```
                /
                /       THIS PROGRAM RELIES ON THE PROGRAM INTERUPT FACILITY FOR
                /       REAL WORLD TIMING PURPOSES.
                /

        0000            *0

00000   0000            0                       /EFFECTIVE JMS 0 ON PROGRAM INTERUPT
00001   5402            JMP I 2                 /EXIT IMMEDIATLY TO SERVICE ROUTINE
00002   0513            INTSER

00003   0000  EMPTY,    0                       /THESE LOCATIONS ARE RESERVED FOR
00004   0000  ODT1,     0                       /DEBUGGERS, ETC.
00005   0000  ODT2,     0
00006   0000  ODT3,     0

                /
                /       ALL THE AUTO INDEX REGISTERS ARE NAMED BUT NOT ALL OF
                /       THEM ARE USED. THE STATUS OF ANY GIVEN REGISTER CANNOT
                /       BE DETERMINED AT ANY TIME EXCEPT BY CAREFUL INSPECTION OF
                /       THE CODE.
                /


        0010            *10

00010   0000  AUTO10,   0
00011   0000  AUTO11,   0
00012   0000  AUTO12,   0
00013   0000  AUTO13,   0
00014   0000  AUTO14,   0
00015   0000  AUTO15,   0
00016   0000  AUTO16,   0
00017   0000  AUTO17,   0

                /
                /       THE FOLLOWING ARE THE DATA FILES FOR THE TWO SPACE SHIPS
                /       AS WELL AS CERTAIN OTHER PARAMETERS FOR CALCULATING POSITIONS
                /       AND SO ON.  THE ORDER OF THE LOCATIONS MUST BE PRESERVED
                /       ALTHOUGH THE SIZE OF THE TABLES MAY BE VARIED
                /

        0020            *20

00020   0000  ONEOUT,   0                       /IF NON-ZERO CONTAINS REAMINING TIME OF EXPLOSION
00021   0000  ONECNT,   0                       /NUMBER OF POINTS IN FIGURE TO BE DISPLAYED
00022   0000  ONEFLG,   0                       /IN OR OUT OF NORMAL SPACE
00023   0000  ONETHE,   0                       /ANGLE OF ORIENTATION ON SCREEN
00024   0000  ONEVEX,   0                       /X COMPONENT OF VELOCITY
00025   0000  ONEVEY,   0                       /Y COMPONENT OF VELOCITY
00026   0000  ONEPEX,   0                       /X POSITION (12 BITS)
00027   0000  ONEPEY,   0                       /Y POSITION (12 BITS)
00030   0000  ONESIN,   0                       /SINE OF ANGLE
00031   0000  ONECOS,   0                       /COSINE OF ANGLE
00032   0000  ONEFIN,   0                       /SET WHEN EXPLOSION DIES OUT
```

PATCH TO REALIGN SHIPS

226 / 1742
3036

172 / 0263

```
00033  0000  TWOOUT, 0                    /SAME CONTENT AND ORDER
00034  0000  TWOCNT, 0                    /AS ABOVE
00035  0000  TWOFLG, 0
00036  0000  TWOTHE, 0
00037  0000  TWOVEX, 0
00040  0000  TWOVEY, 0
00041  0000  TWOPEX, 0
00042  0000  TWOPEY, 0
00043  0000  TWOSIN, 0
00044  0000  TWOCOS, 0
00045  0000  TWOFIN, 0


               /
               /       THESE LOCATIONS ARE USED BY THE "VECTOR GENERATOR" IN
               /       DISPLAYING THE FIGURES.  A FOUR DOT VECTOR WILL BE DRAWN
               /       FROM XONE,YONE TO XTWO,YTWO WITH STEPS OF SIZE DIXTEM,DIYTEM
               /

00046  0000  XONEDS, 0
00047  0000  YONEDS, 0
00050  0000  XTWODS, 0
00051  0000  YTWODS, 0
00052  0000  DIXTEM, 0
00053  0000  DIYTEM, 0
00054  0000  DISCNT, 0


               /
               /       THE NEXT LOCATIONS ARE USED BY CALPOS TO DO A FAST
               /       MULTIPLY TO HELP CALCULATE THE DISPLAY FILES.
               /
00055  0000  T10SIN, 0
00056  0000  T20SIN, 0
00057  0000  T30SIN, 0
00060  0000  T10COS, 0
00061  0000  T20COS, 0
00062  0000  T30COS, 0

00063  0000  CALSIN, 0
00064  0000  CALCOS, 0
```

DISPLAY COORD. LOC.

```
                        /
                        /       NOW COME THE VARIOUS ODDS AND ENDS ONE USUALLY FINDS ON
                        /       PAGE ZERO
                        /

00065  6400  SINE,    SINEIN
00066  6463  COSINE,  COSINI
00067  6621  MULT,    MULTI
00070  6675  RSHIFT,  SHIFTR
00071  1475  VECTOR,  DISPLY
00072  6703  CALPOS,  POSCAL
00073  0000  INTWRD,  0
00074  0000  INTCNT,  0
00075  0000  CLOCK,   0
00076  2200  HYPER,   HYPSET
00077  7000  MESOUT,  CHARS
00100  2475  THEADJ,  THEAJI
00101  2451  VEESCL,  VEELIM
00102  1535  ISHFT,   DISHFT
00103  1675  RESET1,  RESE1
00104  0000  GAMOVR,  0
00105  0000  ACCFLG,  0
00106  7750  ACCPER,  -30
00107  7400  MEXP,    -400

00110  0000  PROX,    0
00111  0000  PROY,    0
00112  7420  PROLIF,  -360
00113  0000  BUFTMP,  0
00114  7400  ONEFIL,  DISBUF
00115  7440  TWOFIL,  DISBUF+40

00116  0005  P5,      5
00117  0010  P10,     10
00120  0017  P17,     17
00121  0020  P20,     20
00122  0037  P37,     37
00123  0040  P40,     40
00124  0100  P100,    100
00125  0132  P132,    132
00126  0200  P200,    200
00127  0400  P400,    400
00130  0550  P550,    550
00131  3777  P3777,   3777

00132  7774  M4,      -4
00133  7772  M6,      -6
00134  7770  M10,     -10
00135  7767  M11,     -11
00136  7514  M264,    -264
00137  7600  M200,    -200
00140  7400  M400,    -400
00141  7230  M550,    -550

                        /
```

LOC 2677

/ Projectile life

sock interval

4 dots

= 6

= 10

ETC

3376
7420

```
                /
                /       THE PROGRAM MAY BE STARTED OR RESTARTED AT ANYTIME AT 0200.
                /       THE DATA FILE ON PAGE ZERO IS CLEARED, ALL FLAGS INITIALIZED,
                /       AND THE SR EXAMINED.  IF THE SR=0 THE DISPLAY UPDATE ROUTINES
                /       ARE SET TO PICK UP THE STATUS WORD FROM THE SR.  IF THE SR
                /       DOES NOT EQUAL ZERO, THE STATUS WORD IS READ FROM THE EIGHT
                /       CONTINGENCY INPUTS ON THE BLUE RIBBON CONNECTOR OF THE AX08
                /       (XR OPTION ONLY).  JUMP IS THEN TO THE DISPLAY
                /       FILE UPDATE TO START OFF THE GAME.
                /

          0200          *200

00200  7300  START,  CLA CLL                 /START OR RESTART HERE ANY OLD TIME
00201  7604          LAS                     /SR
00202  7650          SNA CLA
00203  1311          TAD SWRD                /USE THE SR
00204  1312          TAD XROPT               /USE THE BLUE RIBBON CONNECTOR
00205  3251          DCA COLDST              /AND LEAVE IN THE TRAP LOCATION

00206  7240  RESTRT, CLA CMA
00207  6334          XRCL                    — CLR A/D (SEE ADE/S
00210  7300          CLA CLL

00211  1120          TAD P17                 /FIRST CLEAR THE POSITION AND DATA
00212  3010          DCA AUTO10              /TABLES OF THE TWO SHIPS
00213  1303          TAD TABLEN
00214  3011          DCA AUTO11
00215  3410          DCA I AUTO10
00216  2011          ISZ AUTO11
00217  5215          JMP .-2

00220  1307          TAD STRT1               /SET THE STARTING POSITIONS OF THE
00221  3026          DCA ONEPEX              /TWO SHIPS
00222  1310          TAD STRT2
00223  3041          DCA TWOPEX
00224  1122          TAD P37                 /SET TRIG FUNCTIONS JUST IN CASE
00225  3031          DCA ONECOS
00226  1122          TAD P37
00227  3044          DCA TWOCOS              /ZERO DEGREES IS POINTING STRAIGHT UP
00230  1106          TAD ACCPER              /SET COUNT FOR VELOCITY INCREASE
00231  3105          DCA ACCFLG
00232  3032          DCA ONEFIN              /CLEAR ALL GAME END FLAGS
00233  3045          DCA TWOFIN
00234  3104          DCA GAMOVR
00235  4702          JMS I BUFSET            /RESET ALL PROJECTILE DISPLAY BUFFERS
00236  1127          TAD P400                /START UP THE CRYSTAL CLOCK IN THE AX08
00237  6342          ZTEN                    — turn off 6132 (CLOCK INTERVAL)
00240  6344          OTEN                    — turn on 6131
00241  6042          TCF                     /CLEAR OTHER REMAINING LIKELY FLAGS
00242  6022          PCF
00243  6012          RRB
00244  6072-7000     CRF                     — DICD > clears Ready Flg + Interrupt flag in AX08
00245  6052-7000     CCF                     —
```

TAD ENABLE

```
00246  7200        CLA
00247  5251        JMP COLDST              /AND GO TO IT
```

```
                        /
                        /       UPDATE IS REACHED WHENEVER THE PROGRAM IS STARTED OR THE
                        /       CLOCK COUNT OVERFLOWS INDICATING TIME TO RECALCULATE THE
                        /       THE DISPLAY FILES AND REFRESH THE DISPLAY.  THE INTERUPT
                        /       COUNT IS RESTORED, THE STATUS WORD IS PICKED UP FROM EITHER
                        /       THE SR OR BRC, AND THE RECALCULATION PROCESS BEGUN.
                        /

00250  7300  UPDATE, CLA CLL                  /HERE ON CLOCK COUNT OVERFLOW.
                                              /START NEXT SWEEP
00251  0000  COLDST, 0                       /TRAP TO READ SR OR BRC
00252  7604          LAS                     /HERE FOR SR
00253  3073          DCA INTWRD              /STORE TEMPORARILY
00254  1073          TAD INTWRD              /MASK OUT LEFTMOST 4 BITS
00255  7012          RTR                     /FOR NUMBER ONE
00256  7012          RTR
00257  0305          AND LFTHAF
00260  3304          DCA INTTEM              /AND STORE
00261  1073          TAD INTWRD              /MASK OUT RIGHTMOST BITS FOR NUMBER TWO
00262  0306          AND RYTHAF
00263  1304          TAD INTTEM              /ADD TOGETHER
00264  5267          JMP .+3                 /AND CONTINUE

00265  6331  CODST,  XRIN - 6533 ADRB        /HERE FOR BRC - PICK UP AND CLEAR
00266  6334          XRCL - 6530 ADCL
00267  3073          DCA INTWRD              /CONTINUE
00270  1141          TAD M550                /RESTORE INTERUPT COUNT BEFORE NEXT
00271  3074          DCA INTCNT              /UPDATE
00272  6001          ION                     /GET READY FOR THE NEXT CYCLE
00273  1105          TAD ACCFLG              /ALLOW VELOCITY INCREASE THIS TIME?
00274  7001          IAC                     /ONLY WHEN ACCFLG=0
00275  7540          SMA SZA
00276  1106          TAD ACCPER              /IF ZERO, RESET COUNT
00277  3105          DCA ACCFLG

00300  5701          JMP I .+1               /NOW GET DOWN TO WORK.
00301  0400          ONEUP

00302  1726  BUFSET, SETBUF
00303  7733  TABLEN, AUTO17-CALCOS
00304  0000  INTTEM, 0
00305  0360  LFTHAF, 0360
00306  0017  RYTHAF, 0017
00307  1000  STRT1,  1000
00310  7000  STRT2,  -1000
00311  1513  SWRD,   2000-CODST
00312  5265  XROPT,  JMP CODST
```

