	17102	103777	NPMSK	OCT	103777	-OPMSK
0368	17103	016000	ABMSK	OCT	16000	
0369	17104	100000	IMSK	OCT	100000	INDIRECT REFERENCE MASK
0370	17105	002000	PMSK	OCT	2000	ZERO/CURRENT PAGE MASK
0371	17106	070000	MMSK	OCT	70000	MEMORY REFERENCE MASK
0372	17107	000000	USERQ	BSS	1	

0374	17110	000134	BSLSH	OCT	134	<BACKSLASH>
0375	17111	000012	LF	OCT	12	LF
0376	17112	000057	SLASH	OCT	57	/
0377	17113	000136	UPARO	OCT	136	<UP ARROW>
0378	17114	000137	LARO	OCT	137	<LEFT ARROW>
0379	17115	000015	CR	OCT	15	CR
0380	17116	000043	LB	OCT	43	#
0381	17117	000077	QUEST	OCT	77	?
0382	17120	000040	BLANK	OCT	40	BLANK
0383	17121	000055	MINUS	OCT	55	-
0384	17122	000053	PLUS	OCT	53	+
0385	17123	000056	DOTT	OCT	56	.
0386	17124	000073	SEMIC	OCT	73	<SEMI-COLON>
0387	17125	000101	AAA	OCT	101	A
0388	17126	000102	BBB	OCT	102	B
0389	17127	000104	DDD	OCT	104	D
0390	17130	000107	GGG	OCT	107	G
0391	17131	000111	III	OCT	111	I
0392	17132	000114	LLL	OCT	114	L
0393	17133	000120	PPP	OCT	120	P
0394	17134	000124	TTT	OCT	124	T
0395	17135	000075	EQL	OCT	75	=
0396	17136	000041	EXCL	OCT	41	<EXCLAMATION POINT>
0397			END			

** NO ERRORS*

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0001

ASMB,A,B,L

** NO ERRORS*


```

0001      ASMB,A,B,L
0003      *
0004 17200      ORG      17200B
0005      *
0006 17200 107700      CLC      0,C      TURN OFF INTERRUPTS BY RESETTING
0007      *      CONTROL BITS
0008      *SET UP DMA AND TAPE CONTROLLER
0009 17201 063344      LDA      SAFE      (CLC DMA,C)
0010 17202 070007      STA      7      SET UP FOR DMA INTERRUPTS
0011 17203 063327      LDA      HALT      (HALT 4)
0012 17204 070010      STA      10B      INTERRUPT FROM TAPE DATA CHANNEL IS
0013      *      ERROR
0014 17205 063345      LDA      SAFE+1      (JSE 2B,I)
0015 17206 070011      STA      11B      SET UP TAPE COMMAND INTERRUPT VECTOR
0016 17207 063346      LDA      SAFE+2      (DEF CHECK)
0017 17210 070002      STA      2B
0018      *
0019 17211 063347      LDA      CW1      (DATA CHANNEL, CLC)
0020 17212 103607      OTA      DMA,C      SET UP DMA CONTROL WORD ONE
0021 17213 102100      STF      0      REENABLE INTERRUPTS
0022 17214 103711      STC      CMMD,C
0023 17215 063341      LDA      CLR      CLEAR THE TAPE CONTROLLER, BE SAFE
0024 17216 103611      OTA      CMMD,C
0025 17217 027217      JMP      *      AND WAIT FOR COMPLETION INTERRUPT
0026 17220 000011      OCT      11      MASK FOR CONTROLLER BUSY, RESET
0027      *      FAILURES
0028      *
0029 17221 063335      LDA      SEL1      SELECT COMMAND FOR TAPE UNIT #1
0030 17222 103611      OTA      CMMD,C
0031      *
0032 17223 103511      LIA      CMMD,C      GET TAPE STATUS
0033 17224 013343      AND      BOT      IS TAPE AT LOAD POINT?
0034 17225 002002      SZA
0035 17226 027237      JMP      SPACE      YES. CONTINUE
0036 17227 063333      LDA      REW      NO. GET REWIND COMMAND
0037 17230 103611      OTA      CMMD,C      OUTPUT IT
0038 17231 027231      JMP      *      WAIT TO COMMAND INIATION PAU
0039 17232 001417      OCT      1417      (OFF LINE,REJECT,ERROR,OR BUSY) FAIL
0040      *      MASK
0041 17233 102511      RWND      LIA      CMMD      NOW WAIT TILL TAPE
0042 17234 013343      AND      BOT      REWIND TO LOAD POINT
0043 17235 002003      SZA,RSS      OK YET?
0044 17236 027233      JMP      RWND      NO

