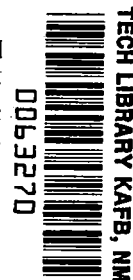


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The PR2D (Place, Route in 2-Dimensions) Automatic Layout Computer Program Handbook

Teddy M. Edge

SEPTEMBER 1978

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The PR2D (Place, Route in 2-Dimensions) Automatic Layout Computer Program Handbook

Teddy M. Edge
*George C. Marshall Space Flight Center
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NASA

National Aeronautics
and Space Administration

**Scientific and Technical
Information Office**

1978



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THE PR2D (PLACE, ROUTE IN 2-DIMENSIONS) AUTOMATIC LAYOUT COMPUTER PROGRAM HANDBOOK

SUMMARY

Place, Route in 2-Dimensions (PR2D) is a standard cell automatic layout computer program for generating Large Scale Integrated/Metal Oxide Semiconductor (LSI/MOS) arrays, and is one of the software components of the NASA/MSFC Computer Aided Design and Test system (CADAT). The PR2D program source is available from the COSMIC software distribution system.

This material describes the compilation, loading, and execution of the program on a Sigma V CP-V operating system located at NASA/MSFC. This material can also be used as a guide in the conversion and execution of the program at other facilities even if equipped with different data processing systems.

The PR2D computer program is written in FORTRAN IV and consists of 50 FORTRAN source routines including the main program.

One source routine of importance is the input/output routine, which is usually unique to each installation. This routine was called TAPES in the original RCA source but was modified and renamed IOSCR for the Sigma V CP-V installation. The commented source for the routine can be used as a guide in creating an input/output routine for a particular system.

I. COMPILING AND LOADING PR2D

With the CP-V FORTRAN, large programs can only be compiled sequentially from tape, not from disc. Therefore, it is easier to edit the total source (approximately 30 000 card images) on a disc file and then compile and load the program with a batch job that copies the PR2D source file to tape and then compiles from the tape. Loading can be done in the same job or with a separate batch loading job.

Individual routines can be modified by copying them from the total source file into separate source files and editing them individually. The separate source files can be compiled on-line to generate the object modules. A batch load run is made to include the new rather than the old object modules. This procedure works well if changes are limited to a few routines.

II. FLOWCHARTS OF THE MAJOR PR2D FUNCTIONS

Flowcharts of the major functions MAIN (program executive), PLACE (executive routine PLEX 1), ROUTE (executive routine RTEXX1), and ARTWORK (executive routine ARTEX1) of the PR2D program are included for aid in understanding or making modifications to the program. The flowcharts for MAIN, PLACE, ROUTE, and ARTWORK are shown in Figures 1, 2, 3, and 4, respectively. A suggested overlay structure for loading PR2D is shown in Figure 5.

Listed in Figure 6 is a job control setup deck to compile and load the PR2D program with the MSFC Sigma V CP-V operating system. Compiling and loading require approximately 45 min of CPU time, with load time being insignificant.

A listing of PR2D related files and PR2D object modules created by the FORTRAN compiler and their sizes in granules (1 granule equals five hundred and twelve 32-bit words) are shown in Figure 7.

The created load module (LMPR2DC) requires 146 granules of disc space and approximately sixty four thousand 32-bit words of memory to run. During a normal computer run, PR2D generates data files along with the artwork output file and requires approximately 1000 granules of temporary disc space for a 200 × 200 mil chip. The temporary disc storage requirements are a function of the design complexity. Execution time can vary from 5 min to 1 h of CPU time determined by the design complexity.

III. EXECUTING PR2D

The input data to PR2D consists of a number of program control parameters, logic pattern assignments, and the interconnecting nets. The program reads the input data, searches a data file (pin data file) for data on

each pattern, generates a placement of the patterns (PLACE), interconnects the patterns (ROUTE), and outputs the artwork for the layout (ARTWORK). Two examples of layouts that have been created with PR2D are included in this material. The first is a 4-bit adder done in silicon on sapphire and the material includes the partitioned logic diagram (Fig. 8), a complete PR2D computer run printout, and the resulting unmodified chip layout (Fig. 9). The second example is a programmable timing circuit done in bulk silicon and the material includes the partitioned logic diagram (Fig. 10), the job control and input data, and the resulting unmodified chip layout (Fig. 11). Table 1 lists the effects on the layout of the C015 Programmable Timer if the number of logic cell rows are varied by PR2D.

With the MSFC CP-V operating system, PR2D control and input data are created with an on-line editor and batched into the job stream.

