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STANDARD TRANSISTOR ARRAY (STAR)
Addendum 2 to Volume 1: CAPSTAR Programmer's Guide

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16. ABSTRACT

The cell placement techniques developed for use with the Standard Transistor Array (STAR2 have been incorporated in a placement program, the Cell Arrangement Program for STAR (CAPSTAR). Instructions for updating and maintaining this program are given in this document.

Placement techniques are described in NASA CR-161289; the CAPSTAR User's Guide is published as NASA CR-161291.

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I. INTRODUCTION

The Cell Arrangement Program for STAR (CAPSTAR) provides automated techniques for the layout of STARs. The procedures utilized in this program are described in another work ([1]). Instructions for program execution are given in [2].

This document is intended to serve as a programmer's reference manual for CAPSTAR. Descriptions of the internal logic flow of the program and of the organization of major internal data and file structures are provided. In addition, information necessary for future program improvement and modification is given.

The logical flow and data structure organization of CAPSTAR is described in Chapter II of this report. Chapter III contains outlines of the methods for particular program modifications and extensions. A listing of the program is given in an Appendix to this report. The remainder of this chapter is devoted to a general discussion of CAPSTAR.

General Description

CAPSTAR has been developed as a means of providing near-optimum STAR layouts while requiring a relatively small amount of computing resources. In addition, the program has been written so as to provide ease of modification and transportation.

The program is written in the FORTRAN-IV programming language and language compatibility has been certified for the IBM FORTRAN-IV level G and the XDS extended FORTRAN compilers.

With the exception of the use of Implied-DO constructs in I/O statements, the FORTRAN used is ANSII standard. Thus, minimal modification of the source language should allow use of the program with most FORTRAN-IV compilers.

The organization of CAPSTAR supports program modification and computing resource conservation. Program functions are modularized at the subroutine level so that any individual function can be easily modified or extended. Main storage requirements are minimized by use of overlaid unlabelled COMMON areas for local data storage. Sequential-access disk files are maintained to allow storage of data outside the main computer memory.

Finally, to provide operator convenience, the program has been divided into two segments (Part A and Part B) which execute separately. This segmentation provides run-time modules which are small enough for execution on the XDS SIGMA/5 time-sharing system allowing operator supervision of program progress.

II. PROGRAM AND DATA ORGANIZATION

The high-level organization of CAPSTAR and of major program data structures is outlined in this chapter.

CAPSTAR Structure

In order to restrict execution storage requirements, CAPSTAR has been divided into two segments, Part A and Part B. The first of these segments implements the data entry, clustering, and linear ordering functions of the STAR cell placement procedure presented in [1]. The second segment performs the cell and pad placement tasks and builds the output database. The hierarchy of routines within each segment is indicated in Figures 1 and 2.

Both A and B parts of CAPSTAR are modular at the subroutine level. Each subroutine contains explanatory comments relating to routine flow (see Appendix). The high-level structure of the major routines is also shown in Figures 3 through 15.

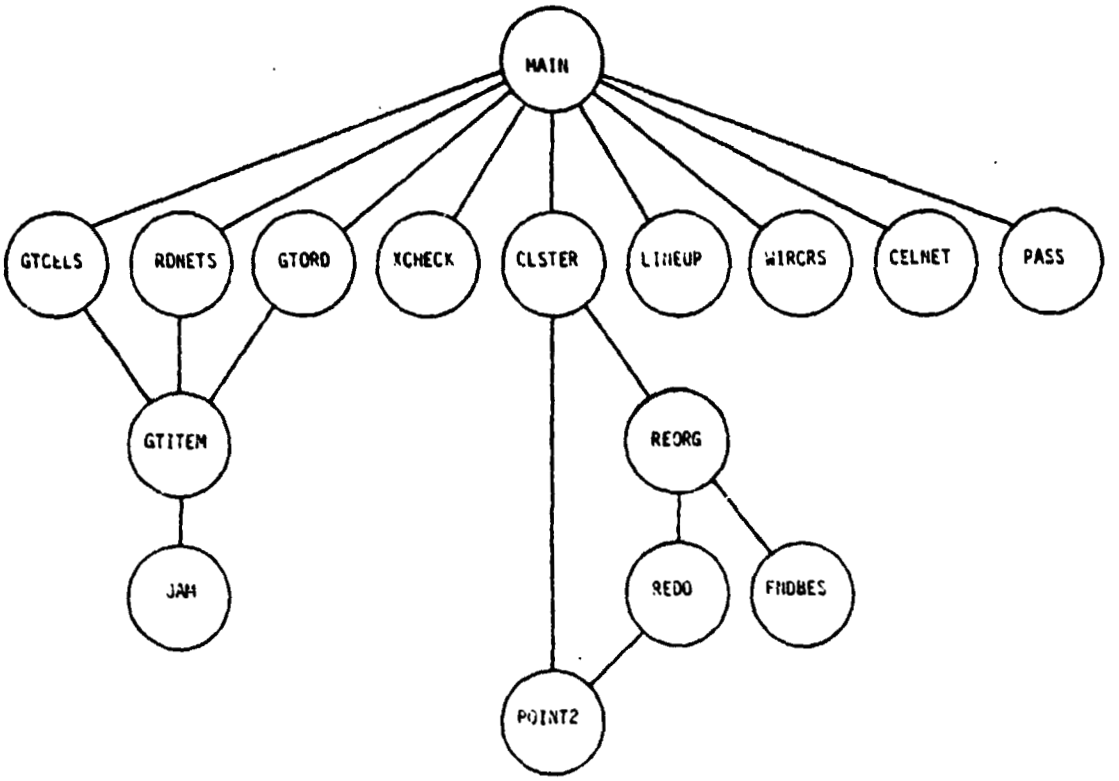

Figure 1. CAPSTAR - Part A Calling Structure

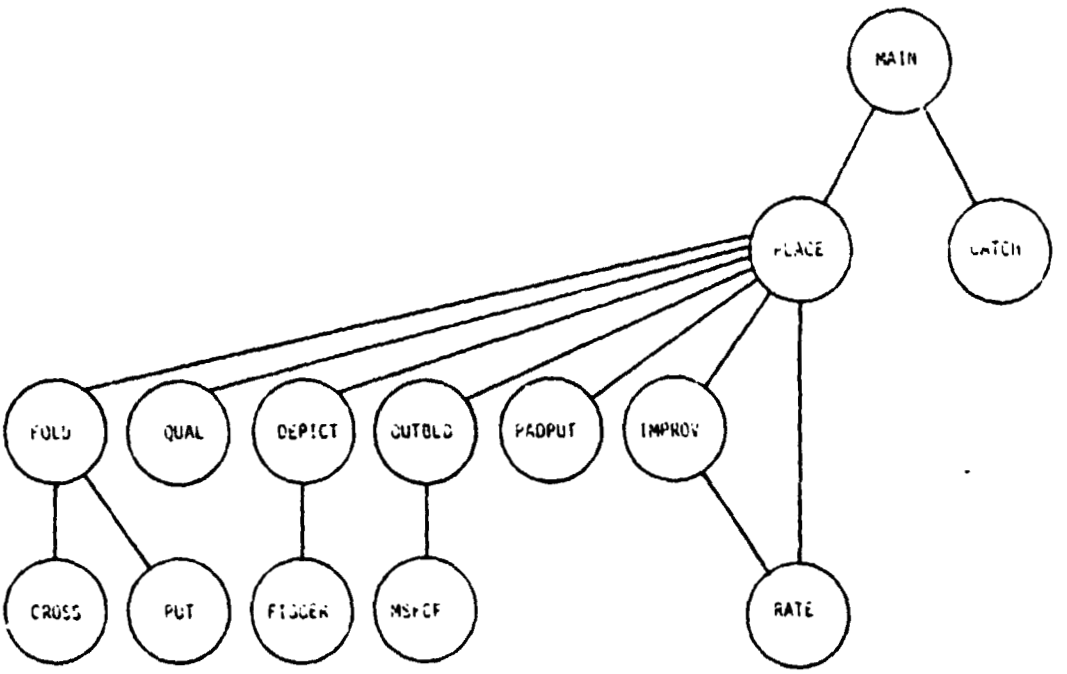

Figure 2. CAPSTAR - Part B Calling Structure

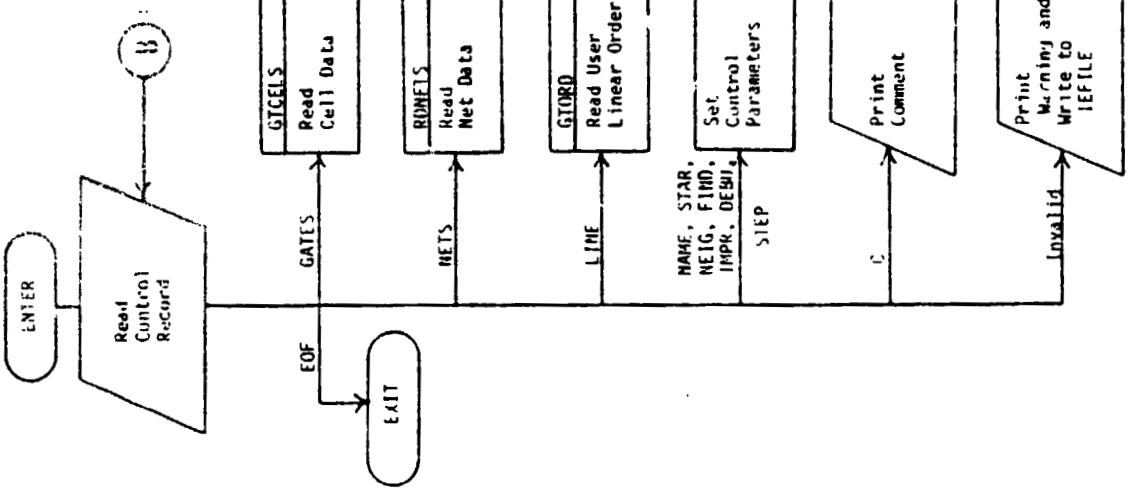

Figure 4. Control Record Processing

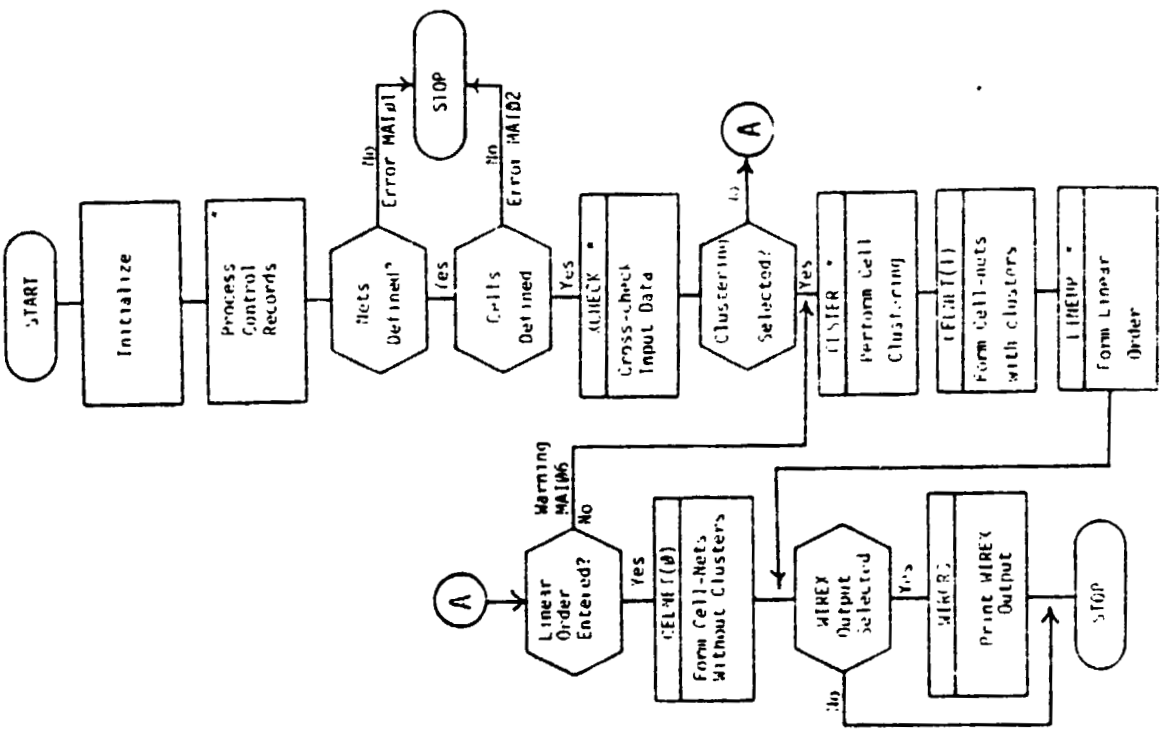

Figure 3. Part A Main Control Routine

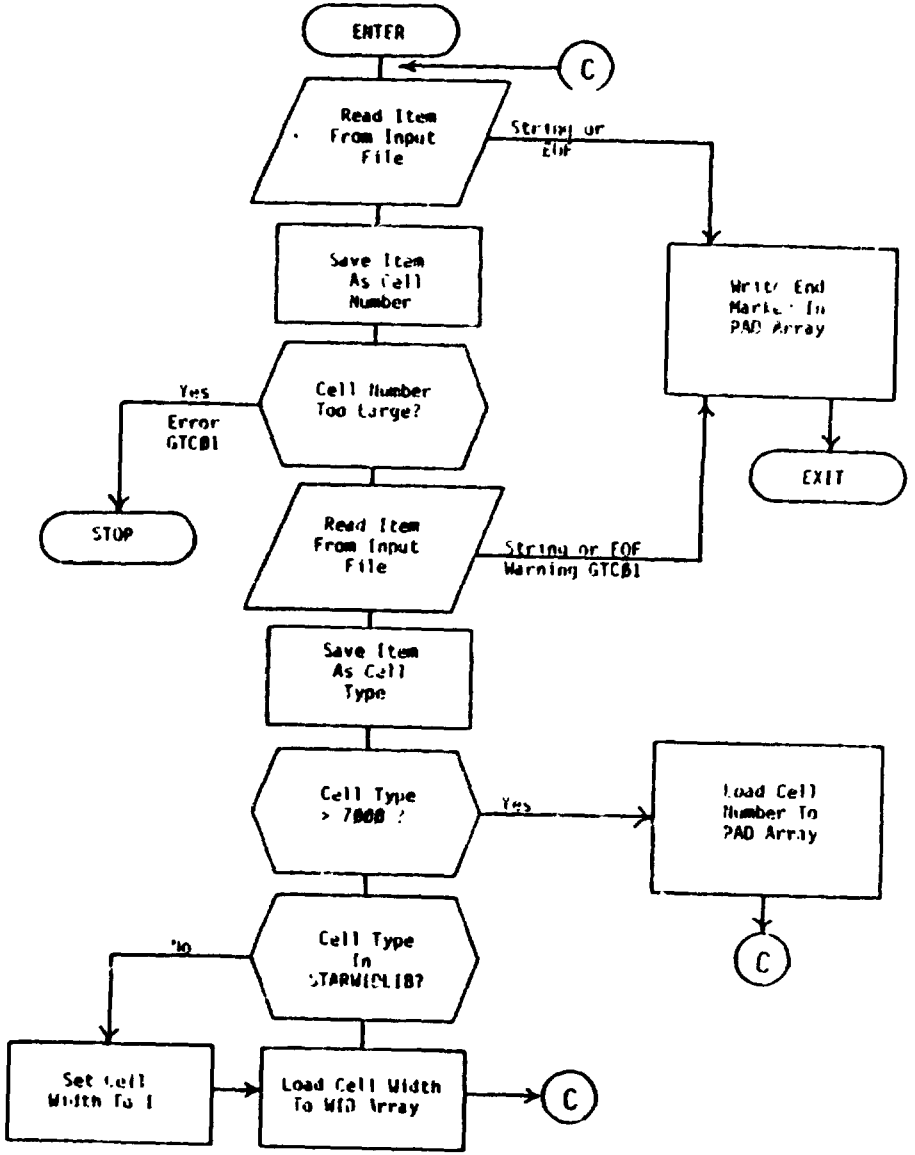

Figure 5. Subroutine GTCELS

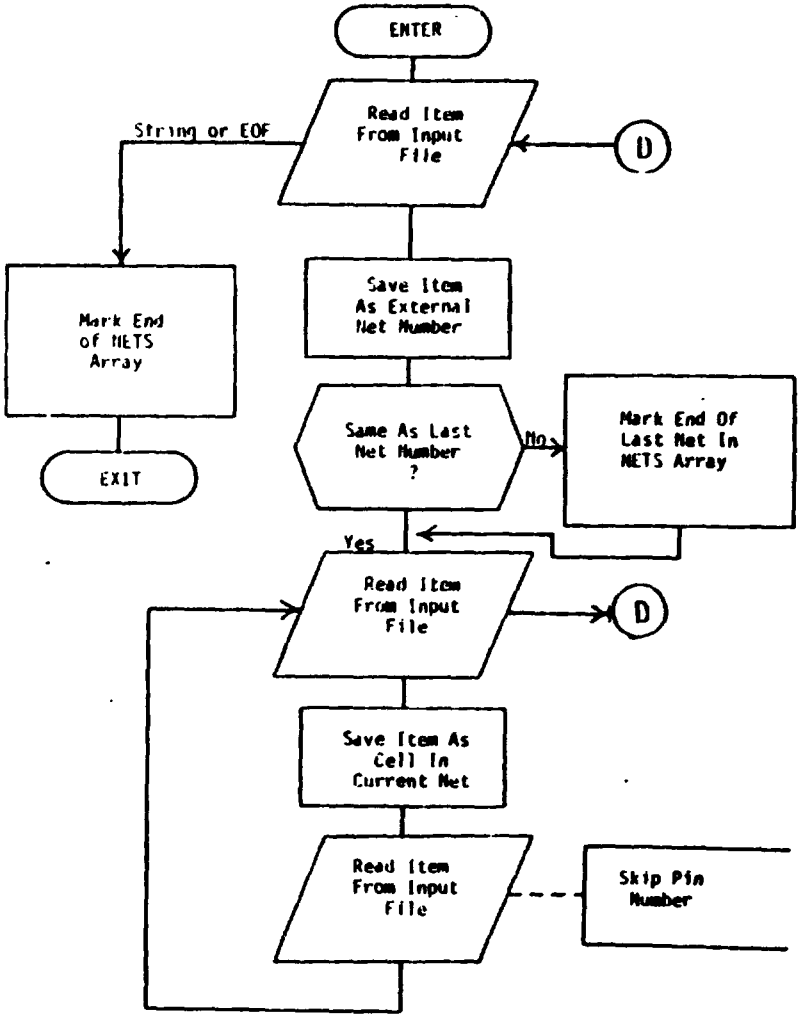

Figure 6. Subroutine RDNETS

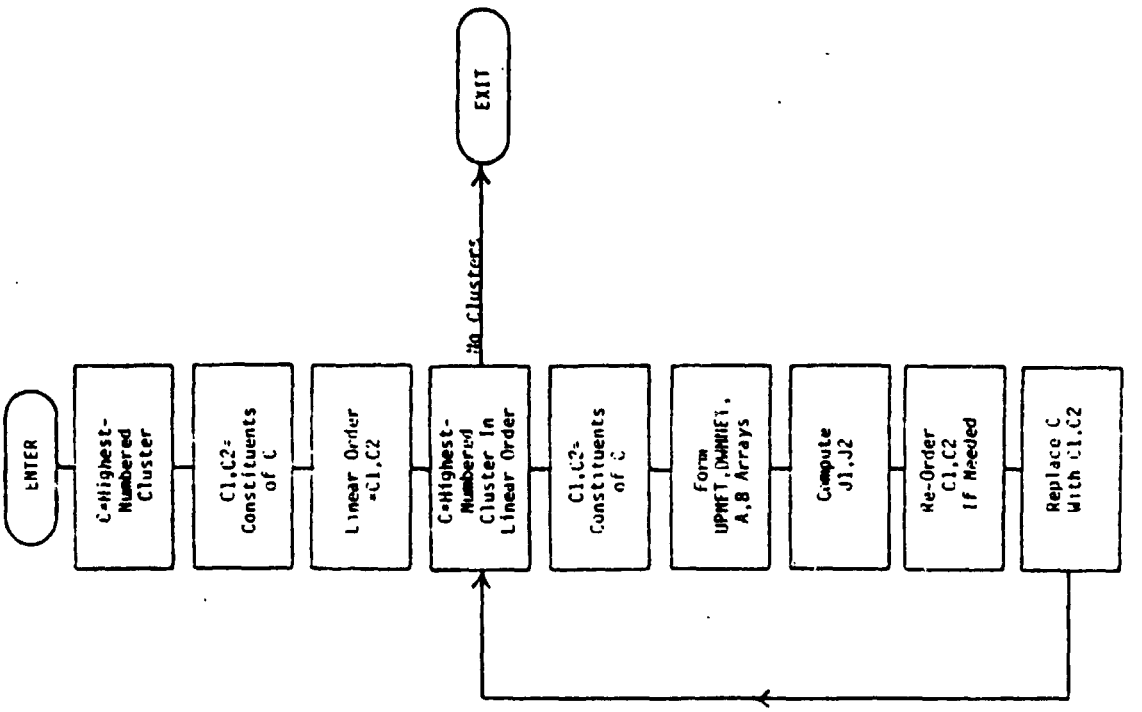

Figure 8. Subroutine L UP

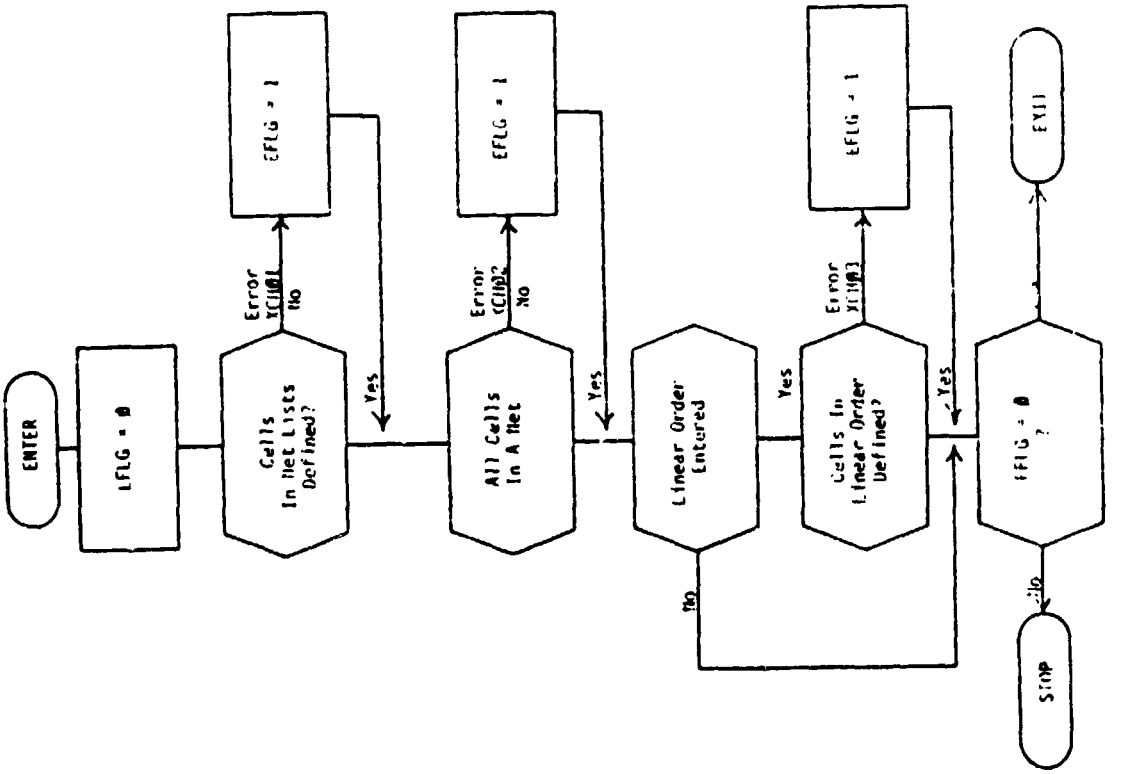

Figure 7. Subroutine XCHECK

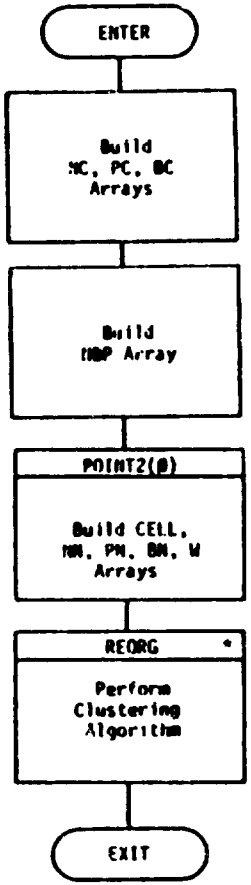

Figure 9. Subroutine CLSTER

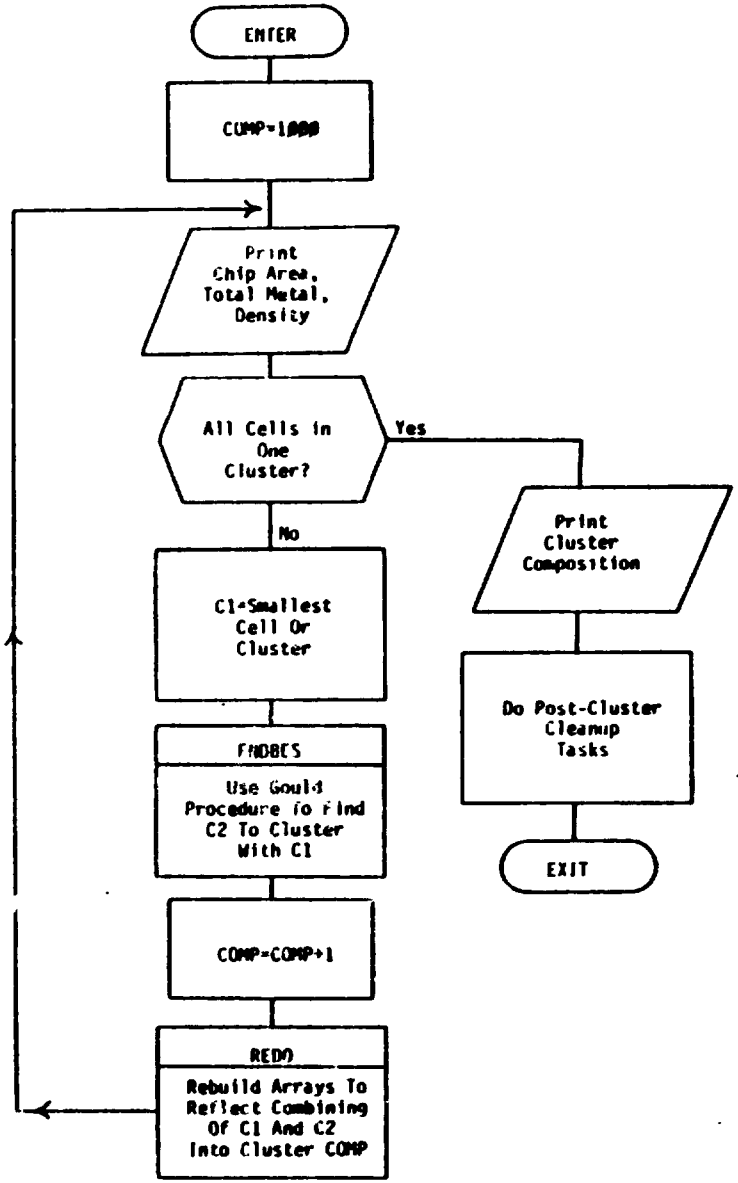

Figure 10. Subroutine REORG

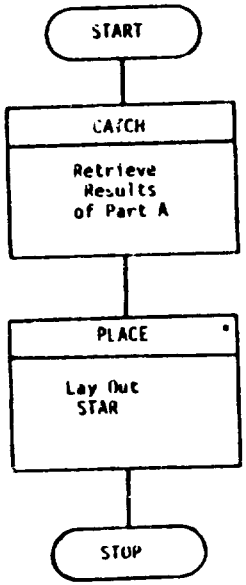

Figure 11. Part B Main Control Routine

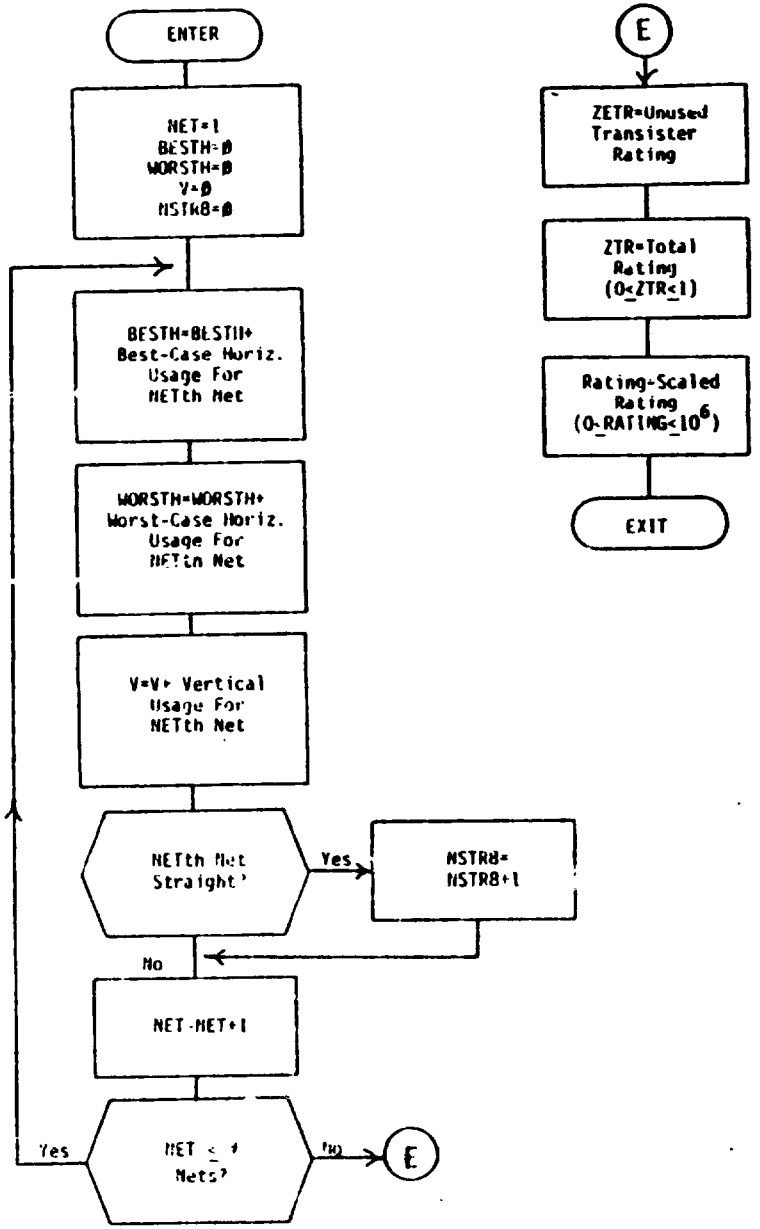

Figure 12. Subroutine RATE

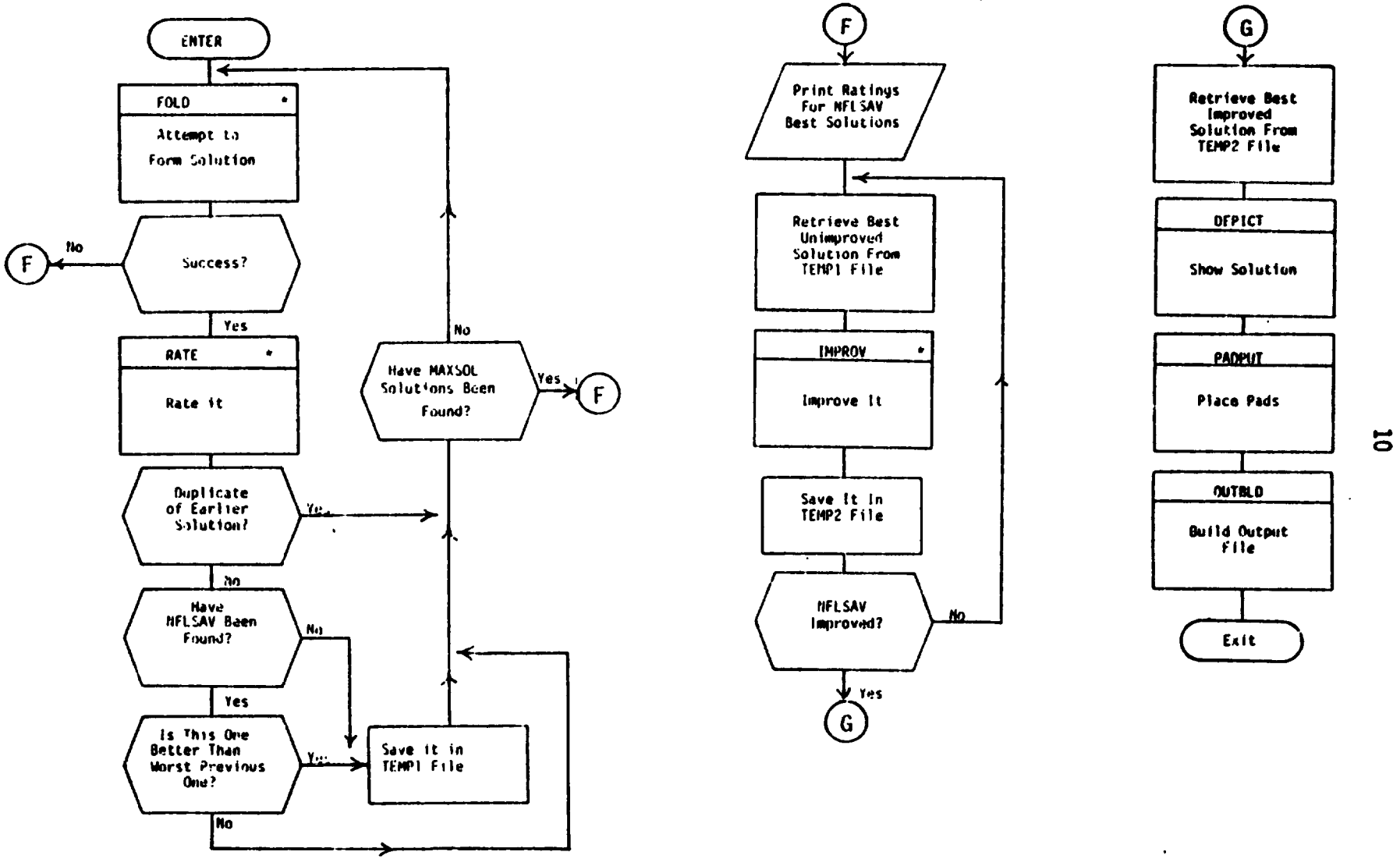

Figure 13. Subroutine PLACE

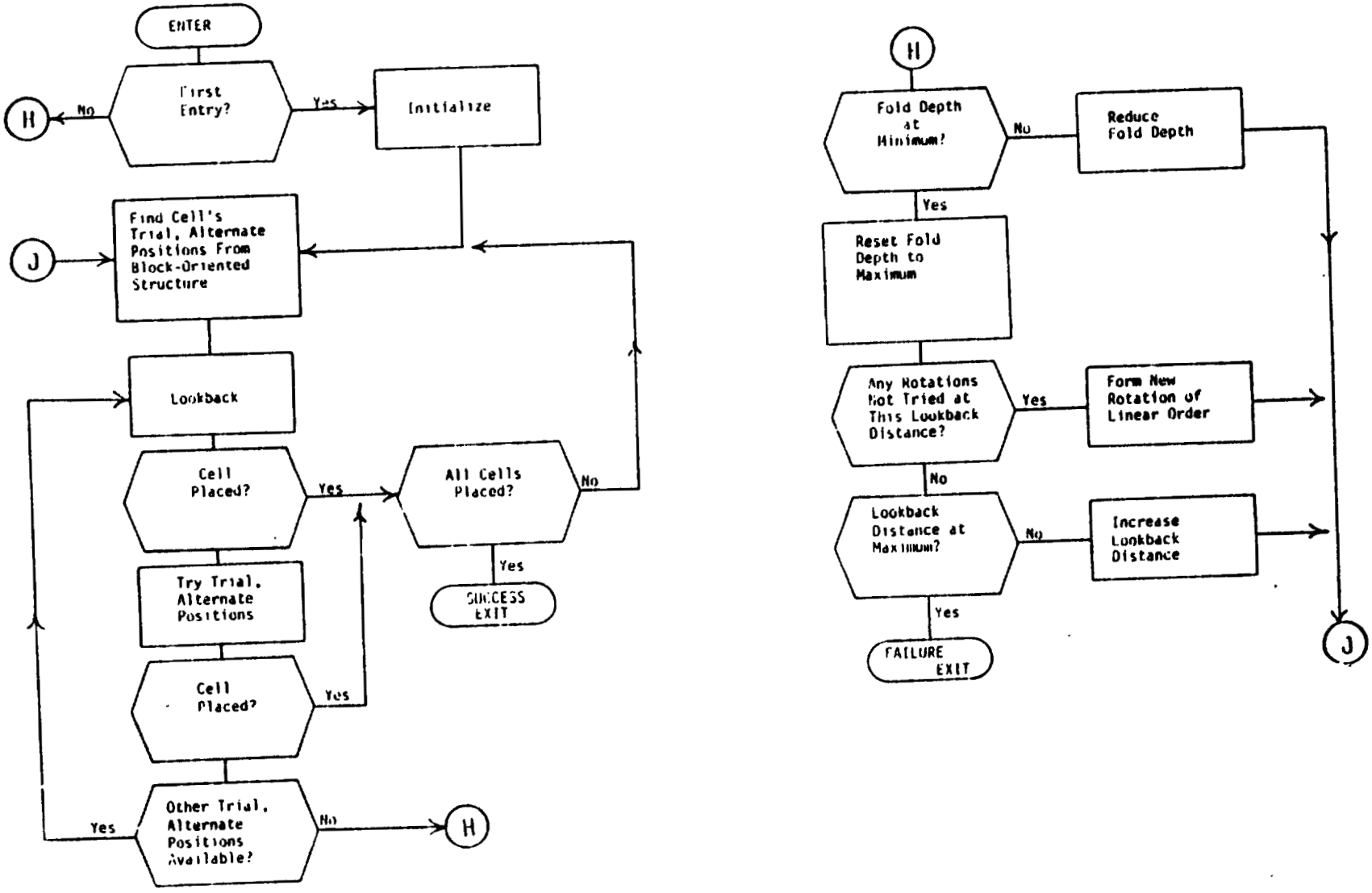

Figure 14. Subroutine FOLD

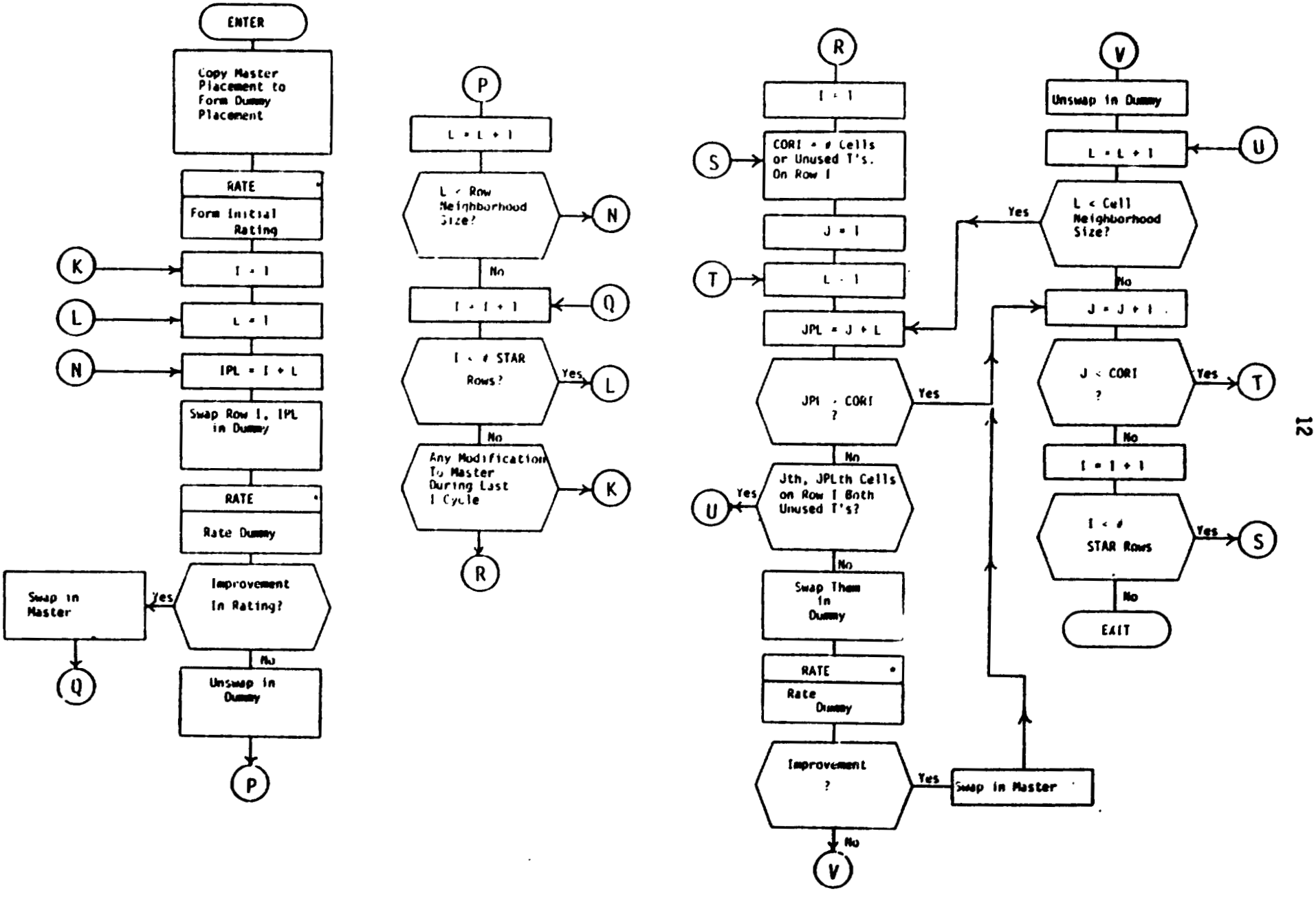

Figure 15. Subroutine IMPROV

Internal Data Structures

To facilitate data linkage and storage area re-use, the arrays used for internal CAPSTAR data storage reside in several FORTRAN COMMON blocks. With the exception of the unlabelled COMMON area (used for local data storage), the data in each COMMON block is global data and is associated with the results of a particular processing step.