> READ POTS ON A-D & ADBE
↓
ADLM
ADST
JMP-1
ADRB
JMP

go to loc 400

```
                /
                /       THIS IS THE INTERUPT SERVICE ROUTINE.  MOST OF THE
                /       INTERUPTS WILL BE FROM THE CRYSTAL CLOCK WHICH WILL BE
                /       COUNTED AND UNLESS THE COUNT OVERFLOWS THE INTERUPT IS
                /       DISMISSED IMMEDIATLY.  IF THE COUNT OVER FLOWS, JMP IS TO
                /       UPDATE WITH IOF.
                /
                /       SPECIAL CASE IS KEYBOARD INTERUPT WHEN THE GAMOVR FLAG IS
                /       SET IN WHICH CASE THE GAME IS RESTARTED.
                /
                /       UNEXPECTED INTERUPTS ARE COUNTED AND AFTER ENOUGH OF THEM
                /       HAPPEN THE PROGRAM HALTS.  IF THIS HAPPENS RELOAD OR FIND THE
                /       STRANGE FLAG
                /

00313  3346  INTSER, DCA INTACC        /HERE RIGHT AFTER INTERUPT - STORE
00314  7010         RAR                /AC AND LINK
00315  3347         DCA INTLNK         /FOR POSSIBLE CONTINUATION
00316  6321         SKXK = 6131 CLSK   /WAS IT THE CRYSTAL CLOCK? --
00317  5326         JMP INTBUS         /NO TRY SOMETHING ELSE
00320  6352         CLXK --> 6135 CLSA /YES CLEAR THE FLAG
00321  2075         ISZ CLOCK          /AND BUMP CLOCK COUNTER
00322  7000         NOP                /IGNORE OVERFLOW
00323  2074         ISZ INTCNT         /TIME FOR AN UPDATE?
00324  5340         JMP INTRET         /NO, DISMISS THE INTERUPT
00325  5250         JMP UPDATE         /YES, GO TO IT

00326  6031  INTBUS, KSF               /HERE ON NON-CLOCK INTERUPT
00327  5334         JMP .+5            /NOT THE KEYBOARD
00330  6032         KCC                /CLEAR KEYBOARD FLAG
00331  1104         TAD GAMOVR         /IS THE GAMEOVER
00332  7640         SZA CLA
00333  5206         JMP RESTRT         /YES, RESTART
00334  6042         TCF                /NO, HELL WITH IT
00335  2350         ISZ INTGLH         /COUNT ONE BADDIE
00336  7410         SKP
00337  7402         HLT                /HALT IF TOO MANY BADDIES

00340  7300  INTRET, CLA CLL           /HERE TO DISMISS THE INTERUPT
00341  1347         TAD INTLNK
00342  7004         RAL
00343  1346         TAD INTACC
00344  6001         ION
00345  5400         JMP I 0

00346  0000  INTACC, 0
00347  0000  INTLNK, 0
00350  0000  INTGLH, 0
```

```
                        /
                        /       NOW BEGINS THE GREAT UPDATE PROCEEDURE, FIRST FOR SHIP
                        /       NUMBER ONE (THE DELTA SHAPED SHIP WHICH APPEARS ON
                        /       THE LEFT AT THE START OF THE GAME).  IF ALIVE THE STATUS
                        /       WORD (INTWRD) IS TESTED FOR REQUESTS FOR LEFT TURN,
                        /       RIGHT TURN, THRUST ON, AND LAUNCH PROJECTILE.  THESE ACTIONS
                        /       MAY OR MAY NOT BE ACTED UPON DEPENDING ON COUNTS AND FLAGS.
                        /       WHEN THIS IS COMPLETE THE SAME OPERATION IS PERFORMED FOR
                        /       NUMBER TWO.
                        /

          0400          *400

00400   1022  ONEUP,   TAD ONEFLG              /FIRST SEE IF IT'S IN NORMAL SPACE
00401   7450            SNA
00402   5210            JMP ONEOK               /YES IT IS
00403   7001            IAC                     /NO, BUT IS IT JUST COMING OUT?
00404   7450            SNA
00405   1032            TAD ONEFIN              /YES, THROW BACK IN IF ALREADY DESTROYED
00406   3022            DCA ONEFLG              /OTHERWISE JUST COUNT ONE
00407   5752            JMP I ITWOUP            /AND GO TO FIX UP NUMBER TWO

00410   1020  ONEOK,   TAD ONEOUT              /IN NORMAL SPACE - IS IT EXPLODING?
00411   7640            SZA CLA
00412   5237            JMP ONEFIG              /IF YES, ALLOW NO CONTROLS
00413   1045            TAD TWOFIN              /HAS THE ENEMY BEEN VANQUISHED?
00414   7640            SZA CLA
00415   4756            JMS I ONEWN             /YES, SIGNAL VICTORY
00416   1073            TAD INTWRD              /NOW BEGIN TEST OF REQUEST
00417   0354            AND OP300               /LEFT AND RIGHT TURN TOGETHER MEAN HYPERSPACE!
00420   1355            TAD OM300               /TEST BITS 4 AND 5
00421   7640            SZA CLA
00422   5225            JMP ONELEF              /NOPE, CONTINUE
00423   7040            CMA                     /YES, CALL HYPER WITH AC=-1 FOR NUMBER ONE
00424   5476            JMP I HYPER
00425   1073  ONELEF,   TAD INTWRD              /REQUEST FOR LEFT TURN?
00426   0126            AND P200                /TEST BIT 4
00427   7650            SNA CLA
00430   5233            JMP ONERYT              /NO
00431   7340            CLA CLL CMA             /YES DECREMENT ANGLE
00432   5237            JMP ONEFIG

00433   1073  ONERYT,   TAD INTWRD              /HOW ABOUT RIGHT TURN
00434   0124            AND P100                /TEST BIT 5
00435   7640            SZA CLA
00436   7001            IAC                     /YES, INCREMENT ANGLE

00437   1023  ONEFIG,   TAD ONETHE              /PICK UP AND ADJUST ANGLE (MAYBE)
00440   4500            JMS I THEADJ            /BRING BACK WITHIN LIMITS OF TRIG FUNCTIONS
00441   3023            DCA ONETHE              /AND STORE
00442   1023            TAD ONETHE              /FIND THEM TRIG FUNCTIONS
00443   4465            JMS I SINE              /AND STORE ONCE AND FOR ALL
00444   3030            DCA ONESIN              /IN THE APPROPRIATE PLACES
00445   1023            TAD ONETHE
```

```
438  00446  4466  JMS I COSINE
439  00447  3031  DCA ONECOS
440  00450  1020  TAD ONEOUT          /DO NOT ALLOW THRUST IF EXPLODING
441  00451  7640  SZA CLA
442  00452  5272  JMP ONEVEL
443
```

```
                                                
                                                
20453  1105  ONEMOV,  TAD ACCFLG          /ALLOW ANY VELOCITY INCREASE THIS CYCLE?
20454  7640           SZA CLA
20455  5272           JMP ONEVEL          /NOPE
20456  1073           TAD INTWRD          /YES, ANY REQUESTED?
20457  0123           AND P40             /TEST BIT 6
20460  7650           SNA CLA
20461  5272           JMP ONEVEL          /NONE REQUESTED
20462  1031           TAD ONECOS          /YES, ADD IN VELOCITY INCREMENT DEPENDING
20463  1025           TAD ONEVEY          /ON ORIENTATION
20464  4501           JMS I VEESCL        /BUT DO NOT ALLOW TO EXCEED MAXIMUM
20465  3025           DCA ONEVEY          /AND STORE
20466  1030           TAD ONESIN          /DO THE SAME FOR THE OTHER (X) COMPONENT
20467  1024           TAD ONEVEX
20470  4501           JMS I VEESCL
20471  3024           DCA ONEVEX
                                                
                                                
                                                
20472  1024  ONEVEL,  TAD ONEVEX          /NOW UPDATE THE POSITION WITH THE
20473  4502           JMS I ISHFT 1535     /VELOCITY COMPONENTS DIVIDED BY 4
20474  4502           JMS I ISHFT          /THIS MAINTAINS MAXIMUM RESOLUTION
20475  1026           TAD ONEPEX
20476  3026           DCA ONEPEX           /IGNORE ANY OVERFLOW
20477  1025           TAD ONEVEY           /DO THE SAME FOR Y COORDINATE
20500  4502           JMS I ISHFT          /AND VELOCITY COMPONENT
20501  4502           JMS I ISHFT
20502  1027           TAD ONEPEY
20503  3027           DCA ONEPEY
20504  1020           TAD ONEOUT           /DO NOT ALLOW PROJECTILE LAUNCH IF
20505  7640           SZA CLA              /EXPLODING
20506  5752           JMP I ITWOUP 600
                                                
```

```
00507  1353  ONELNC, TAD LNC1FG          /OTHERWISE, SEE IF RELOAD IS FINISHED
00510  7650          SNA CLA
00511  5314          JMP .+3
00512  2353          ISZ LNC1FG          /NO, CONTINUE RELOADING
00513  5752          JMP I ITWOUP        /AND EXIT
00514  1073          TAD INTWRD          /YES, READY TO LAUNCH, TRIGGER BEEN PULLED?
00515  0121          AND P20             /TEST BIT7
00516  7650          SNA CLA
00517  5752          JMP I ITWOUP        /NO, WAIT FOR A BETTER SHOT
                                         /.....I GUESS.....
00520  1112          TAD PROLIF          /YES, SET CYCLE COUNT FOR THIS LAUNCH
00521  3416          DCA I AUTO16        /AUTO16 ALWAYS POINTS AT THE NEXT SLOT IN THE FILE
00522  1024          TAD ONEVEX          /ADD SHIPS VELOCITY (SCALED OF COURSE)
00523  4502          JMS I ISHFT         /TO ORIENTATION TO EXTABLISH X VELOCITY
00524  4470          JMS I RSHIFT        /COMPONENT OF PROJECTILE
00525  1030          TAD ONESIN
00526  4470          JMS I RSHIFT        /AND STICK IT IN THE FILE
00527  3416          DCA I AUTO16
00530  1030          TAD ONESIN          /MOVE THE LAUNCH POINT OUTSIDE THE
00531  7106          CLL RTL             /SHIP OF ORIGIN
00532  1026          TAD ONEPEX
00533  3416          DCA I AUTO16        /AND STORE X POSITION
00534  1025          TAD ONEVEY          /NOW DO THE SAME FOR THE Y VELOCITY AND
00535  4502          JMS I ISHFT         /POSITION
00536  4470          JMS I RSHIFT
00537  1031          TAD ONECOS
00540  4470          JMS I RSHIFT
00541  3416          DCA I AUTO16
00542  1031          TAD ONECOS
00543  7106          CLL RTL
00544  1027          TAD ONEPEY
00545  3416          DCA I AUTO16
00546  1137          TAD M200            /START RELOAD CYCLE
00547  3353          DCA LNC1FG
00550  4503          JMS I RESET1        /RESET AUTO16 TO NEXT HOLE

00551  5752          JMP I .+1           /NOW TO FIX IT UP WITH NUMBER TWO
00552  0600  ITWOUP, TWOUP

00553  0000  LNC1FG, 0                   /PROJECTILE LAUNCH ENABLE

00554  0300  OP300,  300                 /HYPERSPACE REQUEST CODE BITS 4 AND 5
00555  7500  OM300,  -300
00556  2507  ONEWN,  ONEWIN              /POINTER TO VICTORY MESSAGE
```

```
                        /
                        /       HERE BEGINS THE UPDATE PROCEEDURE FOR SHIP NUMBER TWO,
                        /       OPERATION IS THE SAME AS FOR NUMBER ONE ABOVE.
                        /

          0600          *600

00600  1035  TWOUP,  TAD TWOFLG          /FIRST SEE IF IT'S IN NORMAL SPACE
00601  7450          SNA
00602  5210          JMP TWOOK           /YES, CONTINUE
00603  7001          IAC                 /NO, BUMP COUNT AND TEST FOR REENTRY
00604  7450          SNA
00605  1045          TAD TWOFIN          /IF RE-ENTERING THROW BACK OUT IF FINISHED
00606  3035          DCA TWOFLG          /AND CONTINUE
00607  5750          JMP I IONEST 1000

00610  1033  TWOOK,  TAD TWODUT          /HERE WHEN READY TO UPDATE IN NORMAL SPACE
00611  7640          SZA CLA             /IS IT EXPLODING?
00612  5235          JMP TWOFIG          /YES DO NOT ALLOW HYPERSPACE
00613  1032          TAD ONEFIN          /DID WE JUST WIN?
00614  7640          SZA CLA
00615  4754          JMS I TWOWN         /YES ENABLE END OF GAME MESSAGE
00616  1073          TAD INTWRD          /TEST FOR HYPERSPACE REQUEST
00617  0352          AND OP14
00620  1353          TAD OM14            /BITS 8 AND 9 MUST BE SET
00621  7650          SNA CLA
00622  5476          JMP I HYPER         /8 AND 9 SET, ENTER HYPER ROUTINE WITH AC=0
                                         /FOR SHIP NUMBER 2
00623  1073  TWOLEF, TAD INTWRD          /TEST FOR LEFT TURN - BIT 8
00624  0117          AND P10