By way of the PR2D mode control parameters, functions of the program (place, route, etc.) can be executed in steps for flexibility and reduced computer run times. Due to interaction between the layout control parameters, it is best to start with a working set of parameters (from the included examples) and carefully make variations on them. Their impact upon the layout should be observed by plotting. The included PR2D users guide and control parameter definition list describes the format and effects of each user option. Combinations can be found that achieve a desired layout.

The PR2D program outputs a map or printer plot that can be assembled into the final chip layout. All pertinent data with regard to the layout are shown on the map, and a printout of the chip statistics is output.

It has been our experience that modifications are required on the final PR2D layout. These modifications may be as simple as correcting misplaced test transistors, border modifications, or labeling. However, they have included uncompleted ground bridges to the cells and missing wiring segments. It is recommended that the layouts be carefully studied and each net manually checked against the plotted design layout. At MSFC these modifications are currently done with interactive graphics. However, they were done before by manually editing the PR2D artwork output data.

The EXEC (first routine of the source) contains a well commented section describing the functions of the mode control and layout control parameters, and has been included in this material. It is suggested that this be studied

carefully and used in conjunction with the simplified users guide when using the PR2D automatic layout program.

The PR2D program has been used to create numerous random logic arrays in different technologies at NASA/MSFC. While the program is large and complex, it is practical to implement and to learn how to use. It can produce quick turnaround layouts in mature technologies with acceptable device densities for many applications.

IV. SIMPLIFIED USERS GUIDE FOR PR2D PROGRAM (INPUT DATA)

The following paragraphs list various input data and control cards for the PR2D program. (Section IV.H. lists PR2D program format modifications.)

A. Mode Card (4I2, 16I4) Format

The mode card is used to control execution of program functions, control, identification, and debug printing.

1) Mode (1), Starting Function

- = 0,1 start with Input function
- = 2 start with Place function
- = 3 start with Route function
- = 4 start with Art function
- = 5 start with Manmod function
- = 6 error condition

2) Mode (2), Sub-Restart (within Function)

Start with parameter. Can only be used when Mode (1) = Mode (3); primarily used to debug program.

- = 0,1 start with first sub-function
- = 2 start with second sub-function
- = 3 start with third sub-function
- = 4 start with fourth sub-function

3) Mode (3), Ending Function

- = 1 end after Input function is complete
- = 2 end after Place function is complete
- = 3 end after Route function is complete
- = 4,0 end after Art function is complete
- = 5 error condition

4) Mode (4), Sub-Restart (within Function) Stop After Parameter

Can only be used when Mode (1) = Mode (3).

- = 1 stop after first sub-function
- = 2 stop after second sub-function
- = 3 stop after third sub-function
- = 0,4 stop after fourth sub-function

5) Mode (5), Chip Identification Number

Must be > 0 and < 1000.

6) Mode (6), Technology Switch

- = 1 is for aluminum gate, bonded wire
- = 2 is for aluminum gate, beam lead
- = 3 is for silicon gate, bonded wire
- = 4 is for silicon gate, beam lead
- = 5 silicon on sapphire (SOS), bonded wire

7) Mode (7), Pin Data File Control

- = 0,1 pin data are from tape
- = 2 pin data are from cards and tape
- = 3 pin data are from cards

8) Mode (8), Pin Data Validation Keys = n1, n2, n3, n4

n1n2 = revision level
n3n4 = engineering level

- 9) Mode (9), Chip Design Type
- Internally set to 1
- 10) Mode (10), User Specification of Number of Device Cell Rows
- = 0 number of rows determined by linear mils of all active cells
= n user specification of number of row
- $1 < n < 13$
- 11) Mode (11), User Specification of Number of Bonding Pads on Each Side of Chip
- = 0 program determined
= n user specification
- n must be greater than number calculated by program
- 12) Mode (12), Automatic Change of Specific Constants in Coding
- 13) Mode (15), Debug Control for Common data
- Equal to 1 or 2, print common data after Read of common data from tape
Equal to 2 or 3, print common data after Write of common data to tape
- 14) Mode (16), Debug Control for Place Function
- 15) Mode (17), Debug Control for Route Function
- 16) Mode (18), Debug Control for Artwork Function
- 17) Mode (19), Debug Control for Manmod Function
- 18) NEW - Column 80 - Parameter Patch Control
- NEW = 1 - next card patches IP(JX)=JY

- = 2 - The IP array is replaced by the next IPX words read in format 20I4 from cards which follow. Elements which are blank or zero on the patch cards will not be changed; however, no further patches are permitted.
- = 3 - next card patches LIM(JX)=JY
- = 0 - no additional patches will be made.