```

0046		*				
0047	17237	063342	SPACE	LDA	FSF	GET FORWARD SPACE FILE TO SKIP TO
0048			*			FILEMARK
0049	17240	002040		SEZ		IF WE ARE WRITING THEN
0050	17241	063340		LDA	GWFM	REPLACE IT WITH A GAP AND WRITE
0051			*			THE FILEMARK
0052	17242	103611		OTA	CMMD,C	AND OUTPUT IT
0053	17243	027243		JMP	*	WAIT FOR COMPLETION INTERRUPT
0054	17244	003477		OCT	3477	(ONLY EOF AND NO WRITE RING ON, OK)
0055			*			
0056	17245	002041	CRE	SEZ	RSS	ARE WE TO READ OR WRITE?
0057	17246	027262		JMP	DOIT	READ
0058	17247	102000		HLT	0	WRITE. STOP
0059	17250	106501		LIB	SR	SR SHOULD HAVE BEGINNING ADDRESS OF
0060			*			BLOCK
0061	17251	102001		HLT	1	STOP
0062	17252	102501		LIA	SR	SR SHOULD HAVE END ADDRESS OF BLOCK
0063	17253	003004		CMA	INA	TWO'S COMPLEMENT
0064	17254	040001		ADA	B	NOW ADD TO BEGINNING TO MAKE
0065			*			NEGATIVE WORD COUNT
0066			*			
0067	17255	073354		STA	WDCNT	
0068	17256	077353		STB	BEGIN	
0069	17257	102002		HLT	2	
0070	17260	102501		LIA	SR	SR SHOULD HAVE ENTRY POINT TO
0071			*			TRANSFER TO
0072	17261	073355		STA	ENTRY	OR 0 TO CONTINUE WITH SUCCESSIVE BLOC
0001	17262	063352	DOIT	LDA	FIRST	GET POINTS TO DMA, FIXED PARAMETER
0002			*			LIST
0003	17263	017300		JSB	RDWRT	GO. R/W PARAMETER RECORD
0004	17264	063350		LDA	CW2	GET POINTER TO NEW PARS FROM
0005			*			PARAMETER RECORD
0006	17265	017300		JSB	RDWRT	GO R/W DATA BLOCK