00625  7650          SNA CLA
00626  5231          JMP TWORYT          /NOT SET
00627  7340          CLA CLL CMA         /SET, DECREMENT TWOTHE BY 1 DEGREE
00630  5235          JMP TWOFIG          /SKIP TEST FOR RIGHT TURN

00631  7307  TWORYT, CLA CLL IAC RTL      /TEST FOR RIGHT TURN - BIT 9
00632  0073          AND INTWRD
00633  7640          SZA CLA
00634  7001          IAC                 /IF SET INCREMENT TWOTHE BY 1 DEGREE

00635  1036  TWOFIG, TAD TWOTHE          /UPDTAE TWOTHE
00636  4500          JMS I THEADJ        /BRING TO WITHIN LIMITS OF SINE,COSINE
00637  3036          DCA TWOTHE          /AND STORE
00640  1036          TAD TWOTHE
00641  4465          JMS I SINE          /CALCULATE SINE AND COSINE FUNCTIONS
00642  3043          DCA TWOSIN          /AND STORE IN DATA TABLE
00643  1036          TAD TWOTHE
00644  4466          JMS I COSINE
00645  3044          DCA TWOCOS
00646  1033          TAD TWODUT          /DO NOT ALLOW VELOCITY CHANGE IF EXPLODING
00647  7640          SZA CLA
00650  5270          JMP TWOVEL
```

```
579
582
581   22651  1105  TWOMOV, TAD ACCFLG        /NOW FOR ACCELERATION,  TEST TO SEE IF ALLOWED
582   22652  7640          SZA CLA           /DURING THIS UPDATE CYCLE
583   22653  5270          JMP TWOVEL        /NOPE
584   22654  7105          CLL IAC RAL       /YES, TEST FOR BIT 2 SET
585   22655  2273          AND INTWRD
586   22656  7650          SNA CLA
587   22657  5270          JMP TWOVEL        /NOT SET
588
589   22660  1243          TAD TWOSIN        /UPDATE X VELOCITY COMPONENT BY SINE OF
590   22661  1237          TAD TWOVEX        /ANGLE OF ORIENTATION
591   22662  4501          JMS I VEESCL      /AND SCALE TO NOT EXCEED MAX
592   22663  3237          DCA TWOVEX        /UPDATE Y COMPONENT WITH COSINE
593
594   22664  1244          TAD TWOCOS
595   22665  1240          TAD TWOVEY
596   22666  4501          JMS I VEESCL
597   22667  3240          DCA TWOVEY
598
599
600
621   22670  1237  TWOVEL, TAD TWOVEX        /NOW UPDATE THE POSITION WITH THE VELOCITY
602   22671  4502          JMS I ISHFT       /COMPONENTS/16
623   22672  4502          JMS I ISHFT
624   22673  1241          TAD TWOPEX
625   22674  3241          DCA TWOPEX
626   22675  1240          TAD TWOVEY
627   22676  4502          JMS I ISHFT
626   22677  4502          JMS I ISHFT
629   22700  1242          TAD TWOPEY
612   22701  3242          DCA TWOPEY
611   22702  1233          TAD TWOOUT
612   22703  7640          SZA CLA
613   22704  5750          JMP I IONEST
614
```

```
00705  1351  TWOLNC, TAD LNC2FG          /NOW CHECK FOR PROJECTILE LAUNCH, FIRST
00706  7650          SNA CLA              /TEST TO SEE IF RELOAD COMPLETE
00707  5312          JMP .+3
00710  2351          ISZ LNC2FG           /NO, COUNT ONE CYCLE AND EXIT
00711  5750          JMP I IONEST
00712  7001          IAC                  /YES, TEST TRIGGER BIT 11
00713  0073          AND INTWRD
00714  7650          SNA CLA
00715  5750          JMP I IONEST         /NOT SET, HELL WITH IT

00716  1112          TAD PROLIF           /OK, SET PROJECTILE LIFE
00717  3416          DCA I AUTO16         /AUTO16 IS ALWAYS POINTING AT THE NEXT SLOT
00720  1037          TAD TWOVEX           /ADD SHIPS VELOCITY
00721  4502          JMS I ISHFT          /(ADJUSTED)
00722  4470          JMS I RSHIFT
00723  1043          TAD TWOSIN           /TO THAT OF PROJECTILE  - AGAIN X COMPONENT
00724  4470          JMS I RSHIFT         /FROM SINE OF ANGLE OF ORIENTATION
00725  3416          DCA I AUTO16
00726  1043          TAD TWOSIN           /SET INITIAL POSITION TO BE JUST AHEAD
00727  7106          CLL RTL              /OF THE SHIP
00730  1041          TAD TWOPEX           /X COMPONENT
00731  3416          DCA I AUTO16
00732  1040          TAD TWOVEY           /NOW THE Y COMPONENTS FROM Y VELOCITY
00733  4502          JMS I ISHFT          /Y POSITION AND COSINE
00734  4470          JMS I RSHIFT
00735  1044          TAD TWOCOS
00736  4470          JMS I RSHIFT
00737  3416          DCA I AUTO16
00740  1044          TAD TWOCOS
00741  7106          CLL RTL
00742  1042          TAD TWOPEY
00743  3416          DCA I AUTO16
00744  1137          TAD M200
00745  3351          DCA LNC2FG           /200 CYCLES OF RELOAD
00746  4503          JMS I RESET1         /DRINK LEADEN DEATH, NUMBER ONE!

00747  5750          JMP I .+1            /FINAL EXIT TO DISPLAY FILE CALCULATIONS
00750  1000  IONEST, ONESET

00751  0000  LNC2FG, 0                   /RELOAD COUNT

00752  0014  OP14,   14                  /HYPERSPACE CODE
00753  7764  OM14,   -14
00754  2515  TWOWN,  TWOWIN
```

```
                    /
                    /       HERE BEGINS THE DISPLAY CALCULATIONS FOR THE TWO SHIPS.  AT
                    /       THIS POINT ONLY THE POSITION AND ORIENTATION OF EACH VESSEL
                    /       IS ONF INTEREST SINCE THE VELOCITY AND ALL THAT HAVE ALREADY
                    /       BEEN TAKEN CARE OF.  FOR THE BOTH SHIPS THE DISPLAY FILES ARE
                    /       CALCULATED AS A SERIES OF PAIRS OF X,Y COORDINATES.  BETWEEN
                    /       EACH PAIR OF POINTS A FOUR POINT VECTOR WILL BE DRAWN.  THE
                    /       ACTUAL COORDINATES ARE CALCULATED AS DISPLACEMENTS
                    /       FROM THE CENTRAL PSOTION OF THE SHIP, TAKING INTO ACCOUNT THE
                    /       ANGLE OF ORIENTATION.  THE FORMULAS FOLLOWED ARE:
                    /
                    /       X(POINT)=X(BASE)+X(REL)*COS(THE)+Y(REL)*SINE(THE)
                    /
                    /       Y(POINT)=Y(BASE)+Y(REL)*COS(THE)-X(REL)*SINE(THE)
                    /
                    /       WHERE SINE(THE) AND COS(THE) ARE THE FUNCTIONS OF THE
                    /       ANGLE OF ORIENTATION, X(BASE) AND Y(BASE) ARE THE
                    /       COORDINATES OF THE SHIPS POSITION AND X(REL) AND Y(REL)
                    /       CORRESPOND TO DISPLACEMENT PAIRS DEPENDING ON THE SHAPE
                    /       OF THE FIGURE.  ALL X AND Y RELS LIE WITHIN THE RANGE 0-3 AND
                    /       THERE FORE ALL NECESSARY DISPLACEMENTS FROM BASE COORDINATES
                    /       MAY BE CALCULATEDFROM DIFFERENT COMBINATIONS OF T10SIN, T20COS
                    /       ETC.  THESE VALUES ARE CALCULATED BY A CALL TO POSCAL WITH THE SINE
                    /       AND COSINE OF THE ANGLE OF INTEREST IN CALSIN AND CALCOS.
                    /
                    /       FOLLOWING THIS METHOD ANY FIGURE DESCRIBABLE WITH A 7 BY 7
                    /       MATRIX OF POINTS MAY BE QUICKLY CALCULATED.
                    /
                    /       BEGINNING AT ONESET DIFFERENT DISPLACEMENT PAIRS ARE CALCULATED
                    /       AND DEPOSITIED THROUGH AUTO10 TO FORM THE DISPLAY FILE FOR SHIP NUMBER ONE.
                    /


            1000            *1000

01000   7300    ONESET, CLA CLL                 /BEGIN DISPLAY FILE FOR NUMBER ONE
01001   1022            TAD ONEFLG              /DONT BOTHER IF NOT IN NORMAL SPACE
01002   7640            SZA CLA
01003   5753            JMP I ITWOST            1200
01004   1030            TAD ONESIN              /SET UP FOR MATRIX COMPONENT CALCULATIONS
01005   3063            DCA CALSIN
01006   1031            TAD ONECOS
01007   3064            DCA CALCOS
01010   4472            JMS I CALPOS            /CALL THE CALCULATOR

                    /
                    /       CONSIDER THE 7 BY 7 MATRIX OF DISPLACEMENT POINTS WITH THE
                    /       CENTER AT 0,0 CORRESPONDING TO THE SHIPS POSITION.  A SERIES
                    /       OF POINTS IS NOW DESCRIBED AROUND THIS CENTER USING THE
                    /       MULTIPLES OF THE TRIG FUNCTIONS JUST CALCULATED
                    /       SO THAT ANY POINT ON THE OUTLINE IS DESCRIBABLE AS X,Y
                    /       DISPLACED BY X,Y OF THE SHIP ITSELF
                    /
```

```
717  01011  1114    TAD ONEFIL      /SET UP AUTO10 AS THE DISPLAY FILE
718  01012  3010    DCA AUTO10      /POINTER
719  01013  1026    TAD ONEPEX      /THE FIRST POINT OF THE OUTLINE IS
720  01014  1057    TAD T30SIN
721  01015  3410    DCA I AUTO10    /       0,3     OR TOP CENTER
722  01016  1027    TAD ONEPEY
723  01017  1062    TAD T30COS
724  01020  3410    DCA I AUTO10
725
726  01021  1060    TAD T10COS
727  01022  7041    CIA             /THE SECOND IS
728  01023  1026    TAD ONEPEX
729  01024  3410    DCA I AUTO10    /       -1,0
730  01025  1055    TAD T10SIN      /OR JUST LEFT OF DEAD CENTER
731  01026  1027    TAD ONEPEY      /AND SO ON
732  01027  3410    DCA I AUTO10
733
734  01030  1057    TAD T30SIN
735  01031  1062    TAD T30COS      /THE THIRD POINT IS
736  01032  7041    CIA
737  01033  1026    TAD ONEPEX      /       -3,-3
738  01034  3410    DCA I AUTO10
739  01035  1062    TAD T30COS      /OR BOTTOM LEFT HAND CORNER
740  01036  7041    CIA
741  01037  1057    TAD T30SIN
742  01040  1027    TAD ONEPEY
743  01041  3410    DCA I AUTO10
744
```

```
01042  1055          TAD T10SIN
01043  7041          CIA                     /FOURTH POINT
01044  1026          TAD ONEPEX
01045  3410          DCA I AUTO10            /       0,-1
01046  1060          TAD T10COS
01047  7041          CIA                     /OR JUST BELOW CENTER
01050  1027          TAD ONEPEY
01051  3410          DCA I AUTO10

01052  1073  FLAM1,  TAD INTWRD              /TEST FOR POWER ON. IF ON, DRAW THE
01053  0123          AND P40                 /FLAME WITH AN EXTRA POINT SOME
01054  7650          SNA CLA                 /DISTANCE DIRECTLY BELOW THE SHIP.
01055  5321          JMP ONECON              /POWER NOT ON - CONTINUE
01056  1020          TAD ONEOUT              /DO NOT ALLOW IF EXPLODING
01057  7640          SZA CLA                 /
01060  5321          JMP ONECON

01061  1354          TAD ONFG1               /USE ONFG1 TO TURN THE FLAME ON AND
01062  7450          SNA                     /OFF TO MAKE IT FLICKER.  DISPLAY THE
01063  7344          CLA CLL CMA RAL         /FLAME ONE TIME OUT OF THREE
01064  3354          DCA ONFG1

01065  2354          ISZ ONFG1
01066  5321          JMP ONECON              /ONE OUT OF THREE TIMES THIS WILL SKIP

01067  1355          TAD ONFG2               /VARY ALSO THE LENGHT OF THE FLAME
01070  7040          CMA                     /WITH LONG SHORT LONG SHORT
01071  3355          DCA ONFG2

01072  1355          TAD ONFG2               /TIP OF FLAME AT EITHER
01073  7650          SNA CLA
01074  1055          TAD T10SIN              /       0,-4    OR
01075  1057          TAD T30SIN              /       0,-3
01076  7041          CIA
01077  1026          TAD ONEPEX
01100  3410          DCA I AUTO10
01101  1355          TAD ONFG2
01102  7650          SNA CLA
01103  1060          TAD T10COS
01104  1062          TAD T30COS
01105  7041          CIA
01106  1027          TAD ONEPEY
01107  3410          DCA I AUTO10

01110  1055          TAD T10SIN
01111  7041          CIA
01112  1026          TAD ONEPEX              /RETURN DISPLAY TO 0,-1
01113  3410          DCA I AUTO10
01114  1060          TAD T10COS
01115  7041          CIA
01116  1027          TAD ONEPEY
01117  3410          DCA I AUTO10
01120  7344          CLA CLL CMA RAL         /ADD -2 TO POINT COUNT
```