Cards read in modes 1 and 3 will contain the following data in Format 3I4: JX, JY, NEW. The value of NEW read in this field determines the mode in which the next card is to be read.

B. Pin Data File (Cards or Tape), Header Data (10A4, 4I4)

If data are on tape, file cannot be opened unless KEY1, KEY2, and KEY3 are valid. If data are on cards and on tape, new header card will be copied to the new pin data tape (if generated). If header card data are blank, the header data from the old tape will be copied to the new pin data tape. This also applied to the revision date described in B1.

The program will automatically sort pin data by cell pattern number and by pin number within each cell type. If card data and tape data have the same cell pattern number, the program will automatically replace the new card pin data for the old tape pin data.

- 1) Pin Data File Description (10A4) — Last 8 characters should be date file was generated in nn/nn/nn format.
- 2) KEY1 — Revision level of data, see Mode (8) data.
- 3) KEY2 — Engineering level of data, see Mode (8) data.
- 4) KEY3 — Technology key for data, see Mode (6) data.
- 5) NEW — The control to generate a new pin data tape.

- a) If equal to zero, new pin data file tape will be generated.
- b) If greater than zero, a new pin data file tape will NOT be generated.

C. Cell Pattern Header Card and Pin Data Cards (514, 10A4, 14) Format

- 1) The pattern number must be entered on all cards (including header card).
- 2) The pin number must be zero for header card. The number of pins on each cell is not limited (can be 1 to N). Furthermore, not all pins need to exist and the pins need not be in numerical order.
- 3) The pin reassignment flag must be zero on header card and on last card of each cell pattern. This last card is used to specify the X/Y limits of that cell.
- 4) The pin X-coordinate must be zero on the header card. Enter the X-distance of the center of the pin from the origin of the cell in tenths of mils.
- 5) The pin capacitance must be zero on the header card on reference pin Y-coordinate of cell from cell origin (distance of ground center to cell origin).
- 6) The cell description data are entered on header card and optionally on pin data cards.
- 7) The technology code [same value as Mode (6)] must be entered on each and every card.

D. Stop Control Card

The stop control card following last pin data card is used to end reading of pin data file from cards. End of file will terminate reading pin data file from tape. The stop control card can be:

- 1) A blank card
- 2) "STOP" entered in columns 25-28 of stop control card
- 3) "ENDb" or "bEND" entered in columns 25-28 of stop control card.

E. Element to Pattern Assignment (1614, 14X, 12) Format

Element number-pattern-position-row assignment are entered four to a data card. Elements need not be in numerical order or in sequence. That is, the chip may contain N elements and be assigned any unique element number between a and b, where $1 \leq a \leq N \leq b \leq 400^*$.

*Because the program automatically generates 1 or more subelements for large cells, $b + N_{\text{sub}}$ must be less than or equal to 400.

Element data are generated in sets as follows:

- 1) Element number
- 2) Pattern number
- 3) User specification of fixed order of element in a specified row.
(For nonbonding pad rows, all elements of that row MUST be assigned, but their order need not be assigned.)
- 4) Fixed row specification of element; i. e. ,

For ROW = -N, element will be in reverse orientation in row N.

For ROW = N, element will be in normal orientation in row N.

For Row = 0, element is not fixed to any row and will not be assigned to any row which contains any fixed row elements.

Note: If user specifies any nonbonding pad element as fixed in a row, all other elements in that row must also be fixed. Specification of order within a row implies that the row must be specified, but the converse is not true.

The program will terminate reading element/pattern data when an element and corresponding pattern are both zero or when a positive number is entered in columns 79-80 in the last card of these data. Once the element to pattern assignment has been completed, the program will automatically extract those patterns used in the chip design from the pin data file.

F. Node List

The program will stop reading node data when an end of file is read or if columns 77-80 of the last card has a value greater than zero.

1. First Card of Node Card (20I4) Format. This card contains the node weighting factor followed by element pin data in pairs (up to column 76). If a node can be completed in one data card, a node continuation card must be used and the pin for the last element must be the first entry on the continuation card. Columns 73-76 of the node card MUST be zero.

2. Node Continuation Card (8X, 18I4) Format. This card is used to read the pin number of the last element on the previous data card and additional element-pin data in pairs (columns 9-76). Node continuation cards may continue to be used, as required, by making the pin number of the last element on a data card blank and placing the pin number in the first field of the next continuation data card.