The various CAPSTAR COMMON areas and the data with which each is associated are:

Unlabelled Area - Local Data
GLBL Area - CAPSTAR Control Variables
HEADER Area - Output Header Data
NETDTA Area - Network Description
CLSDTA Area - Cell Clusters
LINDTA Area - Linear Order
CLNET Area - Cell-Net Lists
FLDDTA Area - Cell Placement
PADPL Area - Pad Placement

The arrays and variables saved in each of these areas are described in the documenting comments at the beginning of the source listing of Part A (see Appendix). The structure of several of the more crucial global arrays is shown in Figures 16 and 17.

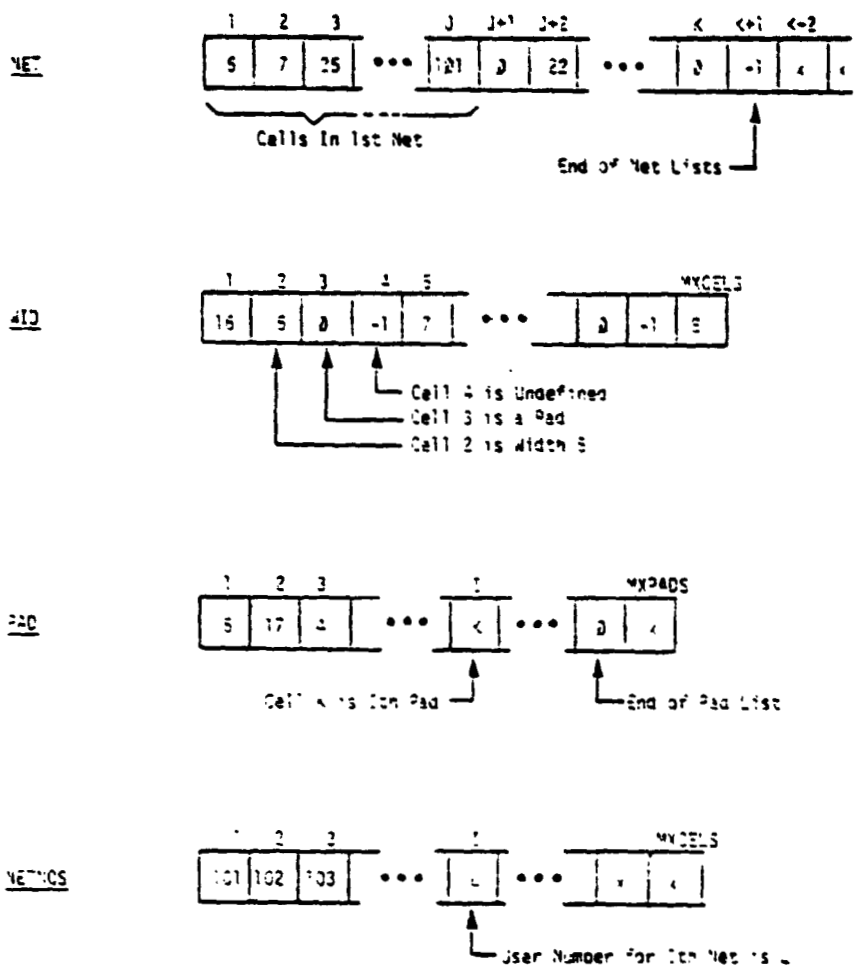

Figure 16. Organization of Circuit Description Arrays

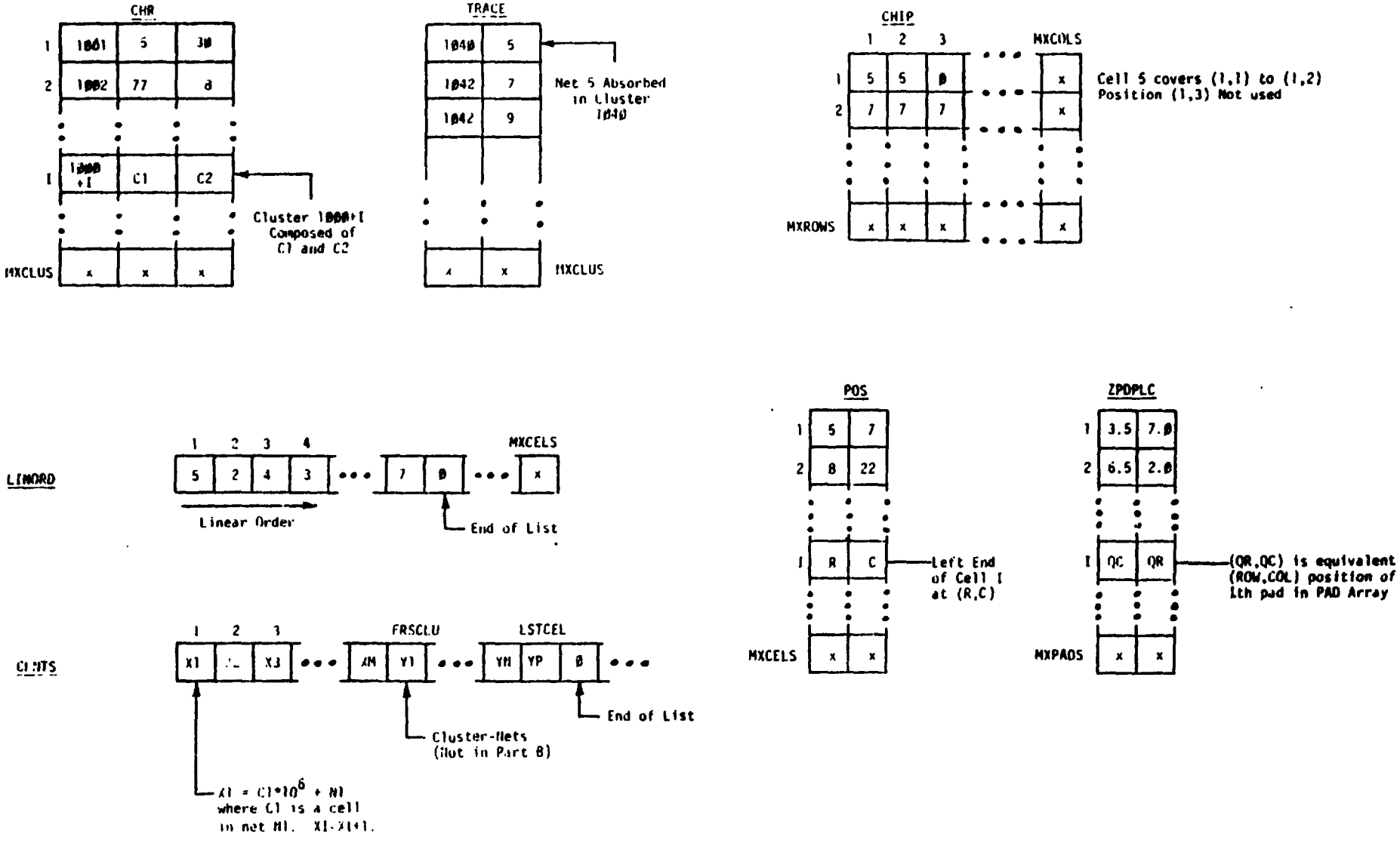

Figure 17. Organization of Processing Step Result Arrays

CAPSTAR File Usage

A number of disk files are accessed or constructed during a normal CAPSTAR run. These files are used for specification of input data, STAR cell type and pad location data, internal program storage, and output data. Each of the CAPSTAR files is briefly described in the following paragraphs.

Input File

Internal Name - RDR

Channel - 15

Purpose - Contains circuit description and user commands.

Organization - Described in [2].

Cell Width File (STARWIDLIB)

Internal Name - None

Channel - 14

Purpose - Provides mapping from cell type numbers to cell widths (in transistors).

Organization - Each record contains a single cell type number and width in 2(I4) format.

Pad Location File (STARPADLOC)

Internal Name - PADFIL

Channel - 13

Purpose - Specifies (x,y) co-ordinates for pads in each of the STAR sizes.

Organization - Each record contains two entries in 2(I4) format. The data for the R-row by C-column STAR begins with a record containing (-R,C). The following records contain the (x,y) pairs for each I/O pad location in the R x C STAR. Power and ground pad locations should not be included.

Reduced Input File (IEFILE)

Internal Name - IEFILE

Channel - 12

Purpose - Contains 'parsed' data from input file to ease construction of output file.

Organization - Divided into sections by header records of form (0,-I) where I indicates what data is in the following records.
I=1 - Circuit name in 2(A4) format.
I=2 - STAR size in 2(I12) format.
I=3 - (cell #,type #)'s in 2(I12) format.
I=4 - Net data header.
I=5 - Net # (I12 format), then (cell,pin)'s in 2(I12) format.
I=6 - Source record in 72(A1) format in next record, only.
I=7 - End of data.

Data Passage File (PASS)

Internal Name - PASSFL

Channel - 18

Purpose - Contains global data passed from Part A to Part B.

Organization - GLBL, NETDTA, LINDTA COMMON areas in 20(I4) format, first 3000 entries of CELNET area in 10(I8) format, HEADER area in 10(A4) format, (ROWS, COLS, NFLSAV, NPISAV, MAXSOL, RN, CN) in 20(I4) format.

Temp Placement Files 1 and 2

Internal Name - SAVFIL, SAVE2

Channels - 16, 17

Purpose - Used for holding intermediate placements.

Organization - Each record contains (placement #, rating, TEMP array) where TEMP(I)=POS(I,2)*10**6 + POS(I,1). Pointers to records in the files are maintained in the PLPNT array.

Output File and Narrative Output File

Internal Name - OUFILE, PRNTR

Channels - 19, 6

Purpose - Output file contains circuit data and layout in form suitable for router. Narrative output provided for user supervision.

Organization - Described in [2].

III. MODIFYING CAPSTAR

In this chapter, methods for performing modifications to the CAPSTAR system are outlined. The following sections are organized functionally by the type of modification desired. The remainder of this section deals with general program updating policy.

For consistency with previous revisions of this program, it is recommended that a new revision number should be assigned to the program each time that the source code is altered. In order to make this change, the revision number and date headers at the beginning of the two CAPSTAR segments should be updated. Also, the fourth entry of the array HEAD (defined in the MAIN routine in Part A) should be modified.

In revisions which are designated for a particular target machine, the first two entries of the HEAD array should be changed. If no particular target machine is desired, these two fields can be left blank.

Adding Cell Types to The STAR Cell Width Library

Each cell to be placed by CAPSTAR must have a type number specified in the STAR cell width file (STARWIDLIB). To add a new cell type number, CT, to this file, the record

CT CW

should be added at the end of the file, where CW is the width (in transistors) of the new cell type. The entries should appear in 2(I4) format.

Defining New STARs

The positions of the I/O (not Power or Ground) pads for each STAR size must be specified in the STAR pad location file (STARPADLOC). In order to define pad positions for an R-row by C-column STAR, the record

-R C

should be added at the end of the file. This record should be followed by records of the form

x y

where x and y are the co-ordinates of one I/O pad. A record should be included for each I/O pad position. Each record should be typed in 2(I4) format.

If the size of the new STAR exceeds the current MXROWS by MXCOLS maximum STAR size, it will be necessary to increase these bounds (see "Resetting Program Bounds").

Resetting Program Bounds

Restrictions on input circuit and STAR size are set at the values assigned to 10 constant dimension control variables. The functions of these variables, each of which begins with "MX", are shown in the "Global CAPSTAR Variables" section of the documenting comments at the beginning of Part A (see Appendix). The value of each of the variables is set in the MAIN routine of Part A.

The variables are used to establish the dimensions of many of the local and global arrays used in CAPSTAR. Thus,

modification of the values of the variables necessitates re-dimensioning of some arrays. To facilitate this operation, a list of all CAPSTAR arrays, the variables upon which their dimensions depend, and the program segment and COMMON areas in which they appear is provided at the beginning of Part A of the CAPSTAR source. Care should be taken that any change in the dimension control variable values is accompanied by re-dimensioning of all associated arrays.

Internal programming procedures establish implicit upper limits on the values assigned to two of the dimension control variables. Since it is necessary, at times, to maintain lists containing both cell and cluster numbers, the maximum cell number (MXCELS) is strictly upper-bounded by the lowest cluster number (1000). In addition, the maximum number of circuit nets (MXNETS) is limited to less than 1000 by the cell-net data packing procedure. Extension of variable settings beyond these implicit limits would require program data storage or procedure modification.

Modifying the Rating Structure

The quality of the STAR placements produced depends directly upon the STAR placement rater (RATE). The primary result of this routine is a value, RATING, which lies between 0 and 10^6 with higher values indicating more desirable conditions.

RATING is obtained by taking a linear multiple of the PR value shown in Chapter 5 of [1]. The value of PR (ZTR in the source listing) is derived from a weighted sum of the factors

relating to desired qualities. The weights assigned to each factor reflect the relative importance of the factors to the over-all placement quality.

Thus, to increase the likelihood of occurrence of a characteristic, it is necessary to increase the weight multiple associated with it. It should be noted ([1]) that the weights also appear in the denominator of ZTR so that adjustment of this term is also required.

It is also possible to modify the rating structure s to include previously unmeasured characteristics of the placement. The factor computed for the new characteristic should take on values between 0 and 1 with higher values indicating less-desired characteristics. A weighting factor should then be calculated and included in the STAR computation as previously indicated.

Re-Dividing The Program

To maintain CAPSTAR in a form adaptable to time-shared execution, it has been necessary to divide the program into two parts. If future division is required, the scheme used in the PASS and CATCH routines should be used for program linkage.

This organization entails writing all necessary global and local data areas to a disk file prior to termination of the first segment and reloading the data in the second. Care should be taken that any global variables (such as RN or CN) are also passed.

REFERENCES

[1] Cox,G. and B. Carroll, "STAR Placement," NASA Contract no. NAS8-31572, Electrical Engineering Dept., Auburn University, Auburn AL, July, 1979.

[2] Cox,G. and B. Carroll, "CAPSTAR User's Guide," NASA Contract no. NAS8-31572, Electrical Engineering Dept., Auburn University, Auburn AL, July, 1979.