800

```
821
822
823  01121  1133  ONECON, TAD M6                  /SET POINT COUNT TO -6 OR -8
824  01122  3021          DCA ONECNT
825
826  01123  1057          TAD T30SIN              /CONTINUE WITH DISPLAY FILE - THIS POINT
827  01124  7041          CIA
828  01125  1062          TAD T30COS              /       AT 3,-3
829  01126  1026          TAD ONEPEX              /
830  01127  3410          DCA I AUTO10            /OR LOWER RIGHT HAND CORNER
831  01130  1057          TAD T30SIN
832  01131  1062          TAD T30COS
833  01132  7041          CIA
834  01133  1027          TAD ONEPEY
835  01134  3410          DCA I AUTO10
836
837  01135  1060          TAD T10COS              /NEXT
838  01136  1026          TAD ONEPEX              /
839  01137  3410          DCA I AUTO10            /       1,0
840  01140  1055          TAD T10SIN              /
841  01141  7041          CIA                     / OR JUST RIGHT OF CENTER
842  01142  1027          TAD ONEPEY
843  01143  3410          DCA I AUTO10
844
845  01144  1057          TAD T30SIN              /FINALLY BACK TO
846  01145  1026          TAD ONEPEX              /
847  01146  3410          DCA I AUTO10            /       0,3
848  01147  1062          TAD T30COS              /
849  01150  1027          TAD ONEPEY              / TOP CENTE
850  01151  3410          DCA I AUTO10
851
852  01152  5753          JMP I ITWOST            /NOW FOR NUMBER TWO
853  01153  1200  ITWOST, TWOSET
854
855  01154  0000  ONFG1,  0                       /USED TO COUNT FLICKERS
856  01155  0000  ONFG2,  0                       /SHORT OR LONG FLAG
857
```

```
                        /
                        /       HERE BEGINS THE DISPLAY FILE GENERATOR FOR SHIP TWO.
                        /       IT WORKS JUST LIKE THE ONE FOR NUMBER ONE BUT WITH
                        /       DIFFERENT DISPLACEMENT PAIRS AND TWO EXTRA POINTS
                        /

                1200            *1200

01200   7300    TWOSET, CLA CLL                 /DONT BOTHER IF NOT IN NORMAL SPACE
01201   1035            TAD TWOFLG
01202   7640            SZA CLA
01203   5775            JMP I IFILDS
01204   1043            TAD TWOSIN              /SET UP TO HAVE DISPLACEMENT INCREMENTS
01205   3063            DCA CALSIN              /CALCULATED
01206   1044            TAD TWOCOS
01207   3064            DCA CALCOS
01210   4472            JMS I CALPOS

01211   1115            TAD TWOFIL              /SET AUTO10 TO POINT TO SECOND DISPLAY
01212   3010            DCA AUTO10              /FILE
01213   1057            TAD T30SIN              /FIRST POINT AT
01214   1041            TAD TWOPEX              /
01215   3410            DCA I AUTO10            /       0,3
01216   1062            TAD T30COS              /
01217   1042            TAD TWOPEY              / OR TOP CENTER
01220   3410            DCA I AUTO10

01221   1061            TAD T20COS
01222   7041            CIA
01223   1056            TAD T20SIN
01224   1041            TAD TWOPEX
01225   3410            DCA I AUTO10
01226   1056            TAD T20SIN
01227   1061            TAD T20COS              /SECOND POINT
01230   1042            TAD TWOPEY              /       -2,2
01231   3410            DCA I AUTO10

01232   1061            TAD T20COS              /THIRD POINT
01233   7041            CIA                     /       -2,0
01234   1041            TAD TWOPEX
01235   3410            DCA I AUTO10
01236   1056            TAD T20SIN
01237   1042            TAD TWOPEY
01240   3410            DCA I AUTO10



01241   1061            TAD T20COS
01242   1057            TAD T30SIN
01243   7041            CIA
01244   1041            TAD TWOPEX              /FOURTH POINT
01245   3410            DCA I AUTO10            /       -2,-3
01246   1062            TAD T30COS
01247   7041            CIA
```

```
893  01250  1056          TAD T20SIN
894  01251  1042          TAD TWOPEY
895  01252  3410          DCA I AUTO10
896
```

```
897
898
899  01253  1056          TAD T20SIN
900  01254  7041          CIA                     /NEXT
901  01255  1041          TAD TWOPEX              /       0,-2
902  01256  3410          DCA I AUTO10
903  01257  1061          TAD T20COS
904  01260  7041          CIA
905  01261  1042          TAD TWOPEY
906  01262  3410          DCA I AUTO10
907
908  01263  7305  FLAM2,  CLA CLL IAC RAL        /NOW THE FLAME BIT. CHECK FOR POWER ON
909  01264  0073          AND INTWRD
910  01265  7650          SNA CLA
911  01266  5332          JMP TWOCON              /NO, FORGET IT
912  01267  1033          TAD TWOOUT              /NOT ALLOWED IF EXPLODING
913  01270  7640          SZA CLA
914  01271  5332          JMP TWOCON
915
916  01272  1376          TAD TWFG1               /SET THE 1-3 FLICKER AS WITH #1
917  01273  7450          SNA
918  01274  7344          CLA CLL CMA RAL
919  01275  3376          DCA TWFG1
920
921  01276  2376          ISZ TWFG1               /ALSO THE LENGHT VARIATION
922  01277  5332          JMP TWOCON
923
924  01300  1377          TAD TWFG2               /EVERY OTHER TIME LONG
925  01301  7040          CMA
926  01302  3377          DCA TWFG2
927                                               /FLAME TIP AT EITHER
928  01303  1377          TAD TWFG2               /       0,-3
929  01304  7650          SNA CLA                 /OR
930  01305  1056          TAD T20SIN              /       0,-5
931  01306  1057          TAD T30SIN
932  01307  7041          CIA
933  01310  1041          TAD TWOPEX
934  01311  3410          DCA I AUTO10
935  01312  1377          TAD TWFG2
936  01313  7650          SNA CLA
937  01314  1061          TAD T20COS
938  01315  1062          TAD T30COS
939  01316  7041          CIA
940  01317  1042          TAD TWOPEY
941  01320  3410          DCA I AUTO10
942
943  01321  1056          TAD T20SIN              /NOW BACK UP TO THE SHIP
944  01322  7041          CIA
945  01323  1041          TAD TWOPEX
946  01324  3410          DCA I AUTO10
947  01325  1061          TAD T20COS
948  01326  7041          CIA
949  01327  1042          TAD TWOPEY
950  01330  3410          DCA I AUTO10
951
```

```
952   01331  7344          CLA CLL CMA RAL          /ADD -2 TO POINT COUNT
953
```

```
954
955
956  01332  1134  TWOCON, TAD M10          /SET POINT COUNT TO -8 OR -10
957  01333  3034          DCA TWOCNT
958
959  01334  1057          TAD T30SIN       /CONTINUE WITH DISPLAY FILE
960  01335  7041          CIA              /NEXT POINT AT 2,-3
961  01336  1061          TAD T20COS
962  01337  1041          TAD TWOPEX
963  01340  3410          DCA I AUTO10
964  01341  1062          TAD T30COS
965  01342  1056          TAD T20SIN
966  01343  7041          CIA
967  01344  1042          TAD TWOPEY
968  01345  3410          DCA I AUTO10
969
970
971
972  01346  1061          TAD T20COS       /NEXT POINT
973  01347  1041          TAD TWOPEX       /
974  01350  3410          DCA I AUTO10     /       2,0
975  01351  1056          TAD T20SIN
976  01352  7041          CIA
977  01353  1042          TAD TWOPEY
978  01354  3410          DCA I AUTO10
979
980  01355  1061          TAD T20COS       /AND THE NEXT AT
981  01356  1056          TAD T20SIN
982  01357  1041          TAD TWOPEX       /       2,2
983  01360  3410          DCA I AUTO10
984  01361  1056          TAD T20SIN
985  01362  7041          CIA
986  01363  1061          TAD T20COS
987  01364  1042          TAD TWOPEY
988  01365  3410          DCA I AUTO10
989
990  01366  1057          TAD T30SIN
991  01367  1041          TAD TWOPEX
992  01370  3410          DCA I AUTO10
993  01371  1062          TAD T30COS       /AND THE LAST AT
994  01372  1042          TAD TWOPEY       /
995  01373  3410          DCA I AUTO10     /       0,3
996
997  01374  5775          JMP I IFILDS     /NOW TO DISPLAY THE WHOLE MESS
998  01375  1400  IFILDS, FILDIS
999
1000 01376  0000  TWFG1,  0                /FLIK THE FLAME
1001 01377  0000  TWFG2,  0                /LONG OR SHORT
1002
```

```
1003
1004                    /
1005                    /       HERE TO DISPLAY THE TWO SHIPS.  CHECK FIRST FOR COLLISION
1006                    /       AND THEN SET THE TWO PAIRS OF COORDENATES FOR THE END
1007                    /       POINTS AND CALL THE "VECTOR GENERATOR" TO DRAW THE DOTS
1008                    /       IN BETWEEN.  WHEN THE COUNT OVERFLOWS DO THE SAME FOR
1009                    /       NUMBER TWO.  THEN EXIT TO DISPLAY ALL THE PROJECTILES.
1010                    /
1011
1012            1400            *1400
1013
1014    01400   7300    FILDIS, CLA CLL                 /ALL SET TO GO
1015    01401   4672            JMS I COLIDE            /TEST FOR COLLISION FIRST
1016    01402   6325            DSB 1 — DSX 6055        /IF NO COLLISION
1017    01403   1022            TAD ONEFLG              /SKIP NUMBER ONE IF NOT IN NORMAL
1018    01404   7640            SZA CLA                 /SPACE
1019    01405   5236            JMP TWODIS
1020
1021    01406   1114            TAD ONEFIL              /SET UP POINTERS TO DISPLAY FILE
1022    01407   3010            DCA AUTO10              /FOR NUMBER ONE
1023    01410   1021            TAD ONECNT              /ALONG WITH VECTOR COUNT
1024    01411   3011            DCA AUTO11
1025    01412   1410            TAD I AUTO10            /SET OUT THE FIRST POINT PAIR
1026    01413   3046            DCA XONEDS
1027    01414   1410            TAD I AUTO10
1028    01415   3047            DCA YONEDS
1029    01416   1020            TAD ONEOUT              /NORMAL DISPLAY OR EXPLOSION?
1030    01417   7640            SZA CLA
1031    01420   5673            JMP I IONEEX            /GO ELSE WHERE FOR EXPLOSION
1032
1033    01421   1410    FILONE, TAD I AUTO10            /STEP TO NEXT PAIR OF POINTS
1034    01422   3050            DCA XTWODS              /SET X AND Y TO NEW POINT
1035    01423   1410            TAD I AUTO10
1036    01424   3051            DCA YTWODS
1037    01425   4471            JMS I VECTOR            /CALL THE DOT DRAWING MACHINE
1038    01426   2011            ISZ AUTO11
1039    01427   7410            SKP                     /COUNT
1040    01430   5236            JMP TWODIS              /DO NUMBER TWO ON OVERFLOW
1041    01431   1050            TAD XTWODS              /SWAP POINTS FOR NEXT PAIR
1042    01432   3046            DCA XONEDS
1043    01433   1051            TAD YTWODS              /THE GENERATOR DRAWS FROM ONE
1044    01434   3047            DCA YONEDS              /TOWARDS TWO
1045    01435   5221            JMP FILONE
1046
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1047
1048
1049  01436  1035  TWODIS,  TAD TWOFLG        /HERE TO DO NUMBER TWO
1050  01437  7640           SZA CLA           /BUT NOT IF IN HYPER SPACE
1051  01440  5664           JMP I IPRODS

1052
1053  01441  1115           TAD TWOFIL        /SET UP FILE POINTER AS IN ONE
1054  01442  3010           DCA AUTO10
1055  01443  1034           TAD TWOCNT        /AND THE COUNT
1056  01444  3011           DCA AUTO11
1057  01445  1410           TAD I AUTO10      /I SUPPOSE THIS COULD BE A SUBROUTINE TOO
1058  01446  3046           DCA XONEDS
1059  01447  1410           TAD I AUTO10
1060  01450  3047           DCA YONEDS
1061  01451  1033           TAD TWOOUT        /IS IT EXPLODING?
1062  01452  7640           SZA CLA
1063  01453  5674           JMP I ITWOEX      /YES, HOW EXCITING
1064
1065  01454  1410  TWDLOP,  TAD I AUTO10      /NO HOW DULL, STICK IN NEXT PAIR OF
1066  01455  3050           DCA XTWODS        /POINTS
1067  01456  1410           TAD I AUTO10
1068  01457  3051           DCA YTWODS        /AND CALL THE VECTOR SEQUENCE
1069  01460  4471           JMS I VECTOR
1070  01461  2011           ISZ AUTO11
1071  01462  5265           JMP .+3

1072
1073  01463  5664           JMP I .+1         /WHEN COUNT OVERFLOWS GO ON TO
1074  01464  1600  IPRODS,  PRODIS           /DO THE PROJECTILE THING

1075
1076  01465  1050           TAD XTWODS        /OTHERWISE SWAP ON TO THE NEXT PAIR
1077  01466  3046           DCA XONEDS        /OF POINTS
1078  01467  1051           TAD YTWODS
1079  01470  3047           DCA YONEDS
1080  01471  5254           JMP TWDLOP

1081
1082  01472  2074  COLIDE,  COLLID
1083  01473  2271  IONEEX,  ONEEXP
1084  01474  2310  ITWOEX,  TWOEXP
1085
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1086
1087                    /
1088                    /       THIS IS THE SO CALLED "VECTOR GENERATOR" WHICH DRAWS A
1089                    /       SERIES OF DOTS FROM XONEDS,YONEDS TO XTWODS,YTWODS.
1090                    /       THE COORDINATE COMPONENTS ARE DIVIDED INTO FOURTHS  AND
1091                    /       FOUR DOTS DRAWN ON THE SCOPE SCREEN,  NOTE THAT NO DOT
1092                    /       IS DRAWN AT XONEDS,YONEDS.  THIS IS COMPENSATED FOR ELSEWHERE.
1093                    /
1094
1095
1096    01475   0000    DISPLY, 0                       /ENTER TO DRAW A FOUR POINT VECTOR
1097    01476   1046            TAD XONEDS              /FROM XONEDS,YONEDS
1098    01477   7041            CIA                     /TO XTWODS,YTWODS
1099    01500   1050            TAD XTWODS              /DIVIDE COORDINATE DIFERENCES INTO
1100    01501   4335            JMS DISHFT              /FOURTHS
1101    01502   3052            DCA DIXTEM              /AND STORE INCREMENT
1102    01503   1047            TAD YONEDS
1103    01504   7041            CIA
1104    01505   1051            TAD YTWODS
1105    01506   4335            JMS DISHFT
1106    01507   3053            DCA DIYTEM
1107    01510   1132            TAD M4                  /FOR FOUR DOTS
1108    01511   3054            DCA DISCNT
1109
1110    01512   1046    DISLOP, TAD XONEDS              /ADD INCREMENT TO CURRENT X AND Y
1111    01513   1052            TAD DIXTEM
1112    01514   3046            DCA XONEDS              /NOTE THAT THIS ROUTINE DESTROYS
1113    01515   1047            TAD YONEDS              /XONEDS AND YONEDS
1114    01516   1053            TAD DIYTEM
1115    01517   3047            DCA YONEDS
1116    01522   1046            TAD XONEDS
1117    01521   7012            RTR                     /DIVIDE BY 8 TO FIT SCREEN SIZE
1118    01522   7010            RAR
1119    01523   6303            DXC DXL                 /SET X VALUE
1120    01524   7200            CLA
1121    01525   1047            TAD YONEDS              /DO THE SAME FOR Y
1122    01526   7012            RTR
1123    01527   7010            RAR
1124    01530   6317            DYC DYL DIS             /AT LAST SOMETHING TO SEE!!
1125    01531   7200            CLA
1126    01532   2054            ISZ DISCNT              /DONE YET?
1127    01533   5312            JMP DISLOP              /NOPE
1128    01534   5675            JMP I DISPLY            /YUP
1129
1130
1131    01535   0000    DISHFT, 0                       /A GENERALIZED SHIFT ROUTINE CALLED
1132    01536   7100            CLL                     /FROM EVERYWHERE TO DIVIDE THE
1133    01537   7510            SPA                     /AC BY FOUR WITH AN ASR RIGHT
1134    01540   7021            CML IAC                 /NOTE THAT NEGATIVE NUMBERS ARE
1135    01541   7010            RAR                     /ROUNDED UPWARDS (TOWARD ZERO)
1136    01542   7100            CLL                     /TO MAKE IT COME OUT RIGHT
1137    01543   7510            SPA
1138    01544   7021            CML IAC                 /EVEN SO THERE ARE SOME ROUNDING ERRORS
1139    01545   7010            RAR                     /SOMEWHERE.  SO MUCH FOR 12 BIT MACHINES
1140    01546   5735            JMP I DISHFT
```