G. Comnod Data Cards (4I4, 2A4) Format

These data cards are used to modify any data in any array in common. This option can only be exercised (automatically) after common data have been recovered from magnetic tape (READ subroutine).

- 1) LL1 is the i index of the data in the array being modified.
- 2) LL2 is the j index (if required) of the data in the array being modified.
- 3) LL3 is the k index (if required) of the data in the array being modified.
- 4) LL4 is the number assigned to each array in common:

LL4 = 1 for CHIP (I)
 LL4 = 2 for ICAP (I)
 LL4 = 3 for INFO (I,J)
 LL4 = 4 for IP (I)
 LL4 = 5 for IPIN (I,J)
 LL4 = 6 for LCS (i)
 LL4 = 7 for LIM (I)
 LL4 = 8 for MODE (I)
 LL4 = 9 for NODE (I)
 LL4 = 10 for JART (I,J)
 LL4 = 11 for JFAC (I,J)
 LL4 = 12 for MAP (I,J,K)
 LL4 = 13 for NOD (I)
 LL4 = 14 for NR (I,J)

This number is optional. If the array name is entered for ALP variable (see item 7), the program will calculate LL4.

- 5) LL5 is the new data to be stored in common (for numeric data).
- 6) BET is the new data to be stored in common (for alpha data).
- 7) ALP is the first four characters of the name of the array in which data are being changed. This is optional. If the array number is entered for LL4, these data are not required.

H. PR2D Program Format Modifications

The latest modification of PR2D which included the SOS technology requires some input data modifications. In all cases, the data format changes are minor. If old data are to be used with the new program, only a few minor changes are required. The reason for these data format changes is to confine all data between columns 1 and 72. No data are allowed in columns 73 to 80. The following are the changes:

- 1) MODE Data Card — The new format is (4I2, 16I4).
- 2) Parameter Modification Cards (INIT) — The effective format is now (I1, I3, 2I4). The actual format is still (3I4). See INIT subroutine for details. I1 and I3 represents V and C in equation $IP(IV + C) = \text{New Data}$. For example, columns 1 to 4 should be:

<u>To Modify</u>	<u>Data</u>	<u>Alternate*</u>
I0 + 10	0b10	7b11
I1 + 10	1b10	7111
I2 + 10	2b10	7151

*(b = space or zero)

That is, the user may enter the IV variable plus the offset constant C to calculate the correct index in the array IP(I), where V = 0, 1, 2, 3, 4, 5, or 6. If the alternate method is used, the user must calculate the correct index (IV + C) for IP(I) and MUST prevent the program from adding the variable V to that index. To prevent the program from adding V, set V = 7.

3) Parameter Modification Cards (COMMOD) — This operates exactly like item 2. The effective format is now (I1, I4, ...). For example:

<u>To Modify</u>	<u>Data*</u>	<u>Alternate*</u>
I0 + 10	0bb10	7b11

*(b = space or zero)

4) Element to Pattern Assignment — The new format is (I6I4, 6X, I2). This change has no effect on the element to pattern data. It only effects the skip data/stop control. These data must now be in columns 71 and 72.

5) Node List — The node list format is now (18I4). Generally, this will require no changes to the node data. The only change is that when there is exactly 9 (17, 25, ...) pins in a node, the pin for that 9th (17th, 25th, ...) element MUST be entered on the next data card. Formally, the program had allowed a nine pin node to be totally contained on one data card. The new program requires the use of two data cards for that nine pin node. Nodes with 2 to 8 pins, 10 to 16 pins, etc. are not effected.

6) Restart Mode — When PR2D is executed in the restart mode, a chip description data card must follow the mode data card in the RESTART mode.

I. Execution

The following are the suggested methods for execution of the PR2D program:

1) The PR2D program should be executed one function at a time. Without exception, the placement function and route function should NOT be executed in the same computer run. The output of the placement function should be examined. Sometimes interchanging two adjacent bonding pads can improve the final chip design. See design improvement.

2) The PR2D program should be executed at least two times using a different placement surface for each run (See Section III). Each resulting chip design should be plotted on a Calcomp plotter.

3) The best chip design (smallest area) (Paragraph IV. B) should be used for the final chip design.

J. Design Improvement

Using the COMMOD method to change data in common, the program can be controlled to generate different placements and make improvements in these placements. Changes to the placement surface will generate these different placements.