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0008		*			
0009	17266	067355	END	LDB ENTRY	IS THERE AN ENTRY POINT?
0010	17267	006003		SZB,RSS	
0011	17270	027245		JMP CRE	NO, ITERATE BLOCKS
0012	17271	063334		LDA RWS	OK LAST BLOCK
0013	17272	103611		OTA CMMD,C	OUTPUT A REWIND, OFFLINE
0014	17273	027273		JMP *	WAIT TO CLEAN UP INTERRUPTS
0015			*		
0016	17274	000000		OCT 0	(ANYTHING OK NOW)
0017	17275	002040		SEZ	ARE WE CREATING
0018	17276	102003		HLT 3	YES, PAU HANA
0019	17277	124001		JMP B,I	NO, ENTER SOMETHING AND RUN IT.
0020			*		
0021	17300	000000	RDWRT	NOP	
0022	17301	106703		CLC DMA2	SET DMA POINTER TO CW2
0023	17302	164000		LDB A,I	GETS MEMCRY ADDRESS OF BEGINNING
0024	17303	002041		SEZ,RSS	ARE WE TO READ INTO CORE
0025	17304	047332		ADB READ	YES. TURN ON IN BIT
0026	17305	106603		OTB DMA2	LOAD DMA CW2
0027	17306	102703		STC DMA2	POINTER TO CW3
0028	17307	034000		ISZ A	
0029	17310	164000		LDB A,I	GET WORD COUNT
0030	17311	106603		OTB DMA2	LOAD DMA WORD COUNT
0031	17312	067337		LDB RCC	GET READ TAPE COMMAND
0032	17313	002040		SEZ	ARE WE WRITING?
0033	17314	067336		LDB WCC	YES. REPLACE IT WITH WRITE
0034	17315	107611		OTB CMMD,C	OUTPUT IT
0035	17316	103707		STC DMA,C	AND START DMA
0036	17317	027317		JMP *	WAIT FOR COMPLETION
0037	17320	003477		OCT 3477	(ONLY EOF, NO WRITE RING)
0038	17321	127300		JMP RDWRT,I	NORMAL EXIT
0039	17322	000000	CHECK	NOP	NORMAL ENTRY
0040	17323	037322		ISZ CHECK	BUMP RETURN POINTER TO MASK
0041	17324	103511		LIA CMMD,C	GET CONTROLLER STATUS WORD
0042	17325	113322		AND CHECK,I	MASK IT
0043	17326	002002		SZA	FAILURE BITS SET
0044	17327	102004	HALT	HLT 4	YES. GIVE UP TRYING
0045	17330	037322		ISZ CHECK	NO. BUMP RETURN POINTER
0046	17331	127322		JMP CHECK,I	NORMAL EXIT

```

0048      *
0049      *          CONSTANTS
0050      *
0051 17332 100000 READ      OCT      100000
0052 17333 000011 REW      OCT        11
0053 17334 000031 RWS      OCT        31
0054 17335 001400 SEL1     OCT      1400
0055 17336 000301 WCC      OCT        301
0056 17337 000203 RCC      OCT        203
0057 17340 000161 GWFM     OCT        161
0058 17341 000110 CLR      OCT        110
0059 17342 000043 FSF      OCT         43
0060 17343 000040 BOT      OCT         40
0061      *
0062 17344 107707 SAFE     CLC      DMA,C
0063 17345 114002          JSB      2,I
0064 17346 017322          DEF      CHECK
0065      *
0066 17347 020010 CW1      OCT      20010
0067 17350 017353 CW2      DEF      BEGIN
0068 17351 177767          OCT      -11
0069      *
0070 17352 017350 FIRST    DEF      CW2
0071      *
0072 17353 000000 BEGIN    BSS        1
0073 17354 000000 WDCNT    BSS        1
0074 17355 000000 ENTRY    BSS        1
0075 17356 000000          BSS        6
0076      *
0077      *          ASSEMBLER DEFINITIONS
0078      *
0079 00011          CMMD     EQU      11B
0080 00007          DMA      EQU      7B
