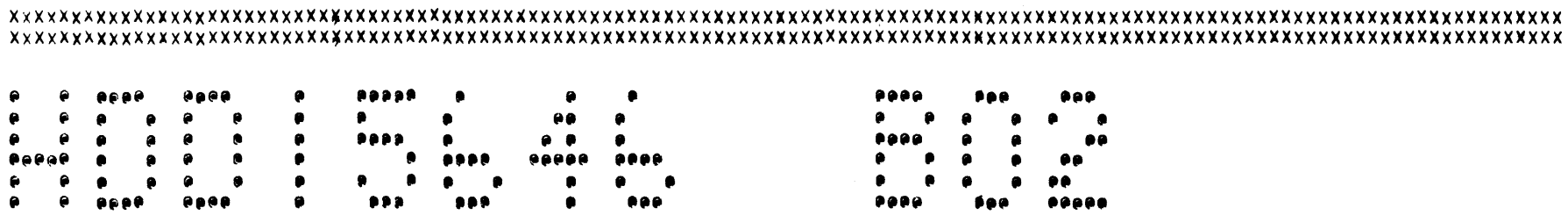

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**********************************
**********************************
**                              **
**  PDP-9 MINI TIME-SHARING SYSTEM  **
**        SWAPPER OVERLAY       **
**            DTSS:SWP          **
**             DK0:BQ2          **
**             TPN:BQ2          **
**                              **
**********************************
**********************************
```

```
100             .TITLE  SWAPPING OVERLAY
110             .NAME   SWP--B02
120
130     *
140     *
150     *       A SWAPPER CALL CAN BE INITIATED BY EITHER THE RESIDENT PROGRAM OR A
160     *       RUNNING PROGRAM. IN EITHER CASE, THE ACTUAL SWAPPER FETCH IS ACCOMPLISHED BY
170     *       USING THE RESIDENT DISK
180     *       HANDLER TO READ IN THE SWAPPER AND TRANSFER TO IT. THIS MEANS THAT
190     *       NO MATTER WHO INITIATES THE SWAPPER CALL, IT IS ENTERED WITH THE
200     *       SYSTEM-USING-THE-DISK FLAG (DKLOK) SET. DKLOK BEING SET PREVENTS
210     *       FURTHER INTERRUPTS FROM TRYING TO CALL THE SWAPPER PREMATURELY. THEIR
220     *       OCCURENCE IS MERELY NOTED.
230     *
240     *
250     *       IF THE RESIDENT PROGRAM INITIATES A SWAPPER CALL, IT IS THE RESULT
260     *       OF A PROGRAM INTERRUPT:
270     *
280     *            1) A USER HAS TYPED A NULL (CONTROL SHIFT P). THIS KILLS HIS OUTPUT AND
290     *               RUNNING PROGRAM AND SETS A FLAG THAT HE NEEDS THE MONITOR.
300     *               IF NO OTHER USER IS CURRENTLY RUNNING, IT ALSO CAUSES THE SWAPPER
310     *               TO BE CALLED TO LOAD THE MONITOR FOR HIM.
320     *
330     *            2) THE CLOCK HAS RUN OUT AND THERE IS ANOTHER USER WHO IS READY
340     *               TO RUN (I.E. NOT I/O ROADBLOCKED). THIS CAUSES THE SWAPPER
350     *               TO BE CALLED TO SWAP THE USERS.
360     *
370     *
380     *       A RUNNING PROGRAM MAY INITIATE A SWAPPER CALL AS THE RESULT OF A PROGRAMMING
390     *       ERROR, A SPECIAL IOT INSTRUCTION, OR A DECISION.
400     *
410     *            1) WHEN A MEMORY PROTECT ROUTINE DETECTS A PROGRAMMING ERROR IT CALLS THE
420     *               SWAPPER TO TRANSFER THE USER TO THE MONITOR/SYSTEM MESSAGES PROGRAM.
430     *
440     *            2) WHEN THE USER PROGRAM EXECUTES A SPECIAL IOT INSTRUCTION A MEMORY PROTECT
450     *               ROUTINE DISCOVERS IT AND CALLS THE SWAPPER TO GET THE SPECIAL
460     *               IOT INSTRUCTION HANDLER OVERLAY AND TRANSFER TO IT.
470     *
480     *            3) A RUNNING PROGRAM MAY DECIDE TO CALL THE SWAPPER ITSELF (E.G.
490     *               MONITOR WISHES TO CALL DDT).
500     *
510     *
520     *       EACH OF THESE TYPES OF SWAPPER CALLS, EXCEPT THE LAST, HAS ITS
530     *       OWN SPECIAL ENTRY TO THE SWAPPER (E.G. SWMTR & SWSPL) TO LET THE
540     *       SWAPPER SET UP THE SWAPPING PARAMETERS AND TO MINIMIZE THE AMOUNT
550     *       OF REQUIRED RESIDENT OR OVERLAY CODE. THIS ALSO KEEPS THE SETTING OF
560     *       THE SWAPPER CONTROL WORD WITHIN THE SWAPPER, FACILITATING FUTURE CHANGES IN THE
570     *       SWAPPER.
580     *
590     *       THE INTERRUPT SYSTEM MUST BE TURNED ON FOR AS MUCH OF THE SWAPPER
600     *       OPERATING TIME AS POSSIBLE, OR ELSE TELETYPE OUTPUT CANNOT BE GUARANTEED
610     *       TO BE CONTINUOUS. BEFORE THE INTERRUPT SYSTEM CAN BE TURNED ON, THE
```

```
620      *       SAVED USER REGISTERS MUST BE COPIED TO PREVENT THEIR DESTRUCTION.
630      *       ALSO THE CURRENT CORE USER STATUS MUST BE SAVED SO THAT $RCORE CAN
640      *       BE SET TO ZERO TO SIGNAL THE RESIDENT PROGRAM THAT THERE IS NO MEMORY
650      *       PROTECT PROGRAM IN CORE, OTHERWISE THE RESIDENT PROGRAM WILL ATTEMPT
660      *       TO TRANSFER TO NON-EXISTANT ROUTINES.
670      *
680      *       THE SWAPPING OVERLAY IS CONTROLLED BY FOUR PARAMETERS PASSED TO IT
690      *       ($UTEM0-$UTEM3). IT WILL PASS TO THE CALLED PROGRAM THE CALLING
700      *       PROGRAM'S NAME (IN $UTEM4), THE CALLING PROGRAM'S OVERLAY (IN $UTEM5),
710      *       AND THE PASSED PARAMETERS ($UTEM6 - $UTEM7)
720      *       THIS IS TO ALLOW SOME INTER-PROGRAM COMMUNICATIONS.
730      *
740      *            $UTEM0: SWAPPER PARAMETER #1 -- BIT CODED WORD TO CONTROL THE SWAPPER OPERATION
750      *                                            SWAPPER PASSES CALLING PROGRAM'S NAME
760      *            $UTEM1: SWAPPER PARAMETER #2 -- NAME OF PHANTOM OR S-USER PROGRAM BEING SWAPPED
770      *                                            SWAPPER PASSES CALLING PROGRAM'S EXTENDED PC
780      *            $UTEM2: SWAPPER PARAMETER #3 -- RESTART ADDRESS OVERRIDE
790      *                                            (INTERNALLY) DIRECT RESTART
800      *
810      *            $UTEM4: PASSED PARAMETER #1
820      *            $UTEM5: PASSED PARAMETER #2
830      *            $UTEM6: PASSED PARAMETER #3
840      *
850      *       THE "CURRENT CORE USER" (CCU) IS THE JOB WHOSE PROGRAM NAME IS IN $RCORE.
860      *       INITIALLY THIS IS THE JOB WHICH THE SWAPPER INTERRUPTED.
870      *
880      *       THE "NEXT CORE USER" (NCU) IS THE ONE WHOSE USER NUMBER IS PASSED IN
890      *       $3TEM4.
900      *
910      *
920      *       THE GENERAL SWAPPER PROCEDURE IS:
930      *            1) SET UP ANY OF THE PARAMETERS THAT STILL NEED TO BE SET UP.
940      *               (SPECIAL ENTRANCES ONLY).
950      *            2) SAVE EVERYTHING THE INTERRUPT SYSTEM WOULD CLOBBER IF ALLOWED TO.
960      *            3) SAVE THE SWAPPER CONTROL PARAMETERS, THE PASSED PARAMETERS, THE CCU
970      *               AND NCU STATUS; FLAG THE SYSTEM IS USING THE DISK AND THERE
980      *               IS NO MEMORY PROTECT OVERLAY IN CORE CURRENTLY.
990      *            4) INITIALIZE THE EXIT TO BE THROUGH $PIDON AND TURN ON THE INTERRUPTS.
1000     *            5) SET UP A COPY OF THE MONITOR FOR EACH USER WHO HAS REQUESTED IT.
1010     *            6) RESTORE THE SWAPPER CONTROL PARAMETERS.
1020     *            7) DO THE REQUESTED SWAPPER ACTIVITY.
1030     *
1040               .INSRT  DEFINS
100                .IFUND  DEFINS
```