PR2D
MAIN PROGRAM

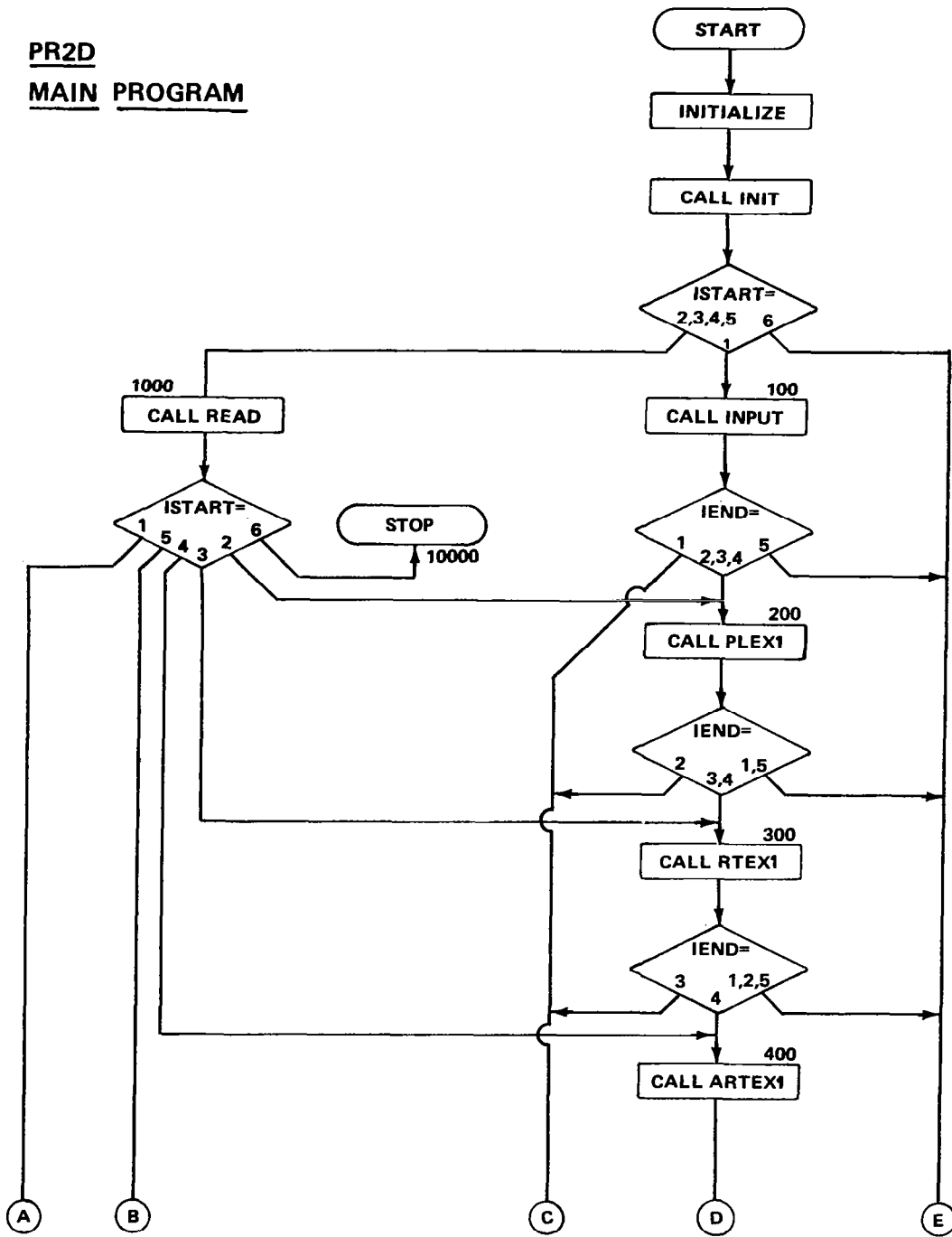


Figure 1. PR2D main program flowchart.