APPENDIX

CAPSTAR SOURCE LISTING

```
C                                                                       00000110
C                                                                       00000120
C                                                                       00000130
C    CCCCC       A      PPPPPP     SSSSS   TTTTTTT    A      RRRRRR    00000140
C   C     C     A A     P     P   S     S     T      A A     R     R   00000150
C   C          A   A    P     P   S           T     A   A    R     R   00000160
C   C         A     A   PPPPPP     SSSSS      T    A     A   RRRRRR    00000170
C   C         AAAAAAA   P               S     T    AAAAAAA   R   R     00000180
C   C     C   A     A   P         S     S     T    A     A   R    R    00000190
C    CCCCC    A     A   P          SSSSS      T    A     A   R     R   00000200
C                                                                       00000210
C                                                                       00000220
C     CELL ARRANGEMENT PROGRAM FOR THE STANDARD                         00000230
C                  TRANSISTOR ARRAY                                     00000240
C                                                                       00000250
C                                                                       00000260
C     VERSION 2A REVISION 4 -- JUNE 1979                                00000270
C*****************************************************                  00000280
C                                                                       00000290
C                                                                       00000300
C                                                                       00000310
C                                                                       00000320
C     AUTHOR:       GLENN W. COX                                        00000330
C                   EE DEPT                                             00000340
C                   AUBURN UNIVERSITY                                   00000350
C                   AUBURN, AL 36830                                    00000360
C                                                                       00000370
C                                                                       00000380
C*****************************************************                  00000390
C                                                                       00000400
C     THE PURPOSE OF THE CAPSTAR PROGRAM IS TO PROVIDE                  00000410
C     TWO-DIMENSIONAL PLACEMENTS OF LOGIC CELLS AND                     00000420
C     PADS FOR THE STANDARD TRANSISTOR ARRAY (STAR).                    00000430
C                                                                       00000440
C     THE INPUT TO THE PROGRAM IS THE LOGIC CIRCUIT                     00000450
C     CELL AND INTERCONNECTION DESCRIPTION.  THE OUTPUT                 00000460
C     CONSISTS OF THE CIRCUIT DESCRIPTION AND THE                       00000470
C     GENERATED CELL PLACEMENT IN A FORM SUITABLE FOR                   00000480
C     USE BY A STAR ROUTING PROGRAM.  APPROPRIATE                       00000490
C     USER (NARRATIVE) OUTPUT IS ALSO PROVIDED.                         00000500
C                                                                       00000510
C                                                                       00000520
C*****************************************************                  00000530
C                                                                       00000540
C                                                                       00000550
C     CAPSTAR FUNCTIONAL SECTIONS                                       00000560
C                                                                       00000570
C                                                                       00000580
C                                                                       00000590
C                                                                       00000600
C                                                                       00000610
C     CNTL          FUNCTION: CAPSTAR CONTROL                           00000620
```

```
C                ROUTINES: MAIN IN BOTH PROGRAM SEGMENTS                00000630
C                                                                       00000640
C     INPT       FUNCTION: CIRCUIT AND CONTROL DATA INPUT               00000650
C                ROUTINES: GTITEM,JAM,RDNETS,GTCELS,GTORD               00000660
C                                                                       00000670
C     XCHK       FUNCTION: INPUT DATA CROSS-CHECKING                    00000680
C                ROUTINES: XCHECK                                       00000690
C                                                                       00000700
C     CLST       FUNCTION: CELL CLUSTERING                              00000710
C                ROUTINES: CLSTER,POINT2,REORG,FNDBES,RFDO              00000720
C                                                                       00000730
C     LINE       FUNCTION: CLUSTER DECOMPOSITION                        00000740
C                ROUTINES: LINEUP,CELNET                                00000750
C                                                                       00000760
C     PASS       FUNCTION: DATA PASSAGE BETWEEN PROGRAM SEGMENTS        00000770
C                ROUTINES: PASS,CATCH                                   00000780
C                                                                       00000790
C     PLAC       FUNCTION: PLACEMENT CONTROL                            00000800
C                ROUTINES: PLACE                                        00000810
C                                                                       00000820
C     FOLD       FUNCTION: LINEAR ORDER FOLDING                         00000830
C                ROUTINES: FOLD,PUT,CROSS                               00000840
C                                                                       00000850
C     IMPR       FUNCTION: PLACEMENT IMPROVEMENT                        00000860
C                ROUTINES: IMPROV                                       00000870
C                                                                       00000880
C     RATE       FUNCTION: PLACEMENT RATING                             00000890
C                ROUTINES: RATE                                         00000900
C                                                                       00000910
C     PADP       FUNCTION: PAD PLACEMENT                                00000920
C                ROUTINES: PADPUT                                       00000930
C                                                                       00000940
C     FOUT       FUNCTION: OUTPUT FILE CONSTRUCTION                     00000950
C                ROUTINES: OUTBLD,MSFCF                                 00000960
C                                                                       00000970
C     NOUT       FUNCTION: NARRATIVE OUTPUT FORMATTING                  00000980
C                ROUTINES: WIRCRS,DEPICT,FIGGER,QUAL                    00000990
C                                                                       00001000
C                                                                       00001010
C*************************************************                      00001020
C                                                                       00001030
C                                                                       00001040
C     CAPSTAR CALLING STRUCTURE (PART A)                                00001050
C                                                                       00001060
C                                                                       00001070
C                                                                       00001080
C     MAIN-------------                                                 00001090
C           :           :                                               00001100
C           :-->GTCELS--:                                               00001110
C           :           :-->GTITEM-->JAM                                00001120
C           :-->RDNETS--:                                               00001130
C           :           :                                               00001140
```

```
C           :-->GTORD --                                                    00001150
C           :                                                               00001160
C           :-->XCHECK             --->FNDBES                               00001170
C           :                      :                                        00001180
C           :-->CLSTER----->REORG----->REDO--                               00001190
C           :           :                    :-->POINT2                     00001200
C           :           ------------------                                  00001210
C           :                                                               00001220
C           :-->LINEUP                                                      00001230
C           :                                                               00001240
C           :-->WIRCRS                                                      00001250
C           :                                                               00001260
C           :-->PASS                                                        00001270
C           :                                                               00001280
C           --->CELNET                                                      00001290
C                                                                           00001300
C                                                                           00001310
C                                                                           00001320
C     CAPSTAR CALLING STRUCTURE (PART B)                                    00001330
C                                                                           00001340
C                                                                           00001350
C     MAIN----->CATCH                                                       00001360
C           :                                                               00001370
C           --->PLACE----->FOLD----->CROSS                                  00001380
C                       :         :                                         00001390
C                       :         --->PUT                                   00001400
C                       :                                                   00001410
C                       :-->RATE                                            00001420
C                       :                                                   00001430
C                       :-->QUAL                                            00001440
C                       :                                                   00001450
C                       :-->IMPROV-->RATE                                   00001460
C                       :                                                   00001470
C                       :-->DEPICT-->FIGGER                                 00001480
C                       :                                                   00001490
C                       :-->PADPUT                                          00001500
C                       :                                                   00001510
C                       --->OUTBLD-->MSFCF                                  00001520
C                                                                           00001530
C                                                                           00001540
C                                                                           00001550
C                                                                           00001560
C***************************************************                        00001570
C                                                                           00001580
C                                                                           00001590
C     FORTRAN CHANNEL ASSIGNMENTS                                           00001600
C                                                                           00001610
C                                                                           00001620
C                                                                           00001630
C                                                                           00001640
C                                                                           00001650
C     CHANNEL:     ASSIGNED TO:                                           00001660
```

```
C                                                                       00001670
C                                                                       00001680
C     6           NARRATIVE OUTPUT DEVICE                               00001690
C                                                                       00001700
C     12          REDUCED INPUT FILE                                    00001710
C                                                                       00001720
C     13          STAR PAD LOCATION FILE                                00001730
C                                                                       00001740
C     14          STAR CELL WIDTH FILE                                  00001750
C                                                                       00001760
C     15          INPUT FILE                                            00001770
C                                                                       00001780
C     16          TEMP PLACEMENT FILE 1                                 00001790
C                                                                       00001800
C     17          TEMP PLACEMENT FILE 2                                 00001810
C                                                                       00001820
C     18          DATA PASSAGE FILE                                     00001830
C                                                                       00001840
C     19          OUTPUT FILE                                           00001850
C                                                                       00001860
C                                                                       00001870
C                                                                       00001880
C*****************************************************                  00001890
C                                                                       00001900
C                                                                       00001910
C     GLOBAL CAPSTAR VARIABLES                                          00001920
C                                                                       00001930
C     (* -- CONSTANT FOR A GIVEN REVISION)                             00001940
C                                                                       00001950
C                                                                       00001960
C                                                                       00001970
C                                                                       00001980
C                                                                       00001990
C     VARIABLE:   MEANING:                                              00002000
C                                                                       00002010
C                                                                       00002020
C     CAPMC1 *    TARGET MACHINE NAME (1ST 4 CHAR.)                     00002030
C                                                                       00002040
C     CAPMC2 *    TARGET MACHINE NAME (2ND 4 CHAR.)                     00002050
C                                                                       00002060
C     CAPREV *    CAPSTAR REVISION NUMBER                               00002070
C                                                                       00002080
C     CAPVER *    CAPSTAR VERSION NUMBER                                00002090
C                                                                       00002100
C     CN          CELL NEIGHBORHOOD FOR IMPROVEMENT                     00002110
C                                                                       00002120
C     COLS        ACTUAL # OF STAR COLUMNS                              00002130
C                                                                       00002140
C     DEBUG       CONTROLS OUTPUT DEBUGGING MODE                        00002150
C                                                                       00002160
C     MAXSOL      USER-SEL. MAX # FOLDING SOLUTIONS                     00002170
C                                                                       00002180
```

```
C     MXCELS *     MAXIMUM # OF CELLS AND PADS IN CIRCUIT                00002190
C                                                                          00002200
C     MXCLNT *     MAXIMUM SUM OF NET SIZES                              00002210
C                                                                          00002220
C     MXCLUS *     MAXIMUM # OF CLUSTERS FORMED                          00002230
C                                                                          00002240
C     MXCOLS *     MAXIMUM # OF STAR COLUMNS                             00002250
C                                                                          00002260
C     MXDFSZ *     MAXIMUM # OF DIFFERENT NET SIZES                      00002270
C                                                                          00002280
C     MXNETS *     MAXIMUM # OF NETS                                     00002290
C                                                                          00002300
C     MXNTCL *     MAXIMUM # OF NETS ON ONE CELL                         00002310
C                                                                          00002320
C     MXNTSZ *     MAXIMUM NET SIZE                                      00002330
C                                                                          00002340
C     MXPADS *     MAXIMUM # OF CIRCUIT PADS                             00002350
C                                                                          00002360
C     MXROWS *     MAXIMUM # OF ROWS IN STAR                             00002370
C                                                                          00002380
C     NAME1        CIRCUIT NAME (1ST 4 CHAR.)                            00002390
C                                                                          00002400
C     NAME2        CIRCUIT NAME (2ND 4 CHAR.)                            00002410
C                                                                          00002420
C     NCELLS       ACTUAL # OF CELLS AND PADS IN CIRCUIT                 00002430
C                                                                          00002440
C     NFLSAV       # FOLDING SOLUTIONS TO BE IMPROVED                    00002450
C                                                                          00002460
C     NNETS        ACTUAL # OF NETS IN CIRCUIT                           00002470
C                                                                          00002480
C     NPADS        ACTUAL # OF PADS IN CIRCUIT                           00002490
C                                                                          00002500
C     NPISAV *     # IMPROVED SOLUTIONS TO BE PRESENTED                  00002510
C                                                                          00002520
C     PRNTR  *     FORTRAN CHANNEL # FOR NARRATIVE OUTPUT                00002530
C                                                                          00002540
C     RDR    *     FORTRAN CHANNEL # FOR INPUT                           00002550
C                                                                          00002560
C     ROWS         ACTUAL # OF STAR ROWS                                 00002570
C                                                                          00002580
C     RN           ROW NEIGHBORHOOD FOR IMPROVEMENT                      00002590
C                                                                          00002600
C     TRACK        EFFECTIVE LENGTH OF TRACE ARRAY                       00002610
C                                                                          00002620
C                                                                          00002630
C**************************************************                      00002640
C                                                                          00002650
C                                                                          00002660
C     CAPSTAR ARRAYS                                                       00002670
C                                                                          00002680
C                                                                          00002690
C                                                                          00002700
```

```
C                                                                       00002710
C                                                                       00002720
C     A           ALTERNATE NAMES: NONE                                 00002730
C                 DIMENSION:       MXNTCL                               00002740
C                 PURPOSE:         LIST OF NETS CONNECTED TO            00002750
C                                  CELL C1 IN DECOMP. PROC.             00002760
C                 USED IN:         LINE                                 00002770
C                 COMMON AREA:     BLANK                                00002780
C                                                                       00002790
C     B           ALTERNATE NAMES: NONE                                 00002800
C                 DIMENSION:       MXNTCL                               00002810
C                 PURPOSE:         LIST OF NETS CONNECTED TO            00002820
C                                  CELL C2 IN DECOMP. PROC.             00002830
C                 USED IN:         LINE                                 00002840
C                 COMMON AREA:     BLANK                                00002850
C                                                                       00002860
C     BANK        ALTERNATE NAMES: NONE                                 00002870
C                 DIMENSION:       MXNTSZ                               00002880
C                 PURPOSE:         TEMP STORAGE                         00002890
C                 USED IN:         CLST                                 00002900
C                 COMMON AREA:     BLANK                                00002910
C                                                                       00002920
C     BARIER      ALTERNATE NAMES: NONE                                 00002930
C                 DIMENSION:       MXPADS,2                             00002940
C                 PURPOSE:         LIST OF BARRIERS NEEDED              00002950
C                                  TO KEEP ROUTER OUT OF                00002960
C                                  UNUSED PAD AREAS                     00002970
C                 USED IN:         PADP                                 00002980
C                 COMMON AREA:     BLANK                                00002990
C                                                                       00003000
C     BC          ALTERNATE NAMES: NONE                                 00003010
C                 DIMENSION:       MXCLNT                               00003020
C                 PURPOSE:         NET LISTS FOR CLUSTERING             00003030
C                 USED IN:         CLST                                 00003040
C                 COMMON AREA:     BLANK                                00003050
C                                                                       00003060
C     BN          ALTERNATE NAMES: NONE                                 00003070
C                 DIMENSION:       MXCLNT                               00003080
C                 PURPOSE:         CELL-NET LISTS FOR CLUSTERING        00003090
C                 USED IN:         CLST                                 00003100
C                 COMMON AREA:     BLANK                                00003110
C                                                                       00003120
C     C5          ALTERNATE NAMES: NONE                                 00003130
C                 DIMENSION:       MXCELS                               00003140
C                 PURPOSE:         ROTATION BOUNDARY ORDERING FOR FOLD   00003150
C                 USED IN:         FOLD                                 00003160
C                 COMMON AREA:     BLANK                                00003170
C                                                                       00003180
C     CARD        ALTERNATE NAMES: NONE                                 00003190
C                 DIMENSION:       73                                   00003200
C                 PURPOSE:         HOLDS INPUT RECORD FOR PROCESSING    00003210
C                 USED IN:         INPT                                 00003220
```

```
C                COMMON AREA:     NONE                                    00003230
C                                                                         00003240
C     CC         ALTERNATE NAMES: NONE                                    00003250
C                DIMENSION:       2*MXCLNT+2                              00003260
C                PURPOSE:         CONTAINS CELNET COMMON FOR PASS         00003270
C                USED IN:         PASS                                    00003280
C                COMMON AREA:     CLNET                                   00003290
C                                                                         00003300
C     CELL       ALTERNATE NAMES: NONE                                    00003310
C                DIMENSION:       MXCELS                                  00003320
C                PURPOSE:         CELL LIST FOR CLUSTERING                00003330
C                USED IN:         CLST                                    00003340
C                COMMON AREA:     BLANK                                   00003350
C                                                                         00003360
C     CELLST     ALTERNATE NAMES: NONE                                    00003370
C                DIMENSION:       MXCELS                                  00003380
C                PURPOSE:         LIST OF CELLS HOOKED TO EACH PAD        00003390
C                USED IN:         PADP                                    00003400
C                COMMON AREA:     BLANK                                   00003410
C                                                                         00003420
C     CELPNT     ALTERNAME NAMES: NONE                                    00003430
C                DIMENSION:       MXPADS                                  00003440
C                PURPOSE:         POINTER FOR CELLST ARRAY                00003450
C                USED IN:         PADP                                    00003460
C                COMMON AREA:     BLANK                                   00003470
C                                                                         00003480
C     CHIP       ALTERNATE NAMES: C,C7                                    00003490
C                DIMENSION:       MXROWS,MXCOLS                           00003500
C                PURPOSE:         STAR MODEL                              00003510
C                USED IN:         PLAC,FOLD,RATE,IMPR,NOUT                00003520
C                COMMON AREA:     FLDDTA                                  00003530
C                                                                         00003540
C     CHR        ALTERNATE NAMES: NONE                                    00003550
C                DIMENSION:       MXCLUS,3                                00003560
C                PURPOSE:         CELL CLUSTERING HISTORY                 00003570
C                USED IN:         CLST,LINE                               00003580
C                COMMON AREA:     CLSDTA                                  00003590
C                                                                         00003600
C     CLNTS      ALTERNATE NAMES: NONE                                    00003610
C                DIMENSION:       2*MXCLNT                                00003620
C                PURPOSE:         CELL-NET LISTS                          00003630
C                USED IN:         LINE,NOUT                               00003640
C                COMMON AREA:     CLNET                                   00003650
C                                                                         00003660
C     CNTWDL:    ALTERNATE NAMES: NONE                                    00003670
C                DIMENSION:       13                                      00003680
C                PURPOSE:         CAPSTAR CONTROL STATEMENT TEMPLATES     00003690
C                USED IN:         CNTL                                    00003700
C                COMMON AREA:     NONE                                    00003710
C                                                                         00003720
C     COUNT      ALTERNATE NAMES: NONE                                    00003730
C                DIMENSION:       MXNETS                                  00003740
```

```
C                PURPOSE:          NET SIZES FOR WIRECROSS OUTPUT      00003750
C                USED IN:          NOUT                                00003760
C                COMMON AREA:      BLANK                               00003770
C                                                                      00003780
C     DALST      ALTERNATE NAMES:  NONE                                00003790
C                DIMENSION:        6                                   00003800
C                PURPOSE:          DATA AVAILABILITY FLAGS             00003810
C                USED IN:          CNTL                                00003820
C                COMMON AREA:      NONE                                00003830
C                                                                      00003840
C     DIG        ALTERNATE NAMES:  NONE                                00003850
C                DIMENSION:        10                                  00003860
C                PURPOSE:          DIGIT CHARACTER TEMPLATES           00003870
C                USED IN:          INPT                                00003880
C                COMMON AREA:      NONE                                00003890
C                                                                      00003900
C     DIGS       ALTERNATE NAMES:  NONE                                00003910
C                DIMENSION:        12                                  00003920
C                PURPOSE:          CHARACTERS FOR DEPICT OUTPUT        00003930
C                USED IN:          NOUT                                00003940
C                COMMON AREA:      NONE                                00003950
C                                                                      00003960
C     DWNNET     ALTERNATE NAMES:  NONE                                00003970
C                DIMENSION:        MXCLNT                              00003980
C                PURPOSE:          LIST OF NETS TERMINATING TO         00003990
C                                  RIGHT OF TARGET CELL IN DECOMP. PROC00004000
C                USED IN:          LINE                                00004010
C                COMMON AREA:      BLANK                               00004020
C                                                                      00004030
C     FWID       ALTERNATE NAMES:  NONE                                00004040
C                DIMENSION:        MXCELS                              00004050
C                PURPOSE:          FORWARD CUMULATIVE CELL WIDTHS      00004060
C                                  FOR WIRECROSS OUTPUT                00004070
C                USED IN:          NOUT                                00004080
C                COMMON AREA:      BLANK                               00004090
C                                                                      00004100
C     GG         ALTERNATE NAMES:  NONE                                00004110
C                DIMENSION:        16                                  00004120
C                PURPOSE:          CONTAINS GLBL COMMON FOR PASS       00004130
C                USED IN:          PASS                                00004140
C                COMMON AREA:      GLBL                                00004150
C                                                                      00004160
C     HEAD       ALTERNATE NAMES:  NONE                                00004170
C                DIMENSION:        6                                   00004180
C                PURPOSE:          INITIALIZATION                      00004190
C                USED IN:          CNTL                                00004200
C                COMMON AREA:      NONE                                00004210
C                                                                      00004220
C     HH         ALTERNATE NAMES:  NONE                                00004230
C                DIMENSION:        6                                   00004240
C                PURPOSE:          CONTAINS HEADER COMMON FOR PASS     00004250
C                USED IN:          PASS                                00004260
```

```
C                COMMON AREA:     HEADER                                    00004270
C                                                                           00004280
C     L          ALTERNATE NAMES: L1                                        00004290
C                DIMENSION:       MXCELS                                    00004300
C                PURPOSE:         LINEAR ORDER                              00004310
C                USED IN:         FOLD                                      00004320
C                COMMON AREA:     BLANK                                     00004330
C                                                                           00004340
C     LO         ALTERNATE NAMES: NONE                                      00004350
C                DIMENSION        MXCELS                                    00004360
C                PURPOSE:         UNROTATED LINEAR ORDER FOR FOLDING        00004370
C                                 (PADS DELETED)                            00004380
C                USED IN:         FOLD                                      00004390
C                COMMON AREA:     BLANK                                     00004400
C                                                                           00004410
C     LINORD     ALTERNATE NAMES:L,LL                                       00004420
C                DIMENSION:       MXCELS                                    00004430
C                PURPOSE:         LINEAR ORDER                              00004440
C                USED IN:         LINE,INPT,XCHK,PASS                       00004450
C                COMMON AREA:     LINDTA                                    00004460
C                                                                           00004470
C     NBP        ALTERNATE NAMES: NONE                                      00004480
C                DIMENSION:       MXCLUS+MXCELS                             00004490
C                PURPOSE:         LIST OF # OF PADS IN EACH CLUSTER         00004500
C                USED IN:         CLST                                      00004510
C                COMMON AREA:     BLANK                                     00004520
C                                                                           00004530
C     NC         ALTERNATE NAMES: NONE                                      00004540
C                DIMENSION:       MXNETS                                    00004550
C                PURPOSE:         LIST OF NET SIZES FOR CLUSTERING          00004560
C                USED IN:         CLST                                      00004570
C                COMMON AREA:     BLANK                                     00004580
C                                                                           00004590
C     NET        ALTERNATE NAMES: NETS,INP                                  00004600
C                DIMENSION:       MXCLNT                                    00004610
C                PURPOSE:         CIRCUIT NET LISTS                         00004620
C                USED IN:         ALL                                       00004630
C                COMMON AREA:     NETDTA                                    00004640
C                                                                           00004650
C     NETNOS     ALTERNATE NAMES: NONE                                      00004660
C                DIMENSION:       MXNETS                                    00004670
C                PURPOSE:         LIST OF USER-ASSIGNED NET NAMES           00004680
C                USED IN:         ALL                                       00004690
C                COMMON AREA:     NETDTA                                    00004700
C                                                                           00004710
C     NN         ALTERNATE NAMES: NONE                                      00004720
C                DIMENSION:       MXCELS                                    00004730
C                PURPOSE:         # OF NETS FOR EACH CELL FOR CLST          00004740
C                USED IN:         CLST                                      00004750
C                COMMON AREA:     BLANK                                     00004760
C                                                                           00004770
C     NN         ALTERNATE NAMES: NONE                                      00004780
```

```
C                DIMENSION:       MXCLNT+MXCELS+MXPADS+MXNETS          00004790
C                PURPOSE:         CONTAINS NETDTA COMMON FOR PASS      00004800
C                USED IN:         PASS                                 00004810
C                COMMON AREA:     NETDTA                               00004820
C                                                                      00004830
C     NO         ALTERNATE NAMES: NONE                                 00004840
C                DIMENSION:       MXNETS                               00004850
C                PURPOSE:         TEMP STORAGE                         00004360
C                USED IN:         LINE                                 00004870
C                COMMON AREA:     BLANK                                00004880
C                                                                      00004890
C     OPT        ALTERNATE NAMES: NONE                                 00004900
C                DIMENSION:       MXPADS,2                             00004910
C                PURPOSE:         LIST OF OPTIMUM PAD ASSIGNMENTS      00004920
C                USED IN:         PADP                                 00004930
C                COMMON AREA:     BLANK                                00004940
C                                                                      00004950
C     P          ALTERNATE NAMES: NONE                                 00004960
C                DIMENSION:       MXCELS,2                             00004970
C                PURPOSE:         DUMMY POS ARRAY FOR IMPROVEMENT      00004980
C                USED IN:         IMPR                                 00004990
C                COMMON AREA:     BLANK                                00005000
C                                                                      00005010
C     PAD        ALTERNATE NAMES: P                                    00005020
C                DIMENSION:       MXPADS                               00005030
C                PURPOSE:         LIST OF CIRCUIT PADS                 00005040
C                USED IN:         ALL                                  00005050
C                COMMON AREA:     NETDTA                               00005060
C                                                                      00005070
C     PC         ALTERNATE NAMES: NONE                                 00005080
C                DIMENSION:       MXNETS                               00005090
C                PURPOSE:         POINTER FOR BC ARRAY                 00005100
C                USED IN:         CLST                                 00005110
C                COMMON AREA:     BLANK                                00005120
C                                                                      00005130
C     PCN        ALTERNATE NAMES: NONE                                 00005140
C                DIMENSION:       10                                   00005150
C                PURPOSE:         PLACEMENT CHARACTERIZATION #S        00005160
C                                 TO ALLOW ELIMINATION OF DUPLICATES   00005170
C                USED IN:         PLAC                                 00005180
C                COMMON AREA:     NONE                                 00005190
C                                                                      00005200
C     PLPNT      ALTERNATE NAMES: NONE                                 00005210
C                DIMENSION:       10,2                                 00005220
C                PURPOSE:         POINTERS TO PLACEMENTS IN TEMP FILE  00005230
C                USED IN:         PLAC                                 00005240
C                COMMON AREA:     BLANK                                00005250
C                                                                      00005260
C     PN         ALTERNATE NAMES: NONE                                 00005270
C                DIMENSION:       MXCELS                               00005280
C                PURPOSE:         POINTER FOR BN ARRAY                 00005290
C                USED IN:         CLST                                 00005300
```

```
C                COMMON AREA:     BLANK                                      00005310
C                                                                            00005320
C     POS        ALTERNATE NAMES: NONE                                       00005330
C                DIMENSION:       MXCELS,2                                   00005340
C                PURPOSE:         LIST OF CELL POSITIONS                     00005350
C                USED IN:         PLAC,IMPR,NOUT,RATE                        00005360
C                COMMON AREA:     FLDDTA                                     00005370
C                                                                            00005380
C     REG        ALTERNATE NAMES: NONE                                       00005390
C                DIMENSION:       MXCELS                                     00005400
C                PURPOSE:         TEMP STORAGE                               00005410
C                USED IN:         CLST                                       00005420
C                COMMON AREA:     BLANK                                      00005430
C                                                                            00005440
C     SPACE      ALTERNATE NAMES: NONE                                       00005450
C                DIMENSION:       MXROWS                                     00005460
C                PURPOSE:         CONTAINS SPACE REMAINING ON EACH ROW       00005470
C                USED IN:         FOLD                                       00005480
C                COMMON AREA:     BLANK                                      00005490
C                                                                            00005500
C     STPLST     ALTERNATE NAMES: NONE                                       00005510
C                DIMENSION:       6                                          00005520
C                PURPOSE:         FLAGS FOR STEPS SELECTED                   00005530
C                USED IN:         CNTL                                       00005540
C                COMMON AREA:     NONE                                       00005550
C                                                                            00005560
C     STPNAM     ALTERNATE NAMES: NONE                                       00005570
C                DIMENSION:       6                                          00005580
C                PURPOSE:         TEMPLATES FOR STEP NAME SELECTION          00005590
C                USED IN:         CNTL                                       00005600
C                COMMON AREA:     NONE                                       00005610
C                                                                            00005620
C     TEMP       ALTERNATE NAMES: NONE                                       00005630
C                DIMENSION:       72                                         00005640
C                PURPOSE:         HOLDS OUTPUT RECORD FOR BUILDING           00005650
C                USED IN:         FOUT                                       00005660
C                COMMON AREA:     BLANK                                      00005670
C                                                                            00005680
C     TEMP       ALTERNATE NAMES: NONE                                       00005690
C                DIMENSION:       MXNTSZ                                     00005700
C                PURPOSE:         TEMP STORAGE                               00005710
C                USED IN:         CNTL                                       00005720
C                COMMON AREA:     NONE                                       00005730
C                                                                            00005740
C     TEMP       ALTERNATE NAMES: NONE                                       00005750
C                DIMENSION:       MXCELS                                     00005760
C                PURPOSE:         TEMP STORAGE                               00005770
C                USED IN:         XCHK                                       00005780
C                COMMON AREA:     BLANK                                      00005790
C                                                                            00005800
C     TEMP       ALTERNATE NAMES: NONE                                       00005810
C                DIMENSION:       MXNTSZ                                     00005820
```

```
C                PURPOSE:         TEMP STORAGE                                00005830
C                USED IN:         CLST                                        00005840
C                COMMON AREA:     BLANK                                       00005850
C                                                                             00005860
C     TEMP       ALTERNATE NAMES: NONE                                        00005870
C                DIMENSION:       MXNTSZ                                      00005880
C                PURPOSE:         TEMP STORAGE                                00005890
C                USED IN:         INPT                                        00005900
C                COMMON AREA:     BLANK                                       00005910
C                                                                             00005920
C     TRACE      ALTERNATE NAMES: TRACK                                       00005930
C                DIMENSION:       MXCLUS,2                                    00005940
C                PURPOSE:         NET ABSORPTION HISTORY                      00005950
C                USED IN:         CLST,LINE                                   00005960
C                COMMON AREA:     CLSDTA                                      00005970
C                                                                             00005980
C     UPNET      ALTERNATE NAMES: NONE                                        00005990
C                DIMENSION:       MXCLNT                                      00006000
C                PURPOSE:         LIST OF NETS TERMINATING TO LEFT            00006010
C                                 OF TARGET CELL IN DECOMP. PROC.             00006020
C                USED IN:         LINE                                        00006030
C                COMMON AREA:     BLANK                                       00006040
C                                                                             00006050
C     W          ALTERNATE NAMES: NONE                                        00006060
C                DIMENSION:       MXCELS                                      00006070
C                PURPOSE:         CELL WIDTHS FOR CLUSTERING                  00006080
C                USED IN:         CLST                                        00006090
C                COMMON AREA:     BLANK                                       00006100
C                                                                             00006110
C     WID        ALTERNATE NAMES: W                                           00006120
C                DIMENSION:       MXCELS                                      00006130
C                PURPOSE:         CIRCUIT CELL WIDTHS                         00006140
C                USED IN:         ALL                                         00006150
C                COMMON AREA:     NETDTA                                      00006160
C                                                                             00006170
C     ZPDLOC     ALTERNATE NAMES: NONE                                        00006180
C                DIMENSION:       MXPADS,2                                    00006190
C                PURPOSE:         LIST OF PAD POSITIONS FOR GIVEN-SIZE        00006200
C                                 STAR                                        00006210
C                USED IN:         PADP                                        00006220
C                COMMON AREA:     BLANK                                       00006230
C                                                                             00006240
C     ZPDPLC     ALTERNATE NAMES: NONE                                        00006250
C                DIMENSION:       MXPADS,2                                    00006260
C                PURPOSE:         LIST OF PLACED PAD LOCATIONS                00006270
C                USED IN:         PADP,NOUT                                   00006280
C                COMMON AREA:     PADPL                                       00006290
C                                                                             00006300
C                                                                             00006310
C                                                                             00006320
C*************************************************                            00006330
C                                                                             00006340
```

```
C                                                                       00006350
C                                                                       00006360
C                                                                       00006370
C*****************************************************                  00006380
C                                                                       00006390
C                                                                       00006400
C     M A I N   C O N T R O L   R O U T I N E                           00006410
C                                                                       00006420
C                                                                       00006430
C*****************************************************                  00006440
C                                                                       00006450
      IMPLICIT INTEGER(A-Y)                                             00006460
C                                                                       00006470
C     DEFINE COMMON DATA AREAS                                          00006480
C                                                                       00006490
C                                                                       00006500
C     GLOBAL COMMON                                                     00006510
C                                                                       00006520
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                  00006530
     & ,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL                00006540
     & ,MXROWS,MXCOLS,MXDFSZ                                            00006550
C                                                                       00006560
C     NET DATA COMMON                                                   00006570
C                                                                       00006580
      COMMON /NETDTA/ NET(3000),WID(1000),PAD(100),NETNOS(500)          00006590
C                                                                       00006600
C     CLUSTER DATA COMMON                                               00006610
C                                                                       00006620
      COMMON /CLSDTA/ CHR(500,3),TRACE(500,2),TRACK                     00006630
C                                                                       00006640
C     LINEAR ORDER DATA COMMON                                          00006650
C                                                                       00006660
      COMMON /LINDTA/ LINORD(1000)                                      00006670
C                                                                       00006680
C                                                                       00006690
C     HEADER COMMON                                                     00006700
C                                                                       00006710
      COMMON /HEADER/ CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2           00006720
C                                                                       00006730
C                                                                       00006740
C     SET UP LOCAL DATA                                                 00006750
C                                                                       00006760
C                                                                       00006770
      INTEGER STPLST(6),DALST(6),CARD(73),                              00006780
     & CNTWDL(13)/'GATE','NETS','LINE','NAME','DEBU','STAR',            00006790
     & 'STEP','GO  ','C   ','FIND','IMPR','SHOW','NEIG'/,               00006800
     & STPNAM(6)/'CLUS','LINE','WIRE',                                  00006810
     & 'FOLD','RATE','DEPI'/                                            00006820
      INTEGER HEAD(6)/'SIGM','A/5 ','2A  ','4   ','    ','    '/       00006830
      INTEGER TEMP(100)                                                 00006840
C                                                                       00006850
C     DEFINE I/O ASSIGNMENTS                                            00006860
```

```
C                                                                       00006870
      RDR=15                                                            00006880
      PRNTR=6                                                           00006890
      IEFILE=12                                                         00006900
C                                                                       00006910
C     SET MAX SIZES (VERSION DEPENDENT)                                 00006920
C                                                                       00006930
      MXCELS=999                                                        00006940
      MXNETS=500                                                        00006950
      MXCLNT=3000                                                       00006960
      MXCLUS=700                                                        00006970
      MXNTSZ=100                                                        00006980
      MXPADS=100                                                        00006990
      MXNTCL=20                                                         00007000
      MXROWS=30                                                         00007010
      MXCOLS=100                                                        00007020
      MXDFSZ=100                                                        00007030
C                                                                       00007040
C                                                                       00007050
C     SET DEFAULT CONTROLS                                              00007060
C                                                                       00007070
      DEBUG=0                                                           00007080
      ROWS=28                                                           00007090
      COLS=94                                                           00007100
      NFLSAV=3                                                          00007110
      NPISAV=1                                                          00007120
      MAXSOL=49                                                         00007130
      RN=1                                                              00007140
      CN=1                                                              00007150
C                                                                       00007160
C                                                                       00007170
C     SET UP HEADER INFO                                                00007180
C                                                                       00007190
C                                                                       00007200
      CAPMC1=HEAD(1)                                                    00007210
      CAPMC2=HEAD(2)                                                    00007220
      CAPVER=HEAD(3)                                                    00007230
      CAPREV=HEAD(4)                                                    00007240
      NAME1=HEAD(5)                                                     00007250
      NAME2=HEAD(6)                                                     00007260
C                                                                       00007270
C                                                                       00007280
C     PRINT HEADER                                                      00007290
C                                                                       00007300
      WRITE(PRNTR,99999)CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2         00007310
99999 FORMAT('1',40(1H*),' CAPSTAR F ',2A4,' V.',A4,' REV.',A4          00007320
     &, 5X,'NETWORK - ',2A4,5X,'STEP - DATA ENTRY')                     00007330
C     INITIALIZE STEP LINKAGE CONTROL                                   00007340
C                                                                       00007350
C                                                                       00007360
C     ALL STEPS SELECTED INITIALLY--NO DATA AVAILABLE                   00007370
C                                                                       00007380
```

```
      DO 100 I=1,6                                                    00007390
       STPLST(I)=1                                                    00007400
       DALST(I)=0                                                     00007410
100   CONTINUE                                                        00007420
C                                                                     00007430
C     FORCE NEW RECORD AND GET NEXT COMMAND                           00007440
C                                                                     00007450
110   CHAR=73                                                         00007460
111   CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                          00007470
      IF(TYPE.EQ.4) GO TO 111                                         00007480
C                                                                     00007490
C     STRING?                                                         00007500
C                                                                     00007510
115   IF(TYPE.EQ.2) GO TO 130                                         00007520
C                                                                     00007530
C     NO--TRY EOF                                                     00007540
C                                                                     00007550
      IF(TYPE.EQ.5) GO TO 120                                         00007560
C                                                                     00007570
C     NOT EOF--SHOW ERROR                                             00007580
C                                                                     00007590
      WRITE(PRNTR,9001) CARD                                          00007600
      GLENN=0                                                         00007610
      COX=-6                                                          00007620
      WRITE(IEFILE,8004) GLENN,COX                                    00007630
8004  FORMAT(2(I12))                                                  00007640
      WRITE(IEFILE,8001) CARD                                         00007650
9001  FORMAT('0',73(A1),'  RECORD PASSED')                            00007660
8001  FORMAT(73(A1))                                                  00007670
      GO TO 110                                                       00007680
120   CONTINUE                                                        00007690
C                                                                     00007700
C     EOF SEEN--QUIT                                                  00007710
      WRITE(PRNTR,9002)                                               00007720
9002  FORMAT('0END OF INPUT DATA')                                    00007730
      GO TO 1000                                                      00007740
130   CONTINUE                                                        00007750
C                                                                     00007760
C     STRING FOUND--CHECK AGAINST COMMAND LIST                        00007770
C                                                                     00007780
C                                                                     00007790
C     'GATES TO PATTERNS'?                                            00007800
C                                                                     00007810
      IF(ITEM.NE.CNTWDL(1)) GO TO 140                                 00007820
      WRITE(PRNTR,9003) CARD                                          00007830
9003  FORMAT('0',72(A1))                                              00007840
      LUCY=0                                                          00007850
      COX=-3                                                          00007860
      WRITE(IEFILE,8004) LUCY,COX                                     00007870
      CALL GTCELS(TYPE,ITEM,ITEM2,CARD,CHAR)                          00007880
      DALST(2)=1                                                      00007890
      GO TO 115                                                       00007900
```

```
C                                                                       00007910
C     'NETS'?                                                           00007920
C                                                                       00007930
140   IF(ITEM.NE.CNTWDL(2)) GO TO 150                                   00007940
      WRITE(PRNTR,9003) CARD                                            00007950
      GLENN=0                                                           00007960
      COX=-4                                                            00007970
      WRITE(IEFILE,8004) GLENN,COX                                      00007980
      CALL RDNETS(TYPE,ITEM,ITEM2,CARD,CHAR)                            00007990
      DALST(1)=1                                                        00008000
      GO TO 115                                                         00008010
C                                                                       00008020
C     'LINEAR ORDER'?                                                   00008030
C                                                                       00008040
150   IF(ITEM.NE.CNTWDL(3)) GO TO 160                                   00008050
      WRITE(PRNTR,9003) CARD                                            00008060
      CALL GTORD(TYPE,ITEM,ITEM2,CARD,CHAR)                             00008070
      DALST(5)=1                                                        00008080
      STPLST(1)=0                                                       00008090
      STPLST(2)=0                                                       00008100
      GO TO 115                                                         00008110
C                                                                       00008120
C     'NAME'?                                                           00008130
C                                                                       00008140
160   IF(ITEM.NE.CNTWDL(4)) GO TO 170                                   00008150
165   CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00008160
      GO TO(166,167,166,165,120),TYPE                                   00008170
166   WRITE(PRNTR,9004) CARD                                            00008180
9004  FORMAT('0WARNING(MAI01)--EXPECTED NETWORK NAME--RECORD WAS:'//20X,00008190
     & 72(A1)//' IGNORED')                                              00008200
      GO TO 110                                                         00008210
167   NAME1=ITEM                                                        00008220
      NAME2=ITEM2                                                       00008230
      WRITE(PRNTR,9005) NAME1,NAME2                                     00008240
9005  FORMAT('0NAME, ',2(A4))                                           00008250
      FUTURE=0                                                          00008260
      SHOCK=-1                                                          00008270
      WRITE(IEFILE,8004) FUTURE,SHOCK                                   00008280
      WRITE(IEFILE,8004) NAME1,NAME2                                    00008290
      GO TO 110                                                         00008300
C                                                                       00008310
C     'DEBUG'?                                                          00008320
C                                                                       00008330
170   IF(ITEM.NE.CNTWDL(5)) GO TO 180                                   00008340
         WRITE(PRNTR,9003) CARD                                         00008350
      DEBUG=1                                                           00008360
      GO TO 110                                                         00008370
C                                                                       00008380
C     'STAR SIZE'?                                                      00008390
C                                                                       00008400
180   IF(ITEM.NE.CNTWDL(6)) GO TO 190                                   00008410
182   CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00008420
```

```
        GO TO (183,183,184,182,120),TYPE                                  00008430
183     WRITE(PRNTR,9006) CARD                                            00008440
9006    FORMAT('0WARNING(MAI02)--EXPECTED STAR SIZE--RECORD WAS:'//20X,   00008450
     & 72(A1)//' SIZE COMMAND IGNORED')                                   00008460
        GO TO 110                                                         00008470
184     R1=ITEM                                                           00008480
185     CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00008490
        GO TO (183,183,186,185,120),TYPE                                  00008500
186     ROWS=R1                                                           00008510
        COLS=ITEM                                                         00008520
        WRITE(PRNTR,9007) ROWS,COLS                                       00008530
9007    FORMAT('0STAR SIZE',2(I5))                                        00008540
        DEJA=0                                                            00008550
        VU=-2                                                             00008560
        WRITE(IEFILE,8004) DEJA,VU                                        00008570
        WRITE(IEFILE,8004) ROWS,COLS                                      00008580
        GO TO 110                                                         00008590
C                                                                         00008600
C       'STEP'?                                                           00008610
C                                                                         00008620
190     IF(ITEM.NE.CNTWDL(7)) GO TO 200                                   00008630
        WRITE(PRNTR,9010)                                                 00008640
9010    FORMAT('0STEPS SELECTED')                                         00008650
        DO 192 I=1,6                                                      00008660
         STPLST(I)=0                                                      00008670
192     CONTINUE                                                          00008680
193     CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00008690
        GO TO (194,195,194,111,120),TYPE                                  00008700
194     WRITE(PRNTR,9008) CARD                                            00008710
9008    FORMAT('0WARNING(MAI03)--EXPECTED STEP NAME--RECORD WAS:'//20X,   00008720
     & 72(A1)//' ITEM IGNORED')                                           00008730
        GO TO 193                                                         00008740
195     TMP=0                                                             00008750
        DO 196 I=1,6                                                      00008760
         IF(ITEM.EQ.STPNAM(I)) TMP=I                                      00008770
196     CONTINUE                                                          00008780
        IF(TMP.NE.0) GO TO 197                                            00008790
        WRITE(PRNTR,9009) ITEM,ITEM2                                      00008800
9009    FORMAT('0WARNING(MAI04)--EXPECTED STEP NAME--DATA WAS: ',2(A4),   00008810
     & ' --IGNORED')                                                      00008820
        GO TO 193                                                         00008830
197     STPLST(TMP)=1                                                     00008840
        WRITE(PRNTR,9011) ITEM,ITEM2                                      00008850
9011    FORMAT('0',20X,2(A4))                                             00008860
        GO TO 193                                                         00008870
C                                                                         00008880
C       'GO'?                                                             00008890
C                                                                         00008900
200     IF(ITEM.EQ.CNTWDL(8)) GO TO 1000                                  00008910
C                                                                         00008920
C       COMMENT?                                                          00008930
C                                                                         00008940
```

```
      IF(ITEM.NE.CNTWDL(9)) GO TO 210                                    00008950
      WRITE(PRNTR,9003) CARD                                             00008960
      GO TO 110                                                          00008970
C                                                                        00008980
C        'FIND'?                                                         00008990
C                                                                        00009000
210      IF(ITEM.NE.CNTWDL(10)) GO TO 300                                00009010
         WRITE(PRNTR,9003)CARD                                           00009020
211      CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                          00009030
         GO TO (220,220,215,211,120),TYPE                                00009040
215      MAXSOL=ITEM                                                     00009050
         GO TO 110                                                       00009060
220      WRITE(PRNTR,9040) ITEM,ITEM2                                    00009070
9040    FORMAT('0WARNING(MAIO5) --EXPECTED NUMERIC FIELD -- DATA WAS: ',00009080
     & 2(A4),' -- COMMAND IGNORED')                                      00009090
         GO TO 110                                                       00009100
C                                                                        00009110
C        'IMPROVE'?                                                      00009120
C                                                                        00009130
300      IF(ITEM.NE.CNTWDL(11)) GO TO 400                                00009140
         WRITE(PRNTR,9003) CARD                                          00009150
301      CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                          00009160
         GO TO (220,220,310,301,120),TYPE                                00009170
310      NFLSAV=ITEM                                                     00009180
         GO TO 110                                                       00009190
400      CONTINUE                                                        00009200
C                                                                        00009210
C        'NEIGHBORHOOD'?                                                 00009220
C                                                                        00009230
500      IF(ITEM.NE.CNTWDL(13)) GO TO 900                                00009240
         WRITE(PRNTR,9003) CARD                                          00009250
501      CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                          00009260
         GO TO (220,220,510,501,120),TYPE                                00009270
510      R1=ITEM                                                         00009280
511      CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                          00009290
         GO TO(220,220,520,511,120),TYPE                                 00009300
520      RN=R1                                                           00009310
         CN=ITEM                                                         00009320
         GO TO 110                                                       00009330
900   WRITE(PRNTR,9001) CARD                                             00009340
      PING=0                                                             00009350
      PONG=-6                                                            00009360
      WRITE(IEFILE,8004) PING,PONG                                       00009370
      WRITE(IEFILE,8001) CARD                                            00009380
      GO TO 110                                                          00009390
1000  CONTINUE                                                           00009400
C                                                                        00009410
C                                                                        00009420
C************** MAIN CONTROL ROUTINE ****************                  00009430
C                                                                        00009440
C                                                                        00009450
C     CHECK FOR CELL & NET DEFINITION                                    00009460
```

```
C                                                                       00009470
      KING=0                                                            00009480
      KONG=-7                                                           00009490
      WRITE(IEFILE,8004) KING,KONG                                      00009500
      ENDFILE IEFILE                                                    00009510
      IF(DALST(1).NE.0) GO TO 1010                                      00009520
      WRITE(PRNTR,9020)                                                 00009530
9020  FORMAT('0ERROR(MAI01) --NET DEFINITION MISSING')                  00009540
      STOP                                                              00009550
1010  IF(DALST(2).NE.0) GO TO 1020                                      00009560
      WRITE(PRNTR,9021)                                                 00009570
9021  FORMAT('0ERROR(MAI02) --CELL DEFINITION MISSING')                 00009580
      STOP                                                              00009590
C                                                                       00009600
C     DO INPUT DATA X-CHECKING                                          00009610
C                                                                       00009620
1020  CALL XCHECK(DALST(5))                                             00009630
C                                                                       00009640
C     CLUSTERING SELECTED?                                              00009650
C                                                                       00009660
      IF(STPLST(1).EQ.1) GO TO 1200                                     00009670
C                                                                       00009680
C     NO--MAKE SURE LINEAR ORDER IS IN                                  00009690
C                                                                       00009700
      IF(DALST(5).NE.0) GO TO 1030                                      00009710
      WRITE(PRNTR,9022)                                                 00009720
9022  FORMAT('0WARNING(MAI06) --CLUSTERING STEP NOT SELECTED BUT NO',   00009730
     & ' LINEAR ORDER ENTERED'//' PROCEEDING AT CLUSTERING',            00009740
     & ' STEP')                                                         00009750
      GO TO 1200                                                        00009760
C                                                                       00009770
C     FORM CELL-NETS (NO CLUSTERS)                                      00009780
C                                                                       00009790
1030  CALL CELNET(0)                                                    00009800
      DALST(4)=1                                                        00009810
      GO TO 1300                                                        00009820
C                                                                       00009830
C     DO CLUSTERING STEP                                                00009840
C                                                                       00009850
1200  CALL CLSTER                                                       00009860
      DALST(3)=1                                                        00009870
C                                                                       00009880
C     FORM CELL-NETS (WITH CLUSTERS)                                    00009890
C                                                                       00009900
      CALL CELNET(1)                                                    00009910
      DALST(4)=2                                                        00009920
C                                                                       00009930
C     FORM LINEAR ORDER                                                 00009940
C                                                                       00009950
      CALL LINEUP                                                       00009960
      DALST(5)=1                                                        00009970
C                                                                       00009980
```

```
C     SHOW WIRECROSS OUTPUT IF SELECTED                                 00009990
C                                                                       00010000
1300  IF(STPLST(3).EQ.1) CALL WIRCRS                                    00010010
C                                                                       00010020
C     BUILD PASS FILE FOR PART B                                        00010030
C                                                                       00010040
      CALL PASS(ROWS,COLS,NFLSAV,NPISAV,MAXSOL,RN,CN)                   00010050
C                                                                       00010060
2000  WRITE(PRNTR,9030)                                                 00010070
9030  FORMAT('1NORMAL CAPSTAR PART 2A TERMINATION'//' RUN PART 2B TO CON00010080
     &TINUE')                                                           00010090
      STOP                                                              00010100
      END                                                               00010110
      SUBROUTINE GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                      00010120
C                                                                       00010130
C*************************************************                      00010140
C                                                                       00010150
C     GTITEM -- READS UNFORMATTED FIELDS FROM CARDS.                    00010160
C               FIELDS ARE TERMINATED BY COMMA.                         00010170
C               NUMERIC FIELDS ALSO TERMINATED BY SP.                   00010180
C               FIRST 4 COLUMNS OF PHYS. RECORD BLANK INDIC             00010190
C               ATES CONTINUED LOGICAL RECORD.  NUMERIC                 00010200
C               ITEMS (INTEGER ONLY) RETURNED IN ITEM.                  00010210
C               FIRST 8 CHARACTERS OF STRINGS RETURNED                  00010220
C               IN ITEM AND ITEM2. CARD IMAGE STORED IN                 00010230
C               ARRAY CARD.                                             00010240
C                                                                       00010250
C               ITEM TYPE CONTAINED IN TYPE:                            00010260
C                                                                       00010270
C                     2 -- STRING                                       00010280
C                     3 -- INTEGER                                      00010290
C                     4 -- END OF LOGICAL RECORD                        00010300
C                     5 -- END OF DECK                                  00010310
C                                                                       00010320
C                                                                       00010330
C*************************************************                      00010340
C                                                                       00010350
C                                                                       00010360
      IMPLICIT INTEGER(A-Z)                                             00010370
C                                                                       00010380
C     DEFINE CHARACTERS WE WANT TO LOOK FOR                             00010390
C                                                                       00010400
      COMMON /GLBL/ PRNTR,RDR,XXX(14)                                   00010410
C                                                                       00010420
      INTEGER CARD(73),A/'A   '/,Z/'Z   '/,MINUS/'-   '/,               00010430
     & BLANK/'    '/,COMMA/',   '/,DIG(10)/'0   ','1   ',              00010440
     & '2   ','3   ','4   ','5   ','6   ','7   ','8   ','9   '/        00010450
      INTEGER ENDFLG/0/                                                 00010460
C                                                                       00010470
C                                                                       00010480
C     CHECK FOR PENDING END OF DECK                                     00010490
C                                                                       00010500
```

```
C                                                                       00010510
      IF(ENDFLG.EQ.0 ) GO TO 10                                         00010520
      TYPE =5                                                           00010530
      GO TO 20000                                                       00010540
C                                                                       00010550
C                                                                       00010560
C     CHECK FOR END OF RECORD                                           00010570
C                                                                       00010580
C                                                                       00010590
10    IF(CHAR.LE.72) GO TO 1200                                         00010600
C                                                                       00010610
C                                                                       00010620
C     READ NEXT CARD INTO ARRAY CARD                                    00010630
C                                                                       00010640
C                                                                       00010650
      READ(RDR,1000,END=10000) (CARD(I),I=1,72)                         00010660
1000  FORMAT(72(A1))                                                    00010670
C                                                                       00010680
C     INITIALIZE POINTER INTO CARD                                      00010690
C                                                                       00010700
      CHAR=1                                                            00010710
C                                                                       00010720
C                                                                       00010730
C     CHECK FOR CONTINUED RECORD                                        00010740
C                                                                       00010750
C                                                                       00010760
      DO 1100 I=1,4                                                     00010770
       IF(CARD(I).EQ.BLANK) GO TO 1100                                  00010780
C                                                                       00010790
C      NOT CONTINUED-- RETURN END OF RECORD                             00010800
C                                                                       00010810
       TYPE=4                                                           00010820
       GO TO 20000                                                      00010830
1100  CONTINUE                                                          00010840
      CHAR=5                                                            00010850
C                                                                       00010860
C                                                                       00010870
C     ARE WE LOOKING AT THE START OF A STRING?                          00010880
C                                                                       00010890
C                                                                       00010900
 1200 CONTINUE                                                          00010910
      IF((CARD(CHAR).LT.A).OR.(CARD(CHAR).GT.Z)) GO TO 2000             00010920
C                                                                       00010930
C     STRING START FOUND-- RESET PASS FLAG                              00010940
C                                                                       00010950
      IFLAG=0                                                           00010960
      ITEM2=BLANK                                                       00010970
C                                                                       00010980
C     SET UP ITEM FOR JAMMING OPERATION                                 00010990
C                                                                       00011000
1505  CONTINUE                                                          00011010
      ITEM=CARD(CHAR)                                                   00011020
```

```
      CHAR=CHAR+1                                                       00011030
C                                                                       00011040
C     JAM FOUR CHARACTERS INTO TERM                                     00011050
C                                                                       00011060
      DO 1515 I=1,3                                                     00011070
       CNT=4-I                                                          00011080
C                                                                       00011090
C      CHECK FOR FIELD TERMINATION                                      00011100
C                                                                       00011110
       IF((CARD(CHAR).EQ.COMMA).OR.(CHAR.EQ.71)) GO TO 1520             00011120
       CALL JAM(ITEM,CARD(CHAR),CNT)                                    00011130
       CHAR=CHAR+1                                                      00011140
1515  CONTINUE                                                          00011150
C                                                                       00011160
C     IF ONLY ONE PASS THROUGH THIS SECTION MADE, DO IT                 00011170
C        AGAIN -- SAVE ITEM IN TEMP                                     00011180
C                                                                       00011190
      IF(IFLAG.NE.0) GO TO 1510                                         00011200
      IF((CARD(CHAR).EQ.COMMA).OR.(CHAR.EQ.71)) GO TO 1520              00011210
      IFLAG=1                                                           00011220
      TEMP=ITEM                                                         00011230
      GO TO 1505                                                        00011240
C                                                                       00011250
C     FIRST 8 CHARACTERS WERE JAMMED, BUT STRING FIELD                  00011260
C        END HASN'T BEEN FOUND-- EAT CHARACTERS UNTIL                   00011270
C        COMMA OR END OF CARD SEEN                                      00011280
C                                                                       00011290
1510  CHAR=CHAR+1                                                       00011300
      IF((CARD(CHAR).NE.COMMA).AND.(CHAR.LT.71)) GO TO 1510             00011310
C                                                                       00011320
C     SET TYPE NUMBER AND CLEAN UP FOR STRING EXIT                      00011330
C                                                                       00011340
1520  CONTINUE                                                          00011350
      CHAR=CHAR+1                                                       00011360
      TYPE=2                                                            00011370
      IF(IFLAG.EQ.0) GO TO 20000                                        00011380
      ITEM2=ITEM                                                        00011390
      ITEM=TEMP                                                         00011400
      GO TO 20000                                                       00011410
C                                                                       00011420
C                                                                       00011430
C     CHECK FOR NUMERIC FIELD                                           00011440
C                                                                       00011450
C                                                                       00011460
2000  IF((CARD(CHAR).NE.MINUS).AND.((CARD(CHAR).LT.DIG(1))              00011470
     & .OR.(CARD(CHAR).GT.DIG(10)))) GO TO 2500                         00011480
C                                                                       00011490
C                                                                       00011500
C     NUMERIC FIELD FOUND--INITIALIZE                                   00011510
C                                                                       00011520
C                                                                       00011530
      TYPE=3                                                            00011540
```

```
      MIFLG=0                                                          00011550
      ITEM=0                                                           00011560
C                                                                      00011570
C     CHECK FOR NEGATIVE NUMBER                                        00011580
C                                                                      00011590
      IF(CARD(CHAR).NE.MINUS) GO TO 2050                               00011600
      MIFLG=1                                                          00011610
2200  CHAR=CHAR+1                                                      00011620
C                                                                      00011630
C     AS LONG AS DIGITS ARE SEEN, KEEP MULTIPLYING                     00011640
C       ITEM BY TEN AND ADDING NEW DIGIT                               00011650
C                                                                      00011660
2050  DO 2100 I=1,10                                                   00011670
       IF(CARD(CHAR).NE.DIG(I)) GO TO 2100                             00011680
       ITEM=ITEM*10+I-1                                                00011690
       GO TO 2200                                                      00011700
2100  CONTINUE                                                         00011710
C                                                                      00011720
C     WHEN OUT OF DIGITS, SET RESULT SIGN AND EXIT                     00011730
C                                                                      00011740
      IF(MIFLG.EQ.1) ITEM=-ITEM                                        00011750
      GO TO 20000                                                      00011760
C                                                                      00011770
C                                                                      00011780
C     IF NOT NUMERIC OR STRING, IGNORE                                 00011790
C                                                                      00011800
C                                                                      00011810
2500  CONTINUE                                                         00011820
      CHAR=CHAR+1                                                      00011830
      GO TO 10                                                         00011840
C                                                                      00011850
C     END OF DECK SEEN                                                 00011860
C                                                                      00011870
C                                                                      00011880
10000 TYPE=4                                                           00011890
      ENDFLG=1                                                         00011900
C                                                                      00011910
C                                                                      00011920
C     NORMAL ROUTINE EXIT                                              00011930
C                                                                      00011940
C                                                                      00011950
20000 RETURN                                                           00011960
      END                                                              00011970
      SUBROUTINE JAM(ITEM,CAR,CNT)                                     00011980
C                                                                      00011990
C                                                                      00012000
C                                                                      00012010
C********** JAM -- LOADS CHARACTER IN INTEGER                          00012020
C                  PASSED INTO NORMAL A4 INTEGER                       00012030
C                  FORMAT                                              00012040
C                                                                      00012050
C                                                                      00012060
```

```
C                                                                       00012070
      IMPLICIT INTEGER (A-Z)                                            00012080
      DO 100 J=1,CNT                                                    00012090
       ITEM=ITEM/256                                                    00012100
100   CONTINUE                                                          00012110
      IF(ITEM.LT.0) ITEM=ITEM-1                                         00012120
      DO 200 J=1,CNT                                                    00012130
       ITEM=ITEM*256                                                    00012140
200   CONTINUE                                                          00012150
      D=4-CNT                                                           00012160
      C=CAR                                                             00012170
      DO 300 J=1,D                                                      00012180
       C=C/256                                                          00012190
300   CONTINUE                                                          00012200
      IF(C.LT.0) C=C-1                                                  00012210
      ITEM=ITEM+C                                                       00012220
      IF(C.LT.0) ITEM=ITEM+256**CNT                                     00012230
      RETURN                                                            00012240
      END                                                               00012250
      SUBROUTINE XCHECK(LOEFLG)                                         00012260
C                                                                       00012270
C*****************************************************               00012280
C                                                                       00012290
C                                                                       00012300
C     XCHECK-- PERFORMS CROSS-CHECK TO DETECT                           00012310
C              ERRORS IN INPUT DATA                                     00012320
C                                                                       00012330
C                                                                       00012340
C*****************************************************               00012350
C                                                                       00012360
      IMPLICIT INTEGER(A-Y)                                             00012370
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,XXX(9)    00012380
      COMMON /LINDTA/ L(1000)                                           00012390
      COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)         00012400
      COMMON TEMP(1000)                                                 00012410
C                                                                       00012420
C     PRINT HEADER                                                      00012430
C                                                                       00012440
      WRITE(PRNTR,100)                                                  00012450
100   FORMAT('0',12X,'DATA CROSS-CHECK INITIATED')                      00012460
      EFLG=0                                                            00012470
C                                                                       00012480
C     CLEAR TEMP ARRAY                                                  00012490
C                                                                       00012500
      DO 110 I=1,MXCELS                                                 00012510
       TEMP(I)=0                                                        00012520
110   CONTINUE                                                          00012530
C                                                                       00012540
C     CHECK FOR UNDEFINED CELLS                                         00012550
C                                                                       00012560
      NET=1                                                             00012570
      NETPNT=1                                                          00012580
```

```
C                                                                       00012590
C     NEXT LOC. IN NETS ARRAY                                           00012600
C                                                                       00012610
120   TRY=NETS(NETPNT)                                                  00012620
      IF(TRY.NE.0) GO TO 130                                            00012630
      NET=NET+1                                                         00012640
125   NETPNT=NETPNT+1                                                   00012650
      GO TO 120                                                         00012660
130   IF(TRY.EQ.-1) GO TO 200                                           00012670
C                                                                       00012680
C     GOT A CELL #-- SEE IF THERE'S A WIDTH                             00012690
C                                                                       00012700
      IF (WID(TRY).EQ.0) GO TO 150                                      00012710
140   TEMP(TRY)=1                                                       00012720
      GO TO 125                                                         00012730
150   CONTINUE                                                          00012740
C                                                                       00012750
C     NO WIDTH-- CHECK FOR PAD                                          00012760
C                                                                       00012770
      DO 155 I=1,NPADS                                                  00012780
       IF(PAD(I).EQ.TRY) GO TO 140                                      00012790
155   CONTINUE                                                          00012800
C                                                                       00012810
C     NOT A PAD -- FLAG AN ERROR                                        00012820
C                                                                       00012830
      WRITE(PRNTR,160) TRY,NETNOS(NET)                                  00012840
160   FORMAT('0',20X,'ERROR(XCH01) --CELL ',I4,' IN NET ',I4,' NOT SPECI00012850
     &FIED')                                                            00012860
      EFLG=1                                                            00012870
      GO TO 125                                                         00012880
200   CONTINUE                                                          00012890
C                                                                       00012900
C     CHECK FOR UNCONNECTED CELLS                                       00012910
C                                                                       00012920
      I=1                                                               00012930
250   CONTINUE                                                          00012940
      IF((WID(I).NE.0).AND.(TEMP(I).EQ.0)) WRITE(PRNTR,210) I           00012950
      IF((WID(I).NE.0).AND.(TEMP(I).EQ.0)) EFLG=1                       00012960
210   FORMAT('0',20X,'ERROR(XCH02) --CELL ',I4,' IN NO NETS')           00012970
      I=I+1                                                             00012980
      IF(I.LT.MXCELS) GO TO 250                                         00012990
      IF(NPADS.EQ.0) GO TO 221                                          00013000
      DO 220 I=1,NPADS                                                  00013010
       IF(TEMP(PAD(I)).EQ.0) WRITE(PRNTR,210) PAD(I)                    00013020
       IF(TEMP(PAD(I)).EQ.0) EFLG=1                                     00013030
220   CONTINUE                                                          00013040
C                                                                       00013050
C     ALL DONE                                                          00013060
C                                                                       00013070
C      LINEAR ORDER ENTERED?                                            00013080
C                                                                       00013090
221   IF(LOEFLG.EQ.0) GO TO 226                                         00013100
```

```
C                                                                       00013110
C     YES -- MAKE SURE CELLS DEFINED                                    00013120
C                                                                       00013130
      DO 222 I=1,MXCELS                                                 00013140
       IF(L(I).EQ.0) GO TO 226                                          00013150
       IF(TEMP(L(I)).NE.0) GO TO 222                                    00013160
       WRITE(PRNTR,7000) L(I)                                           00013170
7000   FORMAT('0ERROR(XCH03) -- CELL',I4,' IN LINEAR ORDER NOT DEFINED')00013180
       EFLG=1                                                           00013190
222   CONTINUE                                                          00013200
226   CONTINUE                                                          00013210
      IF(EFLG.EQ.0) GO TO 500                                           00013220
      WRITE(PRNTR,300)                                                  00013230
300   FORMAT('0','EXECUTION TERMINATED DUE TO CROSS-CHECK ERRORS')      00013240
      STOP                                                              00013250
500   WRITE(PRNTR,510)                                                  00013260
510   FORMAT('0',12X,'DATA CROSS-CHECK COMPLETED')                      00013270
      RETURN                                                            00013280
      END                                                               00013290
      SUBROUTINE CLSTER                                                 00013300
C                                                                       00013310
C*************************************************                      00013320
C                                                                       00013330
C                                                                       00013340
C     CLUSTERING ROUTINE                                                00013350
C                                                                       00013360
C*************************************************                      00013370
C                                                                       00013380
C                                                                       00013390
C                                                                       00013400
      IMPLICIT INTEGER(A-Y)                                             00013410
      COMMON TEMP(100),BANK(100),REG(1000),                             00013420
     & NC(500),PC(500),BC(3000),CELL(1000),                             00013430
     & NN(1000),PN(1000),BN(3000),W(1000)                               00013440
     &,QQ(101),NBP(1700)                                                00013450
C                                                                       00013460
C     DEFINE COMMON DATA AREAS                                          00013470
C                                                                       00013480
C                                                                       00013490
C     GLOBAL COMMON                                                     00013500
C                                                                       00013510
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                  00013520
     &,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL                 00013530
     & ,MXROWS,MXCOLS,MXDFSZ                                            00013540
C                                                                       00013550
C     NET DATA COMMON                                                   00013560
C                                                                       00013570
      COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)         00013580
C                                                                       00013590
C     CLUSTER DATA COMMON                                               00013600
C                                                                       00013610
      COMMON /CLSDTA/ CHR(700,3),TRACE(700,2),TRACK                     00013620
```

```
C                                                                       00013630
C     HEADER COMMON                                                     00013640
C                                                                       00013650
      COMMON /HEADER/ CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2           00013660
C                                                                       00013670
C                                                                       00013680
C     PRINT HEADER                                                      00013690
C                                                                       00013700
      WRITE(PRNTR,99999)CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2         00013710
99999 FORMAT('1',40(1H*),' CAPSTAR F ',2A4,' V.',A4,' REV.',A4,         00013720
     & 5X,'NETWORK - ',2A4,5X,'STEP - CLUSTERING')                      00013730
C                                                                       00013740
C     SET UP LOCAL DATA AREAS                                           00013750
C                                                                       00013760
C                                                                       00013770
      FLG1=0                                                            00013780
      IX=1                                                              00013790
      TRACK=1                                                           00013800
      DO 40 I=1,MXNETS                                                  00013810
       NC(I)=0                                                          00013820
       PC(I)=0                                                          00013830
40    CONTINUE                                                          00013840
      DO 42 I=1,MXCELS                                                  00013850
       W(I)=0                                                           00013860
42    CONTINUE                                                          00013870
C                                                                       00013880
C     ZERO BC ARRAY                                                     00013890
      DO 43 I=1,MXCLNT                                                  00013900
       BC(I)=0                                                          00013910
43    CONTINUE                                                          00013920
C                                                                       00013930
      R=0                                                               00013940
      PS=1                                                              00013950
      NETPNT=1                                                          00013960
      IF(DEBUG.EQ.1) WRITE(PRNTR,1002)                                  00013970
1002  FORMAT('0',' NET',2X,'SIZE',2X,'CELLS')                           00013980
C                                                                       00013990
C     ZERO TEMP,BANK ARRAYS                                             00014000
1     DO 5 I=1,MXNTSZ                                                   00014010
       TEMP(I)=0                                                        00014020
       BANK(I)=0                                                        00014030
5     CONTINUE                                                          00014040
C                                                                       00014050
C     RETRIEVE NET FROM INPUT ARRAY                                     00014060
C                                                                       00014070
      I=0                                                               00014080
14    I=I+1                                                             00014090
      IF(I.LE.MXNTSZ) GO TO 6001                                        00014100
      WRITE(PRNTR,7001)                                                 00014110
7001  FORMAT('0ERROR(CLS01) --MAX NET SIZE EXCEEDED FOR TEMP ARRAY')    00014120
      STOP                                                              00014130
6001  IF(NETPNT.LE.MXCLNT) GO TO 6002                                   00014140
```

```
      WRITE(PRNTR,7002)                                                 00014150
7002  FORMAT('0ERROR(CLS02) --MISSING END MARKER IN NET ARRAY')         00014160
      STOP                                                              00014170
6002  TEMP(I)=NETS(NETPNT)                                              00014180
      NETPNT=NETPNT+1                                                   00014190
      IF(TEMP(I).EQ.-1)GO TO 37                                         00014200
      IF(TEMP(I).NE.0)GO TO 14                                          00014210
C                                                                       00014220
C     ARRANGES ELEMENTS IN EACH NET IN ORDER                            00014230
      DO 25 J=1,MXNTSZ                                                  00014240
       N=J+1                                                            00014250
       STOR=TEMP(J)                                                     00014260
       IF(STOR.EQ.0)GO TO 9000                                          00014270
       DO 20 I=N,MXNTSZ                                                 00014280
        IF(TEMP(I).EQ.0)GO      TO 25                                   00014290
        IF(STOR.LE.TEMP(I))GO TO 20                                     00014300
        TEMP(J)=TEMP(I)                                                 00014310
        TEMP(I)=STOR                                                    00014320
20     CONTINUE                                                         00014330
25    CONTINUE                                                          00014340
C                                                                       00014350
C      DELETES THE DOUBLE ELEMENT IN EACH NET LINE AND                  00014360
C      STORES IN BANK ARRAY.                                            00014370
9000  CONTINUE                                                          00014380
      N=0                                                               00014390
C                                                                       00014400
C     ARRANGE BANK SAME AS TEMP, BUT DELETE REPEATED ELEMENTS           00014410
      DO 30 I=1,MXNTSZ                                                  00014420
       GGG1=TEMP(I)                                                     00014430
       IF(GGG1.EQ.0)GO TO 34                                            00014440
       N=N+1                                                            00014450
       BANK(N)=GGG1                                                     00014460
       IF(GGG1.EQ.TEMP(I+1))  N=N-1                                     00014470
30    CONTINUE                                                          00014480
C                                                                       00014490
34    R=R+1                                                             00014500
C     FORM NC, PC, BC ARRAYS                                            00014510
C                                                                       00014520
C***** TAKES PLACE OF POINT1 SUB **************                        00014530
C                                                                       00014540
      NC(R)=N                                                           00014550
      PC(R)=PS                                                          00014560
      0018=NC(R)                                                        00014570
      DO 50 I=1,0018                                                    00014580
       BC(PS+(I-1))=BANK(I)                                             00014590
50    CONTINUE                                                          00014600
      IF(DEBUG.EQ.0) GO TO 100                                          00014610
      WRITE(PRNTR,1003) NETNOS(R),N,(BC(PS+(I-1)),I=1,0018)             00014620
1003  FORMAT('0',I4,2X,I4,2X,24(I4,1X))                                 00014630
100   PS=PS+0018                                                        00014640
      GO TO 1                                                           00014650
37    CONTINUE                                                          00014660
```

```
C                                                                       00014670
C     BUILD NBP (NUMBER BURIED PADS) ARRAY                              00014680
      LNC1=MXCELS+MXCLUS                                                00014690
      DO 500 I=1,LNC1                                                   00014700
       NBP(I)=0                                                         00014710
500   CONTINUE                                                          00014720
      DO 510 I=1,NPADS                                                  00014730
       IF(PAD(I).EQ.0) GO TO 520                                        00014740
       NBP(PAD(I))=1                                                    00014750
510   CONTINUE                                                          00014760
520   CONTINUE                                                          00014770
      CALL POINT2(FLG1)                                                 00014780
      CALL REORG(FLG1,IX)                                               00014790
      WRITE(PRNTR,8002)                                                 00014800
8002  FORMAT('0',20X,'NORMAL CLUSTERING STEP TERMINATION')              00014810
      RETURN                                                            00014820
      END                                                               00014830
      SUBROUTINE POINT2(FLG1)                                           00014840
C                                                                       00014850
C                                                                       00014860
C                                                                       00014870
C                                                                       00014880
C  ************   SUBROUTINE POINT2   ************                     00014890
C                                                                       00014900
C                                                                       00014910
C                                                                       00014920
C     MAKES ARRYS CELL, NUMBER OF NETS(NN), POINTER FOR NET(PN)         00014930
C     & ARRAY CONTAINING NETS(BN)                                       00014940
C                                                                       00014950
C                                                                       00014960
C                                                                       00014970
       IMPLICIT INTEGER(A-Y)                                            00014980
       COMMON TEMP(100),BANK(100),REG(1000),NC(500),                    00014990
      & PC(500),BC(3000),CELL(1000),NN(1000),PN(1000),BN(3000),W(1000)  00015000
      &,QQ(101),NBP(1700)                                               00015010
       COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                 00015020
      & ,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL               00015030
      & ,MXROWS,MXCOLS,MXDFSZ                                           00015040
       COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)        00015050
       IN=1                                                             00015060
C                                                                       00015070
C     ZERO NN, PN, BN ARRAYS                                            00015080
      DO 86 I=1,MXCELS                                                  00015090
       CELL(I)=0                                                        00015100
       NN(I)=0                                                          00015110
       PN(I)=0                                                          00015120
86    CONTINUE                                                          00015130
      DO 91 I=1,MXCLNT                                                  00015140
       BN(I)=0                                                          00015150
91    CONTINUE                                                          00015160
C                                                                       00015170
C     IF NC(IN) = 1 THEN NET IS GONE INTO PARTITION                     00015180
```

```
C                                                                       00015190
      IN=IN-1                                                           00015200
79    IN=IN+1                                                           00015210
      IF(IN.LE.MXNETS) GO TO 6000                                       00015220
      WRITE(PRNTR,7001)                                                 00015230
7001  FORMAT('0ERROR(POI01) --MISSING END MARKER IN NC ARRAY')          00015240
      STOP                                                              00015250
6000  IF(NC(IN).EQ.1) GO TO 79                                          00015260
      IB=1                                                              00015270
C     IF PC(IN)=0 THEN END OF FILE                                      00015280
      0019=PC(IN)                                                       00015290
      IF(0019.EQ.0) GO TO 83                                            00015300
      0C1=0019+NC(IN)-1                                                 00015310
      DO 84 IJ=0019,001                                                 00015320
       BANK(IB, 9C(IJ)                                                  00015330
       IB=IB+1                                                          00015340
84    CONTINUE                                                          00015350
      BANK(IB)=0                                                        00015360
C                                                                       00015370
C  ***** MAKES CELL ARRY AND NUMBER OF NETS LOCATED IN(NN)**            00015380
      DO 75 I =1,MXNTSZ                                                 00015390
       JJ=1                                                             00015400
       IF(BANK(I).EQ.0) GO TO 79                                        00015410
820    IF(CELL(JJ).EQ.BANK(I)) GO TO 68                                 00015420
       IF(CELL(JJ).EQ.0) GO TO 67                                       00015430
       JJ=JJ+1                                                          00015440
       IF(JJ.LE.MXCELS) GO TO 820                                       00015450
       WRITE(PRNTR,7002)                                                00015460
7002   FORMAT('0ERROR(POI02) --OUT OF SPACE IN CELL ARRAY')             00015470
       STOP                                                             00015480
68     NN(JJ)=NN(JJ)+1                                                  00015490
       GO TO 75                                                         00015500
67     IF(FLG1.NE.1) W(JJ)=(BANK(I)*10**6)+WID(BANK(I))                 00015510
       CELL(JJ)=BANK(I)                                                 00015520
       NN(JJ)=1                                                         00015530
75    CONTINUE                                                          00015540
      WRITE(PRNTR,8003)                                                 00015550
8003  FORMAT(' ERROR(POI03) --MISSING END MARKER IN NET ARRAY')         00015560
      STOP                                                              00015570
C                                                                       00015580
C  ******MAKES ARRYS PN(POINTER FOR NETS) AND BANK FOR NETS.            00015590
C                                                                       00015600
C                                                                       00015610
83    FLG1=1                                                            00015620
      PN(1)=1                                                           00015630
      DO 100 I=2,MXCELS                                                 00015640
       IF(CELL(I).EQ.0) GO TO 110                                       00015650
       PN(I)=PN(I-1)+NN(I-1)                                            00015660
100   CONTINUE                                                          00015670
110   NET=1                                                             00015680
      L=1                                                               00015690
111   IF(NC(NET).EQ.1) GO TO 131                                        00015700
```

```
      0020=PC(L)                                                        00015710
      IF(0020.EQ.0)GO TO 135                                            00015720
      002=0020+NC(L)-1                                                  00015730
      DO 130 I=0020,002                                                 00015740
       GGG1=BC(I)                                                       00015750
       IF(GGG1.EQ.0)     GO TO 135                                      00015760
       DO 120 J=1,MXCELS                                                00015770
        IF(CELL(J).EQ.GGG1) GO TO 115                                   00015780
120    CONTINUE                                                         00015790
       WRITE(PRNTR,8004) GGG1                                           00015800
8004   FORMAT(' ERROR(POI04) --CELL ',I5,'  NOT IN CELL ARRAY')         00015810
       STOP                                                             00015820
115    0021=PN(J)                                                       00015830
       003=0021+NN(J)-1                                                 00015840
       DO 127 K=0021,003                                                00015850
        IF(BN(K).EQ.0) GO TO 128                                        00015860
127    CONTINUE                                                         00015870
       WRITE(PRNTR,8005)                                                00015880
8005   FORMAT(' ERROR(POI05) -- NO SPACE IN BN ARRAY')                  00015890
       STOP                                                             00015900
128    BN(K)=NET                                                        00015910
130   CONTINUE                                                          00015920
131   NET=NET+1                                                         00015930
      L=L+1                                                             00015940
      GO TO 111                                                         00015950
135   RETURN                                                            00015960
      END                                                               00015970
      SUBROUTINE REORG(FLG1,IX)                                         00015980