0081 00003          DMA2     EQU      3B
0082 00001          SR       EQU      1B
0083 00001          B        EQU      1B
0084 00000          A        EQU      0
0085      *
0086          END

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RESERVE SPACE FOR REMAINING DUMMY WORDS

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ASMS,A,B,L

** NO ERRORS*

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0001      ASMB,A,B,L
0003      *
0004      *
0005      *          BASIC BINARY LOADER (BBL)
0006      *
0007      *
0008      17700      ORG          17700B
0009      *
0010      *
0011      *          MODES SET BY SWITCH REGISTER
0012      *
0013      *          SR = 000000      LOAD CODE
0014      *          SR = 000001      CALCULATE CHECKSUM AND COMPARE ONLY
0015      *          SR = 100000      COMPARE CODE
0016      *
0017      *
0018      *          HALTS
0019      *
0020      *          SR = 102000      COMPARE FAILURE IN CODE
0021      *          CHECK LOC PTR TO SEE ADDRESS
0022      *          SR = 102011      CHECKSUM ERROR
0023      *          SR = 102055      MEMORY LIMIT FAILURE
0024      *          SR = 102077      LOADED SUCCESSFULLY
0025      *
0026      *
0027      17700      ORG          17700B
0028      *
0029      17700 107700 BEGIN CLC      O,C          DISABLE INTERRUPTS
0030      17701 063770      LDA      STOR      ASSUME STORE OPERATION (STA PTR,I)
0031      17702 106501      LIB      1          READ SWITCH REGISTER INTO B
0032      17703 004010      SLB          IS LSB =1
0033      17704 002400      CLA          YES. COMPUTE CHECKSUM ONLY. (NOP)
0034      17705 006020      SSB          IS MSB =1
0035      17706 063771      LDA      COMP      YES, COMPARE CODE (CPA PTR,I)
0036      17707 073736      STA      CELL
0037      17710 006401      CLB,RSS      SKIP INTO READ LOOP
0038      *
0039      17711 067773      LDB      M13      THERE MUST BE LESS THAN 11 NULLS
0040      *          BETWEEN BLOCKS, BUT 2B5 IN LEADER
0041      *
0042      *
0043      17712 006006      LOOP INB,SZB      BUMP NULL COUNT IN B REG
0044      17713 027717      JMP      *+4
0045      17714 107700      CLC      O,C
0046      17715 102077      HLT      77B      SUCCESS HALT, ALL TAPE READ
0047      17716 027700      JMP      BEGIN      RESTART OPERATION
0048      17717 017762      JSB      RDR      GET BYTE
0049      17720 002003      SZA,RSS      IS IT NULL?
0050      17721 027712      JMP      LOOP      YES,SUCK UP LEADER, OR GAP NULLS
0051      17722 003104      CMA,CLE,INA      COMPLEMENT INTO WORD COUNT
0052      17723 073774      STA      CNT
0053      17724 017762      JSB      RDR      EAT UP NULL BYTE
0054      17725 017753      JSB      PACK
0055      17726 070001      STA      B          PUT ADDRESS INTO B AS START OF CHECKSUM
0056      17727 073775      STA      PTR
    
```