PR2D
MAIN PROGRAM

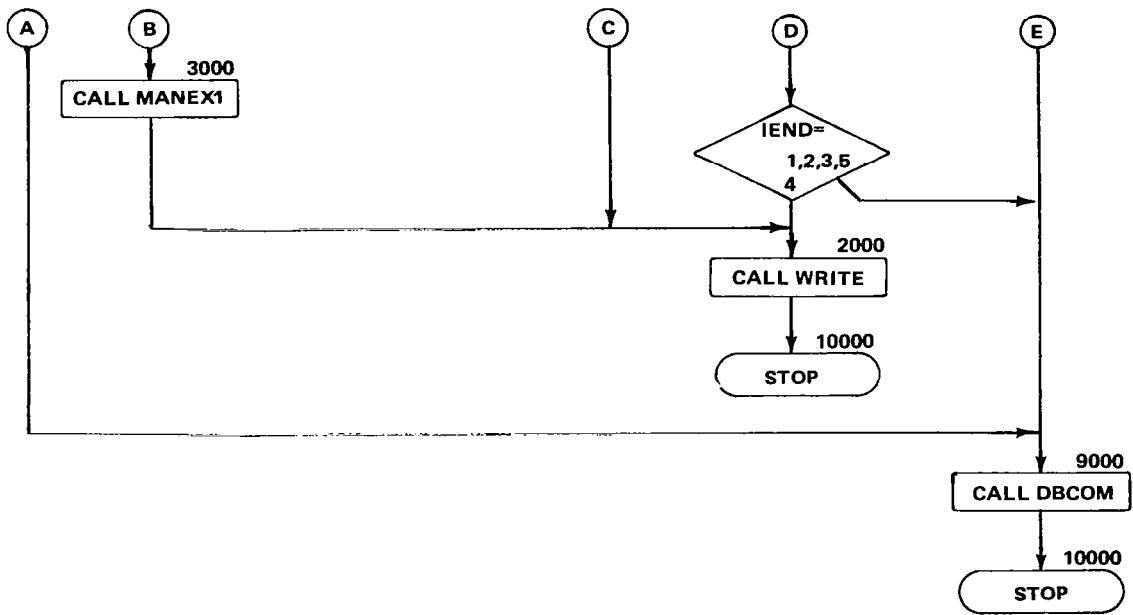


Figure 1. (Concluded).