```
5720            ,LIST   ON
5730            ,END
```

SWAPPER CONSTANTS, ENTRANCES, ETC.

```
                    1050            .STITL  SWAPPER CONSTANTS, ENTRANCES, ETC.
                    1060            .HEAD   S
                    1070
                    1080    *
                    1090    *
                    1100    *       ENTRANCE VECTOR
                    1110    *
    001000          1120            .LOC    OVSTRT          START OF THE OVERLAY AREA
001000  001426      1130    SWCAT   CATLG-1
001001  601054      1140    SWPPR   JMP     SWAP0           GENERAL ENTRANCE TO THE SWAPPER
001002  601015      1150    SWMTR   JMP     SWAP3           ENTRANCE TO CALL THE MONITOR
001003  601012      1160    SWCLK   JMP     SWAP4           ENTRANCE TO EFFECT A CLOCK SWAP (SAVES RESIDENT CODE)
001004  601016      1170    SWERR   JMP     SWAP1           ENTRANCE TO OUTPUT A STANDARD SYSTEM ERROR MESSAGE
001005  601031      1180    SWSPL   JMP     SWP10           ENTRANCE WHEN MEMORY PROTECT ROUTINES DETECT A SPECIAL IOT
001006  601043      1190    SXSPL   JMP     SWP13           ENTRANCE FROM SPECIAL IOT HANDLING TO GET THE USER BACK TO NORMAL
001007  601035      1200    SWMP1   JMP     SWP11           GET MEMORY PROTECTION OVERLAY #1
001010  601037      1210    SWMP2   JMP     SWP12           GET MEMORY PROTECTION OVERLAY #2
001011  601047      1220    SWOPR   JMP     SWP14           MP#2 FOR AN OPERATE INSTRUCTION
                    1230    *
                    1240    *
                    1250    *       ENTRANCES FROM THE RESIDENT PROGRAM
                    1260    *
                    1270    *       CLOCK SWAP ENTRANCE
                    1280    *
    001012          1290    SWAP4   ...
001012  201577      1300            LAC     (662000)
001013  040702      1310            DAC     $OC0            SET THE SWAPPER CONTROL WORD
001014  601054      1320            JMP     SWAP0
                    1330    *
                    1340    *       MONITOR ENTRANCE
                    1350    *
    001015          1360    SWAP3   ...
001015  141706      1370            DZM     $UTEM2          CALL THE MONITOR INSTEAD OF AN ERROR MESSAGE
                    1380    *
                    1390    *
                    1400    *       STANDARD SYSTEM ERROR MESSAGE PRINTOUTS
                    1410    *       ENTER WITH THE MESSAGE NUMBER ALREADY SET IN $UTEM2
                    1420    *
    001016          1430    SWAP1   ...
001016  201600      1440            LAC     (652000)
001017  040702      1450            DAC     $OC0            SET THE SWAPPER CONTROL WORD
001020  201601      1460            LAC     ($MTR)
001021  040703      1470            DAC     $OC1            SET THE SYSTEM PROGRAM NAME: MONITOR/MESSAGES
001022  777777      1480    M1      LAW     -1
001023  340000      1490            TAD     0
001024  500651      1500            AND     $ADRSS
001025  041704      1510            DAC     $UTEM0          SET THE PROGRAM COUNTER TO PRINT
001026  221704      1520            LAC     $UTEM0,X
001027  041705      1530            DAC     $UTEM1          SAVE THE INSTRUCTION GENERATING THE ERROR
001030  601054      1540            JMP     SWAP0
```

S OVERLAY EXCHANGES

```
                    1550            .STITL  OVERLAY EXCHANGES
                    1560    *
                    1570    *
                    1580    *       ENTRANCES TO SWITCH OVERLAYS AROUND. MOST OF THEM ARE MORE
                    1590    *       ABRUPT THAN THE OTHER ENTRANCES. THEY DO NOT NECESSARILY FOLLOW
                    1600    *       THE NORMAL SEQUENCE OF SWAPPER OPERATIONS. THIS IS BECAUSE IT
                    1610    *       IS ASSUMED THAT THEY ARE IN-AND-OUT SO FAST. THIS APPROACH SIMPLIFIES
                    1620    *       CODING A GOOD DEAL AND ALSO LETS THE SYSTEM RUN MORE EFFICIENTLY.
                    1630    *
    001031          1640    SWP10   ...;                    BRING IN THE SPECIAL IOT HANDLER OVERLAY
001031  200047      1650            LAC     $CSPL           LOAD ITS PHYSICAL ADDRESS FROM THE CORE CATALOG
001032  040040      1660            DAC     $SWPS           SET IT IN THE PARAMETERS LIST FOR THE RESIDENT DISK HANDLER
001033  761000      1670            LAW     $SPLST          GET A POINTER TO ITS ENTRANCE
001034  601052      1680            JMP     SWP19
                    1690    *
                    1700    *
                    1710    *       SWITCH FROM MEMORY PROTECTION OVERLAY #2 TO MEMORY PROTECTION OVERLAY #1
                    1720    *
    001035          1730    SWP11   ...;
001035  200045      1740            LAC     $CMP1           LOAD ITS PHYSICAL DISK ADDRESS FROM THE CORE CATALOG
001036  741000      1750            SKP
                    1760    *
                    1770    *
                    1780    *       SWITCH FROM MEMORY PROTECTION OVERLAY #1 TO MEMORY PROTECTION OVERLAY #2
                    1790    *
    001037          1800    SWP12   ...;
001037  200046      1810            LAC     $CMP2           LOAD ITS PHYSICAL DISK ADDRESS FROM THE CORE CATALOG
001040  040040      1820            DAC     $SWPS           SET IT IN THE PARAMETERS LIST FOR THE RESIDENT DISK HANDLER
001041  761002      1830            LAW     $IOT0           LOAD THE RESTART ADDRESS
001042  601052      1840            JMP     SWP19
                    1850    *
                    1860    *
                    1870    *       SWITCH FROM THE SPECIAL IOT HANDLER OVERLAY TO MEMORY PROTECTION #1 OVERLAY
                    1880    *
    001043          1890    SWP13   ...;
001043  200045      1900            LAC     $CMP1           LOAD ITS PHYSICAL DISK ADDRESS FROM THE CORE CATALOG
001044  040040      1910            DAC     $SWPS           SET IT IN THE PARAMETERS LIST FOR THE RESIDENT DISK HANDLER
001045  760270      1920            LAW     $PIDON          LOAD THE RESTART ADDRESS
001046  601332      1930            JMP     SW121
                    1940    *
                    1950    *
                    1960    *       GET MEMORY PROTECTION OVERLAY #2 -- THE OPERATE INSTRUCTION ROUTINE
                    1970    *
    001047          1980    SWP14   ...;
001047  200046      1990            LAC     $CMP2           LOAD ITS PHYSICAL DISK ADDRESS FROM THE CORE CATALOG
001050  040040      2000            DAC     $SWPS           SET IT IN THE PARAMETERS LIST FOR THE RESIDENT DISK HANDLER
001051  761004      2010            LAW     $MPOPR
                    2020    *
                    2030    *
    001052          2040    SWP19   ...;
001052  040654      2050            DAC     $DO             SET THE RESTART ADDRESS
001053  601334      2060            JMP     SW120           SWAP IN THE CORRECT OVERLAY
```

S SETUP AND INITIALIZATION