or equal?

```

0058 *
0059 17730 063775 CONT LDA PTR CHECK THAT WE DON'T OVERRUN THE LOADER
0060 17731 043772 ADA FENCE
0061 17732 002040 SEZ
0062 17733 027751 JMP BOUND NO GOOD
0063 17734 017753 JSB PACK GET NEXT WORD OF DATA
0064 17735 044000 ADB A B HAS THE CHECKSUM GROWING IN IT
0065 *
0066 17736 000000 CELL NOP NOP, STA OR LDA WILL BE HERE
0067 *
0068 17737 002101 CLE,RSS
0069 17740 102000 HLT O COMPARE FAILURE HALT
0070 17741 037775 ISZ PTR INCREMENT ADDRESS POINTER
0071 17742 037774 ISZ CNT INCREMENT CNT, SKP AFTER LAST WORD
0072 17743 027730 JMP CONT KEEP ON TRUCKING
0073 17744 017753 JSB PACK NOW GET THE CHECKSUM
0074 17745 054000 CPB A IS CHECK IN B EQUAL ONE READ IN?
0075 17746 027711 JMP LOOP-1 OK, CONTINUE
0076 17747 102011 HLT 11B CHECKSUM ERROR
0077 17750 027700 JMP BEGIN
0078 *
0079 17751 102055 BOUND HLT 55B MEMORY LIMIT VIOLATION
0080 * POINTER IS NOW UP TO LOADER CODE
0081 17752 027700 JMP BEGIN
0082 *
0083 17753 000000 PACK NOP
0084 17754 017762 JSB RDR GET BYTE
0085 17755 001727 ALF,ALF PUT INTO HI BYTE
0086 17756 073776 STA TEMP SAVE
0087 17757 017762 JSB RDR
0088 17760 033776 IOR TEMP MERGE
0089 17761 127753 JMP PACK,I RETURN. WORD IN A
0090 *
0091 17762 000000 RDR NOP TTY ON LINE 16B
0092 17763 103716 STC TTY,C START PAPER TAPE READER
0093 17764 102316 SFS TTY
0094 17765 027764 JMP *-1 NOTHING YET
0095 17766 102516 LIA TTY CHAR INTO A
0096 17767 127762 JMP RDR,I
0097 *
0098 17770 173775 STOR STA PTR,I
0099 17771 153775 COMP CPA PTR,I
0100 17772 160100 FENCE ABS -BEGIN
0101 17773 177765 M13 OCT -13
0102 17774 000000 CNT BSS 1
0103 17775 000000 PTR BSS 1
0104 17776 000000 TEMP BSS 1
0105 00000 A EQU 0
0106 00001 B EQU 1
0107 00016 TTY EQU 16B
0108 *
0109 END
** NO ERRORS**

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BIFM

622909

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0001

ASMB,A,B,L

** NO ERRORS*


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0001          ASMB,A,B,L
0003 00101          ORG          101B
0004          *
0005 00101 014026   DEF          INPUT          INPUT FROM CHIO
0006 00102 014133   DEF          LIST          LIST OUTPUT TO IOMEC PRINTER
0007 00103 014002   DEF          PUNCH         BINARY OUTPUT TO CHIO
0008          *
0009 00106          ORG          106B
0010          *
0011 00106 013777   ABS          CLEAN-1        END OF FREE CORE
0012          *
0013          *
0014 14000          ORG          14000B
0015          *
0016          *
0017          *
0018 14000 103513   CLEAN     LIA          13B,C        TIGHT LOOP TO EAT UP CHIO BUFFER
0019 14001 026000          JMP          CLEAN
0020          *
0021 14002 000000   PUNCH     NOP
0022 14003 002021          SSA,RSS        CHECK THAT COUNT IS NEGATIVE
0023 14004 102001          HLT          1          FAIL HARD
0024 14005 072326          STA          CNT
0025 14006 076324          STB          BUF        SAVE BUFFER ADDRESS
0026          *
0027 14007 162324   LOOP2    LDA          BUF,I        GET NEW WORD OF BINARY
0028 14010 001727          ALF,ALF       ROTATE LEFT BYTE DOWN
0029 14011 016020          JSB          OUT        AND GET IT PUNCHED OUT
0030 14012 162324          LDA          BUF,I        GET SECOND BYTE
0031 14013 016020          JSB          OUT
0032 14014 036324          ISZ          BUF        READY PTR TO NEXT WORD
0033 14015 036326          ISZ          CNT        ARE WE DONE?
0034 14016 026007          JMP          LOOP2       NO
0035 14017 126002          JMP          PUNCH,I     YES, PAU
0036          *
0037 14020 000000   OUT      NOP
0038 14021 022303          XOR          INV        INVERT BITS 6 AND 7 TO UNDO THE HARDWARE
0039 14022 102213          SFC          13B        IS CHIO READY TO TAKE IT?
0040 14023 026022          JMP          *-1        NO
0041 14024 102613          OTA          13B        OUTPUT RT. BYTE
0042 14025 126020          JMP          OUT,I       RETURN