C                                                                       00015990
C                                                                       00016000
C                                                                       00016010
C                                                                       00016020
C  ***************   SUBROUTINE REORG  ************************         00016030
C                                                                       00016040
C                                                                       00016050
       IMPLICIT INTEGER(A-Y)                                            00016060
       COMMON TEMPPP(100),BANK(100),REG(1000),NC(500),                  00016070
      & PC(500),BC(3000),CELL(1000),NN(1000),PN(1000),BN(3000),         00016080
      & W(1000),TEMP(101)                                               00016090
      &,NBP(1700)                                                       00016100
       COMMON /CLSDTA/ CHR(700,3),TRACE(700,2),TRACK                    00016110
       COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                 00016120
      & ,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL               00016130
      & ,MXROWS,MXCOLS,MXDFSZ                                           00016140
       COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)        00016150
       IF(DEBUG.EQ.0) GO TO 5                                           00016160
       WRITE(PRNTR,6001)                                                00016170
6001   FORMAT('1CELL ',5X,'NN   ',5X,'W    ')                          00016180
       DO 4 I=1,MXCELS                                                  00016190
        WRITE(PRNTR,6002) CELL(I),NN(I),W(I)                            00016200
6002    FORMAT(' ',2(I5,5X),I9)                                         00016210
4      CONTINUE                                                         00016220
```

```
5     CONTINUE                                                          00016230
C                                                                       00016240
      COMP=1000                                                         00016250
      FLG1=1                                                            00016260
C                                                                       00016270
C     FIND TOTAL WIDTH (W9) AND TOTAL STARTING METAL (ZM9)              00016280
C                                                                       00016290
      W9=0                                                              00016300
      ZM9=0.                                                            00016310
      DO 100 I=1,MXCELS                                                 00016320
       IF(CELL(I).EQ.0) GO TO 200                                       00016330
       WC=WID(CELL(I))                                                  00016340
       W9=W9+WC                                                         00016350
       ZM9=ZM9+(SQRT(FLOAT(WC))*FLOAT(NN(I)))                           00016360
100   CONTINUE                                                          00016370
200   ZCD=ZM9/FLOAT(W9)                                                 00016380
      WRITE(PRNTR,7001) W9,ZM9,ZCD                                      00016390
7001  FORMAT('0',12X,'CHIP AREA=',I5,' TOTAL METAL =',F6.0,             00016400
     & ' CHIP DENSITY =',F5.1)                                          00016410
C                                                                       00016420
C     ALL CELLS CLUSTERED?-- IF SO, EXIT THIS PORTION                   00016430
      I=0                                                               00016440
      NUMCLS=0                                                          00016450
205   I=I+1                                                             00016460
      IF(CELL(I).EQ.0) GO TO 432                                        00016470
      IF(CELL(I).LT.1000.AND.WID(CELL(I)).EQ.0) GO TO 205               00016480
      NUMCLS=NUMCLS+1                                                   00016490
      IF(NUMCLS.EQ.1) GO TO 205                                         00016500
C                                                                       00016510
C     FIND SMALLEST CELL (SMLEST)                                       00016520
C                                                                       00016530
      SMLEST=0                                                          00016540
      SMLWID=10**6                                                      00016550
      PNT=0                                                             00016560
      I=1                                                               00016570
C                                                                       00016580
C     IF END OF W ARRAY, WE'RE DONE FINDING SMALLEST                    00016590
C                                                                       00016600
201   IF(W(I).EQ.0) GO TO 1000                                          00016610
      CELL1=W(I)/10**6                                                  00016620
C                                                                       00016630
C     FIND IF THIS CELL IS IN CELL ARRAY                                00016640
C                                                                       00016650
      J=1                                                               00016660
202   IF(CELL(J).EQ.CELL1) GO TO 210                                    00016670
      IF(CELL(J).EQ.0) GO TO 230                                        00016680
      J=J+1                                                             00016690
      GO TO 202                                                         00016700
C                                                                       00016710
C     FOUND IT-- CHECK WIDTH AGAINST CURRENT SMALLEST                   00016720
C                                                                       00016730
210   WIDTH=(W(I)-CELL1*10**6)                                          00016740
```

```
      IF(WIDTH.GE.SMLWID) GO TO 230                                    00016750
C                                                                      00016760
C     SMALLER-- UPDATE SMALLEST DATA                                   00016770
C                                                                      00016780
      SMLEST=CELL1                                                     00016790
      SMLWID=WIDTH                                                     00016800
      PNT=J                                                            00016810
C                                                                      00016820
C     NEXT CELL                                                        00016830
C                                                                      00016840
230   I=I+1                                                            00016850
      GO TO 201                                                        00016860
1000  CONTINUE                                                         00016870
C                                                                      00016880
C     GOT SMALLEST--CALL FNDBES TO FIND BEST PARTNER                   00016890
C                                                                      00016900
      C1=SMLEST                                                        00016910
      W1=SMLWID                                                        00016920
      L1=NN(PNT)+NBP(C1)                                               00016930
      CALL FNDBES(C1,C2,W9,ZM9,W1,L1,W2)                               00016940
C                                                                      00016950
C     CALL REDO TO REDO DATA BASES                                     00016960
C                                                                      00016970
      COMP=COMP+1                                                      00016980
C                                                                      00016990
C     UPDATE NBP ARRAY                                                 00017000
C                                                                      00017010
      NBP(COMP)=NBP(C1)+NBP(C2)                                        00017020
      WB=W1+W2                                                         00017030
      CALL REDO(C1,C2,COMP,FLG1,IX,W1,W2,WB)                           00017040
C                                                                      00017050
C     NEXT CELL                                                        00017060
C                                                                      00017070
      GO TO 200                                                        00017080
C                                                                      00017090
C                                                                      00017100
C***  DETERMINES THE FINAL CELLS IN CID, AND WRITES TO IO 13           00017110
C                                                                      00017120
C                                                                      00017130
432   CONTINUE                                                         00017140
      WRITE(PRNTR,6050)                                                00017150
6050  FORMAT('1 CELL   COMPOSED OF CELLS')                             00017160
      IF(CHR(1,1).EQ.0) GO TO 433                                      00017170
      DO 600 KI=1,MXCLUS                                               00017180
       X1=CHR(KI,1)                                                    00017190
       C1=CHR(KI,2)                                                    00017200
       C2=CHR(KI,3)                                                    00017210
       DO 605 I=1,MXCELS                                               00017220
        REG(I)=0                                                       00017230
605    CONTINUE                                                        00017240
       REG(1)=X1                                                       00017250
       REG(2)=C1                                                       00017260
```

```
      REG(3)=C2                                                          00017270
610   FLG5=0                                                             00017280
612   DO 615 IZ=2,MXCELS                                                 00017290
       IF(REG(IZ).LT.1000) GO TO 630                                     00017300
       FLG5=1                                                            00017310
       DO 680 I=1,MXCLUS                                                 00017320
        IF(REG(IZ).EQ.CHR(I,1)) GO TO 690                                00017330
680    CONTINUE                                                          00017340
       WRITE(PRNTR,8006) REG(IZ)                                         00017350
8006   FORMAT(' ERROR(RE001) --CANT FIND CLUSTER',I5,' IN CHR')          00017360
       STOP                                                              00017370
690    X1=CHR(I,1)                                                       00017380
       C1=CHR(I,2)                                                       00017390
       C2=CHR(I,3)                                                       00017400
       REG(IZ)=C1                                                        00017410
       006=IZ+1                                                          00017420
       DO 642 IY=006,MXCELS                                              00017430
        IF(REG(IY).NE.0)GO TO 642                                        00017440
        REG(IY)=C2                                                       00017450
        GO TO 612                                                        00017460
642    CONTINUE                                                          00017470
       WRITE(PRNTR,8007)                                                 00017480
8007   FORMAT(' ERROR(RE002) --OUT OF SPACE IN REG ARRAY')               00017490
       STOP                                                              00017500
630    IF(REG(IZ).EQ.0) GO TO 640                                        00017510
615   CONTINUE                                                           00017520
      WRITE(PRNTR,8008)                                                  00017530
8008  FORMAT(' ERROR(RE003) --0 NOT FOUND AT END OF REG ARRAY')          00017540
      STOP                                                               00017550
640   IF(FLG5.NE.0) GO TO 610                                            00017560
      WRITE(PRNTR,6051)(REG(I),I=1,IZ)                                   00017570
6051  FORMAT(1X,I4,'-',15I4,20(20(/6X,15I4)))                            00017580
      IF(CHR(KI+1,1).EQ.0) GO TO 433                                     00017590
600   CONTINUE                                                           00017600
433   CONTINUE                                                           00017610
      IF(DEBUG.EQ.0) GO TO 567                                           00017620
      WRITE(PRNTR,6006)                                                  00017630
6006  FORMAT('1',20X,'CELL-WIDTHS')                                      00017640
      DO 560 I=1,MXCELS                                                  00017650
       IF(W(I).EQ.0) GO TO 567                                           00017660
       WRITE(PRNTR,6007)W(I)                                             00017670
6007   FORMAT(' ',20X,I11)                                               00017680
560   CONTINUE                                                           00017690
      WRITE(PRNTR,8009)                                                  00017700
8009  FORMAT(' ERROR(RE004) --MISSING END MARKER IN W ARRAY')            00017710
      STOP                                                               00017720
567   IF(DEBUG.EQ.0) GO TO 1004                                          00017730
      WRITE(PRNTR,1002)                                                  00017740
1002  FORMAT('0',20X,'CLUSTERING HISTORY')                               00017750
      DO 568 I=1,MXCLUS                                                  00017760
       IF(CHR(I,1).EQ.0) GO TO 1004                                      00017770
       WRITE(PRNTR,1003) CHR(I,1),CHR(I,2),CHR(I,3)                      00017780
```

```
1003   FORMAT('0',20X,3(I4,2X))                                          00017790
568    CONTINUE                                                          00017800
1004   CONTINUE                                                          00017810
       I1=I+1                                                            00017820
       T1=TRACK+1                                                        00017830
       CHR(I1,1)=-1                                                      00017840
       CHR(I1,2)=-1                                                      00017850
       CHR(I1,3)=-1                                                      00017860
       TRACE(T1,1)=-1                                                    00017870
       TRACE(T1,2)=-1                                                    00017880
       RETURN                                                            00017890
       END                                                               00017900
       SUBROUTINE FNDBES(C1,C2,W9,ZM9,W1,L1,W2)                          00017910
C**********************SUBROUTINE FNDBES*********************           00017920
C                                                                        00017930
C                                                                        00017940
C                                                                        00017950
C                                                                        00017960
C                                                                        00017970
       IMPLICIT INTEGER(A-Y)                                             00017980
       COMMON TEMP(100),BANK(100),REG(1000),NC(500),                     00017990
      & PC(500),BC(3000),CELL(1000),NN(1000),PN(1000),BN(3000),W(1000)   00018000
      &,QQ(101),NBP(1700)                                                00018010
       COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)         00018020
       COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,XXX(9)    00018030
       INTEGER CANDID(220)                                               00018040
C                                                                        00018050
C      FIND CANDIDATES FOR COMBINATION                                   00018060
C                                                                        00018070
C         FIND C1 IN CELL ARRAY                                          00018080
C                                                                        00018090
       DO 100 I=1,MXCELS                                                 00018100
        IF(CELL(I).EQ.C1) GO TO 200                                      00018110
100    CONTINUE                                                          00018120
       WRITE(PRNTR,9001) C1                                              00018130
9001   FORMAT('0ERROR(FND01) —CANT FIND CELL',I5,' IN CELL ARRAY')       00018140
       STOP                                                              00018150
C                                                                        00018160
C      I1 INDEXES NETS HOOKED TO C1                                      00018170
C      I2 INDEXES CELLS WITHIN NET                                       00018180
C                                                                        00018190
200    GG1=PN(I)                                                         00018200
       GG2=GG1+NN(I)-1                                                   00018210
       NCNDID=0                                                          00018220
       DO 500 I1=GG1,GG2                                                 00018230
        NET=BN(I1)                                                       00018240
        GG3=PC(NET)                                                      00018250
        GG4=GG3+NC(NET)-1                                                00018260
        DO 400 I2=GG3,GG4                                                00018270
         CELLO=BC(I2)                                                    00018280
         IF(CELLO.EQ.C1) GO TO 400                                       00018290
         IF(NCNDID.EQ.0) GO TO 310                                       00018300
```

```
        DO 300 I3=1,NCNDID                                              00018310
         IF(CANDID(I3).EQ.CELLO) GO TO 400                              00018320
300      CONTINUE                                                       00018330
310      NCNDID=NCNDID+1                                                00018340
         CANDID(NCNDID)=CELLO                                           00018350
400     CONTINUE                                                        00018360
500    CONTINUE                                                         00018370
C                                                                       00018380
C      ALL CANDIDATES NOW IN CANDID ARRAY                               00018390
C                                                                       00018400
       WRITE(PRNTR,7001) C1,W1,L1                                       00018410
7001   FORMAT('0',12X,'CELL TO BE COMBINED =',I5,                       00018420
     & ' WIDTH =',I5,' # NETS =',I5)                                    00018430
       WRITE(PRNTR,7002)                                                00018440
7002   FORMAT('0',71(1H#)/1X,'DELTA METAL',4X,                          00018450
     & 'CAND. WIDTH',4X,'CAND. NETS',4X,'NETS IF COMB.',                00018460
     & 4X,'CANDIDATE'/)                                                 00018470
       ZN4=1.0E6                                                        00018480
       DO 10000 I=1,NCNDID                                              00018490
C                                                                       00018500
C       C6 IS CURRENT CANDIDATE                                         00018510
C                                                                       00018520
        C6=CANDID(I)                                                    00018530
C                                                                       00018540
C       ZERO NUMBER TYPE 3,4 NETS FOR THIS C6                           00018550
C                                                                       00018560
        Z3=0.                                                           00018570
        Z4=0.                                                           00018580
C                                                                       00018590
C       LOOKUP C6 IN CELL ARRAY                                         00018600
C                                                                       00018610
        DO 600 I1=1,MXCELS                                              00018620
         IF(CELL(I1).EQ.C6) GO TO 620                                   00018630
600     CONTINUE                                                        00018640
        WRITE(PRNTR,9001) C6                                            00018650
        STOP                                                            00018660
620    DO 621 J1=1,MXCELS                                               00018670
        CC=W(J1)/10**6                                                  00018680
        IF(CC.EQ.C6) GO TO 622                                          00018690
621    CONTINUE                                                         00018700
       WRITE(PRNTR,7010) C6                                             00018710
7010   FORMAT('0ERROR(FND02) --CANT FIND WIDTH FOR CELL',I5)            00018720
       STOP                                                             00018730
622    W6=(W(J1)-CC*10**6)                                              00018740
       IF(W6.EQ.0) GO TO 10000                                          00018750
        L6=NN(I1)+NBP(C6)                                               00018760
C                                                                       00018770
C       FIND NETS FOR C6                                                00018780
C                                                                       00018790
        GG1=PN(I1)                                                      00018800
        GG2=GG1+NN(I1)-1                                                00018810
        DO 700 I2=GG1,GG2                                               00018820
```

```
      NET=BN(I2)                                                        00018830
C                                                                       00018840
C     SEE IF C1 IS IN THIS NET                                          00018850
C                                                                       00018860
      GG3=PC(NET)                                                       00018870
      GG4=GG3+NC(NET)-1                                                 00018880
      DO 650 I3=GG3,GG4                                                 00018890
       IF((BC(I3).EQ.C1).AND.(NC(I3).EQ.2)) Z3=Z3+1.                    00018900
       IF((BC(I3).EQ.C1).AND.(NC(I3).NE.2)) Z4=Z4+1.                    00018910
650   CONTINUE                                                          00018920
700   CONTINUE                                                          00018930
C                                                                       00018940
C     SET W7= WIDTH IF COMBINED                                         00018950
C                                                                       00018960
      W7=W1+W6                                                          00018970
C                                                                       00018980
C     SET L7= # NETS IF COMBINED                                        00018990
C                                                                       00019000
      L7=L1+L6-2*IFIX(Z3+.5)-IFIX(Z4+.5)                                00019010
C                                                                       00019020
C     ZE7= EFFECTIVE EDGE IF COMBINED                                   00019030
C                                                                       00019040
      ZE7=SQRT(FLOAT(W7))                                               00019050
C                                                                       00019060
C     ZE1,ZE6= EFFECTIVE EDGE C1,C2                                     00019070
C                                                                       00019080
      ZE1=SQRT(FLOAT(W1))                                               00019090
      ZE6=SQRT(FLOAT(W6))                                               00019100
C                                                                       00019110
C     COMPUTE ZM8 = DELTA METAL                                         00019120
C                                                                       00019130
      ZM8=ZE1*(Z3+Z4)/2.+ZE6*(Z3+Z4/2.)                                 00019140
      ZM8=ZM8+ZE7*FLOAT(L7)-ZE1*FLOAT(L1)-ZE6*FLOAT(L6)                 00019150
C                                                                       00019160
C     COMPUTE CELL METAL IF COMBINED                                    00019170
C                                                                       00019180
      ZM7=ZE1*FLOAT(L1)+ZE6*FLOAT(L6)+ZM8                               00019190
      WRITE(PRNTR,7003) ZM8,W6,L6,L7,C6                                 00019200
7003  FORMAT(1X,F9.4,9X,I5,9X,I5,10X,I5,11X,I5)                         00019210
C                                                                       00019220
C     SEE IF THIS IS THE BEST SO FAR                                    00019230
C                                                                       00019240
      IF(ZM8.GE.ZM4) GO TO 10000                                        00019250
C                                                                       00019260
C     IT IS-- UPDATE BEST RECORD                                        00019270
C                                                                       00019280
      ZM4=ZM8                                                           00019290
      ZM3=ZM7                                                           00019300
      C2=C6                                                             00019310
      W2=W6                                                             00019320
      ZM2=ZE6*FLOAT(L6)                                                 00019330
10000 CONTINUE                                                          00019340
```

```
      ZM9=ZM9+ZM4                                                       00019350
      ZP1=0.                                                            00019360
      ZP2=0.                                                            00019370
      ZP3=0.                                                            00019380
      KVC1=W1+W2                                                        00019390
      IF(KVC1.NE.0) ZP3=ZM3/FLOAT(W1+W2)                                00019400
      IF(W1.NE.0) ZP1=ZE1*FLOAT(L1)/FLOAT(W1)                           00019410
      IF(W2.NE.0) ZP2=ZM2/FLOAT(W2)                                     00019420
      ZP9=ZM9/FLOAT(W9)                                                 00019430
      WRITE(PRNTR,7004) ZP3,ZP1,ZP2,ZP9,ZM4,W1,W2                       00019440
7004  FORMAT('0','D3=',F4.1,' D1=',F4.1,' D2=',F4.1,                    00019450
     & ' DT=',F4.1,' NEW METAL= +',F4.0,' A1=',I4,' A2=',I4)            00019460
      RETURN                                                            00019470
      END                                                               00019480
      SUBROUTINE REDO(C1,C2,COMP,FLG1,IX,W1,W2,WB)                      00019490
C                                                                       00019500
C                                                                       00019510
C                                                                       00019520
C******   REDO SUBROUTINE  IF COMP IS RETURNED OTHER                   00019530
C       THAN 500 ARRY NC AND BC ARE REDONE.                             00019540
C                                                                       00019550
C                                                                       00019560
C                                                                       00019570
      IMPLICIT INTEGER(A-Y)                                             00019580
      COMMON /CLSDTA/ CHR(700,3),TRACE(700,2),TRACK                     00019590
      COMMON TEMP(100),BANK(100),REG(1000),NC(500),                     00019600
     & PC(500),BC(3000),CELL(1000),NN(1000),PN(1000),BN(3000),W(1000)   00019610
     &,QQ(101),NBP(1700)                                                00019620
      COMMON /GLBL/ PRN  ,RDR,NCELLS,NNETS,NPADS,DEBUG                  00019630
     & ,MXCELS,MXNETS,XXX(8)                                            00019640
      COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)         00019650
C                                                                       00019660
C   ASSIGNGS WEIGTHS TO CELLS                                           00019670
C                                                                       00019680
      FLGW=0                                                            00019690
      DO 232 I=1,MXCELS                                                 00019700
       GG1=W(I)/10**6                                                   00019710
       IF(GG1.EQ.0) GO TO 233                                           00019720
       IF(GG1.EQ.C1) GO TO 234                                          00019730
       IF(GG1.EQ.C2) GO TO 236                                          00019740
       GO TO 232                                                        00019750
234    W1=(W(I)-GG1*10**6)                                              00019760
       GO TO 237                                                        00019770
236    W2=(W(I)-GG1*10**6)                                              00019780
237    FLGW=FLGW+1                                                      00019790
       IF(FLGW.EQ.2) GO TO 238                                          00019800
232   CONTINUE                                                          00019810
233   WRITE(PRNTR,8011)                                                 00019820
8011  FORMAT('0ERROR(REDO1) --CELLS NOT FOUND IN REDO FOR WEIGHTS')     00019830
      STOP                                                              00019840
C                                                                       00019850
C  **** DEFINES WIDTH OF CELLS  ******                                  00019860
```

```
238   DO 231 I =1,MXCELS                                                    00019870
       IF(W(I).EQ.0) GO TO 239                                              00019880
       GG1=W(I)/10**6                                                       00019890
       IF((GG1.EQ.C1).OR.(GG1.EQ.C2)) GO TO 246                             00019900
231   CONTINUE                                                              00019910
      WRITE(PRNTR,8012)                                                     00019920
8012  FORMAT(' ERROR(REDO2) -- IN WIDTH ARRAY,CELL C1 OR C2 NOT FOUND')     00019930
      STOP                                                                  00019940
246   WB=W1+W2                                                              00019950
      W(I)=(COMP*10**6)+WB                                                  00019960
C                                                                           00019970
C  COMBINES THE THREE CELLS INTO ONE WORD(COMP,C1,C2)                       00019980
C                                                                           00019990
239   CHR(IX,1)=COMP                                                        00020000
      CHR(IX,2)=C1                                                          00020010
      CHR(IX,3)=C2                                                          00020020
      WRITE(PRNTR,2177) COMP,C1,C2,WB                                       00020030
2177  FORMAT(13X,'CELL ',I4,' REPLACES ',I4,' & ',I4,10X,                   00020040
     & 'WIDTH =',I4)                                                        00020050
      IX=IX+1                                                               00020060
      CHR(IX,1)=0                                                           00020070
      CHR(IX,2)=0                                                           00020080
      CHR(IX,3)=0                                                           00020090
      DO 235 I=1,MXNETS                                                     00020100
       IF(NC(I).EQ.1) GO TO 235                                             00020110
       IF(NC(I).EQ.0) GO TO 260                                             00020120
       INUM=0                                                               00020130
       0027=PC(I)                                                           00020140
       0014=0027+NC(I)-1                                                    00020150
       0015=0014-1                                                          00020160
       DO 240 J=0027,0014                                                   00020170
283     IF((BC(J).NE.C1).AND.(BC(J).NE.C2)) GO TO 240                       00020180
        INUM=INUM+1                                                         00020190
        IF(INUM.EQ.2)GO TO 255                                              00020200
        DO 265 LL=J,0015                                                    00020210
         BC(LL)=BC(LL+1)                                                    00020220
265     CONTINUE                                                            00020230
        BC(0014)=COMP                                                       00020240
        GO TO 283                                                           00020250
240    CONTINUE                                                             00020260
       GO TO 235                                                            00020270
C      THIS PART MOVES ALL BC ARRY UP ONE POSITION I.  THAT NET             00020280
C      AND ASSIGNS -1-TO LAST POSITION.                                     00020290
255    0017=PC(I)+NC(I)-1                                                   00020300
       DO 272 K=J,0017                                                      00020310
        IF(K.EQ.0017) GO TO 271                                             00020320
        BC(K)=BC(K+1)                                                       00020330
        GO TO 272                                                           00020340
271     BC(K)=-1                                                            00020350
272    CONTINUE                                                             00020360
       NC(I)=NC(I)-1                                                        00020370
       IF(NC(I).NE.1)GO TO 235                                              00020380
```

```
       TRACE(TRACK,1)=COMP                                                    00020390
       TRACE(TRACK,2)=I                                                       00020400
       WRITE(PRNTR,1001) NETNOS(TRACE(TRACK,2))                               00020410
1001   FORMAT(13X,'NET ',I4,' ABSORBED ')                                     00020420
       TRACK=TRACK+1                                                          00020430
       TRACE(TRACK,1)=0                                                       00020440
       TRACE(TRACK,2)=0                                                       00020450
235    CONTINUE                                                               00020460
      WRITE(PRNTR,8013)                                                       00020470
8013  FORMAT(' ERROR(RED03) --0 NOT FOUND AT END OF NC ARRAY')                00020480
      STOP                                                                    00020490
260   CALL POINT2(FLG1)                                                       00020500
C ***** RETURNES TO REORG                                                     00020510
      RETURN                                                                  00020520
      END                                                                     00020530
      SUBROUTINE RDNETS(TYPE,ITEM,ITEM2,CARD,CHAR)                            00020540
C                                                                             00020550
C*************************************************                            00020560
C                                                                             00020570
C                                                                             00020580
C     RDNETS--INPUTS NET LISTS                                                00020590
C                                                                             00020600
C                                                                             00020610
C*************************************************                            00020620
C                                                                             00020630
C                                                                             00020640
      IMPLICIT INTEGER (A-Y)                                                  00020650
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                        00020660
     & ,MXCELS,MXNETS,MXCLNT,XXX(7)                                           00020670
      COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)               00020680
      COMMON TEMP(100)                                                        00020690
      INTEGER CARD(73)                                                        00020700
      LOGICAL FLAG,TRUE/.TRUE./,FALSE/.FALSE./                                00020710
      IEFILE =12                                                              00020720
      NETPNT=1                                                                00020730
      NNETS=0                                                                 00020740
C                                                                             00020750
C     SET UP NETNOS ARRAY WITH -1'S                                           00020760
C                                                                             00020770
      DO 11000 I=1,MXNETS                                                     00020780
       NETNOS(I)=-1                                                           00020790
11000 CONTINUE                                                                00020800
C                                                                             00020810
C     INITIALIZE CHAR TO FORCE NEW CARD                                       00020820
C                                                                             00020830
      CHAR=73                                                                 00020840
      NET=1                                                                   00020850
100   CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                                  00020860
      IF(TYPE.EQ.4) GO TO 100                                                 00020870
      IF(TYPE.NE.3) GO TO 1000                                                00020880
C                                                                             00020890
C     GOT A NET NUMBER                                                        00020900
```

```
C                                                                       00020910
      IF(NET.LT.MXNETS) GO TO 105                                       00020920
      WRITE(PRNTR,7001) MXNETS                                          00020930
7001  FORMAT( OERROR(RDNO1) —MAX NET COUNT (',I4,' ) EXCEEDED')         00020940
      STOP                                                              00020950
105   NETNOS(NET)=ITEM                                                  00020960
      RHETT=0                                                           00020970
      BUTLER=-5                                                         00020980
      WRITE(IEFILE,8001) RHETT,BUTLER                                   00020990
      WRITE(IEFILE,8001) ITEM,RHETT                                     00021000
8001  FORMAT(2(I12))                                                    00021010
      NET=NET+1                                                         00021020
C                                                                       00021030
C     SEE IF THIS IS CONTINUATION OF LAST NET                           00021040
C                                                                       00021050
      IF(NET.EQ.2) GO TO 110                                            00021060
      LNC1=NET-2                                                        00021070
      IF(ITEM.NE.NETNOS(LNC1)) GO TO 110                                00021080
      NET=NET-1                                                         00021090
      NETPNT=NETPNT-1                                                   00021100
110   CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00021110
      IF(TYPE.EQ.3) GO TO 120                                           00021120
      IF(TYPE.NE.4) GO TO 1000                                          00021130
C                                                                       00021140
C     END OF CURRENT NET                                                00021150
C                                                                       00021160
115   NETS(NETPNT)=0                                                    00021170
      NETPNT=NETPNT+1                                                   00021180
      GO TO 100                                                         00021190
120   CONTINUE                                                          00021200
      IF(NETPNT.LT.5000) GO TO 125                                      00021210
      FIVEK=5000                                                        00021220
      WRITE(PRNTR,7002) FIVEK                                           00021230
7002  FORMAT('OERROR(RDNO2) —MAX CELL-NET COUNT (',I4,                  00021240
     & ' ) EXCEEDED ON NET ENTRY')                                      00021250
      STOP                                                              00021260
C                                                                       00021270
C     GOT A CELL NUMBER                                                 00021280
C                                                                       00021290
125   NETS(NETPNT)=ITEM                                                 00021300
      CELNUM=ITEM                                                       00021310
      NETPNT=NETPNT+1                                                   00021320
      CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00021330
C                                                                       00021340
C     IGNORE PIN NUMBER                                                 00021350
C                                                                       00021360
      WRITE(IEFILE,8001) CELNUM,ITEM                                    00021370
      IF(TYPE.EQ.3) GO TO 110                                           00021380
      WRITE(PRNTR,130) ITEM                                             00021390
130   FORMAT('OWARNING(RDNO1) — EXPECTED PIN # — DATA WAS ',I5,         00021400
     & 'NET END ASSUMED')                                               00021410
      GO TO 115                                                         00021420
```

```
1000  CONTINUE                                                          00021430
C                                                                       00021440
C     ALL DONE--WRITE END SYMBOL AND RETURN                             00021450
C                                                                       00021460
      NETS(NETPNT)=-1                                                   00021470
      IF(DEBUG.EQ.0) GO TO 1200                                         00021480
      WRITE(PRNTR,1010)                                                 00021490
1010  FORMAT('0',20X,'STORED DATA')                                     00021500
      J=0                                                               00021510
      COUNT=20                                                          00021520
1050  CONTINUE                                                          00021530
      K=J+COUNT                                                         00021540
      IF(K.GT.NETPNT) COUNT=NETPNT-J                                    00021550
      WRITE(PRNTR,1100) (NETS(I+J),I=1,COUNT)                           00021560
1100  FORMAT(' ',20X,50(I4))                                            00021570
      J=J+COUNT                                                         00021580
      IF(J.LT.NETPNT) GO TO 1050                                        00021590
1200  CONTINUE                                                          00021600
      WRITE(PRNTR,2001)                                                 00021610
2001  FORMAT('0',20X,'NET LISTS')                                       00021620
      NET=1                                                             00021630
      FLAG=TRUE                                                         00021640
      I=1                                                               00021650
2000  00=I+8                                                            00021660
      0099=00                                                           00021670
      001=I+8                                                           00021680
      DO 2002 J=I,0099                                                  00021690
       IF(NETS(J).EQ.-1  GO TO 2010                                     00021700
       IF(NETS(J).NE.0) GO TO 2002                                      00021710
       00=J-1                                                           00021720
       001=J                                                            00021730
       GO TO 2003                                                       00021740
2002  CONTINUE                                                          00021750
2003  CONTINUE                                                          00021760
      IF(.NOT.FLAG) GO TO 2005                                          00021770
      WRITE(PRNTR,2006) NETNOS(NET),(NETS(K),K=I,00)                    00021780
2006  FORMAT('0',20X,'NET',I4,5X,18(I4))                                00021790
      NET=NET+1                                                         00021800
      GO TO 2008                                                        00021810
2005  WRITE(PRNTR,2007) (NETS(K),K=I,00)                                00021820
2007  FORMAT(' ',32X,18(I4))                                            00021830
2008  FLAG=FALSE                                                        00021840
      IF(001.NE.00) FLAG=TRUE                                           00021850
      I=001+1                                                           00021860
      GO TO 2000                                                        00021870
2010  CONTINUE                                                          00021880
      RETURN                                                            00021890
      END                                                               00021900
      SUBROUTINE GTCELS(TYPE,ITEM,ITEM2,CARD,CHAR)                      00021910
C                                                                       00021920
C*****************************************************               00021930
C                                                                       00021940
```

```
C                                                                       00021950
C     GTCELS -- READS GATE DEFINITION DATA, FINDS                       00021960
C               CELL WIDTHS FROM STARLB FILE                            00021970
C                                                                       00021980
C                                                                       00021990
C*****************************************************                  00022000
C                                                                       00022010
      IMPLICIT INTEGER (A-Y)                                            00022020
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,          00022030
     & MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,XXX(4)                        00022040
      COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)         00022050
      INTEGER CARD(73)                                                  00022060
      IEFILE=12                                                         00022070
C                                                                       00022080
C     FORCE NEW INPUT RECORD                                            00022090
C                                                                       00022100
      CHAR=73                                                           00022110
      NPADS=0                                                           00022120
C                                                                       00022130
C     CLEAR WIDTH ARRAY                                                 00022140
C                                                                       00022150
      DO 20 I=1,MXCELS                                                  00022160
       WID(I)=0                                                         00022170
20    CONTINUE                                                          00022180
100   CONTINUE                                                          00022190
C                                                                       00022200
C     READ CELL #                                                       00022210
C                                                                       00022220
      CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00022230
      IF(TYPE.EQ.4) GO TO 100                                           00022240
C                                                                       00022250
C     JUMP OUT IF END OF DATA                                           00022260
C                                                                       00022270
      IF(TYPE.NE.3) GO TO 1000                                          00022280
C                                                                       00022290
C     THIS IS A CELL NUMBER                                             00022300
C                                                                       00022310
      CELL = ITEM                                                       00022320
      IF(CELL.LT.MXCELS) GO TO 110                                      00022330
      WRITE(PRNTR,7001) CELL,MXCELS                                     00022340
7001  FORMAT('0ERROR(GTC01) --CELL NUMBER TOO LARGE-- NUMBER IS',I5,    00022350
     & ' ---MAX IS',I4)                                                 00022360
      STOP                                                              00022370
C                                                                       00022380
C     GET TYPE #                                                        00022390
C                                                                       00022400
110   CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00022410
      IF(TYPE.EQ.4) GO TO 110                                           00022420
      IF(TYPE.EQ.3) GO TO 130                                           00022430
      WRITE(PRNTR,120) ITEM                                             00022440
120   FORMAT('0WARNING(GTC01) --EXPECTED CELL TYPE # -- DATA WAS ',     00022450
     &A4,' --TYPE LIST END ASSUMED')                                    00022460
```

```
      GO TO 1000                                                        00022470
130   CONTINUE                                                          00022480
C                                                                       00022490
C     THIS IS A TYPE NUMBER                                             00022500
C                                                                       00022510
      TYPENO=ITEM                                                       00022520
      WRITE(IEFILE,8001) CELL,TYPENO                                    00022530
8001  FORMAT(2(I12))                                                    00022540
      IF(ITEM.LT.7000) GO TO 140                                        00022550
C                                                                       00022560
C     THIS IS A PAD                                                     00022570
C                                                                       00022580
      NPADS=NPADS+1                                                     00022590
      MXPDS=MXPADS-2                                                    00022600
      IF(NPADS.LT.MXPDS) GO TO 132                                      00022610
      WRITE(PRNTR,7000) MXPDS                                           00022620
7000  FORMAT('0ERROR(GTC02) -- TOO MANY PADS SPECIFIED -- MAX IS ',I4)  00022630
      STOP                                                              00022640
132   CONTINUE                                                          00022650
      PAD(NPADS)=CELL                                                   00022660
      WRITE(PRNTR,135) CELL,TYPENO                                      00022670
135   FORMAT('0',20X,'PAD ',I4,10X,'TYPE ',I4)                          00022680
      GO TO 100                                                         00022690
140   CONTINUE                                                          00022700
C                                                                       00022710
C     THIS IS A CELL -- SEARCH STARLB FOR TYPE #                        00022720
C                                                                       00022730
      READ(14,150,END=200) X,Y                                          00022740
150   FORMAT(2I4)                                                       00022750
      IF(X.NE.TYPENO) GO TO 140                                         00022760
C                                                                       00022770
C     FOUND TYPE # -- LOAD CELL WIDTH                                   00022780
C                                                                       00022790
      WID(CELL)=Y                                                       00022800
      WRITE(PRNTR,155) CELL,TYPENO,Y                                    00022810
155   FORMAT('0',20X,'CELL ',I4,10X,'TYPE ',I4,10X,'WIDTH ',I4)         00022820
      REWIND 14                                                         00022830
      GO TO 100                                                         00022840
200   CONTINUE                                                          00022850
C                                                                       00022860
C     CELL TYPE NOT FOUND -- SET WIDTH TO 1                             00022870
C                                                                       00022880
      WID(CELL)=1                                                       00022890
      WRITE(PRNTR,205) CELL,TYPENO                                      00022900
205   FORMAT('0',20X,'CELL ',I4,10X,'TYPE ',I4,10X,                     00022910
     & 'WIDTH NOT FOUND -- (SET TO 1)')                                 00022920
      REWIND 14                                                         00022930
      GO TO 100                                                         00022940
1000  CONTINUE                                                          00022950
C                                                                       00022960
C     NORMAL EXIT                                                       00022970
C                                                                       00022980
```

```
      PAD(NPADS+1)=0                                                    00022990
      PAD(NPADS+2)=-1                                                   00023000
      RETURN                                                            00023010
      END                                                               00023020
      SUBROUTINE GTORD(TYPE,ITEM,ITEM2,CARD,CHAR)                       00023030
C                                                                       00023040
C*****************************************************                00023050
C                                                                       00023060
C                                                                       00023070
C     GTORD -- READS LINEAR ORDER FROM INPUT DATA                       00023080
C                                                                       00023090
C                                                                       00023100
C*****************************************************                00023110
C                                                                       00023120
      IMPLICIT INTEGER (A-Y)                                            00023130
      COMMON /GLBL/ PRNTR,XXX(15)                                       00023140
      COMMON /LINDTA/ L(1000)                                           00023150
      INTEGER CARD(73)                                                  00023160
C                                                                       00023170
C                                                                       00023180
      WRITE(PRNTR,100)                                                  00023190
100   FORMAT('0',12X,'LINEAR ORDER ENTRY')                              00023200
      CHAR=73                                                           00023210
      LOPNT=1                                                           00023220
110   CONTINUE                                                          00023230
C                                                                       00023240
C     GET CELL #                                                        00023250
C                                                                       00023260
      CALL GTITEM(TYPE,ITEM,ITEM2,CARD,CHAR)                            00023270
      IF (TYPE.EQ.4) GO TO 110                                          00023280
      IF(TYPE.NE.3) GO TO 1000                                          00023290
C                                                                       00023300
C     ADD CELL TO LINEAR LIST                                           00023310
C                                                                       00023320
      L(LOPNT)=ITEM                                                     00023330
      LOPNT=LOPNT+1                                                     00023340
      WRITE(PRNTR,150)ITEM                                              00023350
150   FORMAT('0',15X,I4)                                                00023360
      GO TO 110                                                         00023370
1000  L(LOPNT)=0                                                        00023380
      LOPNT=LOPNT+1                                                     00023390
      L(LOPNT)=-1                                                       00023400
      RETURN                                                            00023410
      END                                                               00023420
      SUBROUTINE LINEUP                                                 00023430
C                                                                       00023440
C*****************************************************                00023450
C                                                                       00023460
C                                                                       00023470
C     LINEUP--USES FLIP FLOP TECHNIQUE TO FORM                          00023480
C             LINEAR ORDERING OF CELLS                                  00023490
C                                                                       00023500
```

```
C                                                                       00023510
C*****************************************************                  00023520
C                                                                       00023530
      IMPLICIT INTEGER (A-Y)                                            00023540
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                  00023550
     & ,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL                00023560
     & ,MXROWS,MXCOLS,MXDFSZ                                            00023570
      COMMON /CLSDTA/ CHR(700,3),TRACK(700,2),TTTTTT                    00023580
      COMMON /LINDTA/ L(1000)                                           00023590
      COMMON/CLNET/CLNTS(5000),LSTCEL,FRSCLU                            00023600
      COMMON UPNET(3000),DWNNET(3000),A(20),B(20)                       00023610
      COMMON /HEADER/ CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2           00023620
C                                                                       00023630
C     PRINT HEADER                                                      00023640
C                                                                       00023650
      WRITE(PRNTR,99999) CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2        00023660
99999 FORMAT('1',40(1H*),' CAPSTAR F ',2A4,' V.',A4,' REV.',A4,         00023670
     & 5X,'NETWORK - ',2A4,5X,'STEP - LINEAR ORDERING')                 00023680
C                                                                       00023690
C     FIND HIGHEST-NUMBERED CLUSTER FORMED                              00023700
C                                                                       00023710
      DO 10094 I=1,MXCLUS                                               00023720
       IF(CHR(I,1).EQ.0) GO TO 10096                                    00023730
10094 CONTINUE                                                          00023740
      WRITE(PRNTR,1001)                                                 00023750
1001  FORMAT('0ERROR(LIN01) -- 0 NOT FOUND AT END OF CHR')              00023760
      STOP                                                              00023770
10096 C=CHR(I-1,1)                                                      00023780
C                                                                       00023790
C     FIND CONSTITUENTS OF THIS CLUSTER (C1,C2)                         00023800
C                                                                       00023810
      C1=CHR(I-1,2)                                                     00023820
      C2=CHR(I-1,3)                                                     00023830
C                                                                       00023840
C     PUT C1,C2 IN LINEAR ORDER                                         00023850
C                                                                       00023860
      L(1)=C1                                                           00023870
      L(2)=C2                                                           00023880
      L(3)=0                                                            00023890
C                                                                       00023900
C********  MAIN LOOP  **************                                   00023910
10200 CONTINUE                                                          00023920
C     FIND HIGHEST-NUMBERED CELL IN ORDER                               00023930
C                                                                       00023940
      J=1                                                               00023950
      DO 10250 I=1,MXCELS                                               00023960
       GG=L(I)                                                          00023970
       IF(GG.EQ.0) GO TO 10252                                          00023980
       IF(GG.GT.L(J)) J=I                                               00023990
10250 CONTINUE                                                          00024000
      WRITE(PRNTR,1002)                                                 00024010
1002  FORMAT('0ERROR(LIN02) -- 0 NOT FOUND AT END OF L ARRAY')          00024020
```

```
      STOP                                                              00024030
10252 CONTINUE                                                          00024040
      C=L(J)                                                            00024050
C                                                                       00024060
C     IF HIGHEST-NUMBERED CELL IS NOT CLUSTER, ALL DONE                 00024070
C                                                                       00024080
      IF(C.LT.1000) GO TO 11000                                         00024090
      REP=J                                                             00024100
C                                                                       00024110
C     FIND CONSTITUENTS OF THIS CLUSTER                                 00024120
C                                                                       00024130
      II=C-1000                                                         00024140
      IF(CHR(II,1).EQ.C) GO TO 16020                                    00024150
      WRITE(PRNTR,1003) C                                               00024160
1003  FORMAT('0ERROR(LIN03) -- CANT FIND CELL ',I4,' IN CHR')           00024170
      STOP                                                              00024180
16020 C1=CHR(II,2)                                                      00024190
      C2=CHR(II,3)                                                      00024200
C                                                                       00024210
C                                                                       00024220
C***********  FORM UPNETS, DWNNETS  ***************                   00024230
C                                                                       00024240
C                                                                       00024250
C     ZERO OUT UPNET, DWNNET ARRAYS                                     00024260
C                                                                       00024270
      DO 17005 00=1,MXCLNT                                              00024280
       UPNET(00)=0                                                      00024290
       DWNNET(00)=0                                                     00024300
17005 CONTINUE                                                          00024310
C                                                                       00024320
C     FORM UPNETS                                                       00024330
C                                                                       00024340
C     IF CELL AT POSITION 1, NO UPNETS                                  00024350
C                                                                       00024360
      IF(J.EQ.1) GO TO 17100                                            00024370
C                                                                       00024380
C        FOR EACH CELL TO LEFT OF TARGET, ADD NETS TO UPNET             00024390
C                                                                       00024400
      00=J-1                                                            00024410
      DO 17070 I1=1,00                                                  00024420
       CELL=L(I1)                                                       00024430
       J1=LSTCEL                                                        00024440
       IF(CELL.LT.1000) J1=FRSCLU-1                                     00024450
17040  001=CLNTS(J1)/1000                                               00024460
       IF(001.EQ.CELL) GO TO 17050                                      00024470
       J1=J1-1                                                          00024480
       IF(J1.NE.0) GO TO 17040                                          00024490
       WRITE(PRNTR,100) CELL                                            00024500
100    FORMAT('0ERROR(LIN04) --CANT FIND CELL ',I4,' FOR UPNETS')       00024510
       STOP                                                             00024520
17050  A7=CLNTS(J1)-(001*1000)                                          00024530
       UPNET(A7)=A7                                                     00024540
```

```
      J1=J1-1                                                          00024550
      001=CLNTS(J1)/1000                                               00024560
      IF(001.EQ.CELL) GO TO 17050                                      00024570
17070 CONTINUE                                                         00024580
17100 00=J+1                                                           00024590
      IF(L(00).EQ.0) GO TO 17180                                       00024600
C                                                                      00024610
C     FOR EACH CELL TO RIGHT OF TARGET, ADD NETS TO DWNNET             00024620
C                                                                      00024630
      DO 17170 I2=00,MXCELS                                            00024640
      CELL=L(I2)                                                       00024650
      IF(CELL.EQ.0) GO TO 17180                                        00024660
      J2=LSTCEL                                                        00024670
      IF(CELL.LT.1000) J2=FRSCLU-1                                     00024680
17140 002=CLNTS(J2)/1000                                               00024690
      IF(002.EQ.CELL) GO TO 17150                                      00024700
      J2=J2-1                                                          00024710
      IF(J2.GT.0) GO TO 17140                                          00024720
      WRITE(PRNTR,200) CELL                                            00024730
200   FORMAT('0ERROR(LIN05) --CANT FIND CELL ',I4,' FOR DWNNETS')      00024740
      STOP                                                             00024750
17150 B7=CLNTS(J2)-(002*1000)                                          00024760
      DWNNET(B7)=B7                                                    00024770
      J2=J2-1                                                          00024780
      002=CLNTS(J2)/1000                                               00024790
      IF(002.EQ.CELL) GO TO 17150                                      00024800
17170 CONTINUE                                                         00024810
17180 CONTINUE                                                         00024820
C                                                                      00024830
C     FORM LIST OF NETS THAT C1 IS IN (A ARRAY)                        00024840
C     AND LIST OF NETS THAT C2 IS IN (B ARRAY)                         00024850
C                                                                      00024860
C                                                                      00024870
      LA=0                                                             00024880
      LB=0                                                             00024890
      I3=0                                                             00024900
      IF(C1.GE.1000) I3=FRSCLU-1                                       00024910
10310 I3=I3+1                                                          00024920
      00=CLNTS(I3)/1000                                                00024930
      IF(00.NE.C1) GO TO 10310                                         00024940
10320 LA=LA+1                                                          00024950
      A(LA)=CLNTS(I3)-(00*1000)                                        00024960
      I3=I3+1                                                          00024970
      00=CLNTS(I3)/1000                                                00024980
      IF(00.EQ.C1) GO TO 10320                                         00024990
      J3=0                                                             00025000
      IF(C2.GE.1000) J3=FRSCLU-1                                       00025010
10330 J3=J3+1                                                          00025020
      00=CLNTS(J3)/1000                                                00025030
      IF(00.NE.C2) GO TO 10330                                         00025040
10340 LB=LB+1                                                          00025050
      B(LB)=CLNTS(J3)-(00*1000)                                        00025060
```

```
      J3=J3+1                                                          00025070
      00=CLNTS(J3)/1000                                                00025080
      IF(00.EQ.C2) GO TO 10340                                         00025090
C                                                                      00025100
C                                                                      00025110
C     COMPUTE J1, J2                                                   00025120
C                                                                      00025130
C                                                                      00025140
      J1=0                                                             00025150
      J2=0                                                             00025160
      DO 10510 IA1=1,LA                                                00025170
       AA=A(IA1)                                                       00025180
       IF(UPNET(AA).EQ.AA) J1=J1+1                                     00025190
       IF(DWNNET(AA).EQ.AA) J1=J1-1                                    00025200
10510 CONTINUE                                                         00025210
      DO 10620 JA1=1,LB                                                00025220
       BB=B(JA1)                                                       00025230
       IF(UPNET(BB).EQ.BB) J2=J2+1                                     00025240
       IF(DWNNET(BB).EQ.BB) J2=J2-1                                    00025250
10620 CONTINUE                                                         00025260
C                                                                      0002527U
C                                                                      00025280
C     USE J1, J2 TO GET C1, C2 ORDERING                                00025290
C                                                                      00025300
C                                                                      00025310
      IF(J1.GE.J2) GO TO 10730                                         00025320
      T=C2                                                             00025330
      C2=C1                                                            00025340
      C1=T                                                             00025350
C                                                                      00025360
C                                                                      00025370
C     REPLACE EXPANDED CLUSTER WITH C1, C2                             00025380
C                                                                      00025390
C                                                                      00025400
10730 L(REP)=C1                                                        00025410
      T1=L(REP+1)                                                      00025420
      L(REP+1)=C2                                                      00025430
      00=REP+2                                                         00025440
      DO 10770 IB1=00,MXCELS                                           00025450
       001=L(IB1)                                                      00025460
       IF(001.NE.0) GO TO 10760                                        00025470
       L(IB1)=T1                                                       00025480
       L(IB1+1)=0                                                      00025490
       GO TO 10200                                                     00025500
10760  T2=L(IB1)                                                       00025510
       L(IB1)=T1                                                       00025520
       T1=T2                                                           00025530
10770 CONTINUE                                                         00025540
      GO TO 10200                                                      00025550
C                                                                      00025560
C                                                                      00025570
C     OUTPUT RESULTS                                                   00025580
```

```
C                                                                       00025590
11000 CONTINUE                                                          00025600
      WRITE(PRNTR,700)                                                  00025610
700   FORMAT('0',20X,'LINEAR ORDER')                                    00025620
      I=0                                                               00025630
11001 00=L(I+1)                                                         00025640
      IF(00.EQ.0) GO TO 20000                                           00025650
      001=I+1                                                           00025660
      002=I+15                                                          00025670
      003=002                                                           00025680
      DO 11005 J=001,002                                                00025690
       IF(L(J).NE.0) GO TO 11005                                        00025700
       003=J-1                                                          00025710
       GO TO 11006                                                      00025720
11005 CONTINUE                                                          00025730
11006 CONTINUE                                                          00025740
      WRITE(PRNTR,710) (L(J),J=001,003)                                 00025750
710   FORMAT('0',15(I4))                                                00025760
      IF(003.NE.002) GO TO 20000                                        00025770
      I=I+15                                                            00025780
      GO TO 11001                                                       00025790
20000 CONTINUE                                                          00025800
      L(003+2)=-1                                                       00025810
      RETURN                                                            00025820
      END                                                               00025830
      SUBROUTINE WIRCRS                                                 00025840
C                                                                       00025850
C*****************************************************                  00025860
C                                                                       00025870
C                                                                       00025880
C     WIRCRS-- IMPLEMENTS WIRCROSSA OUTPUT FOR                          00025890
C              LINEAR ORDER                                             00025900
C                                                                       00025910
C                                                                       00025920
C*****************************************************                  00025930
C                                                                       00025940
      IMPLICIT INTEGER (A-Y)                                            00025950
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,XXX(10)          00025960
      COMMON /LINDTA/ L(1000)                                           00025970
      COMMON /CLNET/ CLNTS(5000),LSTCEL,FRSCLU                          00025980
      COMMON /NETDTA/ NETS(3000),WID(1000),PAD(100),NETNOS(500)         00025990
      COMMON COUNT(500),FWID(1000),OUT(100),OUTTM(500)                  00026000
      COMMON /HEADER/ CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2           00026010
      INTEGER DIGS(12)/'0   ','1   ','2   ','3   ','4   ','5   ',      00026020
     & '6   ','7   ','8   ','9   ','    ','-   '/                      00026030
      LOGICAL STFLG,TRUE/.TRUE./,FALSE/.FALSE./                         00026040
C                                                                       00026050
C     PRINT HEADER                                                      00026060
C                                                                       00026070
      WRITE(PRNTR,99999) CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2        00026080
99999 FORMAT('1',40(1H*),' CAPSTAR F ',2A4,' V.',A4,' REV.',A4,         00026090
     & 5X,'NETWORK - ',2A4,5X,'STEP - WIRECROSS')                       00026100
```

```
C                                                                       00026110
C     LOAD COUNT(I) WITH # CELLS IN NET I                               00026120
C                                                                       00026130
      NOUT=0                                                            00026140
      COUNT(1)=0                                                        00026150
      NETPNT=1                                                          00026160
      I=1                                                               00026170
100   IF(NETS(NETPNT).EQ.-1) GO TO 300                                  00026180
      IF(NETS(NETPNT).EQ.0) GO TO 200                                   00026190
      COUNT(I)=COUNT(I)+1                                               00026200
110   NETPNT=NETPNT+1                                                   00026210
      GO TO 100                                                         00026220
200   I=I+1                                                             00026230
      NETPNT=NETPNT+1                                                   00026240
      COUNT(I)=0                                                        00026250
      GO TO 100                                                         00026260
300   CONTINUE                                                          00026270
C                                                                       00026280
C     LOAD FWID ARRAY WITH CUMULATIVE LINEAR ORDER WIDTHS               00026290
C                                                                       00026300
      FWID(1)=WID(L(1))                                                 00026310
      I=2                                                               00026320
400   IF(L(I).EQ.0) GO TO 450                                           00026330
      FWID(I)=WID(L(I))+FWID(I-1)                                       00026340
      I=I+1                                                             00026350
      GO TO 400                                                         00026360
450   TOTWID=FWID(I-1)                                                  00026370
C                                                                       00026380
C     ZERO OUT ARRAY                                                    00026390
C                                                                       00026400
      DO 550 I=1,100                                                    00026410
       OUT(I)=0                                                         00026420
550   CONTINUE                                                          00026430
C                                                                       00026440
C     MAIN LOOP                                                         00026450
C                                                                       00026460
      LPNT=1                                                            00026470
      CLNTPT=0                                                          00026480
      WRITE(PRNTR,7004)                                                 00026490
7004  FORMAT('0',' FWID RWID CELL')                                     00026500
      WRITE(PRNTR,7001) TOTWID                                          00026510
7001  FORMAT('0','    0',I5)                                            00026520
C                                                                       00026530
C     CHECK FOR END OF LINEAR ORDER                                     00026540
C                                                                       00026550
600   IF(L(LPNT).EQ.0) GO TO 20000                                      00026560
      CLNTPT=0                                                          00026570
C                                                                       00026580
C     FIND NETS FOR THIS CELL                                           00026590
C                                                                       00026600
610   CLNTPT=CLNTPT+1                                                   00026610
      TEST=CLNTS(CLNTPT)/1000                                           00026620
```

```
      IF(TEST.NE.L(LPNT)) GO TO 610                                    00026630
C                                                                      00026640
C     FOUND FIRST NET-- PUT # IN VAR. NET                              00026650
C                                                                      00026660
700   NET=CLNTS(CLNTPT)-TEST*1000                                      00026670
      ZERFLG=0                                                         00026680
C                                                                      00026690
C     IS THIS NET ALREADY IN OUT ARRAY?                                00026700
C                                                                      00026710
      I=1                                                              00026720
705   IF(I.GT.NOUT) GO TO 760                                          00026730
      IF(OUT(I).NE.NET) GO TO 710                                      00026740
C                                                                      00026750
C     ALREADY THERE, DEC. COUNT AND NEXT NET                           00026760
C                                                                      00026770
      OUT(I)=-NET                                                      00026780
      GO TO 780                                                        00026790
710   IF(OUT(I).EQ.0) ZERFLG=1                                         00026800
      I=I+1                                                            00026810
      GO TO 705                                                        00026820
C                                                                      00026830
C     NET NOT THERE--CHECK FOR EMPTY TRACKS                            00026840
C                                                                      00026850
760   IF(ZERFLG.EQ.1) GO TO 765                                        00026860
C                                                                      00026870
C     NO EMPTY TRACKS-- ADD NET TO END                                 00026880
C                                                                      00026890
      OUT(I)=-NET                                                      00026900
      NOUT=NOUT+1                                                      00026910
      GO TO 780                                                        00026920
C                                                                      00026930
C     EMPTY TRACK FOUND--STICK NEW NET IN IT                           00026940
C                                                                      00026950
765   I=0                                                              00026960
770   I=I+1                                                            00026970
      IF(OUT(I).NE.0) GO TO 770                                        00026980
      OUT(I)=-NET                                                      00026990
      ZERFLG=0                                                         00027000
C                                                                      00027010
C     DEC. COUNT FOR THIS NET & WORK ON NEXT ONE                       00027020
C                                                                      00027030
780   COUNT(NET)=COUNT(NET)-1                                          00027040
      CLNTPT=CLNTPT+1                                                  00027050
      TEST=CLNTS(CLNTPT)/1000                                          00027060
      IF(TEST.EQ.L(LPNT)) GO TO 700                                    00027070
C                                                                      00027080
C     NO MORE NETS-- SET UP FOR PRINTOUT                               00027090
C                                                                      00027100
      RWID=TOTWID-WID(LPNT)                                            00027110
      TMPNT=1                                                          00027120
      DO 900 I=1,NOUT                                                  00027130
       TMPTTS=TMPNT+5                                                  00027140
```

```
      DUM=11                                                                    00027150
      NET=OUT(I)                                                                00027160
      IF(NET) 809,811,810                                                       00027170
809   DUM=12                                                                    00027180
      NET=-NET                                                                  00027190
810   NET=NETNOS(NET)                                                           00027200
811   DIG1=NET/100                                                              00027210
      DIG2=(NET-DIG1*100)/10                                                    00027220
      DIG3=(NET-DIG1*100-DIG2*10)                                               00027230
      OUTTM(TMPNT)=DIGS(11)                                                     00027240
      TMPNT=TMPNT+1                                                             00027250
      OUTTM(TMPNT)=DIGS(DUM)                                                    00027260
      TMPNT=TMPNT+1                                                             00027270
      STFLG=FALSE                                                               00027280
      OUTTM(TMPNT)=DIGS(DIG1+1)                                                 00027290
      IF(DIG1.NE.0) STFLG=TRUE                                                  00027300
      IF(STFLG) TMPNT=TMPNT+1                                                   00027310
      OUTTM(TMPNT)=DIGS(DIG2+1)                                                 00027320
      IF(DIG2.NE.0) STFLG=TRUE                                                  00027330
      IF(STFLG) TMPNT=TMPNT+1                                                   00027340
      OUTTM(TMPNT)=DIGS(DIG3+1)                                                 00027350
      IF(DIG3.NE.0) STFLG=TRUE                                                  00027360
      IF(STFLG) TMPNT=TMPNT+1                                                   00027370
820   IF(TMPNT.GE.TMPTTS) GO TO 900                                             00027380
      OUTTM(TMPNT)=DIGS(11)                                                     00027390
      TMPNT=TMPNT+1                                                             00027400
      GO TO 820                                                                 00027410
C                                                                               00027420
C     PRINT THIS CELL'S ROW                                                     00027430
C                                                                               00027440
900   CONTINUE                                                                  00027450
      NPNT=NOUT*5                                                               00027460
      WRITE(PRNTR,7002) FWID(LPNT),RWID,L(LPNT),(OUTTM(I),I=1,NPNT)             00027470
7002  FORMAT(' ',3(I5),4X,100(A1),5(/20X,100(A1)))                              00027480
C                                                                               00027490
C     DELETE ENDED NETS FROM OUT ARRAY                                          00027500
C                                                                               00027510
      I=1                                                                       00027520
920   IF(I.LE.NOUT) GO TO 930                                                   00027530
      LPNT=LPNT+1                                                               00027540
      GO TO 600                                                                 00027550
930   IF(OUT(I).GE.0) GO TO 980                                                 00027560
      OUT(I)=-OUT(I)                                                            00027570
      IF(COUNT(OUT(I)).NE.0) GO TO 980                                          00027580
      OUT(I)=0                                                                  00027590
      IF(I.NE.NOUT) GO TO 980                                                   00027600
960   NOUT=NOUT-1                                                               00027610
      IF(OUT(NOUT).EQ.0) GO TO 960                                              00027620
980   I=I+1                                                                     00027630
      GO TO 920                                                                 00027640
20000 CONTINUE                                                                  00027650
C                                                                               00027660
```

```
C     NORMAL ROUTINE EXIT                                                    00027670
C                                                                            00027680
      RETURN                                                                 00027690
      END                                                                    00027700
      SUBROUTINE CELNET(SWITCH)                                              00027710
C                                                                            00027720
C                                                                            00027730
C********** CELNET ROUTINE ********************                             00027740
C                                                                            00027750
C     FORMS CELL-NET LIST (CLNTS)                                            00027760
C                                                                            00027770
C                                                                            00027780
      IMPLICIT INTEGER(A-Y)                                                  00027790
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                       00027800
     & ,MXCELS,MXNETS,MXCLNT,XXX(7)                                          00027810
      COMMON /NETDTA/INP(3000),WID(1000),PAD(100),NETNOS(500)                00027820
      COMMON /CLSDTA/ CHR(700,3),TRACK(700,2),TTTTTT                         00027830
      COMMON/CLNET/CLNTS(5000),LSTCEL,FRSCLU                                 00027840
      LOGICAL FLG,TRUE/.TRUE./,FALSE/.FALSE./                                00027850
      COMMON NO(500)                                                         00027860
C                                                                            00027870
C     CLEAR OUT NO ARRAY                                                     00027880
C                                                                            00027890
      DO 10042 I=1,MXNETS                                                    00027900
       NO(I)=0                                                               00027910
10042 CONTINUE                                                               00027920
      TO=1                                                                   00027930
      I=1                                                                    00027940
      J=1                                                                    00027950
      K=1                                                                    00027960
C                                                                            00027970
C     BUILD CELL-NETS FOR ORIGINAL (NOT PARTIT-FORMED) CELLS                 00027980
C                                                                            00027990
C                                                                            00028000
10080 IF(INP(I).NE.0) GO TO 10090                                            00028010
      J=J+1                                                                  00028020
      I=I+1                                                                  00028030
10090 IF(INP(I).EQ.-1) GO TO 10200                                           00028040
      CLNTS(K)=(INP(I)*1000)+J                                               00028050
      K=K+1                                                                  00028060
      I=I+1                                                                  00028070
      GO TO 10080                                                            00028080
C                                                                            00028090
C                                                                            00028100
C     BUILD CELL-NETS FOR PARTIT-FORMED CELLS                                00028110
C                                                                            00028120
C                                                                            00028130
10200 I=1                                                                    00028140
      IF(SWITCH.NE.0) GO TO 10205                                            00028150
      CLNTS(K)=10**6                                                         00028160
      K=K+1                                                                  00028170
      GO TO 10300                                                            00028180
```

```
10205 IF(CHR(I,1).EQ.0) GO TO 10300                                    00028190
      C1=CHR(I,2)                                                      00028200
      C2=CHR(I,3)                                                      00028210
10212 IF(CHR(I,1).NE.TRACK(TO,1)) GO TO 10220                          00028220
      NO(TRACK(TO,2))=1                                                00028230
      TO=TO+1                                                          00028240
      GO TO 10212                                                      00028250
10220 OC=K-1                                                           00028260
      DO 10270 J=1,00                                                  00028270
       CO=CLNTS(J)                                                     00028280
       001=CO/1000                                                     00028290
       IF(001.EQ.C1) GO TO 10252                                       00028300
       IF(001.NE.C2)GO TO 10270                                        00028310
10252  002=NO(CO-(001*1000))                                           00028320
       IF(K.LT.5000) GO TO 10254                                       00028330
       FIVEK=5000                                                      00028340
       WRITE(PRNTR,7002) FIVEK                                         00028350
7002   FORMAT('0ERROR(CEL01) --MAX CELL-NET COUNT (',I4,               00028360
     &  ' ) EXCEEDED IN CELNET')                                       00028370
       STOP                                                            00028380
10254  IF(002.NE.0) GO TO 10270                                        00028390
       CLNTS(K)=(CHR(I,1)*1000)+(CO-001*1000)                          00028400
       K=K+1                                                           00028410
10270 CONTINUE                                                         00028420
      I=I+1                                                            00028430
      GO TO 10205                                                      00028440
C                                                                      00028450
C                                                                      00028460
C     SORT CELL-NETS FOR EASIER ACCESS IN LINEUP                       00028470
C                                                                      00028480
C                                                                      00028490
10300 CLNTS(K)=0                                                       00028500
      D=(K-1)/2                                                        00028510
10310 FLG=FALSE                                                        00028520
      I=1                                                              00028530
10315 001=CLNTS(I+D)                                                   00028540
      IF(001.EQ.0) GO TO 10330                                         00028550
      IF(CLNTS(I).LE.001) GO TO 10325                                  00028560
      T=CLNTS(I)                                                       00028570
      CLNTS(I)=001                                                     00028580
      CLNTS(I+D)=T                                                     00028590
      FLG=TRUE                                                         00028600
10325 I=I+1                                                            00028610
      GO TO 10315                                                      00028620
10330 D=D/2                                                            00028630
      IF(D.NE.0) GO TO 10310                                           00028640
      IF(.NOT.FLG) GO TO 10400                                         00028650
      D=1                                                              00028660
      GO TO 10310                                                      00028670
10400 I=1                                                              00028680
      J=1                                                              00028690
C                                                                      00028700
```

```
C                                                                       00028710
C     ELIMINATE THE DUPLICATE ENTRIES IN THE CELL-NET LIST              00028720
C                                                                       00028730
C                                                                       00028740
10410 J=J+1                                                             00028750
      IF(CLNTS(I).EQ.0) GO TO 10500                                     00028760
      IF(CLNTS(I).EQ.CLNTS(J)) GO TO 10410                              00028770
      I=I+1                                                             00028780
      CLNTS(I)=CLNTS(J)                                                 00028790
      GO TO 10410                                                       00028800
10500 K=I                                                               00028810
      LSTCEL=I-1                                                        00028820
      CLNTS(LSTCEL+2)=-1                                                00028830
C                                                                       00028840
C     COUNT CELLS (INCLUDING PADS)                                      00028850
C                                                                       00028860
      NCELLS=0                                                          00028870
      I=1                                                               00028880
      000=CLNTS(1)/1000                                                 00028890
310   GG=CLNTS(I)                                                       00028900
      IF((GG.GE.1000000).OR.(GG.EQ.0)) GO TO 320                        00028910
      I=I+1                                                             00028920
      0001=CLNTS(I)/1000                                                00028930
      IF(0001.EQ.000) GO TO 310                                         00028940
      000=0001                                                          00028950
      NCELLS=NCELLS+1                                                   00028960
      GO TO 310                                                         00028970
320   FRSCLU=I                                                          00028980
      IF(DEBUG.EQ.0) GO TO 20000                                        00028[illegible]
      WRITE(PRNTR,311) NCELLS                                           00029000
311   FORMAT('0',20X,I4,' CELLS COUNTED')                               00029010
      WRITE(PRNTR,7001) FRSCLU                                          00029020
7001  FORMAT('0',20X,'FRSCLU =',I4)                                     00029030
      WRITE(PRNTR,100)                                                  00029040
100   FORMAT('0',20X,'CELL-NETS  (INTERNAL NET #S)')                    00029050
      DO 10600 I=1,K                                                    00029060
       WRITE(PRNTR,200) CLNTS(I)                                        00029070
200    FORMAT(' ',20X,I9)                                               00029080
10600 CONTINUE                                                          00029090
20000 RETURN                                                            00029100
      END                                                               00029110
      SUBROUTINE PASS(ROWS,COLS,NFLSAV,NPISAV,MAXSOL,RN,CN)             00029120
C                                                                       00029130
C                                                                       00029140
C******** *** PASS-- SETS UP FILE FOR PART 2B *****                    00029150
C                                                                       00029160
C                                                                       00029170
C                                                                       00029180
      IMPLICIT INTEGER (A-Y)                                            00029190
      COMMON /GLBL/ GG(16)                                              00029200
      COMMON /NETDTA/ NN(4600)                                          00029210
      COMMON /LINDTA/ LL(1000)                                          00029220
```

```
      COMMON /HEADER/ HH(6)                                              00029230
      COMMON /CLNET/ CC(5002)                                            00029240
      PASSFL=18                                                          00029250
      DO 100 I=1,16                                                      00029260
       IF(GG(I).GT.9999.OR.GG(I).LT.-999) GG(I)=0                        00029270
9000   FORMAT(20(I4))                                                    00029280
100   CONTINUE                                                           00029290
      WRITE(PASSFL,9000) GG                                              00029300
      DO 200 I=1,4600                                                    00029310
       IF(NN(I).GT.9999.OR.NN(I).LT.-999) NN(I)=0                        00029320
200   CONTINUE                                                           00029330
      WRITE(PASSFL,9000) NN                                              00029340
      DO 300 I=1,1000                                                    00029350
       IF(LL(I).GT.9999.OR.LL(I).LT.-999) LL(I)=0                        00029360
300   CONTINUE                                                           00029370
      WRITE(PASSFL,9000) LL                                              00029380
      DO 400 I=1,3000                                                    00029390
       IF(CC(I).GT.99999999.OR.CC(I).LT.-9999999) CC(I)=0                00029400
9002   FORMAT(10(I8))                                                    00029410
400   CONTINUE                                                           00029420
      WRITE(PASSFL,9002) (CC(I),I=1,3000),CC(5001),CC(5002)              00029430
      WRITE(PASSFL,9003) HH                                              00029440
9003  FORMAT(10(A4))                                                     00029450
      WRITE(PASSFL,9000) ROWS,COLS,NFLSAV,NPISAV,MAXSOL,RN,CN            00029460
      PRNTR=GG(1)                                                        00029461
      WRITE(PRNTR,7000)                                                  00029470
7000  FORMAT('0DATA TRANSFER FILE CONSTRUCTED')                          00029480
      RETURN                                                             00029490
      END                                                                00029500
```

```
C                                                                        00000110
C                                                                        00000120
C                                                                        00000130
C    CCCCC        A      PPPPPP     SSSSS   TTTTTTT     A       RRRRRR  00000140
C   C     C      A A     P     P   S     S     T       A A      R     R  00000150
C   C           A   A    P     P   S           T      A   A     R     R  00000160
C   C          A     A   PPPPPP     SSSSS      T     A     A    RRRRRR  00000170
C   C          AAAAAAA   P               S     T     AAAAAAA    R   R   00000180
C   C     C    A     A   P         S     S     T     A     A    R    R  00000190
C    CCCCC     A     A   P          SSSSS      T     A     A    R     R 00000200
C                                                                        00000210
C                                                                        00000220
C     CELL ARRANGEMENT PROGRAM FOR THE STANDARD                          00000230
```

```
C                  TRANSISTOR ARRAY                                     00000240
C                                                                       00000250
C                                                                       00000260
C     VERSION 2B REVISION 4 -- JUNE  1979                               00000270
C*****************************************************                  00000280
C                                                                       00000290
C                                                                       00000300
C                                                                       00000310
C                                                                       00000320
C     AUTHOR:      GLENN W. COX                                         00000330
C                  EE DEPT                                              00000340
C                  AUBURN UNIVERSITY                                    00000350
C                  AUBURN, AL 36830                                     00000360
C                                                                       00000370
C                                                                       00000380
C                                                                       00000390
C     THIS IS PART B OF CAPSTAR -                                       00000400
C                                                                       00000410
C     FOR PROGRAM INFORMATION, SEE PART A                               00000420
C                                                                       00000430
C                                                                       00000440
C                                                                       00000450
C                                                                       00000460
C*****************************************************                  00000470
C                                                                       00000480
C                                                                       00000490
C     M A I N   C O N T R O L   R O U T I N E                           00000500
C                                                                       00000510
C                                                                       00000520
C*****************************************************                  00000530
C                                                                       00000540
      IMPLICIT INTEGER(A-Y)                                             00000550
C                                                                       00000560
C     DEFINE COMMON DATA AREAS                                          00000570
C                                                                       00000580
C                                                                       00000590
C     GLOBAL COMMON                                                     00000600
C                                                                       00000610
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                  00000620
     & ,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL                00000630
     & ,MXROWS,MXCOLS,MXDFSZ                                            00000640
C                                                                       00000650
C     NET DATA COMMON                                                   00000660
C                                                                       00000670
      COMMON /NETDTA/ NET(3000),WID(1000),PAD(100),NETNOS(500)          00000680
C                                                                       00000690
C     LINEAR ORDER DATA COMMON                                          00000700
C                                                                       00000710
      COMMON /LINDTA/ LINORD(1000)                                      00000720
C                                                                       00000730
C     FOLD DATA COMMON                                                  00000740
C                                                                       00000750
```

```
      COMMON /FLDDTA/ CHIP(30,100),ROWS,COLS,POS(1000,2),NFLSAV,NPISAV  00000760
     & ,MAXSOL,RN,CN                                                    00000770
C                                                                       00000780
C     HEADER COMMON                                                     00000790
C                                                                       00000800
      COMMON /HEADER/ CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2           00000810
C                                                                       00000820
C     DEFINE I/O ASSIGNMENTS                                            00000830
C                                                                       00000840
      RDR=15                                                            00000850
      PRNTR=6                                                           00000860
C                                                                       00000870
C                                                                       00000880
C     RETRIEVE DATA FROM PART A                                         00000890
C                                                                       00000900
      CALL CATCH(ROWS,COLS,NFLSAV,NPISAV,MAXSOL,RN,CN)                  00000910
C                                                                       00000920
C       PLACE                                                           00000930
C                                                                       00000940
C                                                                       00000950
      CALL PLACE                                                        00000960
C                                                                       00000970
2000  WRITE(PRNTR,9030)                                                 00000980
9030  FORMAT('1NORMAL CAPSTAR TERMINATION')                             00000990
      STOP                                                              00001000
      END                                                               00001010
      SUBROUTINE CATCH(ROWS,COLS,NFLSAV,NPISAV,MAXSOL,RN,CN)            00001020
C                                                                       00001030
C                                                                       00001040
C******** CATCH-- RETRIEVES DATA FROM PART 2A *****                    00001050
C                                                                       00001060
C                                                                       00001070
      IMPLICIT INTEGER (A-Y)                                            00001080
      COMMON /GLBL/ GG(16)                                              00001090
      COMMON /NETDTA/ NN(4600)                                          00001100
      COMMON /LINDTA/ LL(1000)                                          00001110
      COMMON /HEADER/ HH(6)                                             00001120
      COMMON /CLNET/ CC(3002)                                           00001130
      PASSFL=18                                                         00001140
      READ(PASSFL,9000,END=2000) GG                                     00001150
9000  FORMAT(20(I4))                                                    00001160
      DO 100 I=1,4561,20                                                00001170
       I19=I+19                                                         00001180
       READ(PASSFL,9000,END=2000) (NN(J),J=I,I19)                       00001190
100   CONTINUE                                                          00001200
      READ(PASSFL,9000,END=2000) (NN(J),J=4581,4600)                    00001210
      DO 200 I=1,981,20                                                 00001220
       I19=I+19                                                         00001230
       READ(PASSFL,9000,END=2000) (LL(J),J=I,I19)                       00001240
200   CONTINUE                                                          00001250
      DO 300 I=1,2991,10                                                00001260
       I9=I+9                                                           00001270
```

```
       READ(PASSFL,9002,END=2000) (CC(J),J=I,I9)                          00001280
300    CONTINUE                                                           00001290
9002   FORMAT(10(I8))                                                     00001300
       READ(PASSFL,9002,END=2000) CC(3001),CC(3002)                       00001310
       READ(PASSFL,9003,END=2000) HH                                      00001320
9003   FORMAT(10(A4))                                                     00001330
       READ(PASSFL,9000,END=2000) ROWS,COLS,NFLSAV,NPISAV,MAXSOL,RN,CN    00001340
       PRNTR=GG(1)                                                        00001341
       WRITE(PRNTR,6000)                                                  00001350
6000   FORMAT('0DATA TRANSFER COMPLETED')                                 00001360
       RETURN                                                             00001370
2000   WRITE(6,7000)                                                      00001380
7000    FORMAT('0ERROR(CAT01) --PASS FILE CORRUPT',                       00001390
      & ' -- TRY RE-RUNNING PART 2A TO RE-BUILD')                         00001400
        STOP                                                             00001410
       END                                                                00001420
       SUBROUTINE PLACE                                                   00001430
C                                                                         00001440
C*****************************************************                    00001450
C                                                                         00001460
C                                                                         00001470
C      PLACE -- CONTROLS PLACEMENT ROUTINES                               00001480
C                                                                         00001490
C                                                                         00001500
C*****************************************************                    00001510
C                                                                         00001520
       IMPLICIT INTEGER (A-Y)                                             00001530
       COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,XXX(9)     00001540
       COMMON /FLDDTA/ C(30,100),N,M,POS(1000,2),NFLSAV,NPISAV            00001550
      & ,MAXSOL,RN,CN                                                     00001560
       COMMON /NETDTA/ NET(3000),W(1000),P(100),NETNOS(500)               00001570
       COMMON /HEADER/ CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2            00001580
       COMMON PLPNT(10,2),SPACE(30),LO(1000),C5(1000),L(1000),            00001590
      & TEMP(1000)                                                        00001600
       INTEGER PCN(10)                                                    00001610
       REAL SQRT                                                          00001620
       WRITE(PRNTR,99999) CAPMC1,CAPMC2,CAPVER,CAPREV,NAME1,NAME2         00001630
99999  FORMAT('1',40(1H*),' CAPSTAR F ',2A4,' V.',A4,' REV.',A4,          00001640
      & 5X,'NETWORK - ',2A4,5X,'STEP - PLACEMENT')                        00001650
C                                                                         00001660
C      INITIALIZE                                                         00001670
C                                                                         00001680
       SAVE2=17                                                           00001690
       SAVFIL=16                                                          00001700
       REWIND SAVFIL                                                      00001710
       REWIND SAVE2                                                       00001720
C                                                                         00001730
C      SET NUMBER SOLUTIONS FOUND, SAVED TO 0                             00001740
C                                                                         00001750
       NFLFND=0                                                           00001760
        NSVED=0                                                           00001770
C                                                                         00001780
```

```
C     SET RATING SUM, SUM OF SQUARES TO 0                                    00001790
C                                                                            00001800
      ZM=0.                                                                  00001810
      ZS=0.                                                                  00001820
C                                                                            00001830
C     FORM NEW SOLUTION                                                      00001840
C                                                                            00001850
100   IF(NFLFND.GT.MAXSOL.AND.MAXSOL.NE.0) GO TO 1000                        00001860
      CALL FOLD(SUCCES,TRIALS)                                               00001870
C     IF NONE FOUND, GO TO IMPROVEMENT SECTION                               00001880
C                                                                            00001890
      IF(SUCCES.EQ.0) GO TO 1000                                             00001900
C                                                                            00001910
C     FOUND ONE-- RATE IT                                                    00001920
C                                                                            00001930
      CALL RATE(RATING,ZUH,ZUV,ZST,0)                                        00001940
      NFLFND=NFLFND+1                                                        00001950
C                                                                            00001960
C     UPDATE RATING SUM, SUM OF SQUARES                                      00001970
C                                                                            00001980
      ZR=FLOAT(RATING)/1E6                                                   00001990
      ZM=ZM+ZR                                                               00002000
      ZS=ZS+ZR*ZR                                                            00002010
C                                                                            00002020
C     COMPUTE CHARACTERIZATION #                                             00002030
C                                                                            00002040
      PCN1=0                                                                 00002050
      DO 102 I=1,N                                                           00002060
       PCN1=PCN1+C(I,1)                                                      00002070
102   CONTINUE                                                               00002080
C     FORGET DUPLICATE PLACEMENTS                                            00002090
C                                                                            00002100
      X1=NSVED                                                               00002110
      IF(X1.GT.NFLSAV)X1=NFLSAV                                              00002120
      IF(X1.EQ.0) GO TO 104                                                  00002130
      DO 103 I=1,X1                                                          00002140
       IF(PLPNT(I,1).EQ.RATING.AND.PCN1.EQ.PCN(I))GO TO 100                  00002150
103   CONTINUE                                                               00002160
104   CONTINUE                                                               00002170
C                                                                            00002180
C                                                                            00002190
C     IF NFLSAV NOT YET FOUND, SAVE THIS PLACEMENT                           00002200
C                                                                            00002210
      IF(NSVED.GE.NFLSAV)GO TO 105                                           00002220
      NSVED=NSVED+1                                                          00002230
      PLPNT(NSVED,1)=RATING                                                  00002240
      PLPNT(NSVED,2)=NFLFND                                                  00002250
      PCN(NSVED)=PCN1                                                        00002260
      GO TO 120                                                              00002270
C                                                                            00002280
C     NFLSAV FOUND - MAKE SURE THIS ONE IS BETTER THAN WORST                 00002290
C                                                                            00002300
```

```
105   WC=1E8                                                          00002310
      WP=0                                                            00002320
      DO 110 I=1,NFLSAV                                               00002330
       IF(PLPNT(I,1).GT.WC) GO TO 110                                 00002340
       WC=PLPNT(I,1)                                                  00002350
       WP=I                                                           00002360
110   CONTINUE                                                        00002370
      IF(RATING.LT.WC) GO TO 100                                      00002380
C     BETTER THAN WORST -- REPLACE WORST                              00002390
      PLPNT(WP,1)=RATING                                              00002400