```
                    2070            .STITL  SETUP AND INITIALIZATION
                    2080    *
                    2090    *
                    2100    *       ALL ENTRANCES MERGE HERE
                    2110    *       SAVE THE USER'S REGISTERS BEFORE THE INTERRUPT SYSTEM CLOBBERS THEM
                    2120    *
001054  200000      2130    SWAP0   LAC     0
001055  041776      2140            DAC     $RSTRT
001056  200005      2150            LAC     $3AC
001057  041753      2160            DAC     $AC
001060  200026      2170            LAC     $,310
001061  041723      2180            DAC     $,0+10
001062  200027      2190            LAC     $,311
001063  041724      2200            DAC     $,0+11
                    2210    *
                    2220    *       SAVE THE CURRENT CORE USER (CCU) AND NEXT CORE USER (NCU) NAMES
                    2230    *
001064  201772      2240            LAC     $NAME
001065  041575      2250            DAC     CCU
001066  140035      2260            DZM     $RCORE          SET NO CCU SO RESIDENT PROGRAM DOESN'T ASSUME MEMORY PROTECT OVERLAYS
001067  200055      2270            LAC     $3TEM4
001070  041576      2280            DAC     NCU
                    2290    *
                    2300    *       NOW THE SYSTEM IS SECURE, IT IS OK TO ALLOW INTERRUPTS AGAIN
                    2310    *
001071  700042      2320            ION
001072  760270      2330            LAW     $PIDON
001073  041573      2340            DAC     STRTWD          SET THE STANDARD EXIT, INITIALLY
                    2350    *
                    2360    *
                    2370    *       NOW SAVE THE CCU'S LOW CORE -- 12-17 (THE REST IS ALREADY SAVED)
                    2380    *
001074  760011      2390            LAW     11
001075  040010      2400            DAC     10              SET THE SAVE TO START AT LOCATION 12
001076  761724      2410            LAW     $,0+11
001077  040011      2420            DAC     11              SET THE STORE TO START AT THE IMAGE OF 12
001100  101337      2430            JMS     SW200           DO THE CORE SAVE
001101  200702      2440            LAC     $OC0            LOAD THE SWAPPER CONTROL WORD
```

S MAIN OPERATING ROUTINES

```
                    2450            .STITL  MAIN OPERATING ROUTINES
                    2460    *
                    2470    *       GENERAL SWAP ROUTINE, ACTIVATE SUBROUTINES CALLED FOR BY THE SWAPPER CONTROL WORD IN $$OC0
                    2480    *
 001102  741110     2490            SPAIRAL
 001103  601126     2500            JMP     SW00            SWAP OUT THE CURRENT USER'S CORE
 001104  741110     2510    SW09    SPAIRAL
 001105  601135     2520            JMP     SW10            SWAP OUT THE CURRENT USER'S JOB TABLE (IF NOT ALSO NCU)
 001106  741110     2530    SW19    SPAIRAL
 001107  601150     2540            JMP     SW20            SET NCU := CCU (NUMBER)
 001110  741110     2550    SW29    SPAIRAL
 001111  601155     2560            JMP     SW30            READ IN THE NCU'S JOB TABLE (IF NOT ALSO CCU)
 001112  601166     2570    SW39    JMP     SW40            NOW SEE IF WE NEED TO OVERRIDE THIS SWAP-IN WITH A MONITOR CALL
 001113  741110     2580    SW49    SPAIRAL
 001114  601203     2590            JMP     SW50            READ IN THE NCU'S CORE
 001115  741110     2600    SW59    SPAIRAL
 001116  601224     2610            JMP     SW60            READ IN THE NCU'S PHANTOM PROGRAM NAMED IN $OC1 OVER THE OLD PHANTOM CORE
 001117  741110     2620    SW69    SPAIRAL
 001120  601234     2630            JMP     SW70            READ IN THE NCU'S S-USER PROGRAM NAMED IN $OC1 OVER THE OLD USER CORE
 001121  741110     2640    SW79    SPAIRAL
 001122  601261     2650            JMP     SW80            RECORD THE NEW CCU
 001123  741110     2660    SW89    SPAIRAL
 001124  601270     2670            JMP     SW100           RESET THE RESTART ADDRESS TO THE ONE PASSED IN $OC2
 001125  601273     2680            JMP     SW110           RESTORE THE USER'S LOW CORE, PASSED PARAMETERS, OVERLAY, AND GO
                    2690    *
                    2700    *       SWAP OUT THE CURRENT CORE USER
                    2710    *
 001126  040702     2720    SW00    DAC     $OC0            FIRST SAVE THE SWAPPER CONTROL WORD
 001127  201575     2730            LAC     CCU             LOAD THE CURRENT CORE USER'S NAME
 001130  041361     2740            DAC     OUT1            SET IT FOR SWAPPING
 001131  761133     2750            LAW     .+2             SET THIS ROUTINE'S RESTART
 001132  601360     2760            JMP     OUT             SWAP OUT THE USER
 001133  200702     2770            LAC     $OC0            RELOAD THE SWAPPER CONTROL WORD
 001134  601104     2780            RET     SW09
                    2790    *
                    2800    *       SWAP OUT THE CURRENT CORE USER'S JOB TABLE (UNLESS ALSO NCU)
                    2810    *
 001135  040702     2820    SW10    DAC     $OC0            FIRST SAVE THE SWAPPER CONTROL WORD
 001136  201576     2830            LAC     NCU             LOAD THE NEXT CORE USER'S I.D.
 001137  541575     2840            SAD     CCU             CHECK FOR DIFFERENT FROM CCU
 001140  601146     2850            JMP     SW18            SAME -- DON'T BOTHER
 001141  777777     2860            LAW     -1
 001142  341771     2870            TAD     $NUMBR          FORM THE JOB TABLE FILENAME
 001143  041361     2880            DAC     OUT1            SET FOR THE WRITE
 001144  761146     2890            LAW     .+2             LOAD THE STANDARD RESTART
 001145  601360     2900            JMP     OUT             WRITE OUT THE JOB TABLE
 001146  200702     2910    SW18    LAC     $OC0            RELOAD THE SWAPPER CONTROL WORD
 001147  601106     2920            RET     SW19
                    2930    *
                    2940    *       SET NCU := CCU (NUMBER)
                    2950    *
 001150  040702     2960    SW20    DAC     $OC0            FIRST SET THE SWAPPER CONTROL WORD
```

S MAIN OPERATING ROUTINES