```

TTY ADR = 16B

	HP SID	loc	CHIO SID
branch to assembler	124456	100	124456
input	17416	101	14026
list	17567	102	14133
punch	17567	103	14002
kbd.	17405	104	17405
begin free core	6662	105	6662
end " "	17404	106	13777

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```

0045 *
0046 *
0047 *
0048 * ALL NULLS ARE STRIPPED FROM ASCII INPUT STREAM*
0049 *
0050 14026 000000 INPUT NOP
0051 14027 002020 SSA CHECK TO BE SURE THEY WANT ASCII
0052 14030 102002 HLT 2 NO. FAIL HARD
0053 14031 003004 CMA,INA INVERT COUNT
0054 14032 072326 STA CNT
0055 14033 076324 STB BUF SAVE BUFFER ADDRESS
0056 14034 076325 STB PTR PUT POINTER
0057 14035 002400 CLA
0058 14036 072327 STA CCNT RESET # OF CHARS READ
0059 *
0060 14037 016062 LOOP JSB READ GET LEFT CHAR
0061 14040 036327 ISZ CCNT INCREMENT # READ
0062 14041 162325 LDA PTR,I GET OLD WORD
0063 14042 012313 AND K377 ERASE LEFT CHAR
0064 14043 005727 BLF,BLF ROTATE CHAR IN B UP
0065 14044 030001 IOR 1 MERGE INTO B
0066 14045 172325 STA PTR,I STORE
0067 14046 016105 JSB CHECK SEE IF WE ARE DONE
0068 14047 026122 JMP DONE YES
0069 14050 016062 JSB READ GET RIGHT CHAR
0070 14051 036327 ISZ CCNT BUMP COUNT
0071 14052 162325 LDA PTR,I GET OLD WORD
0072 14053 012312 AND K1774 KEEP GOOD CHAR
0073 14054 030001 IOR B MERGE IN B
0074 14055 172325 STA PTR,I STORE NEW WORD
0075 14056 036325 ISZ PTR READY TO WORK ON NEXT WORD
0076 14057 016105 JSB CHECK
0077 14060 026122 JMP DONE
0078 14061 026037 JMP LOOP NO
0079 *
0080 *
0081 14062 000000 READ NOP
0082 14063 016075 JSB GET GET A CHAR
0083 14064 056314 CPB LF IGNORE LF'S IN GENERAL
0084 14065 026063 JMP *-2
0085 14066 056315 CPB CR BUT LOOK FOR CR-LF
0086 14067 002001 RSS
0087 14070 126062 JMP READ,I NO CR, JUST ORDINARY CHAR
0088 14071 016075 JSB GET LOOK FOR A LF NOW
0089 14072 056314 CPB LF
0090 14073 026122 JMP DONE END OF RECORD GOT HERE
0091 14074 102003 HLT 3 SEQUENCE WRONG, FAIL HARD
0092 *

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0094
0095 14075 000000 GET NOP
0096 14076 102313 SFS 13B IS CHAR HERE FROM CHIO
0097 14077 026076 JMP *-1 NOT YET
0098 14100 106513 LIB 13B PUT INTO B
0099 14101 006003 SZB,RSS IS IT A NULL?
0100 14102 026076 JMP GET+1 SWALLOW ALL NULLS ON INPUT
0101 14103 076331 STB CHAR TEMP SAVE
0102 14104 126075 JMP GET,I SUCCESS RETURN
0103
0104
0105 14105 000000 CHECK NOP
0106 14106 062327 LDA CCNT HOW MANY CHARS HAVE BEEN READ?
0107 14107 042311 ADA M52 IS IT MORE THAN HP ALLOWS
0108 14110 002020 SSA IF SO SAVE FOR LIST LATER
0109 14111 002400 CLA NO, STORE AT BEG OF BUFFER
0110 14112 042330 ADA HPTR BEGINNING OF SPECIAL BUFFER
0111 14113 052415 CPA FIN CHECK FOR RUN AWAY
0112 14114 102004 HLT 4 FAIL HARD ON TOO000 MUCH INPUT
0113 14115 066331 LDB CHAR
0114 14116 174000 STB A,I SAVE IN SAID BUFFER
0115 14117 036326 ISZ CNT HAVE WE GOT ENOUGH?
0116 14120 036105 ISZ CHECK NO
0117 14121 126105 JMP CHECK,I YES
0118
0119
0120
0121 14122 162324 DONE LDA BUF,I GET FIRST WORD OF BUFFER
0122 14123 012312 AND K1774 AND FIRST CHAR OF THAT
0123 14124 066327 LDB CCNT PICK UP NUMBER OF CHARS
0124 14125 052300 CPA STAR WAS FIRST CHAR A '*'?
0125 14126 006400 CLB YES. PUT # OF CHARS _ O
0126 14127 076321 STB RLEN FOR LISTER TO EXPAND LATER
0127
0128 14130 062327 LDA CCNT COUNT IN A
0129 14131 066324 LDB BUF BUFFER ADR IN B
0130 14132 126026 JMP INPUT,I NORMAL RETURN
0131
0132