      PLPNT(WP,2)=NFLFND                                              00002410
      PCN(WP)=PCN1                                                    00002420
      NSVED=NSVED+1                                                   00002430
120   CONTINUE                                                        00002440
C                                                                     00002450
C     LOAD PLACEMENT TO SAVE FILE                                     00002460
      DO 200 I=1,MXCELS                                               00002470
       TEMP(I)=POS(I,2)*10**6+POS(I,1)                                00002480
200   CONTINUE                                                        00002490
      WRITE(SAVFIL) NFLFND, RATING,(TEMP(I),I=1,MXCELS)               00002500
C                                                                     00002510
C     A.D DO NEXT PLACEMENT                                           00002520
C                                                                     00002530
      GO TO 100                                                       00002540
C                                                                     00002550
C                                                                     00002560
C     PLACEMENT IMPROVEMENT SECTION                                   00002570
C                                                                     00002580
C                                                                     00002590
C     BOMB OUT IF NO FOLD SOLUTIONS FOUND                             00002600
C                                                                     00002610
1000  IF(NFLFND.GT.0) GO TO 1010                                      00002620
      WRITE(PRNTR,7002) TRIALS                                        00002630
7002  FORMAT('ONO SOLUTIONS FOUND IN ',I6,' TRIES')                   00002640
      STOP                                                            00002650
C                                                                     00002660
C     GOT SOME SOLUTIONS -- FIND NFLSAV BEST & LOAD POINTERS TO       00002670
C              PLPNT                                                  00002680
C                                                                     00002690
1010  ENDFILE SAVFIL                                                  00002700
      REWIND SAVFIL                                                   00002710
C                                                                     00002720
C     COMPUTE MEAN, S.D.                                              00002730
C                                                                     00002740
      ZMEAN=ZM/FLOAT(NFLFND)                                          00002750
      ZSD=0.                                                          00002760
      IF(NFLFND.EQ.1) GO TO 1020                                      00002770
      ZSD=ZS-ZM*ZM/FLOAT(NFLFND)                                      00002780
      ZSD=ZSD/(FLOAT(NFLFND)-1.)                                      00002790
      ZSD=SQRT(ZSD)                                                   00002800
1020  WRITE(PRNTR,7003) NFLFND,TRIALS                                 00002810
7003  FORMAT('0',I5,' SOLUTIONS FOUND IN ',I6,' TRIES')               00002820
```

```
      IF(NFLFND.LE.NFLSAV)NFLSAV=NFLFND                                  00002830
C                                                                        00002840
C     SORT POINTERS BY RATING                                            00002850
C                                                                        00002860
      N1=NFLSAV-1                                                        00002870
      IF(N1.EQ.0) GO TO 1060                                             00002880
1025  FLAG=0                                                             00002890
      DO 1030 I=1,N1                                                     00002900
          I1=I+1                                                         00002910
       IF(PLPNT(I,1).GE.PLPNT(I1,1)) GO TO 1030                          00002920
       T=PLPNT(I,1)                                                      00002930
       PLPNT(I,1)=PLPNT(I1,1)                                            00002940
       PLPNT(I1,1)=T                                                     00002950
       T=PLPNT(I,2)                                                      00002960
       PLPNT(I,2)=PLPNT(I1,2)                                            00002970
       PLPNT(I1,2)=T                                                     00002980
       FLAG=1                                                            00002990
1030  CONTINUE                                                           00003000
      IF(FLAG.NE.0) GO TO 1025                                           00003010
C                                                                        00003020
C     LOAD QUALITIES TO PCN ARRAY                                        00003030
C                                                                        00003040
      DO 1040 I=1,NFLSAV                                                 00003050
       CALL QUAL(ZMEAN,ZSD,PLPNT(I,1),Q)                                 00003060
       PCN(I)=Q                                                          00003070
1040  CONTINUE                                                           00003080
1060  CONTINUE                                                           00003090
      WRITE(PRNTR,7004) NFLSAV,(PLPNT(I,2),PLPNT(I,1),PCN(I),I=1,NFLSAV)00003100
7004  FORMAT('0',I5,' BEST SELECTED'/,' NUMBER  RATING',                 00003110
     & '-10**6  QUALITY*10**6'//10('0',1X,I4,6X,I7,7X,I7))               00003120
C                                                                        00003130
C     PERFORM PLACEMENT IMPROVEMENT ROUTINE ON NFLSAV BEST PLACEMENTS    00003140
C                                                                        00003150
      WRITE(PRNTR,7020)                                                  00003160
7020  FORMAT('0PLACEMENT IMPROVEMENT INITIATED')                         00003170
      DO 3005 REC1=1,NSVED                                               00003180
       READ(SAVFIL) REC, R,(TEMP(J),J=1,MXCELS)                          00003190
       DO 3000 I=1,NFLSAV                                                00003200
        IF(REC.NE.PLPNT(I,2)) GO TO 3000                                 00003210
C                                                                        00003220
C       REBUILD PLACEMENT                                                00003230
C                                                                        00003240
        DO 2012 J=1,N                                                    00003250
         DO 2011 K=1,M                                                   00003260
          C(J,K)=0                                                       00003270
2011     CONTINUE                                                        00003280
2012     CONTINUE                                                        00003290
         DO 2020 J=1,MXCELS                                              00003300
          POS(J,2)=TEMP(J)/10**6                                         00003310
          POS(J,1)=TEMP(J)-POS(J,2)*10**6                                00003320
          IF(POS(J,1).EQ.0) GO TO 2020                                   00003330
          E=POS(J,1)+W(J)-1                                              00003340
```

```
          GG1=POS(J,1)                                                  00003350
          DO 2015 K=GG1,E                                               00003360
           C(POS(J,2),K)=J                                              00003370
2015      CONTINUE                                                      00003380
2020     CONTINUE                                                       00003390
C                                                                       00003400
C        IMPROVE PLACEMENT                                              00003410
C                                                                       00003420
         CALL IMPROV                                                    00003430
         CALL RATE(RATING,ZUH,ZUV,ZST,0)                                00003440
C                                                                       00003450
C      UPDATE MEAN & S.D. FOR IMPROVED PLACEMENT                        00003460
C                                                                       00003470
       ZR=FLOAT(RATING)/1E6                                             00003480
       ZM=ZM+ZR                                                         00003490
       ZS=ZS+ZR*ZR                                                      00003500
       NFLFND=NFLFND+1                                                  00003510
C                                                                       00003520
C        RE-STORE PLACEMENT                                             00003530
C                                                                       00003540
         DO 2050 J=1,MXCELS                                             00003550
          TEMP(J)=POS(J,2)*10**6+POS(J,1)                               00003560
2050     CONTINUE                                                       00003570
         WRITE(SAVE2) REC, RATING,(TEMP(J),J=1,MXCELS)                  00003580
         PLPNT(I,1)=RATING                                              00003590
         GO TO 3005                                                     00003600
3000    CONTINUE                                                        00003610
3005   CONTINUE                                                         00003620
       ENDFILE SAVE2                                                    00003630
       REWIND SAVE2                                                     00003640
       WRITE(PRNTR,7021)                                                00003650
7021   FORMAT('0PLACEMENT IMPROVEMENT COMPLETED')                       00003660
C                                                                       00003670
C      RECOMPUTE MEAN AND S.D.                                          00003680
C                                                                       00003690
       ZMEAN=ZM/FLOAT(NFLFND)                                           00003700
       ZSD=ZS-ZM*ZM/FLOAT(NFLFND)                                       00003710
       ZSD=ZSD/(FLOAT(NFLFND)-1.)                                       00003720
       ZSD=SQRT(ZSD)                                                    00003730
C                                                                       00003740
C      PRESENT NPISAV BEST IMPROVED PLACEMENTS                          00003750
C                                                                       00003760
       IF(NFLSAV.LT.NPISAV) NPISAV=NFLSAV                               00003770
       N1=NFLSAV-1                                                      00003780
       IF(N1.EQ.0) GO TO 3030                                           00003790
3010   FLAG=0                                                           00003800
       DO 3020 I=1,N1                                                   00003810
        IF(PLPNT(I,1).GE.PLPNT(I+1,1)) GO TO 3020                       00003820
        T=PLPNT(I,1)                                                    00003830
        PLPNT(I,1)=PLPNT(I+1,1)                                         00003840
        PLPNT(I+1,1)=T                                                  00003850
        T=PLPNT(I,2)                                                    00003860
```

```
      PLPNT(I,2)=PLPNT(I+1,2)                                          00003870
      PLPNT(I+1,2)=T                                                   00003880
      FLAG=1                                                           00003890
3020  CONTINUE                                                         00003900
      IF(FLAG.NE.0) GO TO 3010                                         00003910
      WRITE(PRNTR,7022)                                                00003920
7022  FORMAT('0',I4,' BEST PLACEMENTS FOLLOW:')                        00003930
3030  DO 4005 REC=1,NPLSAV                                             00003940
      READ(SAVE2) REC, R,(TEMP(J),J=1,MXCELS)                          00003950
      DO 4000 I=1,NPISAV                                               00003960
       IF(REC.NE.PLPNT(I,2)) GO TO 4000                                00003970
       DO 3520 J=1,N                                                   00003980
        DO 3515 K=1,M                                                  00003990
         C(J,K)=0                                                      00004000
3515     CONTINUE                                                      00004010
3520    CONTINUE                                                       00004020
        DO 3550 J=1,MXCELS                                             00004030
         POS(J,2)=TEMP(J)/10**6                                        00004040
         POS(J,1)=TEMP(J)-POS(J,2)*10**6                               00004050
         IF(POS(J,1).EQ.0) GO TO 3550                                  00004060
         E=POS(J,1)+W(J)-1                                             00004070
         GG1=POS(J,1)                                                  00004080
         DO 3540 K=GG1,E                                               00004090
          C(POS(J,2),K)=J                                              00004100
3540     CONTINUE                                                      00004110
3550    CONTINUE                                                       00004120
        WRITE(PRNTR,7010) REC                                          00004130
7010    FORMAT('1PLACEMENT NUMBER ',I4)                                00004140
        CALL RATE(RATING,ZUH,ZUV,ZST,1)                                00004150
C                                                                      00004160
C       COMPUTE QUALITY OF THIS PLACEMENT                              00004170
C                                                                      00004180
        CALL QUAL(ZMEAN,ZSD,RATING,Q)                                  00004190
        ZQ=FLOAT(Q)/1E6                                                00004200
        ZR=RATING/1E4                                                  00004210
        WRITE(PRNTR,7006) ZR,ZUH,ZUV,ZST,ZQ                            00004220
7006    FORMAT('ORATINGS'//' TOTAL',8X,                                00004230
     &  ' ---',F8.2,' %'//' HORIZONTAL',3X,' ---',F8.2,' %'//' V',     00004240
     &  'ERTICAL',5X,' ---',F8.2,' %'//' STRAIGHT NETS ---',F8.2,' %', 00004250
     &  ' '///' QUALITY',7X,'---',F10.5)                               00004260
        CALL DEPICT                                                    00004270
        CALL PADPUT                                                    00004280
        CALL OUTBLD                                                    00004290
        GO TO 4005                                                     00004300
4000   CONTINUE                                                        00004310
4005  CONTINUE                                                         00004320
      RETURN                                                           00004330
      END                                                              00004340
      SUBROUTINE FOLD(SUCCES,TRIALS)                                   00004350
C                                                                      00004360
C**********************************************************          00004370
C#                                                                     00004380
```

```
C                                                                       00004390
C     FOLD ROUTINE — PERFORMS FOLDING PROCEDURE (NEW)                   00004400
C                                                                       00004410
C                                                                       00004420
C*****************************************************                  00004430
C                                                                       00004440
      IMPLICIT INTEGER (A-Y)                                            00004450
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,XXX(9)    00004460
      COMMON /FLDDTA/ C(30,100),ROWS,COLS,POS(1000,2),NFLSAV,NPISAV     00004470
     & ,MAXSOL,RN,CN                                                    00004480
      COMMON  PLPNT(10,2),SPACE(30),LO(1000),C5(1000),L(1000),          00004490
     & TEMP(1000)                                                       00004500
      INTEGER FIRENT/1/                                                 00004510
C                                                                       00004520
C     IF NOT FIRST ENTRY, GO TO STAR OVERFLOW ROUTINE                   00004530
C                                                                       00004540
      IF(FIRENT.NE.1) GO TO 6000                                        00004550
      ROWS1=ROWS-1                                                      00004560
      FIRENT=0                                                          00004570
         SUCCES=1                                                       00004580
      CA=NCELLS-NPADS+1                                                 00004590
      LBKD=0                                                            00004600
      FOLDEP=ROWS                                                       00004610
      CALL CROSS                                                        00004620
      C5A=1                                                             00004630
      TRIALS=1                                                          00004640
      DO 40 I=1,MXCELS                                                  00004650
       POS(I,1)=0                                                       00004660
       POS(I,2)=0                                                       00004670
40    CONTINUE                                                          00004680
C     BUILD ARRAY LO (LINEAR ORDER W/O PADS)                            00004690
C                                                                       00004700
      DO 50 I=1,NCELLS                                                  00004710
       LO(I)=L(I)                                                       00004720
50    CONTINUE                                                          00004730
C                                                                       00004740
C     START OF 'NEW PLACEMENT' PROCEDURE                                00004750
C                                                                       00004760
100   TTOB=1                                                            00004770
      DO 130 I=1,ROWS                                                   00004780
       DO 120 J=1,COLS                                                  00004790
        C(I,J)=0                                                        00004800
120    CONTINUE                                                         00004810
       SPACE(I)=COLS                                                    00004820
130   CONTINUE                                                          00004830
      FLDP=FOLDEP                                                       00004840
      LTOR=1                                                            00004850
      BASROW=1                                                          00004860
      LOPNT=1                                                           00004870
      STROW=1                                                           00004880
      NROW=0                                                            00004890
C                                                                       00004900
```

```
C     START OF 'PLACE NEXT CELL' ROUTINE                                00004910
C                                                                       00004920
1000  CELL=L(LOPNT)                                                     00004930
C                                                                       00004940
C     START OF LOOKBACK ROUTINE                                         00004950
C                                                                       00004960
      TRY=BASROW-LBKD                                                   00004970
      IF(TRY.LT.1) TRY=1                                                00004980
1005  IF(TRY.EQ.BASROW) GO TO 2000                                      00004990
      CALL PUT(TRY,CELL,COMP,LTOR)                                      00005000
      IF(COMP.EQ.1) GO TO 1020                                          00005010
      TRY=TRY+1                                                         00005020
      GO TO 1005                                                        00005030
C                                                                       00005040
C     CELL PLACED BY LOOKBACK                                           00005050
C                                                                       00005060
1020  LOPNT=LOPNT+1                                                     00005070
C                                                                       00005080
C     ALL CELLS PLACED? IF SO, RETURN SUCCESS - ELSE NEXT CELL          00005090
C                                                                       00005100
      IF(LOPNT.GE.CA) GO TO 20000                                       00005110
         GO TO 1000                                                     00005120
C                                                                       00005130
C     LOOKBACK NOT USED OR UNSUCCESSFUL -- TRY ROW OF BASROW,           00005140
C       BASROW-1+2TTOB WITH THE MOST SPACE ON IT                        00005150
C                                                                       00005160
2000  K=1                                                               00005170
         IF(BASROW.EQ.1) GO TO 2050                                     00005180
      J=BASROW                                                          00005190
      K=J-1+TTOB+TTOB                                                   00005200
C                                                                       00005210
C     CHECK FOR ALTERNATE ROW OFF-CHIP                                  00005220
C                                                                       00005230
      IF((K.LE.ROWS).AND.(K.GE.1)) GO TO 2030                           00005240
      CALL PUT(K,CELL,COMP,LTOR)                                        00005250
      IF(COMP.EQ.1) GO TO 3000                                          00005260
      GO TO 2040                                                        00005270
2030  IF(SPACE(K).LE.SPACE(J)) GO TO 2040                               00005280
C                                                                       00005290
C     KEEP J= ROW WITH MOST SPACE                                       00005300
      T=J                                                               00005310
      J=K                                                               00005320
      K=T                                                               00005330
2040  CALL PUT(J,CELL,COMP,LTOR)                                        00005340
      IF(COMP.EQ.1) GO TO 3000                                          00005350
C                                                                       00005360
C     WON'T FIT ON J -- TRY K                                           00005370
C                                                                       00005380
2050  CALL PUT(K,CELL,COMP,LTOR)                                        00005390
      IF(COMP.EQ.1) GO TO 3000                                          00005400
C                                                                       00005410
C     FAILURE ON ROWS J AND K -- TRY NEXT BASE ROW                      00005420
```

```
C                                                                       00005430
2500  BASROW=BASROW-1+TTOB+TTOB                                         00005440
      NROW=NROW+1                                                       00005450
C                                                                       00005460
C     IF OUT OF ROOM IN BLOCK, START NEW ONE                            00005470
C                                                                       00005480
      IF((BASROW.EQ.0).OR.(NROW.GE.FLDP)) GO TO 5000                    00005490
C                                                                       00005500
C     ELSE, REPEAT PROCEDURE WITH NEW BASE ROW                          00005510
C                                                                       00005520
      GO TO 1000                                                        00005530
C                                                                       00005540
C     CELL WAS PLACED -- BUMP LINEAR ORDER POINTER                      00005550
C                                                                       00005560
3000  LOPNT=LOPNT+1                                                     00005570
C                                                                       00005580
C     IF ALL CELLS PLACED, RETURN SUCCESS                               00005590
C                                                                       00005600
      IF(LOPNT.GE.CA) GO TO 20000                                       00005610
C                                                                       00005620
C     NEXT BASE ROW                                                     00005630
C                                                                       00005640
      BASROW=BASROW-1+TTOB+TTOB                                         00005650
      NROW=NROW+1                                                       00005660
C                                                                       00005670
C     IF FOLD DEPTH NOT SATISFIED, KEEP GOING                           00005680
C                                                                       00005690
      IF(NROW.LT.FLDP) GO TO 1000                                       00005700
C                                                                       00005710
C     FOLD DEPTH SATISFIED -- TURN CORNER (VERTICALLY)                  00005720
C                                                                       00005730
      BASROW=BASROW+1-TTOB-TTOB                                         00005740
      TTOB=IABS(TTOB-1)                                                 00005750
      NROW=0                                                            00005760
      GO TO 1000                                                        00005770
C                                                                       00005780
C     START OF 'BEGIN NEXT BLOCK' ROUTINE                               00005790
C                                                                       00005800
5000  STROW=STROW+FOLDEP                                                00005810
C                                                                       00005820
C     IF NEXT BLOCK STARTS OFF-CHIP, DO STAR                            00005830
C       OVERFLOW PROCEDURE                                              00005840
C                                                                       00005850
      IF(STROW.GT.ROWS) GO TO 6000                                      00005860
      OO=STROW+FLDP                                                     00005870
C                                                                       00005880
C     IF END OF BLOCK OFF-CHIP, REDUCE LOCAL FOLD DEPTH                 00005890
C                                                                       00005900
      IF(OO.GT.ROWS) FLDP=ROWS-STROW+1                                  00005910
      BASROW=STROW                                                      00005920
C                                                                       00005930
C     REVESE LEFT-TO-RIGHT SENSE                                        00005940
```

```
C                                                                       00005950
      LTOR=IABS(LTOR-1)                                                 00005960
C                                                                       00005970
C     ALL BLOCKS START TOP-TO-BOTTOM                                    00005980
C                                                                       00005990
      TTOB=1                                                            00006000
      NROW=0                                                            00006010
C                                                                       00006020
C     NEXT CELL                                                         00006030
C                                                                       00006040
      GO TO 1000                                                        00006050
C                                                                       00006060
C     START OF STAR OVERFLOW PROCEDURE                                  00006070
C                                                                       00006080
C     REDUCE GLOBAL FOLD DEPTH                                          00006090
C                                                                       00006100
6000  FOLDEP=FOLDEP-1                                                   00006110
      TRIALS=TRIALS+1                                                   00006120
C                                                                       00006130
C     IF >= 2, START OVER                                               00006140
C                                                                       00006150
      IF(FOLDEP.GE.2) GO TO 100                                         00006160
C                                                                       00006170
C     ALL FOLD DEPTHS USED -- ROTATE                                    00006180
C                                                                       00006190
      IF(C5(C5A).EQ.0) GO TO 6500                                       00006200
C                                                                       00006210
C     SET C6 = NEXT ROTATE BOUNDARY                                     00006220
C                                                                       00006230
      C6=C5(C5A)                                                        00006240
      C5A=C5A+1                                                         00006250
C                                                                       00006260
C     REBUILD L FROM LO ROTATED ABOUT C6                                00006270
C                                                                       00006280
      K=1                                                               00006290
      L(CA)=0                                                           00006300
      GG=C6+1                                                           00006310
      C4=CA-1                                                           00006320
      DO 6100 I=GG,C4                                                   00006330
       L(K)=LO(I)                                                       00006340
       K=K+1                                                            00006350
6100  CONTINUE                                                          00006360
      DO 6200 I=1,C6                                                    00006370
       L(K)=LO(I)                                                       00006380
       K=K+1                                                            00006390
6200  CONTINUE                                                          00006400
C                                                                       00006410
C     RESET FOLD DEPTH TO MAX AND START OVER                            00006420
C                                                                       00006430
      FOLDEP=ROWS                                                       00006440
      GO TO 100                                                         00006450
C                                                                       00006460
```

```
C     OUT OF ROTATE BOUNDARIES -- INCREASE LOOKBACK DIST.                    00006470
C                                                                            00006480
C     IF ALREADY MAXED OUT, RETURN FAILURE                                   00006490
C                                                                            00006500
6500  IF(LBKD.LT.ROWS1) GO TO 6510                                           00006510
      SUCCES=0                                                               00006520
      GO TO 20000                                                            00006530
6510  LBKD=LBKD+1                                                            00006540
C                                                                            00006550
C     RESET FOLD DEPTH AND ROTATION HISTORY AND START OVER                   00006560
C                                                                            00006570
      FOLDEP=ROWS                                                            00006580
      C5A=1                                                                  00006590
      DO 6520 I=1,NCELLS                                                     00006600
       L(I)=LO(I)                                                            00006610
6520  CONTINUE                                                               00006620
      GO TO 100                                                              00006630
20000 RETURN                                                                 00006640
      END                                                                    00006650
      SUBROUTINE PUT (ROW,CELL,COMP,LTOR)                                    00006660
C                                                                            00006670
C**************************************************                          00006680
C                                                                            00006690
C                                                                            00006700
C     PUT -- ATTEMPTS TO PLACE CELL ON ROW                                   00006710
C            COMP=1 IF SUCCESSFUL                                            00006720
C                                                                            00006730
C                                                                            00006740
C**************************************************                          00006750
C                                                                            00006760
      IMPLICIT INTEGER (A-Y)                                                 00006770
      COMMON /NETDTA/ NET(3000),WID(1000),P(100),NETNOS(500)                 00006780
      COMMON /FLDDTA/ C(30,100),ROWS,COLS,POS(1000,2),NF,NP                  00006790
     & ,MAXSOL,RN,CN                                                         00006800
      COMMON PLPNT(10,2),SPACE(30),LO(1000),C5(1000),L(1000),                00006810
     & TEMP(1000)                                                            00006820
      COMP=0                                                                 00006830
C                                                                            00006840
C     CHECK SPACE ON ROW -- FAIL IF NOT ENOUGH                               00006850
C                                                                            00006860
      WIDTH=WID(CELL)                                                        00006870
      IF(SPACE(ROW).LT.WIDTH) RETURN                                         00006880
C                                                                            00006890
C     ENOUGH ROOM -- PLACE CELL AT LEFT-MOST SPACE IF LTOR=1                 00006900
C                    AT RIGHT-MOST IF LTOR=0                                 00006910
C                                                                            00006920
      COMP=1                                                                 00006930
      INDEX=-1+LTOR+LTOR                                                     00006940
      K=1                                                                    00006950
      IF(LTOR.EQ.0) K=COLS                                                   00006960
500   IF(C(ROW,K).EQ.0) GO TO 1000                                           00006970
      K=K+INDEX                                                              00006980
```

```
      GO TO 500                                                          00006990
C                                                                        00007000
C     FOUND THE PLACE -- UPDATE SPACE, POS, CHIP ARRAYS                  00007010
C                                                                        00007020
1000  SPACE(ROW)=SPACE(ROW)-WIDTH                                        00007030
      POS(CELL,1)=K                                                      00007040
      POS(CELL,2)=ROW                                                    00007050
1010  C(ROW,K)=CELL                                                      00007060
      WIDTH=WIDTH-1                                                      00007070
      K=K+INDEX                                                          00007080
      IF(WIDTH.GT.0) GO TO 1010                                          00007090
      IF(LTOR.EQ.0) POS(CELL,1)=K+1                                      00007100
      RETURN                                                             00007110
      END                                                                00007120
      SUBROUTINE IMPROV                                                  00007130
C                                                                        00007140
C*****************************************************************     00007150
C                                                                        00007160
C                                                                        00007170
C     IMPROV -- PERFORMS PLACEMENT IMPROVEMENT PROCEDURE                 00007180
C                                                                        00007190
C                                                                        00007200
C*****************************************************************     00007210
C                                                                        00007220
      IMPLICIT INTEGER (A-Y)                                             00007230
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,XXX(9)     00007240
      COMMON /FLDDTA/ C(30,100),ROWS,COLS,POS(1000,2),NF,NP              00007250
     & ,MAXSOL,RN,CN                                                     00007260
      COMMON /NETDTA/NET(3000),WID(1000),PAD(100),NETNOS(500)            00007270
      COMMON PLPNT(10,2),SPACE(30),L0(1000),C5(1000),L1(1000),           00007280
     & TEMP(1000),P(1000,2)                                              00007290
C                                                                        00007300
C     SET UP P FOR REAL POSITION ARRAY                                   00007310
C                                                                        00007320
      DO 100 I=1,MXCELS                                                  00007330
       P(I,1)=POS(I,1)                                                   00007340
       P(I,2)=POS(I,2)                                                   00007350
100   CONTINUE                                                           00007360
C                                                                        00007370
C     RATE INITIAL PLACEMENT (R=CURRENT BEST RATING)                     00007380
C                                                                        00007390
      CALL RATE(R,ZUH,ZUV,ZST,0)                                         00007400
C                                                                        00007410
C     ********ROW INTERCHANGE SEGMENT                                    00007420
C                                                                        00007430
C     SET UP ROW COUNTER (I) & SWAP FLAG (F)                             00007440
C                                                                        00007450
110   F=0                                                                00007460
      ROW1=ROWS-1                                                        00007470
      IF(RN.EQ.0) GO TO 2000                                             00007480
      DO 500 I=1,ROW1                                                    00007490
C                                                                        00007500
```

```
C     SET UP NEIGHBORHOOD INDEX (L)                                    00007510
C                                                                      00007520
      L=1                                                              00007530
C                                                                      00007540
C     CHECK FOR NEXT ROW OFF-CHIP                                      00007550
C                                                                      00007560
210   IPL=I+L                                                          00007570
      IF(IPL.GT.ROWS) GO TO 500                                        00007580
C                                                                      00007590
C     TRIAL SWAP ROWS I, I+L                                           00007600
C                                                                      00007610
      DO 250 K=1,COLS                                                  00007620
       C1=C(I,K)                                                       00007630
       C2=C(IPL,K)                                                     00007640
       IF(C1.NE.0) POS(C1,2)=IPL                                       00007650
       IF(C2.NE.0) POS(C2,2)=I                                         00007660
       C(IPL,K)=C1                                                     00007670
       C(I,K)=C2                                                       00007680
250   CONTINUE                                                         00007690
C                                                                      00007700
C     RATE PLACEMENT WITH SWAPPED ROWS                                 00007710
C                                                                      00007720
      CALL RATE(RATING,ZUH,ZUV,ZST,0)                                  00007730
C                                                                      00007740
C     IF RATING OF NEW > OLD BEST, MAKE SWAP IN REAL                   00007750
C                                                                      00007760
      IF(RATING.LE.R) GO TO 400                                        00007770
      DO 350 K=1,COLS                                                  00007780
       T=C(I,K)                                                        00007790
       T1=C(IPL,K)                                                     00007800
       IF(T.NE.0) P(T,2)=I                                             00007810
       IF(T1.NE.0) P(T1,2)=IPL                                         00007820
350   CONTINUE                                                         00007830
      R=RATING                                                         00007840
      F=1                                                              00007850
      GO TO 500                                                        00007860
C                                                                      00007870
C     NEW PLACEMENT WORSE -- UNSWAP                                    00007880
C                                                                      00007890
400   DO 420 K=1,COLS                                                  00007900
       C1=C(I,K)                                                       00007910
       C2=C(IPL,K)                                                     00007920
       IF(C1.NE.0) POS(C1,2)=IPL                                       00007930
       IF(C2.NE.0) POS(C2,2)=I                                         00007940
       C(IPL,K)=C1                                                     00007950
       C(I,K)=C2                                                       00007960
420   CONTINUE                                                         00007970
C                                                                      00007980
C     BUMP NEIGHBORHOOD INDEX                                          00007990
C                                                                      00008000
      L=L+1                                                            00008010
C                                                                      00008020
```

```
C     CONTINUE IF INDEX WITH NEIGHBORHOOD                          00008030
C                                                                  00008040
      IF(L.LE.RN) GO TO 210                                        00008050
500   CONTINUE                                                     00008060
C                                                                  00008070
C     IF ANY SWAPPING DONE, TRY AGAIN                              00008080
C                                                                  00008090
      IF(F.NE.0) GO TO 110                                         00008100
C                                                                  00008110
C     *********CELL INTERCHANGE SEGMENT                            00008120
C                                                                  00008130
C     SET UP ROW POINTER (I)                                       00008140
C                                                                  00008150
2000  IF(CN.EQ.0) GO TO 3000                                       00008160
      DO 1800 I=1,ROWS                                             00008170
C                                                                  00008180
C     SET CORI = TO # CELLS OR EMPTY TRANSISTORS ON ROW I          00008190
C                                                                  00008200
      CORI=0                                                       00008210
      CELL=-1                                                      00008220
      DO 1010 K=1,COLS                                             00008230
       IF(C(I,K).EQ.CELL) GO TO 1010                               00008240
       CORI=CORI+1                                                 00008250
       IF(C(I,K).NE.0) CELL=C(I,K)                                 00008260
1010  CONTINUE                                                     00008270
      IF(CORI.EQ.1) GO TO 1800                                     00008280
C                                                                  00008290
C     RESET SWAP FLAG & SET J FOR CELL COUNTING                    00008300
C                                                                  00008310
1015  F=0                                                          00008320
      CORI1=CORI-1                                                 00008330
      DO 1700 J=1,CORI1                                            00008340
C                                                                  00008350
C     SET UP L FOR NEIGHBORHOOD INDEXING                           00008360
C                                                                  00008370
       L=1                                                         00008380
C                                                                  00008390
C      CHECK FOR END OF ROW                                        00008400
C                                                                  00008410
1060   JPL=J+L                                                     00008420
       IF(JPL.GT.CORI) GO TO 1700                                  00008430
C                                                                  00008440
C      TRIAL SWAP JTH, (J+L)TH CELLS ON ROW I                      00008450
C                                                                  00008460
C      FIND JTH,(J+L)TH CELLS                                      00008470
C                                                                  00008480
       K1=1                                                        00008490
       CNT=0                                                       00008500
       CELL=-1                                                     00008510
1070   IF(C(I,K1).EQ.CELL) GO TO 1100                              00008520
       CNT=CNT+1                                                   00008530
       CELL=C(I,K1)                                                00008540
```

```
      IF(CNT.NE.J) GO TO 1080                                          00008550
      CJ=CELL                                                          00008560
      PJ=K1                                                            00008570
1080  IF(CNT.EQ.JPL) GO TO 1150                                        00008580
1100  K1=K1+1                                                          00008590
      IF(CELL.EQ.0) CELL=-1                                            00008600
      GO TO 1070                                                       00008610
1150  CJPL=CELL                                                        00008620
      PJPL=K1                                                          00008630
C                                                                      00008640
C     TRAP OUT CASE WHERE WE'RE SWAPPING EMPTY TRANSISTORS             00008650
C                                                                      00008660
      IF(CJ.EQ.0.AND.CJPL.EQ.0) GO TO 1600                             00008670
      WJ=1                                                             00008680
      IF(CJ.NE.0)WJ=WID(CJ)                                            00008690
      WJPL=1                                                           00008700
      IF(CJPL.NE.0) WJPL=WID(CJPL)                                     00008710
      WJPL1=WJPL                                                       00008720
C                                                                      00008730
C     COPY CELLS TO LEFT OF JTH CELL TO TEMP                           00008740
C                                                                      00008750
      K1=1                                                             00008760
1155  IF(K1.EQ.PJ) GO TO 1160                                          00008770
      TEMP(K1)=C(I,K1)                                                 00008780
      K1=K1+1                                                          00008790
      GO TO 1155                                                       00008800
C                                                                      00008810
C     REPLACE JTH CELL WITH (J+L)TH                                    00008820
C                                                                      00008830
1160  K2=K1                                                            00008840
1170  TEMP(K2)=CJPL                                                    00008850
      K2=K2+1                                                          00008860
      WJPL=WJPL-1                                                      00008870
      IF(WJPL.NE.0) GO TO 1170                                         00008880
C                                                                      00008890
C     COPY CELLS BETWEEN JTH & (J+L)TH                                 00008900
C                                                                      00008910
      K1=K1+WJ                                                         00008920
1180  IF(K1.EQ.PJPL) GO TO 1190                                        00008930
      TEMP(K2)=C(I,K1)                                                 00008940
      K1=K1+1                                                          00008950
      K2=K2+1                                                          00008960
      GO TO 1180                                                       00008970
C                                                                      00008980
C     REPLACE (J+L)TH WITH JTH CELL                                    00008990
C                                                                      00009000
1190  TEMP(K2)=CJ                                                      00009010
      K2=K2+1                                                          00009020
      WJ=WJ-1                                                          00009030
      IF(WJ.NE.0) GO TO 1190                                           00009040
      K1=K1+WJPL1                                                      00009050
C                                                                      00009060
```

```
C       COPY CELLS TO RIGHT OF (J+L)TH                                    00009070
C                                                                         00009080
1200    IF(K1.GT.COLS) GO TO 1210                                         00009090
        TEMP(K1)=C(I,K1)                                                  00009100
        K1=K1+1                                                           00009110
        GO TO 1200                                                        00009120
C                                                                         00009130
C                                                                         00009140
C       CELLS ARE SWAPPED IN TEMP ARRAY -- MAKE CHANGES TO POS            00009150
C                                                                         00009160
1210    CELL=0                                                            00009170
        DO 1220 K1=1,COLS                                                 00009180
        IF(TEMP(K1).EQ.CELL) GO TO 1220                                   00009190
        CELL=TEMP(K1)                                                     00009200
        IF(CELL.NE.0) POS(CELL,1)=K1                                      00009210
1220    CONTINUE                                                          00009220
      DO 1225 K1=1,COLS                                                   00009230
       GWC5=TEMP(K1)                                                      00009240
       TEMP(K1)=C(I,K1)                                                   00009250
       C(I,K1)=GWC5                                                       00009260
1225  CONTINUE                                                            00009270
C                                                                         00009280
C       CELLS SWAPPED -- RATE                                             00009290
C                                                                         00009300
        CALL RATE(RATING,ZUH,ZUV,ZST,0)                                   00009310
C                                                                         00009320
C       IF BETTER, MAKE SWAP IN REAL                                      00009330
C                                                                         00009340
        IF(RATING.LE.R) GO TO 1350                                        00009350
        DO 1310 K=1,COLS                                                  00009360
         T1=TEMP(K)                                                       00009370
         IF(T1.NE.0)P(T1,1)=POS(T1,1)                                     00009380
1310    CONTINUE                                                          00009390
        R=RATING                                                          00009400
        F=1                                                               00009410
        GO TO 1700                                                        00009420
C                                                                         00009430
C       WORSE -- UNSWAP                                                   00009440
C                                                                         00009450
1350    DO 1360 K=1,COLS                                                  00009460
         T1=TEMP(K)                                                       00009470
         IF(T1.NE.0) POS(T1,1)=P(T1,1)                                    00009480
        C(I,K)=T1                                                         00009490
1360    CONTINUE                                                          00009500
C                                                                         00009510
C       BUMP NEIGHBORHOOD INDEX                                           00009520
C                                                                         00009530
1600    L=L+1                                                             00009540
C                                                                         00009550
C       IF STILL IN SAME NEIGHBORHOOD, CONTINUE                           00009560
C                                                                         00009570
        IF(L.LE.CN) GO TO 1060                                            00009580
```

```
C                                                                       00009590
C       NEIGHBORHOOD DONE -- BUMP J                                     00009600
1700    CONTINUE                                                        00009610
C                                                                       00009620
C       ROW DONE -- IF ANY SWAPS MADE, REPEAT                           00009630
C                                                                       00009640
        IF(F.EQ.1) GO TO 1015                                           00009650
C                                                                       00009660
C       NEXT ROW                                                        00009670
C                                                                       00009680
1800  CONTINUE                                                          00009690
3000  CONTINUE                                                          00009700
      RETURN                                                            00009710
      END                                                               00009720
      SUBROUTINE MSFCF                                                  00009730
C                                                                       00009740
C*****************************************************                  00009750
C                                                                       00009760
C                                                                       00009770
C     MSFCF -- SHOWS PLACEMENT IN MSFC FORMAT                           00009780
C                                                                       00009790
C                                                                       00009800
C*****************************************************                  00009810
C                                                                       00009820
      IMPLICIT INTEGER(A-Y)                                             00009830
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,XXX(9)    00009840
      COMMON /FLDDTA/ C(30,100),ROWS,COLS,POS(1000,2),NFL,NPI           00009850
     & ,MAXSOL,RN,CN                                                    00009860
      COMMON /PADPL/ ZPDPLC(100,2)                                      00009870
      COMMON /NETDTA/ NN(3000),WID(1000),PADS(100),NETNOS(500)          00009880
      INTEGER TEMP(200)                                                 00009890
      WRITE(PRNTR,7001)                                                 00009900
7001  FORMAT('1PLACEM')                                                 00009910
      WRITE(19,8001)                                                    00009920
8001  FORMAT('PLACEM')                                                  00009930
      ODD=1                                                             00009940
      DO 500 I=1,ROWS                                                   00009950
C                                                                       00009960
C     FORM Y-COORD FOR ROW                                              00009970
C                                                                       00009980
       ODD=-ODD                                                         00009990
       IF(ODD.LT.0) RW=17+8*I                                           00010000
       IF(ODD.GT.0) RW=-(25+8*I)                                        00010010
       NTMP=0                                                           00010020
       LCL=0                                                            00010030
C                                                                       00010040
C      SET COLUMN POINTER (J)                                           00010050
C                                                                       00010060
       J=1                                                              00010070
C                                                                       00010080
C      CHECK FOR EMPTY CELLS                                            00010090
C                                                                       00010100
```

```
100     IF(C(I,J).EQ.0) GO TO 200                                       00010110
C                                                                       00010120
C       NOT EMPTY -- SAME AS LAST CELL?                                 00010130
C                                                                       00010140
        IF(C(I,J).EQ.LCL) GO TO 400                                     00010150
C                                                                       00010160
C       NOT THE SAME -- ADD TO TEMP ARRAY                               00010170
C                                                                       00010180
        LCL=C(I,J)                                                      00010190
        START=J                                                         00010200
        CELL =LCL                                                       00010210
        GO TO 250                                                       00010220
C                                                                       00010230
C       HANDLE EMPTY CELLS                                              00010240
C                                                                       00010250
200     CELL=999000                                                     00010260
        START=J                                                         00010270
210     CELL=CELL+1                                                     00010280
        J=J+1                                                           00010290
        IF((J.LE.COLS).AND.(C(I,J).EQ.0)) GO TO 210                     00010300
        J=J-1                                                           00010310
C                                                                       00010320
C       ADD CELL #, X-COORD TO TEMP ARRAY                               00010330
C                                                                       00010340
250     NTMP=NTMP+1                                                     00010350
        TEMP(NTMP)=CELL                                                 00010360
        NTMP=NTMP+1                                                     00010370
        TEMP(NTMP)=3*START+22                                           00010380
C                                                                       00010390
C       NEXT COLUMN                                                     00010400
C                                                                       00010410
400     J=J+1                                                           00010420
        IF(J.LE.COLS) GO TO 100                                         00010430
C                                                                       00010440
C       ROW DONE -- PRINT DATA                                          00010450
C                                                                       00010460
        IND=1                                                           00010470
410     JND=IND+7                                                       00010480
        IF(JND.GT.NTMP) JND=NTMP                                        00010490
        WRITE(PRNTR,7002) RW,(TEMP(K),K=IND,JND)                        00010500
7002    FORMAT('0',9(I7))                                               00010510
        WRITE(19,7003) RW,(TEMP(K),K=IND,JND)                           00010520
7003    FORMAT(9(I7))                                                   00010530
        IND=IND+8                                                       00010540
        IF(IND.LE.NTMP) GO TO 410                                       00010550
C                                                                       00010560
C       NEXT ROW                                                        00010570
C                                                                       00010580
500   CONTINUE                                                          00010590
C                                                                       00010600
C     SHOW PAD PLACEMENT                                                00010610
C                                                                       00010620
```

```
      DO 1000 I=1,NPADS                                                  00010630
       ZR=ZPDPLC(I,2)                                                    00010640
       ZC=ZPDPLC(I,1)                                                    00010650
       IF((ZR.LT.1.E-6).OR.(ZR.GT.ROWS)) X=INT(ZC*3.+15.5)               00010660
       IF(ZC.LT.1.E-6) X=17                                              00010670
       IF(ZC.GT.COLS) X=INT(ZC*3.+21.5)                                  00010680
       IF(ZR.LT.1.E-6) Y=-25                                             00010690
       IF(ZR.GT.ROWS) Y=INT(ZR*8.+17.5)                                  00010700
       IF((ZC.LT.1.E-6).OR.(ZC.GT.COLS)) Y=INT(ZR*8.+13.5)               00010710
       WRITE(PRNTR,7002) Y,PADS(I),X                                     00010720
       WRITE(19,7003) Y,PADS(I),X                                        00010730
1000  CONTINUE                                                           00010740
      RETURN                                                             00010750
      END                                                                00010760
      SUBROUTINE CROSS                                                   00010770
C                                                                        00010780
C                                                                        00010790
C********** CROSS ROUTINE ******************                            00010800
C                                                                        00010810
C                                                                        00010820
C                                                                        00010830
      IMPLICIT INTEGER (A-Y)                                             00010840
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                   00010850
     & ,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL                 00010860
     & ,MXROWS,MXCOLS,MXDFSZ                                             00010870
      COMMON /NETDTA/ INP(3000),WID(1000),PAD(100),NETNOS(500)           00010880
      COMMON /LINDTA/ LINORD(1000)                                       00010890
      COMMON PLPNT(10,2),SPACE(30),LO(1000),CR1(1000),L(1000),           00010900
     & TEMP(1000),CR(1000),T(70)                                         00010910
      REAL CR                                                            00010920
C     SET UP DUMMY LINEAR ORDER                                          00010930
C                                                                        00010940
      DO 10060 I=1,NCELLS                                                00010950
       L(I)=LINORD(I)                                                    00010960
10060 CONTINUE                                                           00010970
      L(NCELLS+1)=0                                                      00010980
C                                                                        00010990
C     ELIMINATE PADS FROM LINEAR ORDER                                   00011000
C                                                                        00011010
      DO 10160 I=1,MXPADS                                                00011020
       GGG1=PAD(I)                                                       00011030
       IF(GGG1.EQ.0) GO TO 10180                                         00011040
       DO 10130 J=1,MXCELS                                               00011050
        IF(L(J).EQ.GGG1) GO TO 10135                                     00011060
10130  CONTINUE                                                          00011070
       WRITE(PRNTR,10131) GGG1                                           00011080
10131  FORMAT('0WARNING(CR001) -- PAD ',I4,' NOT IN LINEAR ORDER')       00011090
       GO TO 10160                                                       00011100
10135  DO 10150 K=J,MXCELS                                               00011110
        IF(L(K).EQ.0) GO TO 10160                                        00011120
        L(K)=L(K+1)                                                      00011130
10150  CONTINUE                                                          00011140
```

```
10160 CONTINUE                                                          00011150
C                                                                       00011160
C     CLEAR OUT CROSSING ARRAY                                          00011170
C                                                                       00011180
10180 DO 10190 I=1,NCELLS                                               00011190
       CR(I)=0.                                                         00011200
10190 CONTINUE                                                          00011210
C                                                                       00011220
C     FIND # NETS CROSSING AT EACH BOUNDARY                             00011230
C                                                                       00011240
      I=1                                                               00011250
C                                                                       00011260
C     CLEAR T ARRAY TO HOLD CURRENT NET                                 00011270
C                                                                       00011280
10220 DO 10230 II=1,70                                                  00011290
       T(II)=0                                                          00011300
10230 CONTINUE                                                          00011310
      K=1                                                               00011320
C                                                                       00011330
C     CHECK FOR END OF NETS                                             00011340
C                                                                       00011350
10240 IF(INP(I).EQ.-1) GO TO 10500                                      00011360
C                                                                       00011370
C     CHECK FOR END OF THIS NET                                         00011380
C                                                                       00011390
      IF(INP(I).EQ.0) GO TO 10300                                       00011400
C                                                                       00011410
C     ADD THIS CELL TO ARRAY T                                          00011420
C                                                                       00011430
      TA=INP(I)                                                         00011440
      DO 10274 J1=1,MXCELS                                              00011450
       IF(L(J1).EQ.TA) GO TO 10280                                      00011460
       IF(J1.GT.NCELLS) GO TO 10285                                     00011470
10274 CONTINUE                                                          00011480
10280 T(K)=TA                                                           00011490
      K=K+1                                                             00011500
10285 I=I+1                                                             00011510
      GO TO 10240                                                       00011520
C                                                                       00011530
C     UPDATE CROSS ARRAY FRO THIS NET                                   00011540
C                                                                       00011550
10300 IF(K.GT.2) GO TO 10310                                            00011560
      I=I+1                                                             00011570
      GO TO 10220                                                       00011580
10310 J=1                                                               00011590
C                                                                       00011600
C     LOOK FOR CELL AT L(J) IN THIS NET                                 00011610
C                                                                       00011620
10315 DO 10320 J1=1,70                                                  00011630
       GG=T(J1)                                                         00011640
       IF(GG.EQ.L(J)) GO TO 10350                                       00011650
       IF(GG.NE.0) GO TO 10320                                          00011660
```

```
       J=J+1                                                          00011670
       GO TO 10315                                                    00011680
10320 CONTINUE                                                        00011690
C                                                                     00011700
C      CELL AT L(J) IS FIRST OCCURRENCE OF CELLS                      00011710
C      IN THIS NET-- ADD 1 TO EACH CROSSING UNTIL                     00011720
C      CELLS HAVE BEEN FOUND                                          00011730
C                                                                     00011740
10350 K=K-1                                                           00011750
10360 K=K-1                                                           00011760
      IF(K.NE.0) GO TO 10370                                          00011770
      I=I+1                                                           00011780
      GO TO 10220                                                     00011790
10370 CR(J)=CR(J)+1.                                                  00011800
      J=J+1                                                           00011810
      DO 10380 J1=1,70                                                00011820
       GG=T(J1)                                                       00011830
       IF(GG.EQ.L(J)) GO TO 10360                                     00011840
       IF(GG.EQ.0) GO TO 10370                                        00011850
10380 CONTINUE                                                        00011860
      WRITE(PRNTR,10381)                                              00011870
10381 FORMAT('0ERROR(CR001) --OUT OF SPACE IN T ARRAY')               00011880
      STOP                                                            00011890
C                                                                     00011900
C                                                                     00011910
C      SORT CROSSINGS IN DESCENDING ORDER                             00011920
C                                                                     00011930
C                                                                     00011940
10500 DO 10510 I=1,MXCELS                                             00011950
       IF(L(I).EQ.0) GO TO 10515                                      00011960
10510 CONTINUE                                                        00011970
      WRITE(PRNTR,10512)                                              00011980
10512 FORMAT('0ERROR(CR002) --OUT OF SPACE IN L ARRAY')               00011990
      STOP                                                            00012000
10515 LAST=I-2                                                        00012010
      DO 10540 I=1,LAST                                               00012020
       ZI=FLOAT(I)                                                    00012030
       CR(I)=CR(I)+ZI/1000.                                           00012040
10540 CONTINUE                                                        00012050
10550 FLAG=0                                                          00012060
      00=LAST-1                                                       00012070
      DO 10580 I=1,00                                                 00012080
       Z001=CR(I+1)                                                   00012090
       IF(CR(I).LT.Z001) GO TO 10580                                  00012100
       CR(I+1)=CR(I)                                                  00012110
       CR(I)=Z001                                                     00012120
       FLAG=1                                                         00012130
10580 CONTINUE                                                        00012140
      IF(FLAG.NE.0) GO TO 10550                                       00012150
C                                                                     00012160
C      FORM FINAL CROSSING ARRAY                                      00012170
C                                                                     00012180
```

```
      DO 10680 I=1,LAST                                                 00012190
       ZC=CR(I)                                                         00012200
       ZC=ZC-FLOAT(IFIX(ZC+.0001))                                      00012210
       CR1(I)=IFIX(ZC*1000.+.5)                                         00012220
10680 CONTINUE                                                          00012230
      CR1(LAST+1)=0                                                     00012240
      IF(DEBUG.EQ.0) GO TO 20000                                        00012250
      WRITE(PRNTR,1001)                                                 00012260
1001  FORMAT('0',20X,'CROSSING DATA')                                   00012270
      DO 1003 I=1,200                                                   00012280
       IF(CR1(I).EQ.0) GO TO 20000                                      00012290
       WRITE(PRNTR,1002) CR(I),CR1(I)                                   00012300
1002   FORMAT('0',20X,F12.4,4X,I4)                                      00012310
1003  CONTINUE                                                          00012320
20000 RETURN                                                            00012330
      END                                                               00012340
      SUBROUTINE RATE(RATING,ZUHAV,ZUV,ZSNP,SWIT)                       00012350
C                                                                       00012360
C*****************************************************                00012370
C                                                                       00012380
C                                                                       00012390
C     RATER ROUTINE-- FORMS PLACEMENT RATINGS                           00012400
C                                                                       00012410
C                                                                       00012420
C*****************************************************                00012430
C                                                                       00012440
      IMPLICIT INTEGER (A-Y)                                            00012450
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                  00012[illegible]
     & ,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL                00012[illegible]
     & ,MXROWS,MXCOLS,MXDFSZ                                            00012[illegible]
      COMMON /NETDTA/ N(3000),WID(1000),PAD(100),NETNOS(500)            00012490
      COMMON /FLDDTA/ C7(30,100),ROWS,COLS,POS(1000,2),NFLSAV,NPISAV    00012500
     & ,MAXSOL,RN,CN                                                    00012510
C                                                                       00012520
C                                                                       00012530
      BESTH=0                                                           00012540
      WORSTH=0                                                          00012550
      V=0                                                               00012560
      NETPNT=1                                                          00012570
      NET=1                                                             00012580
      NETS=0                                                            00012590
      NSTR8=0                                                           00012600
C                                                                       00012610
C     FORM LEFT,RIGHT,TOP,BOTTOM,S1,S2 DATA FOR EACH NET                00012620
C                                                                       00012630
500   MINSJ=99999                                                       00012640
      MAXSK=0                                                           00012650
      MINRJ=99999                                                       00012660
      MAXRK=0                                                           00012670
      MINSJP=99999                                                      00012680
      MAXSKP=0                                                          00012690
      CELLS=0                                                           00012700
```

```
1000  CELL=N(NETPNT)                                                    00012710
C                                                                       00012720
C     END OF NET?                                                       00012730
C                                                                       00012740
      IF(CELL.EQ.0) GO TO 2000                                          00012750
C                                                                       00012760
C     NO -- PAD?                                                        00012770
C                                                                       00012780
      S=POS(CELL,1)                                                     00012790
      IF(S.EQ.0) GO TO 1100                                             00012800
C                                                                       00012810
C     NO -- RESET CURRENT NET BOUNDS IF NEEDED                          00012820
C                                                                       00012830
      CELLS=CELLS+1                                                     00012840
      R=POS(CELL,2)                                                     00012850
      IF(MINSJ.GT.S) MINSJ=S                                            00012860
      IF(MAXSK.LT.S) MAXSK=S                                            00012870
      IF(MINRJ.GT.R) MINRJ=R                                            00012880
      IF(MAXRK.LT.R) MAXRK=R                                            00012890
      SJP=S+WID(CELL)-1                                                 00012900
      IF(MINSJP.GT.SJP) MINSJP=SJP                                      00012910
      IF(MAXSKP.LT.SJP) MAXSKP=SJP                                      00012920
1100  NETPNT=NETPNT+1                                                   00012930
      GO TO 1000                                                        00012940
C                                                                       00012950
C     END OF NET SEEN -- UPDATE BESTH, WORST, V                         00012960
C                                                                       00012970
2000  IF(CELLS.LT.2) GO TO 3000                                         00012980
      IF(MINSJP.LT.MAXSK)BESTH=BESTH+MAXSK-MINSJP+1                     00012990
      IF(MINSJ.LE.MAXSKP)WORSTH=WORSTH+MAXSKP-MINSJ+1                   00013000
      IF(MINRJ.LT.MAXRK)V=V+MAXRK-MINRJ+1                               00013010
2210  CONTINUE                                                          00013020
      NETS=NETS+1                                                       00013030
C                                                                       00013040
C     STRAIGHT NET?                                                     00013050
C                                                                       00013060
      IF((MINRJ.NE.MAXRK).AND.(MINSJP.LT.MAXSK))GO TO 3000              00013070
C                                                                       00013080
C     YES -- UPDATE RECORDS                                             00013090
C                                                                       00013100
      NSTR8=NSTR8+1                                                     00013110
      IF(SWIT.NE.0) WRITE(PRNTR,7002) NETNOS(NET)                       00013120
7002  FORMAT('0',12X,'NET ',I5,' STRAIGHT')                             00013130
C                                                                       00013140
C     IF NOT END OF NET LIST, CONTINUE WITH NEXT NET                    00013150
C                                                                       00013160
3000  NETPNT=NETPNT+1                                                   00013170
      NET=NET+1                                                         00013180
      IF(N(NETPNT).NE.-1) GO TO 500                                     00013190
C                                                                       00013200
C     RATE EMPTY TRANSISTOR PLACEMENT                                   00013210
C                                                                       00013220
```

```
      ZNUMET=0                                                          00013230
      ZETD=0.                                                           00013240
      ZCCOL=FLOAT(COLS)/2.                                              00013250
      DO 8800 I=1,ROWS                                                  00013260
       DO 8799 J=1,COLS                                                 00013270
        IF(C7(I,J).NE.0) GO TO 8799                                     00013280
        ZNUMET=ZNUMET+1.                                                00013290
        ZETD=ZETD+ABS(FLOAT(J)-ZCCOL)                                   00013300
8799   CONTINUE                                                         00013310
8800  CONTINUE                                                          00013320
      ZROWS=FLOAT(ROWS)                                                 00013330
      ZETR=(ZNUMET/2.)*(COLS -1.-(ZNUMET/2./ZROWS))                     00013340
      ZETR=ZETD/ZETR                                                    00013350
C     END OF ENT LIST -- SHOW  RATINGS                                  00013360
C                                                                       00013370
      ZSNP=(FLOAT(NSTR8)/FLOAT(NETS))*100.                              00013380
      ZUHAV=BESTH+WORSTH                                                00013390
      ZUHAV=(ZUHAV*12.5)/(ROWS*COLS)                                    00013400
      ZUV=(V*100.)/(ROWS*COLS)                                          00013410
C                                                                       00013420
C     COMPUTE TOTAL RATING                                              00013430
C                                                                       00013440
      ZW=ZUV                                                            00013450
      ZB=ZUHAV                                                          00013460
      IF(ZUV.GE.ZUHAV) GO TO 4300                                       00013470
      ZW=ZB                                                             00013480
      ZB=ZUV                                                            00013490
4300  ZTR=(.06)*ZW+(.02)*ZB+1.-(.01)*ZSNP+2*ZETR                        00013500
      ZTR=1.-ZTR/11.                                                    00013510
      RATING=IFIX(ZTR*1E6)                                              00013520
      RETURN                                                            00013530
      END                                                               00013540
      SUBROUTINE QUAL(ZMEAN,ZSD,RTOM,Q)                                 00013550
C                                                                       00013560
C*****************************************************************    00013570
C                                                                       00013580
C                                                                       00013590
C     QUAL - ESTIMATES PLACEMENT QUALITY BASED ON RATINGS OF            00013600
C            PLACEMENTS FOUND (USES N.B.S. EQUATION FOR AREA           00013610
C            UNDER NORMAL CURVE)                                       00013620
C                                                                       00013630
C                                                                       00013640
C*****************************************************************    00013650
C                                                                       00013660
      IMPLICIT INTEGER (A-Y)                                            00013670
      REAL EXP                                                          00013680
      ZR=FLOAT(RTOM)/1E6                                                00013690
      ZX=(ZR-ZMEAN)/ZSD                                                 00013700
      Z1=(.398942)*EXP(-ZX*ZX/2.)                                       00013710
      ZT=1./(1.+(.2316419)*ZX)                                          00013720
      Z2=ZT*(-1.821256+(1.330274)*ZT)                                   00013730
      Z3=ZT*(1.781478+Z2)                                               00013740
```

```
      Z4=ZT*(-.356564+Z3)                                                00013750
      Z5=ZT*(.3193815+Z4)                                                00013760
      ZQ=(1.-Z1*Z5)                                                      00013770
      Q=ZQ*1E6                                                           00013780
      RETURN                                                             00013790
      END                                                                00013800
      SUBROUTINE DEPICT                                                  00013810
C                                                                        00013820
C*******************************************************               00013830
C                                                                        00013840
C                                                                        00013850
C     DEPICT ROUTINE -- OUTPUTS STAR IMAGE (WITH                         00013860
C                       NET #S) ON OUTPUT MEDIUM                         00013870
C                                                                        00013880
C                                                                        00013890
C*******************************************************               00013900
C                                                                        00013910
      IMPLICIT INTEGER (A-Y)                                             00013920
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG                   00013930
     & ,MXCELS,MXNETS,MXCLNT,MXCLUS,MXNTSZ,MXPADS,MXNTCL                00013940
     & ,MXROWS,MXCOLS,MXDFSZ                                            00013950
      COMMON/NETDTA/ NETS(3000),WIDTH(1000),PAD(100),NETNOS(500)         00013960
      COMMON/CLNET/CLNTS(3000),LSTCEL,FRSCLU                             00013970
      COMMON/FLDDTA/ CHIP(30,100),ROWS,COLS,POS(1000,2),NFLSAV,NPISAV    00013980
     & ,MAXSOL,RN,CN                                                     00013990
      INTEGER CHAR(14)/'0   ','1   ','2   ','3   ',                     00014000
     &'4   ','5   ','6   ','7   ','8   ','9   ',                        00014010
     &'    ','#   ','-   ',':   '/                                      00014020
      COMMON PLPNT(10,2),LINE1(130),LINE2(130),LINE3(130)                00014030
     & ,NUMNET(1000),START(1000),T(800)                                  00014040
C                                                                        00014050
C     SET INITIAL LINE WIDTH                                             00014060
C                                                                        00014070
      LINWID=70                                                          00014080
C                                                                        00014090
C     ZERO OUT WORKING ARRAYS                                            00014100
C                                                                        00014110
      DO 10400 I=1,MXCELS                                                00014120
       NUMNET(I)=0                                                       00014130
      START(I)=0                                                         00014140
10400 CONTINUE                                                           00014150
C                                                                        00014160
C     FIND NUMNETS, START FOR EACH CELL                                  00014170
C                                                                        00014180
      F1=FRSCLU-1                                                        00014190
      DO 10480 I=1,F1                                                    00014200
       OO=CLNTS(I)/1000                                                  00014210
       NUMNET(OO)=NUMNET(OO)+1                                           00014220
       IF(START(OO).EQ.0) START(OO)=I                                    00014230
10480 CONTINUE                                                           00014240
C                                                                        00014250
C     SET TRANSISTOR WIDTH                                               00014260
```

```
C                                                                       00014270
      TRNWID=0                                                          00014280
      DO 10600 I=1,F1                                                   00014290
       00=CLNTS(I)/1000                                                 00014300
       IF(WIDTH(00).EQ.0) GO TO 10600                                   00014310
       TT=00                                                            00014320
       TRY=IFIX((2*(NUMNET(TT)+1))/WIDTH(TT)+.99)                       00014330
       IF(TRY.GT.TRNWID) TRNWID=TRY                                     00014340
10600 CONTINUE                                                          00014350
      IF(TRNWID.LT.2) TRNWID=2                                          00014360
C                                                                       00014370
C     SET # TRANSISTORS / LINE                                          00014380
C                                                                       00014390
      TPL=0                                                             00014400
10680 TPL=TPL+1                                                         00014410
      00=TPL*(TRNWID+1)+1                                               00014420
      IF(00.LT.LINWID) GO TO 10680                                      00014430
C                                                                       00014440
C     ADJUST LINE WIDTH                                                 00014450
C                                                                       00014460
      TPL=TPL-1                                                         00014470
      LINWID=TPL*(TRNWID+1)+1                                           00014480
C                                                                       00014490
C     SET BASE, ROW FOR OUTPUT                                          00014500
C                                                                       00014510
      BASE=1                                                            00014520
      CALL FIGGER(BASE,BASE,TT,ENDR,TRNWID)                             00014530
11320 ROW=1                                                             00014540
C                                                                       00014550
C     PRINT PAGE HEADER                                                 00014560
C                                                                       00014570
      WRITE(PRNTR,11341)                                                00014580
11341 FORMAT('0'///)                                                    00014590
      WRITE(PRNTR,11343)                                                00014600
11343 FORMAT('0'//)                                                     00014610
C                                                                       00014620
C     IF THIS IS LAST PAGE, ADJUST LINE WIDTH TO ACTUAL                 00014630
C     WIDTH REMAINING                                                   00014640
C                                                                       00014650
11360 00=BASE+LINWID                                                    00014660
      IF(ENDR.LT.00) LINWID=ENDR-BASE+2                                 00014670
C                                                                       00014680
C     PRINT TOP OF CELL ROW                                             00014690
C                                                                       00014700
      DO 11380 I=1,LINWID                                               00014710
       LINE1(I)=CHAR(12)                                                00014720
11380 CONTINUE                                                          00014730
      00=LINWID-1                                                       00014740
      WRITE(PRNTR,11382) (LINE1(I),I=1,00)                              00014750
11382 FORMAT(' ',130(A1))                                               00014760
C                                                                       00014770
C     CLEAR CELL ROW STRINGS                                            00014780
```

```
C                                                                       00014790
      I=1                                                               00014800
      001=BASE+LINWID-2                                                 00014810
      DO 11620 COL=BASE,001                                             00014820
       CALL FIGGER(ROW,COL,TT,ENDR,TRNWID)                              00014830
C                                                                       00014840
C      ADD APPR. NON-NUMERIC CHARACTERS TO STRINGS                      00014850
C                                                                       00014860
       IF(TT.GE.1000) GO TO 11600                                       00014870
       D=CHAR(TT+11)                                                    00014880
       LINE1(I)=D                                                       00014890
      LINE2(I)=D                                                        00014900
      LINE3(I)=D                                                        00014910
       GO TO 11619                                                      00014920
C                                                                       00014930
C      NUMBER ENCOUNTERED IN TEMPLATE-- CONVERT TO                      00014940
C      CHARS AND ADD ONE CHAR TO EACH STRING                            00014950
C                                                                       00014960
11600  00=TT-1000                                                       00014970
       D1=(00/100)                                                      00014980
       D2=(00/10)-(D1*10)                                               00014990
       D3=00-(D2*10)-(D1*100)                                           00015000
11610  IF(D1.NE.0) GO TO 11615                                          00015010
       D1=D2                                                            00015020
       D2=D3                                                            00015030
       D3=10                                                            00015040
       GO TO 11610                                                      00015050
11615  CONTINUE                                                         00015060
       LINE1(I)=CHAR(D1+1)                                              00015070
       LINE2(I)=CHAR(D2+1)                                              00015080
       LINE3(I)=CHAR(D3+1)                                              00015090
11619  I=I+1                                                            00015100
11620 CONTINUE                                                          00015110
      I=I-1                                                             00015120
C                                                                       00015130
C     PRINT CELL ROW STRINGS                                            00015140
C                                                                       00015150
      WRITE(PRNTR,11640) (LINE1(J),J=1,I)                               00015160
      WRITE(PRNTR,11640) (LINE2(J),J=1,I)                               00015170
      WRITE(PRNTR,11640) (LINE3(J),J=1,I)                               00015180
11640 FORMAT(' ',130(A1))                                               00015190
C                                                                       00015200
C     BUMP TEMPLATE ROW POINTER                                         00015210
C                                                                       00015220
      ROW=ROW+1                                                         00015230
      IF(ROW.LE.ROWS) GO TO 11360                                       00015240
C                                                                       00015250
C     ALL ROWS HANDLED, PRINT STAR BOTTOM                               00015260
C                                                                       00015270
      DO 11680 I=1,LINWID                                               00015280
       LINE1(I)=CHAR(12)                                                00015290
11680 CONTINUE                                                          00015300
```

```
      OO=LINWID-1                                                       00015310
      WRITE(PRNTR,11681) (LINE1(I),I=1,OO)                              00015320
11681 FORMAT(' ',130(A1))                                               00015330
C                                                                       00015340
C     SET UP POINTERS FOR NEXT PAGE                                     00015350
C                                                                       00015360
      BASE=BASE+LINWID-1                                                00015370
      OO=TRNWID*(COLS+1)+1                                              00015380
      IF(BASE.LE.OO) GO TO 11320                                        00015390
      IF(BASE.LE.ENDR) GO TO 11320                                      00015400
C                                                                       00015410
C     NORMAL EXIT                                                       00015420
C                                                                       00015430
      RETURN                                                            00015440
      END                                                               00015450
      SUBROUTINE FIGGER(ROW,COL1,TT1,ENDR,TRNWID)                       00015460
C                                                                       00015470
C                                                                       00015480
C*****************FIGGER-- SIMULATES LARGE OUTPUT TEMPLATE             00015490
C                          NEEDED FOR LARGE STAR                        00015500
C                                                                       00015510
C                                                                       00015520
      IMPLICIT INTEGER (A-Y)                                            00015530
      COMMON /GLBL/PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,XXX(10)           00015540
      COMMON /NETDTA/ NETS(3000),WIDTH(1000),PAD(100),NETNOS(500)       00015550
      COMMON /CLNET/CLNTS(3000),LSTCEL,FRSCLU                           00015560
      COMMON /FLDDTA/ CHIP(30,100),ROWS,COLS,POS(1000,2),NFLSAV,NPISAV  00015570
     & ,MAXSOL,RN,CN                                                    00015580
      COMMON PLPNT(10,2),XX(390),NUMNET(1000),START(1000),T(800)        00015590
      INTEGER LASROW/0/                                                 00015600
C                                                                       00015610
C     IF SAME ROW AS LAST REQUEST, LOOK UP IN T ARRAY                   00015620
C                                                                       00015630
      IF(ROW.EQ.LASROW) GO TO 11260                                     00015640
      LASROW=ROW                                                        00015650
      NETIND=0                                                          00015660
      OO=((TRNWID+1)*COLS)+10                                           00015670
      DO 10800 J=1,OO                                                   00015680
       T(J)=0                                                           00015690
10800 CONTINUE                                                          00015700
C                                                                       00015710
C     FORM L-HAND EDGE                                                  00015720
C                                                                       00015730
      T(1)=1                                                            00015740
      TT=1                                                              00015750
                                                                        00015760
C     FORM TRANS BOUNDARIES                                             00015770
C                                                                       00015780
      C=0                                                               00015790
10860 TT=TT+TRNWID+1                                                    00015800
      I=TT                                                              00015810
      T(I)=3                                                            00015820
```

```
      C=C+1                                                              00015830
      IF(C.LT.COLS) GO TO 10860                                          00015840
      I=2                                                                00015850
      COL=1                                                              00015860
C                                                                        00015870
C     LOAD CELL NUMBER                                                   00015880
C                                                                        00015890
11000 CELNUM=CHIP(ROW,COL)                                               00015900
      T(I)=CELNUM+1000                                                   00015910
      OO=I+1                                                             00015920
      T(OO)=2                                                            00015930
C                                                                        00015940
C     CLEAR NET POINTER                                                  00015950
C                                                                        00015960
      NETIND=0                                                           00015970
11040 I=I+1                                                              00015980
C                                                                        00015990
C     IF LOOKING AT TRANS. BOUNDARY, GO TO NEXT TRANS. ROUTINE           00016000
C                                                                        00016010
      IF(T(I).EQ.3) GO TO 11180                                          00016020
C                                                                        00016030
C     IF NO SPACE AFTER LAST NUMBER, SKIP A PLACE                        00016040
C                                                                        00016050
11080 OO=I-1                                                             00016060
      IF(T(OO).GE.1000) GO TO 11040                                      00016070
      IF(CELNUM.EQ.0) GO TO 11040                                        00016080
C                                                                        00016090
C     GET NEXT CELL-NET                                                  00016100
C                                                                        00016110
      NET=CLNTS(START(CELNUM)+NETIND)                                    00016120
C                                                                        00016130
C     IF NET NOT FOR THIS CELL, SKIP IT                                  00016140
C                                                                        00016150
      OO=NET/1000                                                        00016160
      IF(OO.NE.CELNUM) GO TO 11040                                       00016170
C                                                                        00016180
C     LOAD NET NUMBER                                                    00016190
C                                                                        00016200
      T(I)=NETNOS(NET-(OO*1000))+1000                                    00016210
      NETIND=NETIND+1                                                    00016220
      GO TO 11040                                                        00016230
C                                                                        00016240
C     NEXT TRANS. ROUTINE                                                00016250
C                                                                        00016260
11180 COL=COL+1                                                          00016270
      I=I+1                                                              00016280
      IF(COL.LE.COLS) GO TO 11215                                        00016290
      OO=I-1                                                             00016300
      T(OO)=1                                                            00016310
      ENDR=I-1                                                           00016320
      GO TO 11260                                                        00016330
C                                                                        00016340
```

```
C     IF STILL IN SAME CELL, CONTINUE                                    00016350
C                                                                        00016360
11215 IF(CHIP(ROW,COL).EQ.0) GO TO 11240                                 00016370
      IF(CHIP(ROW,COL).EQ.CELNUM) GO TO 11080                            00016380
C                                                                        00016390
C     NEW CELL-- DRAW BOUNDARY AND GO ON                                 00016400
C                                                                        00016410
11240 00=I-1                                                             00016420
      T(00)=1                                                            00016430
      GO TO 11000                                                        00016440
C                                                                        00016450
C     EXIT                                                               00016460
C                                                                        00016470
11260 TT1=T(COL1)                                                        00016480
      RETURN                                                             00016490
      END                                                                00016500
      SUBROUTINE PADPUT                                                  00016510
C                                                                        00016520
C*********************************************************             00016530
C                                                                        00016540
C                                                                        00016550
C     PADPUT -- PLACES PADS TO OPTIMIZE W/ RESPECT TO CELL PLACEMENT     00016560
C                                                                        00016570
C                                                                        00016580
C*********************************************************             00016590
C                                                                        00016600
      IMPLICIT INTEGER (A-Y)                                             00016610
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,XXX(9)     00016620
      COMMON /FLDDTA/ CHIP(30,100),ROWS,COLS,POS(1000,2),NFL,NPI         00016630
      COMMON /PADPL/ ZPDPLC(100,2)                                       00016640
      COMMON /CLNET/ CLNTS(3000),LSTCEL,FRSCLU                           00016650
      COMMON /NETDTA/ NETS(3000),WID(1000),PADS(100),NETNOS(500)         00016660
      COMMON PLPNT(10,2),BARIER(100,2),NBARR,NPADLC,OPT(100,2),          00016670
     & CELPNT(100),CELLST(1000),                                         00016680
     & ZPDLOC(100,2)                                                     00016690
      PADFIL=13                                                          00016700
      NPADLC=0                                                           00016710
      TEST1=8*ROWS+25                                                    00016720
      TEST2=3*COLS+24                                                    00016730
C                                                                        00016740
C     RETRIEVE PAD LOCATION DATA FOR STAR FROM STARPADLOC FILE           00016750
C                                                                        00016760
      REWIND PADFIL                                                      00016770
100   READ(PADFIL,7001,END=200) X1,X2                                    00016780
7001  FORMAT(2(I4))                                                      00016790
C                                                                        00016800
C     IF X1<0, THIS IS START OF NEXT STAR                                00016810
C                                                                        00016820
      IF(X1.GE.0) GO TO 100                                              00016830
C                                                                        00016840
C     CHECK X1,X2 AGAINST ROWS,COLS                                      00016850
C                                                                        00016860
```

```
      X1=-X1                                                            00016870
      IF(X1.NE.ROWS) GO TO 100                                          00016880
      IF(X2.NE.COLS) GO TO 100                                          00016890
      GO TO 300                                                         00016900
C                                                                       00016910
C     STAR SIZE NOT FOUND -- BOMB OUT                                   00016920
C                                                                       00016930
200   WRITE(PRNTR,7002) ROWS,COLS                                       00016940
7002  FORMAT('0ERROR(PAD01) -- ',I4,' BY ',I4,' STAR NOT FOUND',        00016950
     & ' IN PAD LOCATION FILE')                                         00016960
      STOP                                                              00016970
C                                                                       00016980
C     FOUND HEADER FOR STAR -- READ IN PAD LOCATIONS                    00016990
C     AND CONVERT TO ROW, COL EQUIVALENTS FOR                           00017000
C     CENTERS -- SAVE # PAD LOCATIONS IN NPADLC                         00017010
C                                                                       00017020
300   READ(PADFIL,7001,END=400) X,Y                                     00017030
      IF(X.LT.0) GO TO 400                                              00017040
      IF((Y.EQ.-25).OR.(Y.EQ.TEST1)) ZC=(X-15.)/3.                      00017050
      IF(X.EQ.17) ZC=0.                                                 00017060
      IF(X.EQ.TEST2) ZC=COLS+1                                          00017070
      IF((X.EQ.17).OR.(X.EQ.TEST2)) ZR=(Y-13.)/8.                       00017080
      IF(Y.EQ.TEST1) ZR=ROWS+1                                          00017090
      IF(Y.EQ.-25) ZR=0.                                                00017100
      NPADLC=NPADLC+1                                                   00017110
      BARIER(NPADLC,1)=X                                                00017120
      BARIER(NPADLC,2)=Y                                                00017130
      ZPDLOC(NPADLC,1)=ZC                                               00017140
      ZPDLOC(NPADLC,2)=ZR                                               00017150
      GO TO 300                                                         00017160
C                                                                       00017170
C     PAD LOCATIONS RETRIEVED -- CHECK FOR TOO MANY PADS                00017180
C                                                                       00017190
400   IF(NPADLC.GE.NPADS) GO TO 500                                     00017200
      WRITE(PRNTR,7003) NPADS,ROWS,COLS,NPADLC                          00017210
7003  FORMAT('0ERROR(PAD02) -- ',I4,' PADS IN CIRCUIT -- MAX FOR ',I4,  00017220
     & ' BY ',I4,' STAR IS ',I4)                                        00017230
      STOP                                                              00017240
C                                                                       00017250
C     CLEAR PAD PLACEMENT (ZPDPLC) ARRAY                                00017260
C                                                                       00017270
500   DO 510 I=1,NPADS                                                  00017280
       ZPDPLC(I,1)=0.                                                   00017290
       ZPDPLC(I,2)=0.                                                   00017300
510   CONTINUE                                                          00017310
C                                                                       00017320
C     SET # UNPLACED PADS = # PADS                                      00017330
C                                                                       00017340
      NPDREM=NPADS                                                      00017350
C                                                                       00017360
C     FIND OPT. ASSIGNMENT FOR ALL PADS ON FIRST PASS THROUGH ASS. SECTI00017370
C                                                                       00017380
```

```
      ALLFLG=0                                                          00017390
C                                                                       00017400
C     FORM CELPNT,CELLST ARRAYS                                         00017410
C                                                                       00017420
      I=1                                                               00017430
600   CLPTPT=1                                                          00017440
      CLLSPT=1                                                          00017450
      CLNTPT=1                                                          00017460
C                                                                       00017470
C     FIND CELL-NETS FOR ITH PAD                                        00017480
C                                                                       00017490
610   CL=CLNTS(CLNTPT)/1000                                             00017500
      IF(CL.EQ.PADS(I)) GO TO 620                                       00017510
      CLNTPT=CLNTPT+1                                                   00017520
      IF(CLNTPT.LT.FRSCLU) GO TO 610                                    00017530
      WRITE(PRNTR,7004) PADS(I)                                         00017540
7004  FORMAT('0ERROR(PAD03) -- CELL-NETS FOR PAD ',I4,' NOT FOUND')     00017550
      STOP                                                              00017560
C                                                                       00017570
C     FOUND CELL-NETS -- ASSUME ONLY ONE NET -- LOAD ITS # TO PADNET    00017580
C                                                                       00017590
620   PADNET=CLNTS(CLNTPT)-CL*1000                                      00017600
C                                                                       00017610
C     FIND PADNET IN NETS ARRAY                                         00017620
C                                                                       00017630
      NETPNT=1                                                          00017640
      NET=1                                                             00017650
630   IF(NET.EQ.PADNET) GO TO 660                                       00017660
640   NETPNT=NETPNT+1                                                   00017670
      IF(NETS(NETPNT).NE.0) GO TO 650                                   00017680
      NET=NET+1                                                         00017690
      NETPNT=NETPNT+1                                                   00017700
      GO TO 630                                                         00017710
650   IF(NETS(NETPNT).NE.-1) GO TO 640                                  00017720
      WRITE(PRNTR,7005) PADNET                                          00017730
7005  FORMAT('0ERROR(PAD04) -- INT. NET # ',I4,' NOT FOUND')            00017740
      STOP                                                              00017750
C                                                                       00017760
C     PADNET FOUND -- LOAD CELL (NOT PAD) #'S TO CELLST ARRAY           00017770
C                                                                       00017780
660   CELPNT(CLPTPT)=CLLSPT                                             00017790
      CLPTPT=CLPTPT+1                                                   00017800
      CCNT=0                                                            00017810
670   CELL=NETS(NETPNT)                                                 00017820
      IF(WID(CELL).EQ.0) GO TO 680                                      00017830
      CCNT=CCNT+1                                                       00017840
      CELLST(CLLSPT)=CELL                                               00017850
      CLLSPT=CLLSPT+1                                                   00017860
680   NETPNT=NETPNT+1                                                   00017870
      IF(NETS(NETPNT).NE.0) GO TO 670                                   00017880
      IF(CCNT.NE.0) GO TO 690                                           00017890
      WRITE(PRNTR,7006) PADS(I)                                         00017900
```

```
7006  FORMAT('0ERROR(PAD05) -- PAD ',I4,' CONNECTED TO NO CELLS')        00017910
      STOP                                                               00017920
C                                                                        00017930
C     DONE WITH THIS PAD -- IF MORE REMAIN, CONTINUE                     00017940
690   I=I+1                                                              00017950
      CLNTPT=1                                                           00017960
      IF(I.LE.NPADS) GO TO 610                                           00017970
      CELPNT(CLPTPT)=CLLSPT                                              00017980
C                                                                        00017990
C     FORM ASSIGNMENTS FOR ALL PADS ON FIRST PASS                        00018000
C     USE I FOR PAD INDEXING                                             00018010
C                                                                        00018020
      I=1                                                                00018030
C                                                                        00018040
C     FIND OPTIMUM ASSIGNMENT (UNOCCUPIED LOCATION) FOR ITH PAD          00018050
C                                                                        00018060
1000  K=0                                                                00018070
      ZBEST=99999.                                                       00018080
      CLLSPT=CELPNT(I)                                                   00018090
C                                                                        00018100
C     CELL IS A CELL HOOKED TO ITH PAD                                   00018110
C                                                                        00018120
1010  CELL=CELLST(CLLSPT)                                                00018130
C                                                                        00018140
C     USE PADLOC FOR PAD LOCATION INDEXING                               00018150
C                                                                        00018160
      PADLOC=1                                                           00018170
C                                                                        00018180
C     IS PAD LOCATION OCCUPIED? -- IF SO, SKIP IT                        00018190
C                                                                        00018200
1020  IF(ZPDLOC(PADLOC,1).LT.0) GO TO 1030                               00018210
C                                                                        00018220
C     COMPUTE MANHATTAN DISTANCE FROM CELL CENTER TO PAD CENTER          00018230
C                                                                        00018240
      ZDIST=ABS(FLOAT(POS(CELL,1))+.5*FLOAT(WID(CELL))-ZPDLOC(PADLOC,1))00018250
      ZDIST=ZDIST+ABS(FLOAT(POS(CELL,2))-ZPDLOC(PADLOC,2))               00018260
C                                                                        00018270
C     IF THIS DISTANCE IS CURRENT BEST FOR CELLS HOOKED TO ITH PAD,      00018280
C     UPDATE RECORD OF BEST                                              00018290
C                                                                        00018300
      IF(ZDIST.GE.ZBEST) GO TO 1030                                      00018310
      K=PADLOC                                                           00018320
      ZBEST=ZDIST                                                        00018330
C                                                                        00018340
C     CHECK THIS CELL AGAINST NEXT PAD LOCATION                          00018350
C                                                                        00018360
1030  PADLOC=PADLOC+1                                                    00018370
      IF(PADLOC.LE.NPADLC) GO TO 1020                                    00018380
C                                                                        00018390
C     WORK ON NEXT CELL HOOKED TO ITH PAD                                00018400
C                                                                        00018410
      CLLSPT=CLLSPT+1                                                    00018420
```