1141

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1142
1143                    /
1144                    /       HERE TO DISPLAY ALL THE PROJECTILES AND TEST FOR HITS.
1145                    /       THE PROJECTILE DISPLAY FILE IS SEARCHED FOR PROJECTILES WITH
1146                    /       NON-ZERO COUNTS AND WHEN ONE IS FOUND THE POSITION IS
1147                    /       UPDATED BY THE VELOCITY, THE POINT DISPLAYED AND TESTED FOR
1148                    /       A HIT.
1149                    /
1150
1151            1600            *1600
1152
1153    01600   7300    PRODIS, CLA CLL                 / BEGIN DISPLAY OF THE PROJECTILES
1154    01601   1272            TAD BUFST               /POINT TO BEGINNING OF DISPLAY FILE
1155    01602   3113            DCA BUFTMP
1156    01603   6326            DSB 2                   /SET EXTRA BRIGHT FOR SINGLE POINTS
1157
1158    01604   1513    PROLOP, TAD I BUFTMP            /PICK UP NEXT COUNT
1159    01605   7450            SNA
1160    01606   5262            JMP EXPIRE              /THIS ONE IS DEAD - GO TO THE NEXT
1161    01607   7001            IAC                     /INCREMENT COUNT AND REPLACE
1162    01610   3513            DCA I BUFTMP
1163    01611   2113            ISZ BUFTMP              /BUMP POINTER TO X VELOCITY
1164    01612   1513            TAD I BUFTMP
1165    01613   2113            ISZ BUFTMP              /THEN TO XPOSITION AND UPDATE X POSITION
1166    01614   1513            TAD I BUFTMP            /WITH THE VELOCITY WHICH IS CONSTANT
1167    01615   3513            DCA I BUFTMP
1168    01616   1513            TAD I BUFTMP
1169    01617   3110            DCA PROX                /AND STORE X POSITION FOR DISPLAY AND TEST
1170    01620   2113            ISZ BUFTMP              /NOW TO Y POSITION AND VELOCITY
1171    01621   1513            TAD I BUFTMP
1172    01622   2113            ISZ BUFTMP
1173    01623   1513            TAD I BUFTMP            /SAME LITTLE GAME
1174    01624   3513            DCA I BUFTMP
1175    01625   1513            TAD I BUFTMP
1176    01626   3111            DCA PROY                /STORE THE NEW Y VALUE
1177
1178    01627   1110            TAD PROX                /DISPLAY THE POINT WITH
1179    01630   7012            RTR                     /THE SAME SHIFT AS FOR THE SHIPS
1180    01631   7010            RAR                     /FOR THE SMALL SCREEN
1181    01632   6303            DXC DXL
1182    01633   7200            CLA
1183    01634   1111            TAD PROY
1184    01635   7012            RTR                     /
1185    01636   7010            RAR
1186    01637   6317            DYC DYL DIS             /THERE IT IS!!
1187    01640   7200            CLA
1188    01641   4674            JMS I CHKOUT            /TEST  FOR A HIT
1189    01642   2113            ISZ BUFTMP              /MOVE POINTER ON AND TEST FOR END
1190    01643   1113            TAD BUFTMP              /OF BUFFER
1191    01644   1273            TAD BUFLIM
1192    01645   7640            SZA CLA
1193    01646   5204            JMP PROLOP              /NOT AT END - CONTINUE
1194
```

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1195                    /
1196                    /       HERE AT THE END OF THE PROJECTILE DISPLAY.  IF THE GAMOVR
1197                    /       FLAG IS SET, GO ON TO THE MESSAGE DISPLAY - VICTORY LAP
1198                    /       SECTION.  OTHERWISE PICK UP THE REMAINING CLOCK COUNT
1199                    /       TO GIVE THE FANS SOMETHING TO LOOK AT, AND MOVE THE
1200                    /       ELECTRON BEAM TO A LOWER CORNER.  THE COUNT DISPLAYED
1201                    /       IN THE AC IS THE NUMBER OF 100 USEC CLOCK TICKS REMAINING
1202                    /       WHEN THIS CODE IS REACHED BEFORE THE NEXT UPDATE WOULD
1203                    /       BEGIN.  TURNS OUT THAT ROUGHLY 2/3 OF THE CPU IS LEFT
1204                    /       OVER SHOULD ANYONE WANT TO DO ANYTHING VERY FANCY.
1205                    /
1206
1207
1208    01647   1104    FINISH, TAD GAMOVR              /IS THIS THE VICTORY LAP OR WHAT?
1209    01650   7640            SZA CLA
1210    01651   5661            JMP I ENDGAM            /YES, GO TO PUT UP THE MESSAGE
1211    01652   1140            TAD M400                /MOVE THE BEAM OFF SCREEN
1212    01653   6313            DYC DYL
1213    01654   7300            CLA CLL
1214    01655   6303            DXC DXL
1215    01656   1074            TAD INTCNT              /PICK UP THE COUNT
1216    01657   7041            CIA
1217    01660   5260            JMP .-towhere
1218
1219    01661   2527    ENDGAM, JOBLOP
1220
```

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1221
1222
1223  01662  1113  EXPIRE, TAD BUFTMP        /HERE TO ADVANCE THE BUFFER
1224  01663  1116         TAD P5             /POINTER TO THE NEXT PROJECTILE
1225  01664  3113         DCA BUFTMP         /UNLESS THE END
1226  01665  1113         TAD BUFTMP         /OF THE BUFFER
1227  01666  1273         TAD BUFLIM         /IS REACHED
1228  01667  7640         SZA CLA            /IN WHICH CASE
1229  01670  5204         JMP PROLOP         /IT
1230  01671  5247         JMP FINISH         /QUITS
1231
1232  01672  7501  BUFST,  DISBUF+101
1233  01673  0203  BUFLIM, -DISBUF-175
1234  01674  2000  CHKOUT, CHECK
1235
1236  01675  0000  RESE1,  0                  /THIS IS CALLED TO SET THE POINTER
1237  01676  1323         TAD MRES           /(AUTO16) TO THE NEXT FREE SLOT
1238  01677  3324         DCA RESCNT         /FOR A PROJECTILE LAUNCH, 12 POSSIBLE
1239
1240  01700  1325  RESLOP, TAD RESPNT       /MOVE THE POINTER TO THE NEXT SLOT
1241  01701  1116         TAD P5
1242  01702  3325         DCA RESPNT
1243  01703  1325         TAD RESPNT         /RESTE IF AT END OF BUFFER
1244  01704  1273         TAD BUFLIM
1245  01705  7640         SZA CLA
1246  01706  5311         JMP RESCON
1247  01707  1272         TAD BUFST
1248  01710  3325         DCA RESPNT
1249
1250  01711  1725  RESCON, TAD I RESPNT     /FIND A HOLE YET?
1251  01712  7650         SNA CLA
1252  01713  5317         JMP RESFND         /YES, SET UP AUTO16
1253  01714  2324         ISZ RESCNT         /NO COUNT
1254  01715  5300         JMP RESLOP         /AND TRY AGAIN
1255  01716  7402         HLT                /NO HOLES AT ALL?
1256
1257  01717  7040  RESFND, CMA               /BACK THE POINTER FOR AUTO INDEXING
1258  01720  1325         TAD RESPNT
1259  01721  3016         DCA AUTO16
1260  01722  5675         JMP I RESE1
1261
1262  01723  7764  MRES,   -14
1263  01724  0000  RESCNT, 0
1264  01725  0000  RESPNT, 0
1265
1266  01726  0000  SETBUF, 0
1267  01727  7040         CMA                /THIS ROUTINE IS CALLED FROM THE
1268  01730  1272         TAD BUFST          /STARTING SEQUENCE TO INITIALIZE ALL
1269  01731  3016         DCA AUTO16         /THE BUFFER POINTERS AND SO ON
1270  01732  1272         TAD BUFST
1271  01733  3113         DCA BUFTMP
1272  01734  1272         TAD BUFST
1273  01735  3325         DCA RESPNT
1274  01736  1272         TAD BUFST
1275  01737  3347         DCA SETPNT
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1276  01740  3747  SETLOP, DCA I SETPNT
1277  01741  2347          ISZ SETPNT
1278  01742  1347          TAD SETPNT
1279  01743  1273          TAD BUFLIM
1280  01744  7640          SZA CLA
1281  01745  5340          JMP SETLOP
1282  01746  5726          JMP I SETBUF
1283
1284  01747  0000  SETPNT, 0
1285
```

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1286
1287                    /
1288                    /       THIS HERE NOW THING CHECKS THE COORDINATES OF THE MOST RECENTLY
1289                    /       DISPLAYED PROJECTILE AGAINST THOSE OF THE SHIPS ON THE SCREEN,
1290                    /       IF WITH A COLLISION LIMIT  A HIT IS RECORDED AND THE LIFE
1291                    /       COUNT OF THE PROJECTILE ZEROED TO REMOVE IT.  A HIT SHIP
1292                    /       IS SUITABLY FLAGGED
1293                    /
1294
1295            2000            *2000
1296
1297    02000   0000    CHECK,  0                       /HERE TO TEST FOR A PROJECTILE HIT
1298    02001   1022            TAD ONEFLG              /CANT HIT SOMETHING IN HYPERSPACE
1299    02002   7640            SZA CLA
1300    02003   5232            JMP CHECK2
1301    02004   1020            TAD ONEOUT              /OR SOMETHING THAT'S BEEN HIT
1302    02005   7640            SZA CLA
1303    02006   5232            JMP CHECK2
1304
1305    02007   1110            TAD PROX                /CHECK X COORDINATES OF SHIP ONE
1306    02010   7041            CIA                     /AND PROJECTILE
1307    02011   1026            TAD ONEPEX              /THIS SORT OF THING IS WHY THE
1308    02012   7510            SPA                     /COORDINATES HAVE TO BE MAINTAINED TO 12
1309    02013   7041            CIA                     /BITS
1310    02014   1264            TAD LIMIT               /CLOSE ENOUGH?
1311    02015   7700            SMA CLA
1312    02016   5232            JMP CHECK2              /IF X ISN' CLOSE ENOUGH THEN NO HIT
1313    02017   1111            TAD PROY                /X WAS CLOSE ENOUGH, HOW ABOUT Y?
1314    02020   7041            CIA
1315    02021   1027            TAD ONEPEY
1316    02022   7510            SPA
1317    02023   7041            CIA
1318    02024   1264            TAD LIMIT
1319    02025   7700            SMA CLA
1320    02026   5232            JMP CHECK2              /NO HIT
1321
1322    02027   1107            TAD MEXP                /DEPOSIT EXPLOSION COUNT  IN ONEOUT
1323    02030   3020            DCA ONEOUT              /ALL THAT IS NECESSARY
1324    02031   4265            JMS CUTOUT              /REMOVE PROJECTILE
1325
```

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1326
1327
1328  02032  1035  CHECK2, TAD TWOFLG       /NO HIT ON NUMBER ONE, TRY NUMBER TWO
1329  02033  7640         SZA CLA
1330  02034  5600         JMP I CHECK       /BUT NOT IF IN HYPERSPACE
1331  02035  1033         TAD TWOOUT        /OR IF ALREADY HIT
1332  02036  7640         SZA CLA
1333  02037  5600         JMP I CHECK
1334
1335  02040  1110         TAD PROX          /CHECK X'S FIRST
1336  02041  7041         CIA
1337  02042  1041         TAD TWOPEX        /GET ABSOLUTE VALUE OF DIFFERENCE
1338  02043  7510         SPA
1339  02044  7041         CIA
1340  02045  1264         TAD LIMIT         /AND TEST MAGNITUDE AGAINST PROXIMITY
1341  02046  7700         SMA CLA           /LIMIT
1342  02047  5600         JMP I CHECK       /NOWHERE NEAR CLOSE
1343
1344  02050  1111         TAD PROY          /NYAH, NYAH
1345  02051  7041         CIA               /TRY THE Y'S
1346  02052  1042         TAD TWOPEY
1347  02053  7510         SPA               /ABSOLUTE VALUE OF DIFFERENCE
1348  02054  7041         CIA
1349  02055  1264         TAD LIMIT
1350  02056  7700         SMA CLA           /CLEAN MISS!
1351  02057  5600         JMP I CHECK
1352
1353  02060  1107         TAD MEXP          /HIT ON TWO - END EVERYTHING BY SETTING
1354  02061  3033         DCA TWOOUT        /TWOOUT TO NON-ZERO EXPLOSION COUNT
1355  02062  4265         JMS CUTOUT
1356  02063  5600         JMP I CHECK       /EXIT AFTER DESTOYING PROJECTILE
1357
1358  02064  7660  LIMIT, -120             /PROXIMITY LIMIT FOR WHAT CONSTITUTES A HIT
1359
1360  02065  0000  CUTOUT, 0                /THIS ROUTINE ZEROES OUT THE MOST RECENTLY
1361  02066  1132         TAD M4            /DISPLAYED PROJECTILE BY ZEROEING THE
1362  02067  1113         TAD BUFTMP        /COUNT
1363  02070  3273         DCA CUTPNT
1364  02071  3673         DCA I CUTPNT
1365  02072  5665         JMP I CUTOUT
1366
1367  02073  0000  CUTPNT, 0
1368
```

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1369
1370                    /
1371                    /       THIS ROUTINE IS CALLED TO TEST FOR A COLLISION BETWEEN THE
1372                    /       TWO SHIPS.  THE COORDINATES OF BOTH ARE COMPARED
1373                    /       AND IFF SUFFICIENTLY CLOSE BOTH ARE DESTROYED BY SETTING
1374                    /       THEIR EXPLOSION COUNTS NON-ZERO.
1375                    /
1376
1377
1378    02274   0000    COLLID, 0                       /HERE TO TEST FOR COLLISION
1379    02275   1022            TAD ONEFLG              /NO TEST IF EITHER SHIP IS IN
1380    02276   7640            SZA CLA                 /HYPERSPACE OR EXPLODING
1381    02277   5674            JMP I COLLID
1382    02100   1035            TAD TWOFLG
1383    02101   7640            SZA CLA
1384    02102   5674            JMP I COLLID
1385    02103   1020            TAD ONEOUT
1386    02104   7640            SZA CLA
1387    02105   5674            JMP I COLLID
1388    02106   1033            TAD TWOOUT
1389    02107   7640            SZA CLA
1390    02110   5674            JMP I COLLID
1391
1392    02111   1026            TAD ONEPEX              /BOTH SHIPS AVAILABLE FOR COLLISION
1393    02112   7041            CIA                     /CHECK X COORDINATES FIRST
1394    02113   1041            TAD TWOPEX
1395    02114   7510            SPA                     /GET ABSOLUTE VALUE OF DIFFERENCE
1396    02115   7041            CIA
1397    02116   1336            TAD COLLIM              /CLOSE ENOUGH?
1398    02117   7700            SMA CLA
1399    02120   5674            JMP I COLLID            /NOPE, FORGET IT
1400
1401    02121   1027            TAD ONEPEY              /YES, NOW TRY THE Y COORDINATES
1402    02122   7041            CIA
1403    02123   1042            TAD TWOPEY
1404    02124   7510            SPA
1405    02125   7041            CIA                     /GET MAGNITUDE ONLY
1406    02126   1336            TAD COLLIM
1407    02127   7700            SMA CLA                 /CLOSE ENOUGH?
1408    02130   5674            JMP I COLLID
1409    02131   1107            TAD MEXP                /YES, SET BOTH EXPLOSION COUNTS
1410    02132   3020            DCA ONEOUT
1411    02133   1107            TAD MEXP
1412    02134   3033            DCA TWOOUT
1413    02135   5674            JMP I COLLID
1414
1415    02136   7500    COLLIM, -300
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1416
1417                    /
1418                    /       THIS ROUTINE IS CALLED TO SET ONE OF THE TWO SHIPS INTO
1419                    /       HYPERSPACE.  ON ENTRY THE AC=-1 FOR SHIP #1, 0 FOR SHIP
1420                    /       NUMBER 2.  THE LOCATION CLOCK IS USED FOR A RANDOM
1421                    /       ADDRESS POINTER FROM WHICH WILL BE DRAWN THE
1422                    /       VARIOUS PARAMETERS FOR REENTRY.
1423                    /
1424
1425            2200            *2200
1426
1427    02200   3253    HYPSET, DCA RTNFLG              /HERE WITH AC=-1 OR 0
1428    02201   1253            TAD RTNFLG              /SET UP LIST POINTER
1429    02202   7640            SZA CLA
1430    02203   1251            TAD ONEDIF              /TO APPROPRIATE SHIP FILE
1431    02204   1252            TAD TWOLST
1432    02205   3015            DCA AUTO15
1433
1434    02206   1075            TAD CLOCK               /SET UP "RANDOM NUMBER GENERATOR"
1435    02207   3017            DCA AUTO17
1436    02210   1417            TAD I AUTO17            /PICK UP FIRST THE AMOUNT OF TIME
1437    02211   0250            AND TIMOUT              /OUT OF NOMAL SPACE LIMITED TO -777
1438    02212   7041            CIA                     /UPDATE CYCLES ( ABOUT 15 SECONDS)
1439    02213   3415            DCA I AUTO15            /AND STORE IN ONEOUT OR TWO OUT
1440
1441    02214   1417            TAD I AUTO17            /THE NEXT RANDOM NUMBER BECOMES THE
1442    02215   4500            JMS I THEADJ            /ANGLE OR ORIENTATION ON REENTRY
1443    02216   3415            DCA I AUTO15
1444    02217   1417            TAD I AUTO17            /AND THE NEXT BECOMES THE X VELOCITY
1445    02220   4260            JMS VEESET              /COMPONENT
1446    02221   3415            DCA I AUTO15
1447    02222   1417            TAD I AUTO17            /AND THEN THE Y COMPONENT
1448    02223   4260            JMS VEESET
1449    02224   3415            DCA I AUTO15
1450    02225   1417            TAD I AUTO17
1451    02226   3415            DCA I AUTO15
1452
1453    02227   1417            TAD I AUTO17
1454    02230   3415            DCA I AUTO15
1455
1456    02231   1417            TAD I AUTO17            /FINALLY SEE IF RETURN WILL BE SUCCESSFLY
1457    02232   0250            AND TIMOUT
1458    02233   1257            TAD MHYP                /ABOUT 3/4 CHANCE
1459    02234   7700            SMA CLA
1460    02235   5245            JMP HYPRET              /OK
1461    02236   1253            TAD RTNFLG              /THIS IS THE ONE TIME IN FOUR.  SET
1462    02237   7640            SZA CLA                 /UP FOR EXPLOSION ON REENTRY
1463    02240   1251            TAD ONEDIF
1464    02241   1256            TAD OUTLOC
1465    02242   3260            DCA VEESET
1466    02243   1107            TAD MEXP
1467    02244   3660            DCA I VEESET
1468
1469    02245   2253    HYPRET, ISZ RTNFLG
1470    02246   5655            JMP I TWORTN
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1471  02247  5654          JMP I ONERTN
1472
1473  02250  0777  TIMOUT, 777
1474  02251  7765  ONEDIF, ONEFLG-TWOFLG
1475  02252  0034  TWOLST, TWOFLG-1
1476  02253  0000  RTNFLG, 0
1477  02254  0600  ONERTN, TWOUP
1478  02255  1000  TWORTN, ONESET
1479  02256  0033  OUTLOC, TWOOUT
1480  02257  7600  MHYP,   -200
1481
```