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0135
0136 14133 000000 LIST NOP ENTRY POINT TO IOMEC LINE PRINTER DRIVER
0137 14134 002003 SZA,RSS IS CHAR COUNT ZERO?
0138 14135 026207 JMP CRLF YES, JUST LINE FEED
0139 14136 052310 CPA M1 IS IT A FORM FEED REQUEST?
0140 14137 026211 JMP FF YES
0141 14140 002020 SSA MAKE SURE IT IS A CHARACTER COUNT
0142 14141 102005 HLT 5 FAIL HARD
0143
0144 14142 003004 LP1 CMA,INA MAKE AN ISZ COUNT
0145 14143 072326 STA CNT
0146 14144 076324 STB BUF SAVE BUFFER ADDRESS
0147 14145 002400 CLA RESET COUNT OF OUTPUT CHARACTERS
0148 14146 072317 STA SWIT ODD/EVEN SWITCH
0149 14147 072322 STA KCNT
0150 14150 066301 LDB M4 COUNT OF BLANKS
0151 14151 016265 JSB BLANK TO BE SPACED OUT OVER HOLES
0152
0153
0154
0155 14152 162324 LP2 LDA BUF,I GET PACKED WORD
0156 14153 016161 JSB PR PRINT IT (EVENTUALLY)
0157 14154 162324 LDA BUF,I
0158 14155 001727 ALF,ALF ROTATE LOW BYTE UP
0159 14156 016161 JSB PR
0160 14157 036324 ISZ BUF BUMP WORD POINTER
0161 14160 026152 JMP LP2 KEEP ON TRUCKING
0162
0163 14161 000000 PR NOP
0164 14162 016214 JSB P GET IT PRINTED
0165 14163 036326 ISZ CNT ALL DONE YET?
0166 14164 126161 JMP PR,I NO, MORE REMAINS
0167

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062914

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0169      *
0170      *
0171      *      THIS CODE PRINTS OUT CHARACTERS THAT THE HP ASSEMBLER CUT
0172      *
0173      *
0174      14165 036323      ISZ      FLAG      IS IT A COMMENT
0175      14166 026207      JMP      CRLF      YES. DONE HERE
0176      14167 062321      LDA      RLEN      GET COUNT OF CHARS READ IN BEFORE.
0177      14170 042311      ADA      M52       CODE, SO SHORTER
0178      14171 002020      SSA
0179      14172 026207      JMP      CRLF      HP SHOULD HAVE OUTPUT IT ALL
0180      14173 002003      SZA,RSS      BORDERLINE CASE?
0181      14174 026207      JMP      CRLF      YES
0182      14175 003004      CMA,INA      MAKE COUNT OF REMAINDER
0183      14176 072326      STA      CNT
0184      14177 066330      LDB      HPTR      BUFFER BEGINNING
0185      14200 076316      STB      TEMP
0186      *
0187      *
0188      14201 036316      LP3      ISZ      TEMP      INCREMENT POINTER
0189      14202 162316      LDA      TEMP,I     GET CHAR
0190      14203 001727      ALF,ALF      PUT IT ITO POSITION
0191      14204 016241      JSB      STUFF      PRINT
0192      14205 036326      ISZ      CNT        DONE YET?
0193      14206 026201      JMP      LP3        NO
0194      *
0195      *
0196      14207 062306      CRLF      LDA      FEED      GET NEW CARRIAGE FEED
0197      14210 002001      RSS
0198      *
0199      14211 062307      FF      LDA      SLEW      SKIP TO TOP OF PAGE
0200      14212 016241      JSB      STUFF
0201      14213 126133      JMP      LIST,I     ALL DONE
0202      *
0203      *
0204      14214 000000      P      NOP
0205      14215 036322      ISZ      KCNT      BUMP COUNT OF CHARS OUTPUT
0206      14216 066322      LDB      KCNT
0207      14217 056274      CPB      K5        IS THIS THE 5 TH CALL?
0208      14220 026223      JMP      P2        YES, TIME TO CHECK FORM
0209      14221 016241      JSB      STUFF      NO, PRINT IT
0210      14222 126214      JMP      P,I       NORMAL RETURN
0211      *
0212      14223 012312      P2      AND      K1774      IS THIS A '*'?
0213      14224 052300      CPA      STAR
0214      14225 026232      JMP      P1        YES
0215      14226 016241      JSB      STUFF      NO, PRINT IT
0216      14227 062310      LDA      M1        COMMENT FLAG TO CODE
0217      14230 072323      STA      FLAG      SET COMMENT FLAG TO ZERO
0218      14231 126214      JMP      P,I       CODE LINE RETURN
0219      *