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      I1=I+1                                                          00018430
      IF(CLLSPT.LT.CELPNT(I1)) GO TO 1010                             00018440
C                                                                     00018450
C     KTH PAD LOCATION IS OPT. PLACE FOR ITH PAD -- UPDATE RECORD     00018460
C                                                                     00018470
      OPT(I,1)=K                                                      00018480
      OPT(I,2)=INT(ZBEST)                                             00018490
C                                                                     00018500
C     IF THIS IS NOT FIRST PASS, WE'RE DONE -- OTHERWISE, NEXT PAD    00018510
C                                                                     00018520
      IF(ALLFLG.NE.0) GO TO 2000                                      00018530
      I=I+1                                                           00018540
      IF(I.LE.NPADS) GO TO 1000                                       00018550
C                                                                     00018560
C     DONE WITH FIRST PASS -- SET FLAG                                00018570
C                                                                     00018580
      ALLFLG=1                                                        00018590
C                                                                     00018600
C     FIND THE MOST OPTIMUM ASSIGNMENT OVER ALL PADS                  00018610
C                                                                     00018620
2000  BEST=9999                                                       00018630
      DO 2020 I=1,NPADS                                               00018640
       T1=ABS(ZPDPLC(I,1))                                            00018650
       IF(T1.GT.1.E-6) GO TO 2020                                     00018660
       T2=ABS(ZPDPLC(I,2))                                            00018670
       IF(T2.GT.1.E-6) GO TO 2020                                     00018680
       IF(OPT(I,2).GE.BEST) GO TO 2020                                00018690
       BEST=OPT(I,2)                                                  00018700
       L=I                                                            00018710
2020  CONTINUE                                                        00018720
C                                                                     00018730
C     MOST OPT. ASSIGNMENT IS LTH PAD -- IF ITS LOCATION IS           00018740
C     OCCUPIED, RECOMPUTE OPT. LOCATION FOR LTH PAD                   00018750
C                                                                     00018760
      IF(ZPDLOC(OPT(L,1),1).GE.0.) GO TO 2030                         00018770
      I=L                                                             00018780
      GO TO 1000                                                      00018790
C                                                                     00018800
C     NOT OCCUPIED -- PLACE LTH PAD THERE                             00018810
C                                                                     00018820
2030  LOC=OPT(L,1)                                                    00018830
      ZPDPLC(L,1)=ZPDLOC(LOC,1)                                       00018840
      ZPDPLC(L,2)=ZPDLOC(LOC,2)                                       00018850
      ZPDLOC(LOC,1)=-1                                                00018860
      BARIER(LOC,1)=0                                                 00018870
      NPDREM=NPDREM-1                                                 00018880
      WRITE(PRNTR,8000) PADS(L),ZPDPLC(L,2),ZPDPLC(L,1)               00018890
8000  FORMAT('0PAD ',I4,' PLACED AT ',F5.1,' , ',F5.1)                00018900
C                                                                     00018910
C     IF UNPLACED PADS REMAIN, CONTINUE                               00018920
C                                                                     00018930
      IF(NPDREM.NE.0) GO TO 2000                                      00018940
```