```
001151  201771  2970          LAC     $NUMBR          LOAD THE CURRENT CORE USER'S NUMBER
001152  041576  2980          DAC     NCU             SET IT ALSO AS THE NEXT CORE USER
001153  200702  2990          LAC     $OC0            RELOAD THE SWAPPER CONTROL WORD
001154  601110  3000          JMP     SW29
                3010  *
                3020  *
                3030  *       READ IN THE JOB TABLE OF THE USER WHOSE NUMBER IS PASSED IN NCU
                3040  *
001155  040702  3050  SW30    DAC     $OC0            FIRST SAVE THE SWAPPER CONTROL WORD
001156  201576  3060          LAC     NCU             LOAD THE NEXT CORE USER'S I.D.
001157  541575  3070          SAD     CCU             CHECK FOR DIFFERENT FROM CCU
001160  601165  3080          JMP     SW38            SAME -- DON'T BOTHER
001161  341602  3090          TAD     (-1)            FORM THE NAME OF THE NCU JOB TABLE
001162  041364  3100          DAC     IN1             SET FOR READ-IN
001163  761165  3110          LAW     .+2             LOAD THE STANDARD RESTART ADDRESS
001164  601363  3120          JMP     IN              READ IN THE JOB TABLE
001165  200702  3130  SW38    LAC     $OC0            RELOAD THE SWAPPER CONTROL WORD
                3140  *
                3150  *       SEE IF THERE IS A MONITOR CALL OUTSTANDING FOR THIS USER
                3160  *
    001166      3170  SW40    ...
001166  040702  3180          DAC     $OC0            FIRST SAVE THE SWAPPER CONTROL WORD
001167  221771  3190          LAC     $NUMBR,X        LOAD THE MONITOR CALL FLAG
001170  741200  3200          SNA                     SKIP IF THERE IS AN OUTSTANDING FLAG
001171  601201  3210          JMP     SW48            NO -- EXIT
001172  161771  3220          DZM     $NUMBR,X        CLEAR THE REQUEST
001173  201601  3230          LAC     ($MTR)
001174  040703  3240          DAC     $OC1            SET THE MONITOR PROGRAM NAME
001175  200702  3250          LAC     $OC0            LOAD THE GIVEN SWAPPER CONTROL WORD
001176  501603  3260          AND     (077777)        GET RID OF THE GIVEN LOAD CALL
001177  241604  3270          XOR     (200000)        SET A CALL TO LOAD A PHANTOM PROGRAM (MONITOR)
001200  040702  3280          DAC     $OC0            RESTORE THE CORRECTED SWAPPER CONTROL WORD
001201  200702  3290  SW48    LAC     $OC0            LOAD THE SWAPPER CONTROL WORD
001202  601113  3300          RET     SW49
                3310  *
                3320  *
                3330  *       READ IN THE NEXT CORE USER, ALLOWING FOR THE PURE CODE PORTION OF PHANTOM PROGRAMS
                3340  *
001203  040702  3350  SW50    DAC     $OC0            FIRST SAVE THE SWAPPER CONTROL WORD
001204  201576  3360          LAC     NCU             LOAD THE NCU'S NUMBER
001205  101347  3370          JMS     SW210           LOCATE HIM IN THE SWAPPER TABLE
001206  221423  3380          LAC     USER,X          LOAD THE NCU'S NAME
001207  041364  3390          DAC     IN1             AND SET IT FOR SWAPPING
001210  761212  3400          LAW     .+2
001211  601363  3410          JMP     IN              SWAP IN THE USER
001212  201775  3420          LAC     $PURNM          SEE IF THERE IS A PURE CODE PORTION TO LOAD
001213  741200  3430          SNA
001214  601222  3440          JMP     SW58            NO -- CLEAN UP AND EXIT
001215  543700  3450          SAD     $PURSTR         YES -- SEE IF THE PURE CODE IS ALREADY IN
001216  601222  3460          JMP     SW58            YES, SO DON'T RE-READ IT
001217  041364  3470          DAC     IN1             YES -- SET THE PURE CODE DATA FOR SWAP-IN
001220  761222  3480          LAW     .+2             LOAD THE STANDARD RESTART
```

S MAIN OPERATING ROUTINES

```
001221  601363  3490          JMP     IN              AND READ IN THE REST OF THE PHANTOM
001222  200702  3500  SW58    LAC     $OC0            RESTORE THE SWAPPER CONTROL WORD
001223  601115  3510          RET     SW59
                  3520  *
                  3530  *
                  3540  *     READ IN THE PHANTOM PROGRAM NAMED IN $OC1 OVER THE OLD PHANTOM COMMON
                  3550  *
    001224        3560  SW60  ...
001224  740010  3570          RAL                     BYPASS THE S-USER OPTION
001225  040702  3580          DAC     $OC0            NOW SAVE THE SWAPPER CONTROL WORD
001226  763701  3590          LAW     $PURSTR+1