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0221	14232	066275	P1	LDB	M8	BLANK COUNTER
0222	14233	016265		JSB	BLANK	
0223	14234	062300		LDA	STAR	PRINT THE *
0224	14235	016241		JSB	STUFF	
0225	14236	002400		CLA		COMMENT FLAG TO ZERO
0226	14237	072323		STA	FLAG	COMMENT FLAG_1
0227	14240	126214		JMP	P,I	COMMENT LINE RETURN
0228			*			
0229	14241	000000	STUFF	NOP		ROUTINE TO PACK IOMEC WORDS
0230	14242	036317		ISZ	SWIT	BUMP ODD/EVEN SWITCH
0231	14243	066317		LDB	SWIT	
0232	14244	004010		SLB		
0233	14245	026253		JMP	ODD	THIS IS AN ODD ONE
0234	14246	001727		ALF,ALF		EVEN SO ROTATE INTO LOW HALF
0235	14247	012313		AND	K377	MASK JUNK
0236	14250	032320		IOR	SAVE	GET UPPER HALF
0237	14251	016260		JSB	POUT	AND GET IT TO IOMEC
0238	14252	126241		JMP	STUFF,I	RETURN, NOTE LINE IS PRINTED IF
0239			*			THAT WAS A LINE FEED - AUTOMATICAL
0240			*			
0241	14253	002020	ODD	SSA		CARRIAGE CONTROL TEST
0242	14254	016260		JSB	POUT	TRUE, GET IT OUT ON LINE
0243	14255	012304		AND	HI	NOW TO TUCK IT AWAY - ALL CASES
0244	14256	072320		STA	SAVE	TILL 'EVEN' CAN PRINT IT
0245	14257	126241		JMP	STUFF,I	
0246			*			
0247	14260	000000	POUT	NOP		
0248	14261	102314		SFS	14B	PRINTER READY FOR CHAR
0249	14262	026261		JMP	*-1	NO
0250	14263	103614		OTA	14B,C	YES, PRINT SAME
0251	14264	126260		JMP	POUT,I	
0252			*			
0253	14265	000000	BLANK	NOP		ROUTINE TO OUTPUT SPACES
0254	14266	076316		STB	TEMP	SAVE THE COUNT
0255	14267	062305		LDA	BLNK	
0256	14270	016241		JSB	STUFF	
0257	14271	036316		ISZ	TEMP	
0258	14272	026267		JMP	BLANK+2	
0259	14273	126265		JMP	BLANK,I	

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0261
0262 00000      *      EQU      0
0263 00001      B      EQU      1
0264
0265 14274 000005 K5      OCT      5
0266 14275 177760 M8      DEC     -16
0267 14276 000016 K16     OCT     16
0268 14277 177762 M16     OCT    -16
0269 14300 025000 STAR    OCT    25000
0270 14301 177774 M4      OCT     -4
0271 14302 177772 M6      OCT     -6
0272 14303 000300 INV     OCT     300
0273 14304 077400 HI      OCT    077400
0274 14305 020040 BLNK    OCT    20040
0275 14306 100400 FEED    OCT    100400
0276 14307 104400 SLEW    OCT    104400
0277 14310 177777 M1      OCT     -1
0278 14311 177714 M52     DEC    -52
0279 14312 177400 K1774   OCT    177400
0280 14313 000377 K377    OCT     377
0281 14314 000012 LF      OCT     12
0282 14315 000015 CR      OCT     15
0283
0284
0285 14316 000000 TEMP     BSS     1
0286 14317 000000 SWIT     BSS     1
0287 14320 000000 SAVE     BSS     1
0288 14321 000000 RLEN     BSS     1
0289 14322 000000 KCNT     BSS     1
0290 14323 000000 FLAG     BSS     1
0291 14324 000000 BUF      BSS     1
0292 14325 000000 PTR      BSS     1
0293 14326 000000 CNT      BSS     1
0294 14327 000000 CCNT     BSS     1
0295 14330 014331 HPTR     ABS     CHAR
0296 14331 000000 CHAR     BSS     52
0297 14415 014415 FIN      ABS     *
0298
0299

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ASCII '*'

END

** NO ERRORS*