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1482
1483
1484  02260  0000  VEESET, 0                    /HERE TO LIMIT VELOCITY COMPONENTS
1485  02261  7100         CLL                  /GET MAGNITUDE
1486  02262  7510         SPA
1487  02263  7020         CML                  /LIMIT TO 177
1488  02264  0270         AND HM177
1489  02265  7530         SZL CLL
1490  02266  7041         CIA                  /AND EXIT
1491  02267  5660         JMP I VEESET
1492
1493  02270  0177  HM177, 177
1494                                           /HERE TO DISPLAY SHIP NUMBER ONE AS
1495  02271  7300  ONEEXP, CLA CLL              /AN EXPLOSION
1496  02272  1023         TAD ONETHE           /FIRST ROTATE IT BY A GOOD DOLLOP
1497  02273  1333         TAD INCONE
1498  02274  3023         DCA ONETHE           /THEN CALL THE EXPLOSION GENERATOR
1499  02275  4732         JMS I IXPDIS         /DONE WITH THE EXPLOSION?
1500  02276  2020         ISZ ONEOUT           /NO, NORMAL RETURN
1501  02277  5727         JMP I NOWTWO
1502                                           /YES, SET INTO PSEUDO HYPER SPACE
1503  02300  7001         IAC
1504  02301  3022         DCA ONEFLG           /DISABLE RETURN FROM HYPER SPACE
1505  02302  7001         IAC
1506  02303  3032         DCA ONEFIN
1507                                           /IS NUMBER TWO STILL AROUND?
1508  02304  1045         TAD TWOFIN
1509  02305  7650         SNA CLA              /YES, RETURN
1510  02306  5727         JMP I NOWTWO         /NO, TIE BALL GAME
1511  02307  5731         JMP I TIEUP
```

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1512
1513
1514  02310  7300  TWOEXP, CLA CLL                 /HERE TO DISPLAY SHIP NUMBER TWO
1515  02311  1036          TAD TWOTHE              /AS AN EXPLOSION.  BASH IT AROUND
1516  02312  1334          TAD INCTWO
1517  02313  3036          DCA TWOTHE
1518  02314  4732          JMS I IXPDIS            /THEN DISPLAY IT
1519  02315  2033          ISZ TWOOUT              /DONE WITH EXPLOSION?
1520  02316  5730          JMP I NOWPRO            /NO, NORMAL RETURN
1521
1522  02317  7001          IAC                     /YES, SEND INTO PSEUDO HYPER SPACE
1523  02320  3035          DCA TWOFLG
1524  02321  7001          IAC                     /DISABLE NORMAL RETURN FROM HYPERSPACE
1525  02322  3045          DCA TWOFIN
1526                                               /CHECK NUMBER ONE
1527  02323  1032          TAD ONEFIN
1528  02324  7640          SZA CLA                 /STILL ALIVE AND WELL?
1529  02325  5731          JMP I TIEUP             /NO, TIE GAME
1530  02326  5730          JMP I NOWPRO            /YES, CONTINUE ON
1531  02327  1436  NOWTWO, TWODIS
1532  02330  1600  NOWPRO, PRODIS
1533  02331  2523  TIEUP,  NOWIN
1534  02332  2400  IXPDIS, EXPDIS
1535  02333  0055  INCONE, 55
1536  02334  0055  INCTWO, 55
1537
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1538
1539                    /
1540                    /       HERE TO DISPLAY THE FIGURE POINTED TO BY AUTO10 AS
1541                    /       AN EXPLOSION.  THIS WORKS THE SAME WAY AS THE NORMAL
1542                    /       DISPLAY ROUTINE EXCEPT THAT THE COORDINATE INCREMENTS
1543                    /       ARE INVERTED TURNING THE FIGURE INSIDE OUT FOR S
1544                    /       A SORT OF CLOBBY EXPLOSION.
1545                    /
1546
1547            2400            *2400
1548
1549    02400   0000    EXPDIS, 0                       /HERE TO DISPLAY A FIGURE INSIDE OUT
1550    02401   1410            TAD I AUTO10            /WITH THE POINTERS AND COUNTS ALREADY
1551    02402   3050            DCA XTWODS              /SET UP BY FILDIS OR TWODIS
1552    02403   1410            TAD I AUTO10            /STICK NEXT TWO POINTS INTO LINE
1553    02404   3051            DCA YTWODS
1554
1555    02405   1050            TAD XTWODS
1556    02406   7041            CIA                     /CALCULATE INCREMENT THE WRONG WAY
1557    02407   1046            TAD XONEDS
1558    02410   3052            DCA DIXTEM              /AND STORE
1559    02411   1051            TAD YTWODS
1560    02412   7041            CIA
1561    02413   1047            TAD YONEDS
1562    02414   3053            DCA DIYTEM              /SAME FOR Y
1563
1564    02415   1132            TAD M4                  /4 DOTS IN THE VECTOR"
1565    02416   3054            DCA DISCNT              /COULD HAVE CALLED THE OTHER
1566                                                    /VECTOR GENERATOR I SUPPOSE
1567    02417   1046    EXPLOP, TAD XONEDS              /ADD X AND Y INCREMENTS TO THE RUNNING
1568    02420   1052            TAD DIXTEM              /TOTALS AND DISPLAY THE RUNNING
1569    02421   3046            DCA XONEDS              /TOTALS NORMAL SIZE
1570    02422   1047            TAD YONEDS
1571    02423   1053            TAD DIYTEM
1572    02424   3047            DCA YONEDS
1573
1574    02425   1046            TAD XONEDS              /COULD MAKE TWICE AS BIG BY NOP-ING
1575    02426   7012            RTR                     /THE RAR'S BUT THE SCREEN IS SMALL ENOUGH
1576    02427   7010            RAR                     /AS IT IS
1577    02430   6303            DXC DXL
1578    02431   7200            CLA
1579    02432   1047            TAD YONEDS
1580    02433   7012            RTR
1581    02434   7010            RAR
1582    02435   6317            DYC DYL DIS
1583    02436   7200            CLA
1584    02437   2054            ISZ DISCNT              /DONE 4 DOTS?
1585    02440   5217            JMP EXPLOP              /NO
1586
1587    02441   2011            ISZ AUTO11              /DONE ALL VECTORS IN THE FILE?
1588    02442   7410            SKP
1589    02443   5600            JMP I EXPDIS            /YES, EXIT
1590
1591    02444   1050            TAD XTWODS              /NO SWAP TO NEXT PAIR OF POINTS
1592    02445   3046            DCA XONEDS
```