SUBROUTINE
PLEX1

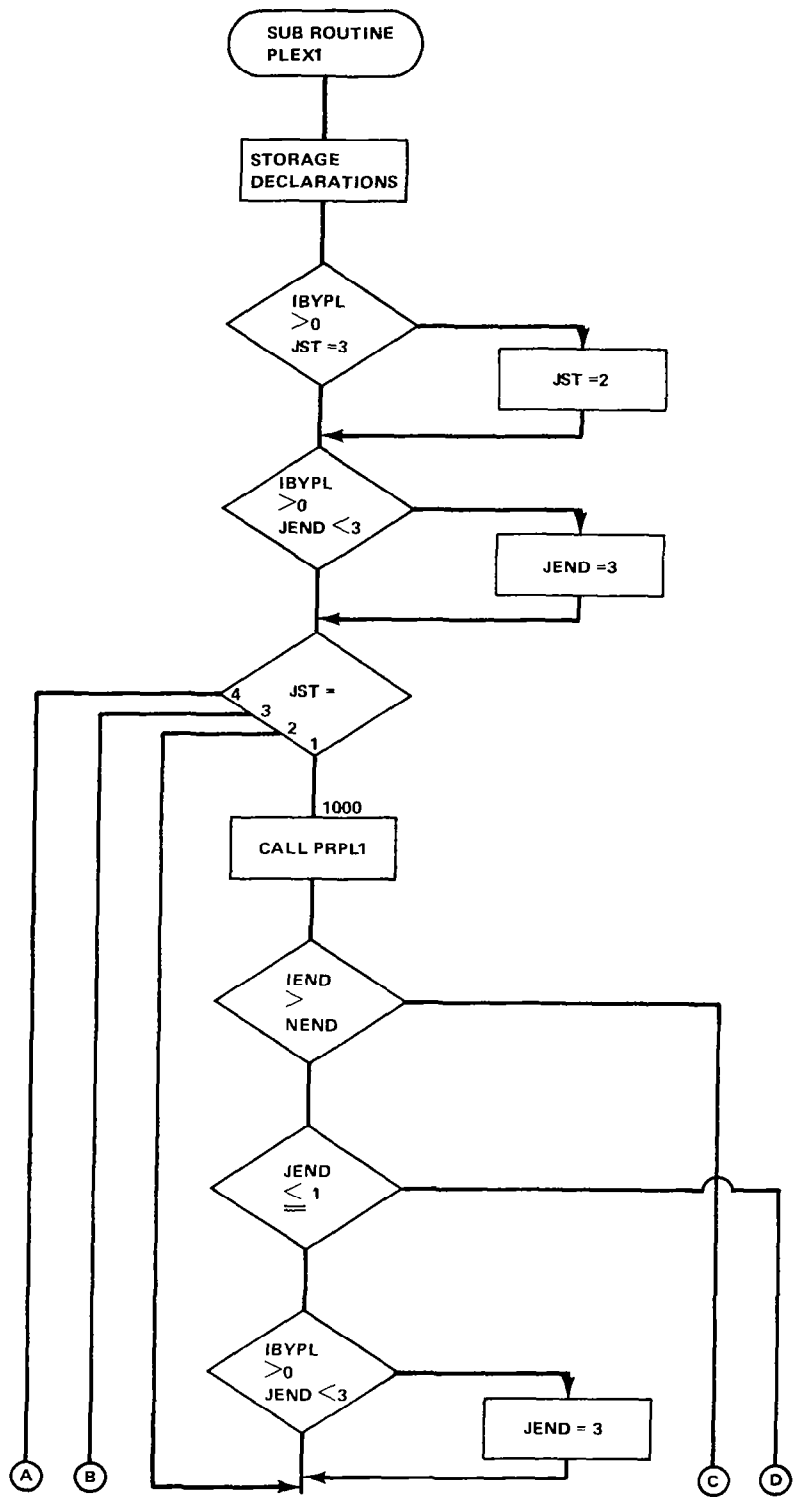


Figure 2. PR2D place executive flowchart.