001227  041776  3600          DAC     $RSTRT          SET THE STANDARD PHANTOM PROGRAM START ADDRESS
001230  201605  3610          LAC     (PHANTOM)
001231  041774  3620          DAC     $TYPE           SET THE TYPE TO BE A PHANTOM PROGRAM
001232  341576  3630          TAD     NCU
001233  601241  3640          JMP     SW72            READ THE NCU'S OLD PHANTOM CORE
                  3650  *
                  3660  *
                  3670  *     READ IN THE S-USER PROGRAM NAMED IN $OC1 OVER THE OLD USER CORE
                  3680  *
001234  040702  3690  SW70    DAC     $OC0            FIRST SAVE THE SWAPPER CONTROL WORD
001235  775777  3700          LAW     $8K-1           LOAD THE MAXIMUM ADDRESS
001236  041776  3710          DAC     $RSTRT          SET IT AS THE S-USER PROGRAM START
001237  141774  3720          DZM     $TYPE           SET A USER-TYPE PROGRAM
001240  201576  3730          LAC     NCU             LOAD THE NCU'S TELETYPE NUMBER
001241  041772  3740  SW72    DAC     $NAME           AND SET IT ALSO AS THE SCRATCH FILE NAME
001242  041364  3750          DAC     IN1             SET IT FOR SWAP-IN
001243  761245  3760          LAW     .+2             LOAD THE STANDARD RESTART
001244  601363  3770          JMP     IN              READ THE OLD USER CORE
001245  200045  3780          LAC     $CMP1           LOAD A POINTER TO THE MEMORY PROTECTION OVERLAY #1 LOCATION
001246  041773  3790          DAC     $OVER           SET IT AS THE STANDARD SYSTEM PROGRAM OVERLAY
001247  200703  3800          LAC     $OC1
001250  041364  3810          DAC     IN1             SET THE FILENAME DESIRED FOR SWAP IN
001251  761253  3820          LAW     .+2             SET THE ROUTINE RESTART
001252  601363  3830          JMP     IN              DO THE SWAP
001253  201774  3840          LAC     $TYPE           LOAD THE PROGRAM TYPE
001254  740200  3850          SZA                     SKIP FOR USER PROGRAMS
001255  203700  3860          LAC     $PURSTR         ELSE LOAD THE PURE-CODE PORTION'S NAME
001256  041775  3870          DAC     $PURNM          SET THE PURE-CODE PORTION NAME (IF ANY)
001257  200702  3880          LAC     $OC0            RESTORE THE SWAPPER CONTROL WORD
001260  601121  3890          RET     SW79
                  3900  *
                  3910  *
                  3920  *     THE FILE HAS BEEN SWAPPED IN -- NOW SET ITS TABLE ENTRY
                  3930  *
001261  040702  3940  SW80    DAC     $OC0            FIRST SAVE THE SWAPPER CONTROL WORD
001262  201771  3950          LAC     $NUMBR          LOAD THE USER NUMBER
001263  101347  3960          JMS     SW210           FIND HIS ENTRY IN THE SWAPPER TABLE
001264  201772  3970          LAC     $NAME           RELOAD HIS USER NUMBER
001265  061423  3980          DAC     USER,X          AND UPDATE THIS USER'S PROGRAM NAME IN SWAPPER'S TABLE
001266  200702  3990          LAC     $OC0            RESTORE THE SWAPPER CONTROL WORD
001267  601123  4000          RET     SW89            AND EXIT
```

S MAIN OPERATING ROUTINES

```
                    4010    *
                    4020    *
                    4030    *       OVERRIDE THE RESTART ADDRESS
                    4040    *
        001270      4050    SW100   ...                     FIRST SAVE THE SWAPPER CONTROL WORD
001270  200704      4060            LAC     $OC2            LOAD THE NEW RESTART ADDRESS
001271  740200      4070            SZA                     SKIP IF NONE
001272  041776      4080            DAC     $RSTRT          AND SET IT
                    4090    *
                    4100    *       RESTORE THE CURRENT CORE USER'S LOW CORE
                    4110    *
001273  760011      4120    SW110   LAW     11
001274  040011      4130            DAC     11              SET THE RESTORATION TO START AT LOCATION 12
001275  761724      4140            LAW     $.0+11
001276  040010      4150            DAC     10              SET THE LOAD TO START AT THE IMAGE OF LOCATION 12
001277  101337      4160            JMS     SW200           DO THE RESTORATION
                    4170    *
                    4180    *       RESTORE THE USER'S MQ AND SC
                    4190    *
001300  201755      4200            LAC     $SC             RELOAD THE OLD STEP COUNT
001301  241606      4210            XOR     (77)            COMPLEMENT THE STEP COUNT
001302  341607      4220            TAD     (640402)        DEVELOP A PSEUDO-NORMALIZE INSTRUCTION
001303  501610      4230            AND     (640477)        DELETE POSSIBLE STEP COUNT OVERFLOW
001304  041305      4240            DAC     .+1             PLACE THE NORMALIZE INSTRUCTION IN SEQUENCE
001305  740040      4250            XX                      STEP COUNT TO THE SC
001306  201754      4260            LAC     $MQ             RELOAD THE OLD MQ
001307  652000      4270            LMQ                     AND SET IT
                    4280    *
                    4290    *       READ IN THE OVERLAY AND GO
                    4300    *
001310  201773      4310            LAC     $OVER           LOAD THE OVERLAY NAME
001311  040040      4320            DAC     $SWPS           SET THE NAME OF THE OVERLAY TO READ
001312  200044      4330            LAC     $CSWP
001313  041361      4340            DAC     OUT1            SET TO COPY THE SWAPPER OUT TO UPDATE CURRENT FILENAMES
001314  761316      4350            LAW     .+2
001315  601360      4360            JMP     OUT             READ OUT THE SWAPPER
001316  700002      4370            IOF                     INHIBIT INTERRUPTS TO RE-ENTER THE RESIDENT ENVIRONMENT
001317  201771      4380            LAC     $NUMBR
001320  040035      4390            DAC     $RCORE
001321  201753      4400            LAC     $AC
001322  040005      4410            DAC     $3AC
001323  201723      4420            LAC     $.0+10
001324  040026      4430            DAC     $.310
001325  201724      4440            LAC     $.0+11
001326  040027      4450            DAC     $.311
001327  201776      4460            LAC     $RSTRT
001330  040000      4470            DAC     0
001331  201573      4480            LAC     STRTWD          SET THE ADDRESS AT WHICH TO RESTART
        001332      4490    SW121   ...
001332  040654      4500            DAC     $DO
001333  140266      4510            DZM     $DKLOK          FLAG THE SYSTEM IS DONE WITH THE DISK
        001334      4520    SW120   ...
```

S MAIN OPERATING ROUTINES

```
001334  760037  4530            LAW     $SWPS-1
001335  040010  4540            DAC     10
001336  600663  4550            JMP     $D03            READ IN A NEW OVERLAY
```

```
                S                       MISCELLANEOUS SUBROUTINES

                        4560            .STITL  MISCELLANEOUS SUBROUTINES
                        4570
                        4580    *
                        4590    *       SUBROUTINE TO TRANSFER 12-17 TO OR FROM USER CORE IMAGE
                        4600    *
        001337          4610    SW200   ENTER
                                        .PMC    SAVE,ON
    001337  740040                     XX
    001340  777772  4620                LAW     -6
    001341  041347  4630                DAC     SW210           SET THE NUMBER OF LOCATIONS TO BE TRANSFERRED
    001342  220010  4640    SW203       LAC     10,X
    001343  060011  4650                DAC     11,X            TRANSFER ONE MORE LOCATION
    001344  441347  4660                ISZ     SW210           AND TEST FOR DONE
    001345  601342  4670                JMP     SW203           NOT DONE -- TRANSFER NEXT LOCATION
    001346  621337  4680                RET     SW200,X         YES -- RETURN
                        4690    *
                        4700    *
                        4710    *       SUBROUTINE TO LOCATE A USER'S ENTRY IN THE SWAPPER TABLE
                        4720    *
        001347          4730    SW210   ENTER
                                        .PMC    SAVE,ON
    001347  740040                     XX
    001350  541611  4740                SAD     ($US0)          CHECK FOR USER #0
    001351  761424  4750                LAW     UN0
    001352  541612  4760                SAD     ($US1)          CHECK FOR USER #1
    001353  761425  4770                LAW     UN1
    001354  541613  4780                SAD     ($US2)          CHECK FOR USER #2
    001355  761426  4790                LAW     UN2
    001356  041423  4800                DAC     USER            SET THE POINTER
    001357  621347  4810                RET     SW210,X
```