SPACE WAR

```
1593  02446  1051          TAD YTWODS
1594  02447  3047          DCA YONEDS
1595  02450  5201          JMP EXPDIS+1
1596
1597
```

```
1598
1599                    /
1600                    /       VEELIM IS THE SCALING ROUTINE FOR VELOCITY COMPONENTS.
1601                    /       THE COMPONENTS ARE SCALED TO REMAIN IN THE RANGE 140
1602                    /       TO -140.  THIS IS NECESSARY TO AVOID ASTRONOMICAL SPPED
1603                    /       BUILDUP ON THE SMALL SCREEN.  UNFORTUNATELY THE X AND Y
1604                    /       COMPONENTS ARE SCALED SEPARATELY WHICH GIVES SLIGHT BUT
1605                    /       NOTICABLE DISTORTIONS IN DIAGONAL FLIGHT PATHS.  IN THE
1606                    /       NORMAL HEAT OF THE BATTLE NO ONE WILL REALLY NOTICE.
1607                    /
1608
1609
1610    02451   0000    VEELIM, 0                       /ENTER TO SCALE VELOCITY HELD IN
1611    02452   3272            DCA VEEHLD              /AC
1612    02453   1272            TAD VEEHLD
1613    02454   7500            SMA                     /BRANCH FOR POSITIVE OR NEGATIV
1614    02455   5263            JMP VEEPOS
1615    02456   1274            TAD VEEMAX
1616    02457   7700            SMA CLA                 /GREATER THAN MAXIMUM POSITIVE?
1617    02460   5270            JMP VEECLR              /NO
1618    02461   1273            TAD VEEMIN              /I MEAN MAXIMUM NEGATIVE - YES SET
1619    02462   5651            JMP I VEELIM            /TO MAX NEGATIV
1620
1621    02463   1273    VEEPOS, TAD VEEMIN              /GREATER THAN MAX?
1622    02464   7710            SPA CLA
1623    02465   5270            JMP VEECLR              /NO
1624    02466   1274            TAD VEEMAX              /YES SET TO MAX
1625    02467   5651            JMP I VEELIM
1626
1627    02470   1272    VEECLR, TAD VEEHLD              /IT WAS IN RANGE ALL ALONG
1628    02471   5651            JMP I VEELIM
1629
1630    02472   0000    VEEHLD, 0
1631    02473   7640    VEEMIN, -140
1632    02474   0140    VEEMAX, 140
1633
1634    02475   0000    THEAJI, 0                       /HERE TO ADJUST THE ANGLE TO A RANGE
1635    02476   7500            SMA                     /0-550 OR 0-360 DEGREES.  THIS IS
1636    02477   5302            JMP .+3                 /NECESSARY TO INSURE THAT PUSHDOWN OVERFLOW
1637    02500   1130            TAD P550                /WILL NOT HAPPEN IN THE SINE AND COSINE
1638    02501   5276            JMP .-3                 /ROUTINES.  THIS SIMPLY TAKES THE AC
1639    02502   1141            TAD M550                /MODULO 360 AND EXITS
1640    02503   7500            SMA
1641    02504   5302            JMP .-2
1642    02505   1130            TAD P550                /FOLLOW IT THROUGH AND SEE IF IT DOESN'T
1643    02506   5675            JMP I THEAJI
1644
```

```
1645
1646                    /
1647                    /       ONE OF THESE ROUTINE IS ENTERED WHEN A WINNER IS DECLARED.
1648                    /       THE ADDRESS OF THE VICTORY MESSAGE IS PLACED IN MESS AND
1649                    /       THE GAMOVR FLAG SET TO CAUSE A BRANCH TO JOBLOP WHEN THE
1650                    /       DISPLAY CYCLE IS COMPLETED.  THE ROUTINE WILL THEN DISPLAY
1651                    /       THE APPROPRIATE MESSAGE OVER THE REMAINING SHIPS IF
1652                    /       ANY UNTIL THE KEYBOARD IS MOLESTED OR THE CLOCK RUNS OUT
1653                    /       AND THE NEXT DISPLAY UPDATE CYCLE IS SET.   AT ANY RATE THE
1654                    /       PROGRAM WILL REACH HERE ONLY WHEN SOMEONE HAS BITTEN THE
1655                    /       INTERGALACTIC DUST.
1656                    /
1657
1658
1659    22507   0000    ONEWIN, 0                       /THIS IS CALLED WHEN TWOFIN IS SET
1660    22510   1342            TAD MES1                /AND ONE FIN IS NOT.  SET ONE TO VICTOR
1661    22511   3347            DCA MESS                /AND SET GAMOVR FLAG
1662    22512   7001            IAC
1663    22513   3104            DCA GAMOVR
1664    22514   5707            JMP I ONEWIN            /THEN RETURN TO UPDATE CYCLE
1665
1666    22515   0000    TWOWIN, 0                       /THIS IS CALLED WHEN ONEFIN IS SET
1667    22516   1343            TAD MES2                /AND TWO FIN IS NOT
1668    22517   3347            DCA MESS                /SET ALSO GAMOVR
1669    22520   7001            IAC
1670    22521   3104            DCA GAMOVR
1671    22522   5715    .       JMP I TWOWIN
1672
1673    22523   1345    NOWIN,  TAD MES4                /GET HERE WHEN BOTH ONEFIN AND TWOFIN
1674    22524   3347            DCA MESS                /ARE SET .
1675    22525   7001            IAC
1676    22526   3104            DCA GAMOVR              /NOBODY EVER REALLY WINDS
1677                                                    /UP THE WINNER IN THESE THINGS
1678    22527   6325    JOBLOP, DSB 1                   /THIS IS ENTERED FROM FINISH WHEN
1679    22530   1341            TAD MES0                /GAMOVR IS SET AND SERVES TO DISPLAY
1680    22531   4477            JMS I MESOUT            /THE VICTORY MESSAGE ON THE SCREEN
1681    22532   1347            TAD MESS                /USING THE CHARACTER GENERATOR SOMEWHAT
1682    22533   4477            JMS I MESOUT            /FURTHER ON UNTIL THE GAME IS RESTARTED
1683    22534   1346            TAD MES5                /OR UNTIL THE INTERRUPT COUNT OVERFLOWS
1684    22535   4477            JMS I MESOUT            /AND THE UPDATE CYCLE IS RESTARTED
1685    22536   1344            TAD MES3
1686    22537   4477            JMS I MESOUT
1687    22540   5327    FINITO, JMP JOBLOP
1688
1689    22541   7337    MES0,   MESS0
1690    22542   7344    MES1,   MESS1
1691    22543   7346    MES2,   MESS2
1692    22544   7350    MES3,   MESS3
1693    22545   7353    MES4,   MESS4
1694    22546   7340    MES5,   MESS5
1695    22547   0000    MESS,   0
1696            7344
```

```
1697
1698                    /
1699                    /       THE FOLLOWING ARE THE SINE AND COSINE ROUTINES CUSTOMIZED
1700                    /       FOR THIS PROGRAM FROM ANOTHER I WORKED ON,  CALL EITHER
1701                    /       SINE OR COSINE WITH ANGLE IN DEGREES IN AC.  THE ARGUEMENT
1702                    /       IS REDUCED THROUGH RECURSION UNTIL BETWEEN 0-89 DEGREES
1703                    /       AND THEN A TABLE LOOKUP DONE TO OBTAIN THE VALUE.  IT TAKES
1704                    /       UP A FAIR AMOUNT OF SPACE BUT IT WORKS JUST FASTER
1705                    /       THAN SHEEP.  THE COSINE CALL JUST TRANSFORMS THE ARGUEMENT
1706                    /       THROUGH SOME TRIGONOMETRIC GARBAGE AND CALLS THE SINE
1707                    /       ROUTINE.  NOTE THAT CALLING EITHER ROUTINE WITH TOO
1708                    /       LARGE AN ARGUEMENT WILL CAUSE PUSHDOWN OVERFLOW AND THEN
1709                    /       ALL HELL WILL BREAK LOOSE.  THE ORIGINAL ROUTINE FROM WHICH
1710                    /       THIS WAS STOLEN HAD FULL WORD PRECISION.
1711                    /
1712
1713            6400            *6400
1714
1715    06400   0000    SINEIN, 0                       /I REALLY CANT BRING MYSELF TO COMMENT
1716    06401   3252            DCA SINARG              /THIS.  IT'S VERY STRAIGHFORWARD
1717    06402   1200            TAD SINEIN
1718    06403   3653            DCA I SINPSH
1719    06404   2253            ISZ SINPSH
1720    06405   1252            TAD SINARG
1721    06406   7440            SZA
1722    06407   5217    .       JMP SINNG2
1723
1724    06410   7340    SINPOP, CLA CLL CMA
1725    06411   1253            TAD SINPSH
1726    06412   3253            DCA SINPSH
1727    06413   1653            TAD I SINPSH
1728    06414   3200            DCA SINEIN
1729    06415   1252            TAD SINARG
1730    06416   5600            JMP I SINEIN
1731
1732    06417   7500    SINNG2, SMA
1733    06420   5226            JMP SINPOS
1734    06421   7041            CIA
1735    06422   4200            JMS SINEIN
1736
1737    06423   7041    SINNEG, CIA
1738    06424   3252            DCA SINARG
1739    06425   5210            JMP SINPOP
1740
1741    06426   1136    SINPOS, TAD M264
1742    06427   7510            SPA
1743    06430   5232            JMP .+2
1744    06431   5222            JMP SINNEG-1
1745    06432   1125            TAD P132
1746    06433   7510            SPA
1747    06434   5244            JMP SINELK
1748    06435   7640            SZA CLA
1749    06436   5241            JMP .+3
1750    06437   1122            TAD P37
1751    06440   5224            JMP SINNEG+1
```

```
1752
1753  26441  1252          TAD SINARG
1754  26442  1136          TAD M264
1755  26443  5222          JMP SINNEG-1
1756
1757  26444  1125  SINELK, TAD P132
1758  26445  1262          TAD SINTAB
1759  26446  3200          DCA SINEIN
1760  26447  1600          TAD I SINEIN
1761  26450  3252          DCA SINARG
1762  26451  5210          JMP SINPOP
1763
```

```
1764
1765
1766    26452  0000  SINARG, 0
1767    26453  6454  SINPSH, SINLST
1768    26454  0000  SINLST, 0
1769    26455  0000          0
1770    26456  0000          0
1771    26457  0000          0
1772    26460  0000          0
1773    26461  0000          0
1774
1775    26462  6467  SINTAB, SINES-1
1776
1777    26463  0000  COSINI, 0
1778    26464  7041          CIA
1779    26465  1125          TAD P132
1780    26466  4200          JMS SINEIN
1781    26467  5663          JMP I COSINI
1782
```

```
1783
1784
1785    06470   0000  SINES,  00      /1
1786    06471   0001          01      /2
1787    06472   0001          01      /3
1788    06473   0002          02      /4
1789    06474   0002          02      /5
1790    06475   0003          03      /6
1791    06476   0003          03      /7
1792    06477   0004          04      /8
1793    06500   0005          05      /9
1794    06501   0005          05      /10
1795    06502   0006          06      /11
1796    06503   0006          06      /12
1797    06504   0007          07      /13
1798    06505   0007          07      /14
1799    06506   0010          10      /15
1800    06507   0010          10      /16
1801    06510   0011          11      /17
1802    06511   0011          11      /18
1803    06512   0012          12      /19
1804    06513   0012          12      /20
1805    06514   0013          13      /21
1806    06515   0013          13      /22
1807    06516   0014          14      /23
1808    06517   0015          15      /24
1809    06522   0015          15      /25
1810    06521   0016          16      /26
1811    06522   0016          16      /27
1812    06523   0017          17      /28
1813    06524   0017          17      /29
1814    06525   0020          20      /30
1815    06526   0020          20      /31
1816    06527   0020          20      /32
1817    06530   0021          21      /33
1818    06531   0021          21      /34
1819    06532   0022          22      /35
1820    06533   0022          22      /36
1821    06534   0023          23      /37
1822    06535   0023          25      /38
1823    06536   0024          24      /39
1824    06537   0024          24      /40
1825    06540   0025          25      /41
1826    06541   0025          25      /42
1827    06542   0025          25      /43
1828    06543   0026          26      /44
1829    06544   0026          26      /45
1830    06545   0027          27      /46
1831    06546   0027          27      /47
1832    06547   0027          27      /48
1833    06550   0030          30      /49
1834    06551   0030          30      /50
1835    06552   0030          30      /51
1836    06553   0031          31      /52
1837    06554   0031          31      /53
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1838    26555  0031          31      /54
1839    26556  0032          32      /55
1840    26557  0032          32      /56
1841    26560  0032          32      /57
1842    26561  0033          33      /58
1843    26562  0033          33      /59
1844    26563  0033          33      /60
1845    26564  0033          33      /61
1846    26565  0034          34      /62
1847    26566  0034          34      /63
1848    26567  0034          34      /64
1849    26570  0035          35      /65
1850    26571  0035          35      /66
1851    26572  0035          35      /67
1852    26573  0035          35      /68
1853    26574  0035          35      /69
1854    26575  0036          36      /70
1855    26576  0036          36      /71
1856    26577  0036          36      /72
1857    26600  0036          36      /73
1858    26601  0036          36      /74
1859    26602  0036          36      /75
1860    26603  0037          37      /76
1861    26604  0037          37      /77
1862    26605  0037          37      /78
1863    26606  0037          37      /79
1864    26607  0037          37      /80
1865    26610  0037          37      /81
1866    26611  0037          37      /82
1867    26612  0037          37      /83
1868    26613  0037          37      /84
1869    26614  0037          37      /85
1870    26615  0037          37      /86
1871    26616  0037          37      /87
1872    26617  0037          37      /88
1873    26620  0037          37      /89
1874
```

```
1875
1876
1877  26621  0000  MULTI,  0                    /THIS IS STANDARD SINGLE PRECISION
1878  26622  7100          CLL                  /MULTIPLY ROUTINE WHICH WAS ONCE
1879  26623  7510          SPA                  /USED.  I'VE LEFT IT IN SINCE
1880  26624  7061          CMA CML IAC          /THERE IS LOTS OF CORE LEFT OVER AND
1881  26625  3271          DCA MULMP1           /MAYBLE SOMEDAY I'LL NEED IT TO PUT
1882  26626  3272          DCA MULMP5           /IN A SUN OR SOMETHING.  THIS IS THE
1883  26627  1621          TAD I MULTI          /STANDARD DEC SUBROUTINE WITH DIFFERENT
1884  26630  7450          SNA                  /LABELS
1885  26631  5255          JMP MULPSN+2
1886  26632  7510          SPA
1887  26633  7061          CMA CML IAC
1888  26634  3273          DCA MULMP2
1889  26635  1270          TAD MULTHR
1890  26636  3274          DCA MULMP3
1891
1892  26637  1271  MULMP4, TAD MULMP1
1893  26640  7010          RAR
1894  26641  3271          DCA MULMP1
1895  26642  1272          TAD MULMP5
1896  26643  7430          SZL
1897  26644  1273          TAD MULMP2
1898  26645  7110          CLL RAR
1899  26646  3272          DCA MULMP5
1900  26647  2274          ISZ MULMP3
1901  26650  5237          JMP MULMP4
1902  26651  1271          TAD MULMP1
1903  26652  7010          RAR
1904  26653  7430  MULPSN, SZL
1905  26654  5261          JMP MULCMP
1906  26655  3271          DCA MULMP1
1907  26656  1272          TAD MULMP5
1908  26657  2221  MULMPZ, ISZ MULTI
1909  26660  5621          JMP I MULTI
1910
1911  26661  7141  MULCMP, CMA CLL IAC
1912  26662  3271          DCA MULMP1
1913  26663  1272          TAD MULMP5
1914  26664  7040          CMA
1915  26665  7430          SZL
1916  26666  7001          IAC
1917  26667  5257          JMP MULMPZ
1918
1919  26670  7764  MULTHR, 7764
1920  26671  0000  MULMP1, 0
1921  26672  0000  MULMP5, 0
1922  26673  0000  MULMP2, 0
1923  26674  0000  MULMP3, 0
1924
```

```
1972
1973            7000            *7000
1974
1975                    /GENERAL PURPOSE SYMBOL GENERATOR
1976                    /
1977    07000   0000    CHARS,  0       /ENTRY TO PLOT CHARACTER STRING
1978    07001   3330            DCA ADDR        /STORE STRING ADDRESS
1979    07002   1730            TAD I ADDR,     /FETCH DOUBLE CHARACTER
1980    07003   7012            RTR     /SHIFT
1981    07004   7012            RTR     /       FOR FIRST
1982    07005   7012            RTR     /       CHARACTER
1983    07006   4216            JMS CHAR        /PLOT CHARACTER
1984    07007   7410            SKP     /NORMAL RETURN -- SKIP
1985    07010   5600            JMP I CHARS     /TERMINATION RETURN -- EXIT
1986    07011   1730            TAD I ADDR      /RECALL DOUBLE CHARACTER
1987    07012   2330            ISZ ADDR        /ADVANCE STRING ADDRESS
1988    07013   4216            JMS CHAR        /PLOT CHARACTER
1989    07014   5202            JMP CHARS+2     /NORMAL RETURN -- REPEAT
1990    07015   5600            JMP I CHARS     /TERMINATION RETURN -- EXIT
1991                    /
1992    07016   0000    CHAR,.  0       /ENTRY TO PLOT SINGLE CHARACTER
1993    07017   0334            AND K77 /MASK OUT UPPER BITS
1994    07020   7104            CLL RAL /MULTIPLY CODE BY TWO
1995    07021   1336            TAD TABLE       /ADD TABLE BASE ADDRESS
1996    07022   3335            DCA POINT       /CONSTRUCT POINTER TO 24-BIT CODE
1997    07023   7040            CMA     /INITIALIZE COUNTER FOR
1998    07024   3332            DCA COUNT2      /       TWO PLOT WORDS
1999    07025   1735            TAD I POINT     /FETCH FIRST PLOT WORD
2000    07026   2335            ISZ POINT       /INCREMENT POINTER FOR NEXT ONE
2001    07027   7450            SNA     /SKIP IF NOT SPECIAL CHARACTER
2002    07030   5274            JMP SPCHAR      /ELSE GO PROCESS IT
2003    07031   3327            DCA CURPLT      /SAVE CURRENT PLOT BITS
2004    07032   1333    XPLOT,  TAD K6 /INITIALIZE 6-BIT
2005    07033   3331            DCA COUNT6      /       COUNTER
2006    07034   1323            TAD YVALUE      /RESET Y TEMPORARY
2007    07035   3326            DCA YTEMP       /       VALUE FOR CHARACTER
2008    07036   1322            TAD XVALUE      /OUTPUT CURRENT
2009    07037   6303            DXC DXL /       X-VALUE TO CRT
2010    07040   1324            TAD XINCR       /INCREMENT
2011    07041   3322            DCA XVALUE      /       ABSCISSA
2012    07042   1327    YPLOT,  TAD CURPLT      /RECALL CURRENT PLOT BITS
2013    07043   7104            CLL RAL /GET NEXT BIT
2014    07044   3327            DCA CURPLT      /SAVE REMAINING PLOT BITS
2015    07045   7420            SNL     /SKIP IF POINT TO PLOT
2016    07046   5255            JMP CNTINU      /ELSE JUMP AHEAD
2017    07047   1326            TAD YTEMP       /OUTPUT CURRENT
2018    07050   6317            DYC DYL DIS /   Y-VALUE TO CRT
2019    07051   7300            CLA CLL /CLEAR AC
2020    07052   1327            TAD CURPLT      /RECALL CURRENT PLOT BITS
2021    07053   7650            SNA CLA /SKIP IF POINTS REMAINING
2022    07054   5263            JMP WRDEND      /ELSE WORD IS FINISHED
2023    07055   1326    CNTINU, TAD YTEMP       /INCREMENT TEMPORARY
2024    07056   1325            TAD YINCR       /       Y-VALUE FOR NEXT
2025    07057   3326            DCA YTEMP       /       CHARACTER STEP
2026    07060   2331            ISZ COUNT6      /SKIP IF 6 BITS PLOTTED
```

clear & load X buffer (use DILX 6053)

clear & load Y buffer & display
(use DILY[6054] & DIXY[6055])