```
C                                                                       00018950
C     ALL PLACED -- FIND # BARRIERS NEEDED & EXIT                       00018960
C                                                                       00018970
      NBARR=0                                                           00018980
      DO 5000 I=1,NPADLC                                                00018990
       IF(BARIER(I,1).NE.0) NBARR=NBARR+1                               00019000
5000  CONTINUE                                                          00019010
      RETURN                                                            00019020
      END                                                               00019030
      SUBROUTINE OUTBLD                                                 00019040
C                                                                       00019050
C*********************************************************            00019060
C                                                                       00019070
C                                                                       00019080
C     OUTBLD-- BUILDS OUTPUT FILE FOR ROUTER                            00019090
C                                                                       00019100
C                                                                       00019110
C*********************************************************            00019120
C                                                                       00019130
      IMPLICIT INTEGER(A-Y)                                             00019140
      COMMON /GLBL/ PRNTR,RDR,NCELLS,NNETS,NPADS,DEBUG,MXCELS,XXX(9)    00019150
      COMMON /NETDTA/ INP(3000),WID(1000),PAD(100),NETNOS(500)          00019160
      COMMON /PADPL/ ZPDPLC(100,2)                                      00019170
      COMMON /FLDDTA/ CHIP(30,100),ROWS,COLS,POS(1000,2),NFL,NPI        00019180
      COMMON PLPNT(10,2),BARIER(100,2),NBARR,NPADLC                     00019190
      INTEGER CHARW/'W   '/,BLANK/'    '/                               00019200
      INTEGER TEMP(72)                                                  00019210
      IEFILE=12                                                         00019220
      OUFILE=19                                                         00019230
      REWIND IEFILE                                                     00019240
      WIRZIN=0                                                          00019250
100   READ(IEFILE,8001,END=10000) A,B                                   00019260
8001  FORMAT(2(I12))                                                    00019270
      IF(A.NE.0) GO TO 10000                                            00019280
C                                                                       00019290
C     TITLE?                                                            00019300
C                                                                       00019310
110   IF(B.NE.-1) GO TO 200                                             00019320
      READ(IEFILE,8001,END=10000)A,B                                    00019330
      WRITE(OUFILE,8002)A,B                                             00019340
8002  FORMAT('TITLE ',2(A4))                                            00019350
      GO TO 100                                                         00019360
C                                                                       00019370
C     SIZE?                                                             00019380
C                                                                       00019390
200   IF(B.NE.-2) GO TO 300                                             00019400
      READ(IEFILE,8001,END=10000)A,B                                    00019410
      WRITE(OUFILE,8003)A,B                                             00019420
8003  FORMAT('STAR SIZE ',2(I5))                                        00019430
      GO TO 100                                                         00019440
C                                                                       00019450
C     FULL-LENGTH RECORD?                                               00019460
```