```
S                                   DISK ROUTINES

                    4820            ,STITL  DISK ROUTINES
                    4830
                    4840    *
                    4850    *
                    4860    *       ROUTINE TO SWAP A FILE OUT TO THE DISK
                    4870    *
001360  101366      4880    OUT     JMS     CAT             CALL THE DISK ROUTINE
001361  000000      4890    OUT1    ,DSA                    TO SWAP THIS FILENAME OUT
001362  000004      4900            $DKWRT                  DISK WRITE COMMAND
                    4910    *
                    4920    *       ROUTINE TO SWAP A FILE IN FROM THE DISK
                    4930    *
001363  101366      4940    IN      JMS     CAT             CALL THE DISK ROUTINE
001364  000000      4950    IN1     ,DSA                    TO SWAP THIS FILENAME IN
001365  000002      4960    IN2     $DKRD                   DISK READ COMMAND
                    4970    *
                    4980    *       SWAPPER CATALOG ROUTINE
                    4990    *
                    5000    *       CALLING FORMAT:
                    5010    *            LAW <RETURN ADDRESS>
                    5020    *            JMS CAT
                    5030    *            <SIXBIT (AC!6) ASCII FILENAME>
                    5040    *            <COMMAND: READ = 3; WRITE = 5>
                    5050    *       ERROR MESSAGE WILL BE PRINTED IF THE FILE CANNOT BE FOUND
                    5060    *
                    5070    *       ROUTINE INITIALIZATION
                    5080    *
    001366          5090    CAT     ENTER
                                    ,PMC    SAVE,ON
001366  740040                      XX
001367  040654      5100            DAC     $DO             SET UP THE RESTART AFTER THE DISK OPERATION
001370  221366      5110            LAC     CAT,X           LOAD THE FILENAME
001371  741200      5120            SNA
001372  620654      5130            RET     $DO,X           IGNORE A NULL FILENAME
001373  441366      5140            INX     CAT
001374  041337      5150            DAC     SW200           SAVE THE FILENAME FOR THE SEARCH
001375  777747      5160            LAW     -SWPCAT
001376  041347      5170            DAC     SW210           SAVE THE NUMBER OF FILES IN THIS CATALOG
001377  761426      5180            LAW     CATLG-1
001400  040010      5190            DAC     10              SET THE POINTER TO THE CATALOG
                    5200    *
                    5210    *       INITIALIZATION DONE -- NOW FIND THE FILENAME
                    5220    *
001401  220010      5230    CAT01   LAC     10,X            LOAD THE NEXT FILENAME FROM THE CATALOG
001402  541337      5240            SAD     SW200           IS IT THE ONE WE WANT?
001403  601413      5250            JMP     CAT09           YES -- CARRY ON
001404  441347      5260            ISZ     SW210           NO -- HAVE WE TRIED ALL OF THE POSSIBLE FILENAMES?
001405  741000      5270            SKP
001406  740040      5280            HLT                     YES, AND IT WAS NOT FOUND
001407  440010      5290            INX     10              NO, SO UPDATE THE FILENAME POINTER
001410  440010      5300            INX     10
001411  440010      5310            INX     10
```

S DISK ROUTINES

```
001412  601401  5320            JMP     CAT01           CHECK THE NEXT FILENAME
                5330    *
                5340    *       FILENAME MATCH HAS BEEN FOUND -- 10 POINTS TO IT
                5350    *
    001413      5360    CAT09   ...
001413  220010  5370            LAC     10,X
001414  707024  5380            DLAL                    SET THE TRUE PHYSICAL DISK ADDRESS
001415  220010  5390            LAC     10,X
001416  040037  5400            DAC     $DKCA           SET THE CORE ADDRESS -1
001417  220010  5410            LAC     10,X
001420  040036  5420            DAC     $DKWC           SET THE TWO'S COMPLEMEMT WORD COUNT
001421  221366  5430            LAC     CAT,X           LOAD THE COMMAND
001422  600672  5440            JMP     $DKOVR          AND DO THE DISK OPERATION
```

S MISCELLANEOUS STORAGE

```
                    5450            .STITL  MISCELLANEOUS STORAGE
                    5460    *
                    5470    *
                    5480    *       CONSTANTS AND POINTERS
                    5490    *
001423  000000      5500    USER    .DSA                    POINTER TO THE TABLE ENTRY ASSOCIATED WITH THE CURRENT USER
001424  000076      5510    UN0     $US0                    CURRENT FILENAME FOR USER #0
001425  000125      5520    UN1     $US1                    CURRENT FILENAME FOR USER #1
001426  000154      5530    UN2     $US2                    CURRENT FILENAME FOR USER #2
                    5540    *
                    5550    *
                    5560    *       SWAPPER CATALOG FORMAT:
                    5570    *            SIXBIT (ACI6) ASCII NAME
                    5580    *            PHYSICAL DISK ADDRESS
                    5590    *            CORE ADDRESS - 1
                    5600    *            TWO'S COMPLEMENT FILE LENGTH
                    5610    *            (TRANSFER CARD OMITTED)
                    5620    *
                    5630    *
    000031          5640    SWPCAT  .EQU    3*3+2*2+2+1     SCRATCH + PHANTOM + S-USER + SWAPPER
    001427          5650    CATLG   .BLOCK  SWPCAT*4
                    5660    *
                    5670    *
                    5680    *       TEMPORARY STORAGE: IN THE COURSE OF ITS OPERATIONS THE SWAPPER MAY
                    5690    *       OVER WRITE THE USER JOB TABLE TEMPORARY STORAGE LOCATIONS (SUTEM0-SUTEM6).
                    5700    *       THEREFORE SWAPPER FIRST COPIES THEM INTO SOC0-TEMP6.
                    5710    *
001573  000000      5720    STRTWD  .DSA
001574  000000      5730    OVOLD   .DSA
001575  000000      5740    CCU     .DSA
001576  000000      5750    NCU     .DSA
001577  662000      5760            .END    OVSTRT
001600  652000
001601  422025
001602  777777
001603  077777
001604  200000
001605  000001
001606  000077
001607  640402
001610  640477
001611  000076
001612  000125
001613  000154