JMS TO

0000
6054 DILY
6055 DISD
JMP-1
DIXY
JMPI

```
2027  07061  5242          JMP YPLOT       /ELSE PLOT NEXT ONE
2028  07062  5232          JMP XPLOT       /GO UPDATE X-VALUE
2029  07063  2332 WRDEND,  ISZ COUNT2      /SKIP IF ANOTHER BIT WORD
```

```
2030  07064  5270          JMP EXIT          /ELSE EXIT
2031  07065  1735          TAD I POINT       /FETCH SECOND BIT WORD
2032  07066  7440          SZA       /SKIP IF NO PLOT POINTS
2033  07067  5231          JMP XPLOT-1       /ELSE GO PLOT THEM
2034  07070  1322  EXIT,   TAD XVALUE        /INCREMENT ABSCISSA
2035  07071  1324          TAD XINCR         /       FOR SPACE BETWEEN
2036  07072  3322          DCA XVALUE        /       SYMBOLS
2037  07073  5616          JMP I CHAR        /EXIT FROM CHAR
2038                       /
2039  07074  1735  SPCHAR, TAD I POINT       /FETCH TRANSFER VECTOR
2040  07075  3335          DCA POINT         /STORE AS INDIRECT ADDRESS
```

```
2041  07076  5735          JMP I POINT     /GO TO APPROPRIATE ROUTINE
2042  07077  1324  SPACE,  TAD XINCR       /FETCH BASIC ABSCISSA INCREMENT
2043  07100  7106          CLL RTL /MULTIPLY BY FOUR AND
2044  07101  5270          JMP EXIT        /       GO CREATE SPACE
2045  07102  1320  CRLF,   TAD INITX       /"CARRIAGE RETURN" RESETS X
2046  07103  3322          DCA XVALUE      /       TO ITS ORIGINAL VALUE
2047  07104  1325  LF,     TAD YINCR       /"LINE FEED"
2048  07105  7106          CLL RTL /       DECREMENTS THE
2049  07106  7145          CLL CIA RAL     /       Y-VALUE BY
2050  07107  1323          TAD YVALUE      /       EIGHT SCALE
2051  07110  3323          DCA YVALUE      /       STEPS
2052  07111  5616          JMP I CHAR      /EXIT FROM CHAR
2053  07112  1320  RESET,  TAD INITX       /"RESET" RESETS
2054  07113  3322          DCA XVALUE      /       X AND Y TO
2055  07114  1321          TAD INITY       /       THEIR ORIGINAL
2056  07115  5310          JMP RESET-2     /       VALUES
2057  07116  2216  TERM,   ISZ CHAR        /TERMINATE CODE CAUSES
2058  07117  5616          JMP I CHAR      /       EXIT TO P+2
2059                /
2060  07120  0000  INITX,  0       /INITIAL X-VALUE
2061  07121  0327  INITY,  327     /INITIAL Y-VALUE
2062  07122  0000  XVALUE, 0       /CURRENT X-VALUE
2063  07123  0000  YVALUE, 0       /CURRENT Y-VALUE
2064  07124  0006  XINCR,  6       /BASIC X INCREMENT VALUE
2065  07125  0010  YINCR,  10      /BASIC Y INCREMENT VALUE
2066  07126  0000  YTEMP,  0       /TEMPORARY Y-VALUE
2067  07127  0000  CURPLT, 0       /CURRENT PLOT BITS
2068  07130  0000  ADDR,   0       /CURRENT STRING ADDRESS
2069  07131  0000  COUNT6, 0       /6-BIT COUNTER
2070  07132  0000  COUNT2, 0       /2-WORD COUNTER
2071  07133  7772  KM6,    -6      /CONSTANT FOR COUNT6
2072  07134  0077  K77,    77      /CHARACTER CODE MASK
2073  07135  0000  POINT,  0       /TABLE POINTER
2074                /
```

```
2130  07223  6151          6151    / Z
2131  07224  4543          4543
2132  07225  7741          7741    / [
2133  07226  0000          0
2134  07227  0204          204     / \
2135  07230  1020          1020
2136  07231  4177          4177    / ]
2137  07232  0000          0
2138  07233  0436          436     / ^
2139  07234  0400          400     / _
2140  07235  0000          0       /SPECIAL CHARACTER (37)
2141  07236  7112          RESET   /RESET
2142  07237  0000          0       /SPECIAL CHARACTER (40)
2143  07240  7077          SPACE   /SPACE
2144  07241  5600          5600    / !
2145  07242  0000          0
2146  07243  0303          303     / "
2147  07244  0000          0
2148  07245  1477          1477    / #
2149  07246  7714          7714
2150  07247  2277          2277    / MARKER
2151  07250  2200          2200
2152  07251  2313          2313    / %
2153  07252  6462          6462
2154  07253  7777          7777    / BLOCK
2155  07254  7777          7777
2156  07255  0300          300     / '
2157  07256  0000          0
2158  07257  3641          3641    / (
2159  07260  0000          0
2160  07261  4136          4136    / )
2161  07262  0000          0
2162  07263  4040          4040    / UNDERSCORE (52)
2163  07264  4040          4040
2164  07265  1034          1034    / +
2165  07266  1000          1000
2166  07267  0000          0       /SPECIAL CHARACTER (54)
2167  07270  7104          LF      /LINE FEED
2168  07271  1010          1010    / -
2169  07272  1000          1000
2170  07273  4000          4000    / .
2171  07274  0000          0
2172  07275  2010          2010    / /
2173  07276  0402          402
2174  07277  3641          3641    / 0
2175  07300  4136          4136
2176  07301  4442          4442    / 1
2177  07302  7740          7740
2178  07303  4261          4261    / 2
2179  07304  5146          5146
2180  07305  2145          2145    / 3
2181  07306  5321          5321
2182  07307  1710          1710    / 4
2183  07310  1077          1077
2184  07311  4745          4745    / 5
```

```
2185   07312  4531          4531
2186   07313  7750          7750    / 6
2187   07314  5070          5070
2188   07315  6111          6111    / 7
2189   07316  0503          503
2190   07317  2255          2255    / 8
2191   07320  5522          5522
2192   07321  0705          705     / 9
2193   07322  0577          577
2194   07323  2400          2400    / :
2195   07324  0000          0
2196   07325  0000          0       /SPECIAL CHARACTER (73)
2197   07326  7102          CRLF    /CARRIAGE RETURN; LINE FEED
2198   07327  1024          1024    / >
2199   07330  4200          4200
2200   07331  1212          1212    / =
2201   07332  1200          1200
2202   07333  4224          4224    / <
2203   07334  1000          1000
2204   07335  0255          255     / ?
2205   07336  0300          300
2206
```

```
2207
2208                    /
2209                    /       HERE FOLLOW THE PACKED ASCII TEXTS FOR THE VARIOUS
2210                    /       VICTORY MESSAGES.  PERSONS ADVENTEROUS TO FIND THIS MIGH CARE
2211                    /       TO TOGGLE IN SOME CUTE LITTLE MESSAGES OF THEIR OWN.
2212                    /
2213
2214    07337   3773    MESS0,  3773
2215    07340   7340    MESS5,  7340
2216    07341   4040            4040
2217    07342   4040            4040
2218    07343   4000            4000
2219
2220    07344   1716    MESS1,  1716        / ONE
2221    07345   0500            0500
2222
2223    07346   2427    MESS2,  2427        / TWO!
2224    07347   1700            1700
2225
2226    07350   2711    MESS3,  2711        / WINS!
2227    07351   1623            1623
2228    07352   4100            4100
2229
2230    07353   1617    MESS4,  1617
2231    07354   0217            0217
2232    07355   0431            0431
2233    07356   0000            0000
2234
```

```
2235
2236            7400            *7400
2237
2238    07400   0000    DISBUF, 0
2239
2240                    /       THE DISPLAY BUFFERS BEGIN HERE AND EXTEND UP SOMEWHERE TO
2241                    /       AROUND 7575 OR SO.
2242                    /
2243                    /
2244                    /
2245                    /
2246                    /
2247
```

2248
2249
2250 $

ACCFLG	0105	ENDGAM	1661	MES1	2542	ONETHE	0023
ACCPER	0106	EXIT	7070	MES2	2543	ONEUP	0400
ADDR	7130	EXPDIS	2400	MES3	2544	ONEVEL	0472
AUTO10	0010	EXPIRE	1662	MES4	2545	ONEVEX	0024
AUTO11	0011	EXPLOP	2417	MES5	2546	ONEVEY	0025
AUTO12	0012	FILDIS	1400	MEXP	0107	ONEWIN	2507
AUTO13	0013	FILONE	1421	MHYP	2257	ONEWN	0556
AUTO14	0014	FINISH	1647	MRES	1723	ONFG1	1154
AUTO15	0015	FINITO	2540	MULCMP	6661	ONFG2	1155
AUTO16	0016	FLAM1	1052	MULMPZ	6657	OP14	0752
AUTO17	0017	FLAM2	1263	MULMP1	6671	OP300	0554
BUFLIM	1673	GAMOVR	0104	MULMP2	6673	OTEN	6344
BUFSET	0302	HM177	2270	MULMP3	6674	OUTLOC	2256
BUFST	1672	HYPER	0076	MULMP4	6637	POINT	7135
BUFTMP	0113	HYPRET	2245	MULMP5	6672	POSCAL	6703
CALCOS	0064	HYPSET	2200	MULPSN	6653	PRODIS	1600
CALPOS	0072	IFILDS	1375	MULT	0067	PROLIF	0112
CALSIN	0063	INCONE	2333	MULTHR	6670	PROLOP	1604
CCF	6052	INCTWO	2334	MULTI	6621	PROX	0110
CHAR	7016	INITX	7120	M10	0134	PROY	0111
CHARS	7000	INITY	7121	M11	0135	P10	0117
CHECK	2000	INTACC	0346	M200	0137	P100	0124
CHECK2	2032	INTBUS	0326	M264	0136	P132	0125
CHKOUT	1674	INTCNT	0074	M4	0132	P17	0120
CLOCK	0075	INTGLH	0350	M400	0140	P20	0121
CLXK	6352	INTLNK	0347	M550	0141	P200	0126
CNTINU	7055	INTRET	0340	M6	0133	P37	0122
COOST	0265	INTSER	0313	NOWIN	2523	P3777	0131
COLDST	0251	INTTEM	0304	NOWPRO	2330	P40	0123
COLIDE	1472	INTWRO	0073	NOWTWO	2327	P400	0127
COLLID	2074	IONEEX	1473	ODT1	0004	P5	0116
COLLIM	2136	IONEST	0750	ODT2	0005	P550	0130
COSINE	0066	IPRODS	1464	ODT3	0006	RESCNT	1724
COSINI	6463	ISHFT	0102	OM14	0753	RESCON	1711
COUNT2	7132	ITWOEX	1474	OM300	0555	RESET	7112
COUNT6	7131	ITWOST	1153	ONECNT	0021	RESET1	0103
CRF	6072	ITWOUP	0552	ONECON	1121	RESE1	1675
CRLF	7102	IXPDIS	2332	ONECOS	0031	RESFND	1717
CURPLT	7127	JOBLOP	2527	ONEDIF	2251	RESLOP	1700
CUTOUT	2065	KM6	7133	ONEEXP	2271	RESPNT	1725
CUTPNT	2073	K77	7134	ONEFIG	0437	RESTRT	0206
DIS	6304	LF	7104	ONEFIL	0114	RSHIFT	0070
DISBUF	7400	LFTHAF	0305	ONEFIN	0032	RTNFLG	2253
DISCNT	0054	LIMIT	2064	ONEFLG	0022	RYTHAF	0306
DISHFT	1535	LNC1FG	0553	ONELEF	0425	SETBUF	1726
DISLOP	1512	LNC2FG	0751	ONELNC	0507	SETLOP	1740
DISPLY	1475	MESOUT	0077	ONEMOV	0453	SETPNT	1747
DIXTEM	0052	MESS	2547	ONEOK	0410	SHIFTR	6675
DIYTEM	0053	MESS0	7337	ONEOUT	0020	SINARG	6452
DSB	6324	MESS1	7344	ONEPEX	0026	SINE	0065
DXC	6301	MESS2	7346	ONEPEY	0027	SINEIN	6400
DXL	6302	MESS3	7350	ONERTN	2254	SINELK	6444
DYC	6311	MESS4	7353	ONERYT	0433	SINES	6470
DYL	6312	MESS5	7340	ONESET	1000	SINLST	6454
EMPTY	0003	MES0	2541	ONESIN	0030	SINNEG	6423

```
SINNG2 6417
SINPOP 6410
SINPOS 6426
SINPSH 6453
SINTAB 6462
SKXK   6321
SPACE  7077
SPCWAR 7074
START  0200
STRT1  0307
STRT2  0310
SWRD   0311
TABLE  7136
TABLEN 0303
TERM   7116
THEADJ 0100
THEAJI 2475
TIEUP  2331
TIMOUT 2250
TWOLOP 1454
TWPG1  1376
TWPG2  1377
TWOCNT 0034
TWOCOM 1332
TWOCOS 0244
TWODIS 1436
TWOEXP 2310
TWOFIG 0035
TWOFIL 0115
TWOFIN 0045
TWOFLG 0035
TWOLEF 0623
TWOLNC 0705
TWOLST 2252
TWOMOV 0651
TWOOK  0610
TWOOUT 0033
TWOPEX 0041
TWOPEY 0042
TWORTN 2255
TWORYT 0631
TWOSET 1200
TWOSIN 0043
TWOTHE 0036
TWOUP  0600
TWOVEL 0670
TWOVEX 0037
TWOVEY 0040
TWOWIN 2515
TWOWN  0754
T10COS 0060
T10SIN 0055
T20COS 0061
T20SIN 0056
T30COS 0062
T30SIN 0057
UPDATE 0250
VECTOR 0071
VEECLR 2470
VEEHLD 2472
VEELIM 2451
VEEMAX 2474
VEEMIN 2473
VEEPOS 2463
VEESCL 0101
VEESET 2260
WRDEND 7063
XINCR  7124
XONEDS 0046
XPLOT  7032
XRCL   6334
XRIN   6331
XROPT  0312
XTWODS 0050
XVALUE 7122
YINCR  7125
YONEDS 0047
YPLOT  7042
YTEMP  7126
YTWODS 0051
YVALUE 7123
ZTEN   6342
```

308 265