```
300   IF(B.NE.-6) GO TO 400                                          00019470
      READ(IEFILE,8004,END=10000)TEMP                                00019480
8004  FORMAT(72(A1))                                                 00019490
      WRITE(OUFILE,8004)TEMP                                         00019500
C                                                                    00019510
C     SET WIRZIN FLAG IF THIS IS 'WIRES'                             00019520
C                                                                    00019530
      I=0                                                            00019540
310   I=I+1                                                          00019550
      IF(TEMP(I).EQ.BLANK) GO TO 310                                 00019560
      IF(TEMP(I).EQ.CHARW) WIRZIN=1                                  00019570
      GO TO 100                                                      00019580
C                                                                    00019590
C     NETS?                                                          00019600
C                                                                    00019610
400   IF(B.NE.-4) GO TO 500                                          00019620
      WRITE(OUFILE,8005)                                             00019630
8005  FORMAT('NETS')                                                 00019640
C                                                                    00019650
C     START OF NET                                                   00019660
C                                                                    00019670
      READ(IEFILE,8001,END=10000)A,B                                 00019680
410   IF(A.NE.0) GO TO 10000                                         00019690
      IF(B.NE.-5) GO TO 110                                          00019700
C                                                                    00019710
C     LOAD NET # TO TEMP                                             00019720
C                                                                    00019730
      READ(IEFILE,8001,END=10000)A,B                                 00019740
      TEMP(1)=A                                                      00019750
      TMP=2                                                          00019760
      NET=A                                                          00019770
C                                                                    00019780
C     GET CELL, PIN PAIRS                                            00019790
C                                                                    00019800
420   READ(IEFILE,8001,END=10000)A,B                                 00019810
      IF(A.EQ.0) GO TO 450                                           00019820
421   TEMP(TMP)=A                                                    00019830
      TMP=TMP+1                                                      00019840
      TEMP(TMP)=B                                                    00019850
      TMP=TMP+1                                                      00019860
      IF(TMP.LT.11) GO TO 420                                        00019870
450   TMP=TMP-1                                                      00019880
      IF(TMP.EQ.1) GO TO 410                                         00019890
      WRITE(OUFILE,8006)(TEMP(I),I=1,TMP)                            00019900
8006  FORMAT(12(I6))                                                 00019910
      IF(A.EQ.0) GO TO 410                                           00019920
      TMP=2                                                          00019930
      TEMP(1)=NET                                                    00019940
      READ(IEFILE,8001,END=10000)A,B                                 00019950
      IF(A.EQ.0) GO TO 410                                           00019960
      GO TO 421                                                      00019970
C                                                                    00019980
```

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C     GATES TO PATTERNS?                                                    00019990
C                                                                           00020000
500   IF(B.NE.-3) GO TO 600                                                 00020010
C                                                                           00020020
C     GET G,P PAIR                                                          00020030
C                                                                           00020040
      WRITE(OUFILE,8007)                                                    00020050
8007  FORMAT('GATES TO PATTERNS')                                           00020060
      TMP=1                                                                 00020070
510   READ(IEFILE,8001,END=10000)A,B                                        00020080
      IF(A.EQ.0) GO TO 520                                                  00020090
C                                                                           00020100
C     LOAD TO TEMP ARRAY                                                    00020110
C                                                                           00020120
      TEMP(TMP)=A                                                           00020130
      TMP=TMP+1                                                             00020140
      TEMP(TMP)=B                                                           00020150
      TMP=TMP+1                                                             00020160
      IF(TMP.LT.13)GO TO 510                                                00020170
520   TMP=TMP-1                                                             00020180
C                                                                           00020190
C     CHECK FOR PADS                                                        00020200
C                                                                           00020210
      I=2                                                                   00020220
522   IF(TEMP(I).LT.7000) GO TO 540                                         00020230
C                                                                           00020240
C     PAD FOUND -- GET R,C POSITION FROM ZPDPLC                             00020250
C                                                                           00020260
      J=I-1                                                                 00020270
      DO 525 K=1,NPADS                                                      00020280
       IF(PAD(K).EQ.TEMP(J)) GO TO 527                                      00020290
525   CONTINUE                                                              00020300
      WRITE(PRNTR,8008) TEMP(J)                                             00020310
8008  FORMAT('0ERROR(OUT01) -- CANT FIND PAD ',I4,' IN PAD ARRAY')          00020320
527   C=ZPDPLC(K,1)                                                         00020330
C                                                                           00020340
C     IF PADS TOP OR BOTTOM, TYPE # OKAY                                    00020350
C                                                                           00020360
      IF((C.NE.0).AND.(C.LT.COLS)) GO TO 540                                00020370
C     ON SIDE -- IS THIS INPUT PAD?                                         00020380
      IF(TEMP(I).NE.9200) GO TO 528                                         00020390
C                                                                           00020400
C     INPUT PAD-- CHANGE TYPE TO 9100                                       00020410
C                                                                           00020420
      TEMP(I)=9100                                                          00020430
      GO TO 540                                                             00020440
C                                                                           00020450
C     OUTPUT PAD-- IF ON LEFT, TYPE IS 9110-- IF RIGHT, 9120                00020460
C                                                                           00020470
528   IF(C.EQ.0) TEMP(I)=9110                                               00020480
      IF(C.GT.COLS)TEMP(I)=9120                                             00020490
540   I=I+2                                                                 00020500
```

```
      IF(I.LE.TMP) GO TO 522                                          00020510
C                                                                     00020520
C     PAD TYPE #'S CORRECTED-- DUMP RECORD                            00020530
C                                                                     00020540
      WRITE(OUFILE,8006)(TEMP(I),I=1,TMP)                             00020550
      IF(A.EQ.0) CALL MSFCF                                           00020560
      IF(A.EQ.0) GO TO 110                                            00020570
      TMP=1                                                           00020580
      GO TO 510                                                       00020590
C                                                                     00020600
C     EOF?                                                            00020610
C                                                                     00020620
600   IF(B.NE.-7) GO TO 10000                                         00020630
C                                                                     00020640
C     DO WE NEED TO ADD BARRIERS? -- IF NOT, SKIP THIS PART           00020650
C                                                                     00020660
      IF(NBARR.EQ.0) GO TO 700                                        00020670
C                                                                     00020680
C     'WIRES' SEGMENT STARTED? -- IF NOT, START IT                    00020690
C                                                                     00020700
      IF(WIRZIN.EQ.0) WRITE(OUFILE,9001)                              00020710
9001  FORMAT('WIRES')                                                 00020720
C                                                                     00020730
C     DUMP BARRIER FOR EACH UNUSED PAD                                00020740
C                                                                     00020750
      TEST1=8*ROWS+25                                                 00020760
      TEST2=8*COLS+24                                                 00020770
      DO 650 I=1,NPADLC                                               00020780
       IF(BARIER(I,1).EQ.0) GO TO 650                                 00020790
C                                                                     00020800
C      XP & YP ARE COORDS OF UNUSED PAD                               00020810
C                                                                     00020820
       XP=BARIER(I,1)                                                 00020830
       YP=BARIER(I,2)                                                 00020840
C                                                                     00020850
C      HANDLE TOP, BOTTOM PADS                                        00020860
C                                                                     00020870
       IF((YP.NE.-25).AND.(YP.NE.TEST1)) GO TO 610                    00020880
       YP=YP+1                                                        00020890
       IF(YP.LT.0)YP=24                                               00020900
       LEVEL=6                                                        00020910
       X1=XP                                                          00020920
       Y1=YP                                                          00020930
       X2=XP+14                                                       00020940
       Y2=YP                                                          00020950
       GO TO 620                                                      00020960
C                                                                     00020970
C      HANDLE SIDE PADS                                               00020980
C                                                                     00020990
610    LEVEL=6                                                        00021000
       X1=XP+5                                                        00021010
       Y1=YP+1                                                        00021020
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      X2=XP+5                                                          00021030
      Y2=YP+15                                                         00021040
620   WRITE(OUFILE,9002) LEVEL,X1,Y1,X2,Y2                            00021050
9002  FORMAT(5(I5,2X),'BARR')                                          00021060
      WRITE(PRNTR,10003) LEVEL,X1,Y1,X2,Y2                             00021070
10003 FORMAT('0BARRIER CONSTRUCTED ON LEVEL ',I3,' FROM ',I5,' , ',    00021080
     & I5,' TO ',I5,' , ',I5)                                          00021090
650   CONTINUE                                                         00021100
700   ENDFILE OUFILE                                                   00021110
      WRITE(PRNTR,8009)                                                00021120
8009  FORMAT('0OUTPUT FILE CONSTRUCTED')                               00021130
      RETURN                                                           00021140
10000 WRITE(PRNTR,8010)                                                00021150
8010  FORMAT('0ERROR(OUT02) END MARKER NOT FOUND IN INPUT ECHO FILE-- OU00021160
     &PUT FILE NOT CONSTRUCTED')                                       00021170
      STOP                                                             00021180
      END                                                              00021190
```