TRANSFER ADDRESS  601000
```

S CROSS REFERENCE TABLE

1713	.0	4510	4520	2180	2200	2410	4140	4420	4440
26	.310	3400	2170	4430					
27	.311	3410	2190	4450					
4464	.DT	570							
6460	.TP	550							
2023	10SAVE	1870	1880						
2024	11SAVE	1880	1920						
5	3AC	3370	2150	4410					
305	3RE$T	3870	3880						
51	3TEM0	3530	3540						
52	3TEM1	3540	3550						
53	3TEM2	3550	3560						
54	3TEM3	3560	3570						
55	3TEM4	3570	3580	2270					
56	3TEM5	3580	3590						
57	3TEM6	3590	3600						
50	3TM20	3520	3530						
2	3TM21	3350							
3	3TM22	3360							
14000	7K	1030							
16000	8K	1020	910	1010	2640	2650	3780		
1753	AC	4520	4530	2160	4400				
1756	ACS	4550	4560						
2015	ACSAVE	1810	1820						
2022	ACSW	1860	1870						
651	ADRSS	4100	4110	1500					
390	AT	2950							
300	ATSGN	2900							
422030	BAS	420							
2151	BCNTRL	2330	2340						
634	BIT0	3970	3980						
641	BIT17	4020	4030						
635	BIT36	3980	3990						
636	BIT5	3990	4000						
637	BIT6	4000	4010						
640	BIT7	4010	4020						
642	BL7	4030	4040						
643	BL8	4040	4050						
2000	BOUNDA	970	960	980	990	1000	1630	5040	5080
377	BRK	5550							
2170	BUFFER	2490	2550						
1000	BUFLEN	2500	2550						
644	CB0	4050	4060						
645	CB1	4060	4070						
646	CB5	4070	4080						
647	CB7	4080	4090						
650	CBL8	4090	4100						
6	CHRMAX	3180	3200						
2	CHRPAK	3130	3200						
50	CLKMAX	2840	3180						
60	CLKSPD	3160	3170						
1757	CLOCK	4560	4570						

S CROSS REFERENCE TABLE

45	CMP1	3490	3500	1740	1900	3780
46	CMP2	3500	3510	1810	1990	
6	CNTRL	3380	3390			
2053	COMFLG	2200	2210			
2150	COMSTO	2270	2280			
160000	CORMAX	910	980			
47	CSPL	3510	3520	1650		
44	CSWP	3480	3490	4330		
60	CTBFR	3600	3630	3640		
100	CTBIN	3640	3650	3670	4250	
2000	CTEMP0	1630				
2001	CTEMP1	1640				
2002	CTEMP2	1650				
2003	CTEMP3	1660				
2004	CTEMP4	1670				
2005	CTEMP5	1680				
2006	CTEMP6	1690				
2007	CTEMP7	1700				
2010	CTEMP8	1710				
2011	CTEMP9	1720				
102	CTFLG	3650	3660			
104	CTNAM	3660				
2043	D PC	2120	2130			
2154	D BCA	2370	2380			
2153	D BDA	2360	2370			
2163	D FDA	2440	2450			
2042	D LOC	2110	2120			
2022	D ACSW	1860				
2156	D BALT	2390	2400			
2155	D BLEN	2380	2390			
2161	D BMAX	2420	2430			
2157	D BMIN	2400	2410			
2162	D BPTR	2430	2440			
2167	D FMAX	2480	2490			
2165	D FMIN	2460	2470			
2046	D MASK	2150	2160			
2164	D MFDA	2450	2460			
2036	DADRSW	2070	2080			
1762	DAP0	4590	4600			
1763	DAP1	4600	4610			
653	DBK	4120	4130			
24	DBKNUM	2220	2270			
2054	DBKTAB	2210	2270			
2035	DBSTOR	2050	2060			
422027	DDT	410				
120000	DDT$T	5000				
2037	DDUMSW	2080	2090			
1761	DFLAG	4580	4590			
1764	DFN	4610	4620			
2151	DFTYPE	2340	2350			
2045	DHIGOR	2140	2150			
2050	DINDIR	2170	2180			

S CROSS REFERENCE TABLE

100	DK0	4270					
127	DK1	4310					
156	DK2	4350					
37	DKCA	2750	5400				
675	DKDON	4170	4180				
16000	DKLEN	2650	2660				
34	DKLENB	2660					
266	DKLOK	3830	3840	4510			
672	DKOVR	4160	4170	5440			
2	DKRD	2760	4960				
36	DKWC	2740	5420				
4	DKWRT	2770	4900				
2041	DLIMIT	2100	2110				
2044	DLOCOR	2130	2140				
2160	DMBMIN	2410	2420				
2166	DMFMIN	2470	2480				
654	DQ	4130	4140	2050	4500	5100	5130
662	DQ2	4140	4150				
663	DQ3	4150	4160	4550			
2152	DQFTYP	2350	2360				
2032	DPACSW	1980					
2040	DPATSW	2090	2100				
2051	DPCMSK	2180	2190				
2052	DREGBR	2190	2200				
2035	DREGSW	2060	2070				
2047	DRELOC	2160	2170				
1765	DSTAT	4620	4630				
446400	DT.	560					
2000	DTEMP0	1630					
2001	DTEMP1	1640					
2002	DTEMP2	1650					
2003	DTEMP3	1660					
2004	DTEMP4	1670					
2005	DTEMP5	1680					
2006	DTEMP6	1690					
2007	DTEMP7	1700					
2010	DTEMP8	1710					
2011	DTEMP9	1720					
275	EQUAL	2910					
692	FGET	3950	3960				
1701	FRCA	4410	4420				
1700	FRDA	4400	4410				
1702	FRLEN	4420	4430				
1703	FRSTA	4430	4440				
2	FUDGE	3190	3200				
276	GREAT	2930					
1790	IMPLEN	990					
3170	IMPSTR	2550					
422020	INT	320					
513	IO.IN	3910	3920				
525	IO.OT	3920	3930				
300000	IOBLK	2830					

S CROSS REFERENCE TABLE

1760	IORS	4570	4580											
1002	IOTO	4900	4910	1830										
652	JMP	4110	4120											
100	JTLEN	960												
1700	JTSTRT	950	940	960	1000	4400								
16	KBLEN	3610	3630	3640	3680	3690	3730	3740						
10	KBNUM	3620	3670	3720										
76	LOLOK	3630												
107	L1BFR	3670	3680	3690										
127	L1BIN	3690	3700	3720	4290									
131	L1FLG	3700	3710											
125	L1LOK	3680												
133	L1NAM	3710												
136	L2BFR	3720	3730	3740										
156	L2BIN	3740	3750	4330										
160	L2FLG	3750	3760											
154	L2LOK	3730												
162	L2NAM	3760	3770											
422026	LOR	390												
2000	LORST	5040												
274	LSS	2920												
2022	M ACSW	1860												
10	MINBUF	3200	3610											
422023	MP1	350												
422024	MP2	360												
2032	MPACSW	1980												
1004	MPOPR	4920	2010											
1000	MPST	4880	4890											
1754	MQ	4530	4540	4260										
2016	MQSAVE	1820	1830											
2000	MTEMP0	1630												
2001	MTEMP1	1640												
2002	MTEMP2	1650												
2003	MTEMP3	1660												
2004	MTEMP4	1670												
2005	MTEMP5	1680												
2006	MTEMP6	1690												
2007	MTEMP7	1700												
2010	MTEMP8	1710												
2011	MTEMP9	1720												
422025	MTR	370	1460	3230										
2000	MTRST	5080												
1772	NAME	4670	4680	2240	3740	3970								
540	NEWBR	3930	3940											
1771	NUMBR	4660	4670	2870	2970	3190	3220	3950	4380					
623	NXPTR	3960	3970											
702	OC0	4180	4190	1310	1450	2440	2720	2770	2820	2910	2960	2990	3050	3130
			3180	3250	3280	3290	3350	3500	3580	3690	3880	3940	3990	
703	OC1	4190	4200	1470	3240	3800								
704	OC2	4200	4210	4060										
705	OC3	4210												
574686	OFF	2730												

S CROSS REFERENCE TABLE

575600	ON	2720							
1773	OVER	4680	4690	3790	4310				
780	OVLEN	940							
1000	OVSTRT	930	920	940	4750	4880	4960	1120	5760
2043	P10$AV	1990	2000						
2034	P11$AV	2000	2050						
2025	PAC$AV	1930	1940						
2032	PAC$W	1980	1990						
241	PBFLAG	3810	3820						
2037	PCSAVE	1830	1840						
227	PFLAG	3770	3780						
77	PH0	4260	4270						
126	PH1	4300	4310						
155	PH2	4340	4350						
1	PHANTO	2780	3610						
2150	PHFLAG	2280	2330						
1700	PHLEN	2640							
2025	PHSTOR	1920	1930						
274	PIDN2	3850	3860						
270	PIDON	3840	3850	1920	2330				
1091	PINT	4890	4900						
303	PIOUT	3860	3870						
602026	PLDR	400							
2026	PMQ$AV	1940	1950						
602025	PMTR	380							
2027	PPC$AV	1950	1960						
606064	PPT	520							
2031	PSC$AV	1970	1980						
2030	PST$AV	1960	1970						
606460	PTP	510							
606462	PTR	500							
12100	PURLEN	1010							
1775	PURNM	4700	4710	3420	3870				
3700	PUR$TR	2560	990	1010	2560	3450	3590	3860	
546	PUTIN	3940	3950						
34	RAC$	3440							
6	RCNT	3390							
35	RCORE	3450	2260	4390					
1003	RDBLK	4910	4920						
32	RDT0	3420							
33	RDT1	3430							
422021	RES	330							
40	RESCAT	3470	3480						
1000	RESLEN	920							
234	RFLAG	3790	3800						
230	RPTP	3780	3790						
235	RPTR	3800	3810						
242	RSCO	3820	3830						
1776	RSTRT	4710	2140	3600	3710	4080	4460		
1363	S IN	4940	3120	3410	3490	3770	3830		
1022	S M1	1480							
1366	S CAT	5090	4880	4940	5110	5140	5430		

S CROSS REFERENCE TABLE

1575	S CCU	5740	2250	2730	2840	3070			
1364	S IN1	4950	3100	3390	3470	3750	3810		
1365	S IN2	4960							
1576	S NCU	5750	2280	2830	2980	3060	3360	3630	3730
1360	S OUT	4880	2760	2900	4360				
1424	S UN0	5510	4750						
1425	S UN1	5520	4770						
1426	S UN2	5530	4790						
1361	S OUT1	4890	2740	2880	4340				
1126	S SW00	2720	2500						
1104	S SW09	2510	2780						
1135	S SW10	2820	2520						
1146	S SW18	2910	2850						
1106	S SW19	2530	2920						
1150	S SW20	2960	2540						
1110	S SW29	2550	3000						
1155	S SW30	3050	2560						
1165	S SW38	3130	3080						
1142	S SW39	2570							
1166	S SW40	3170	2570						
1201	S SW48	3290	3210						
1113	S SW49	2580	3300						
1203	S SW50	3350	2590						
1222	S SW58	3500	3440	3460					
1115	S SW59	2600	3510						
1224	S SW60	3560	2610						
1117	S SW69	2620							
1234	S SW70	3690	2630						
1241	S SW72	3740	3640						
1121	S SW79	2640	3890						
1261	S SW80	3940	2650						
1123	S SW89	2660	4000						
1423	S USER	5500	3380	3980	4800				
1755	SC	4540	4550	4200					
1401	SCAT01	5230	5320						
1433	SCAT09	5360	5250						
1427	SCATLG	5650	1130	5180					
640000	SCRSTR	2670							
2021	SCSAVE	1850	1860						
283	SHARP	2890							
1574	SOVOLD	5730							
377	SPCOD	5410							
422122	SPL	430							
1000	SPLST	4960	1670						
777400	SPMSK	5390							
1270	SSW100	4050	2670						
1273	SSW110	4120	2680						
1334	SSW120	4520	2060						
1332	SSW121	4490	1930						
1337	SSW200	4610	2430	4160	4680	5150	5240		
1342	SSW203	4640	4670						
1347	SSW210	4730	3370	3960	4630	4660	4810	5170	5280

S CROSS REFERENCE TABLE

1054	SSWAP0	2130	1140	1320	1540				
1016	SSWAP1	1430	1170						
1015	SSWAP3	1360	1150						
1012	SSWAP4	1290	1160						
1000	SSWCAT	1130							
1003	SSWCLK	1160							
1004	SSWERR	1170							
1007	SSWMP1	1200							
1010	SSWMP2	1210							
1002	SSWMTR	1150							
1041	SSWOPR	1220							
1031	SSWP10	1640	1180						
1035	SSWP11	1730	1200						
1037	SSWP12	1800	1210						
1043	SSWP13	1890	1190						
1047	SSWP14	1980	1220						
1052	SSWP19	2040	1680	1840					
1001	SSWPPR	1140							
1005	SSWSPL	1180							
1006	SSXSPL	1190							
1573	STRTWD	5720	2340	4480					
2020	STSAVE	1840	1850						
335	SWAP	3880	3890						
336	SWAP1	3890	3900						
340	SWAP3	3900	3910						
1000	SWCAT	4750	4760						
1003	SWCLK	4780	4790						
1004	SWERR	4790	4800						
1007	SWMP1	4820	4830						
1040	SWMP2	4830	4840						
1002	SWMTR	4770	4780						
1041	SWOPR	4840							
422022	SWP	340							
31	SWPCAT	5640	5160	5650					
1001	SWPPR	4760	4770						
40	SWPS	3460	3470	1660	1820	1910	2000	4320	4530
1005	SWSPL	4800	4810						
1006	SXSPL	4810	4820						
1300	SYSBAS	2800	2810						
41300	SYSDA	2810							
1777	SYSMAX	2820							
100	TABLEN	2630	2640						
2000	TEMP0	1630	1640						
2001	TEMP1	1640	1650						
2012	TEMP10	1730	1740						
2013	TEMP11	1740	1750						
2014	TEMP12	1750	1800						
2002	TEMP2	1650	1660						
2003	TEMP3	1660	1670						
2004	TEMP4	1670	1680						
2005	TEMP5	1680	1690						
2006	TEMP6	1690	1700						

S CROSS REFERENCE TABLE

2007	TEMP7	1700	1710			
2010	TEMP8	1710	1720			
2011	TEMP9	1720	1730			
646000	TP.	540				
376	TRCOFF	5540				
375	TRCON	5530				
2000	TTEMP0	1630				
2001	TTEMP1	1640				
2002	TTEMP2	1650				
2003	TTEMP3	1660				
2004	TTEMP4	1670				
2005	TTEMP5	1680				
2006	TTEMP6	1690				
2007	TTEMP7	1700				
2010	TTEMP8	1710				
2011	TTEMP9	1720				
6	TTYCLK	3170	3180			
3	TTYNUM	3140				
10	TTYSPD	3150	3170			
1774	TYPE	4690	4700	3620	3720	3840
1766	UCORE	4630	4640			
1767	UDISK	4640	4650			
336	UPARR	2940				
76	US0	4250	4260	4280	4740	5510
125	US1	4290	4300	4320	4760	5520
154	US2	4330	4340	4360	4780	5530
0	USER	2790				
3	USERS	2850	3200			
14000	USLEN	980	2640			
2015	USTORE	1800	1810			
75	UT0	4280				
124	UT1	4320				
153	UT2	4360				
1704	UTEM0	4440	4450	1510	1520	
1705	UTEM1	4450	4460	1530		
1706	UTEM2	4460	4470	1370		
1707	UTEM3	4470	4480			
1710	UTEM4	4480	4490			
1711	UTEM5	4490	4500			
1712	UTEM6	4500	4510			
1770	VALID	4650	4660			

S UNDEFINED SYMBOLS

#1	5630											
#2	5640											
#3	5650											
#4	5660											
#5	5680											
DEFINS	100	100	120	120	580	580	2680	2680	3210	3210	5330	5330
PURCOD	5140	5270										

S MACRO CROSS REFERENCE TABLE

ENTER	5280	4610	4730	5090
MPOFF	5430			
SWAP	5610			