SUBROUTINE
PLEX1

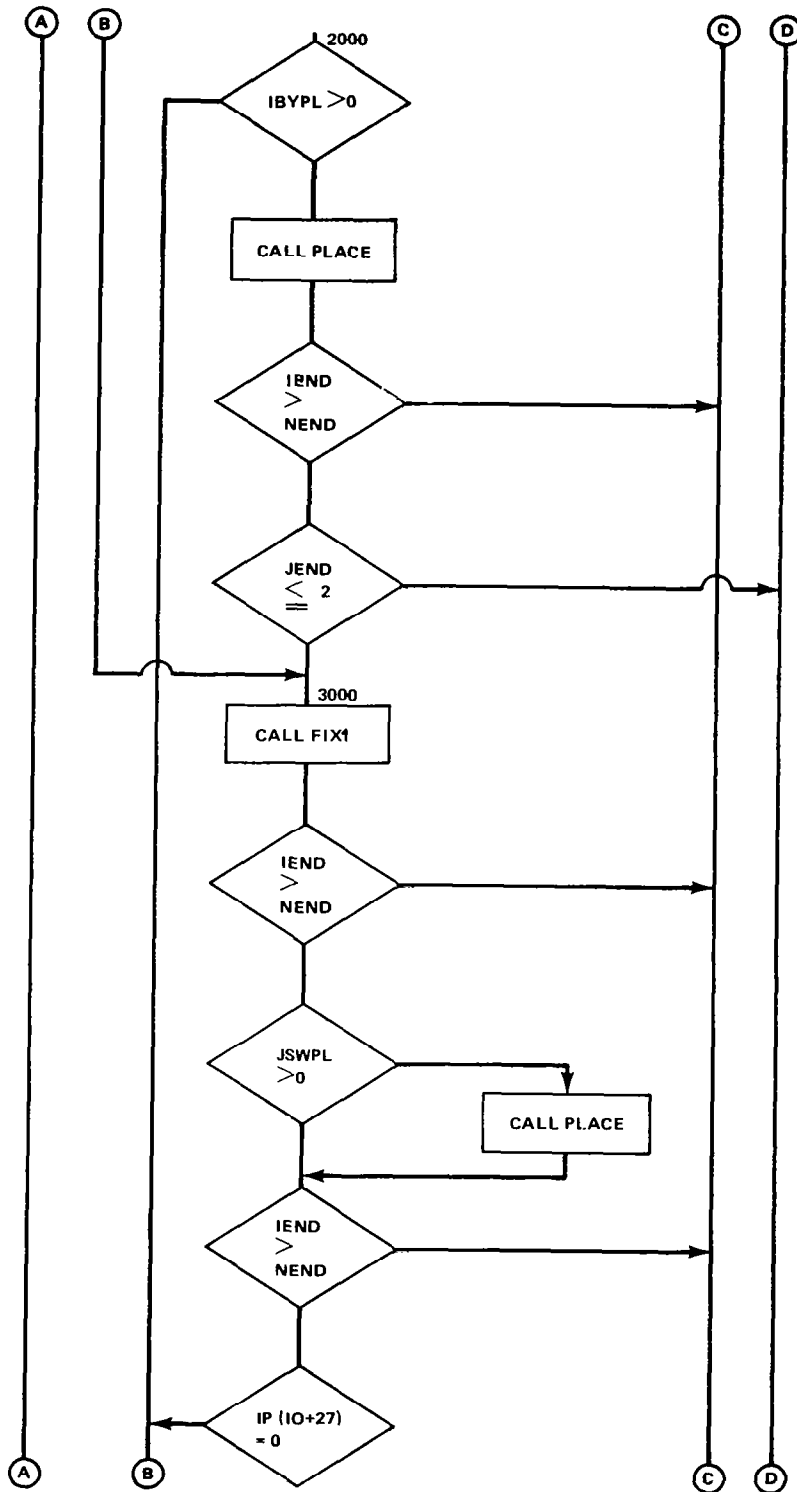


Figure 2. (Continued).

SUBROUTINE
PLEX1

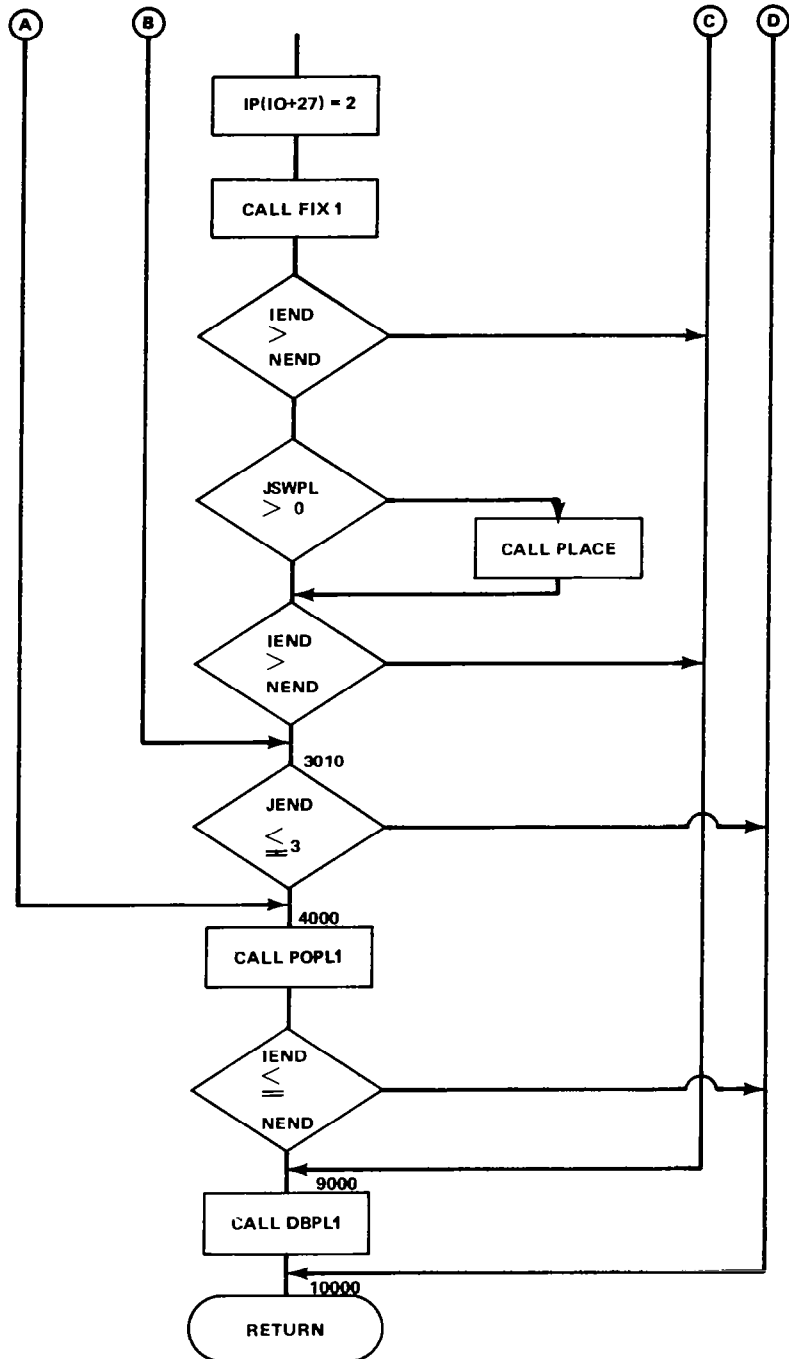


Figure 2. (Concluded).

**SUBROUTINE
RT EX1**

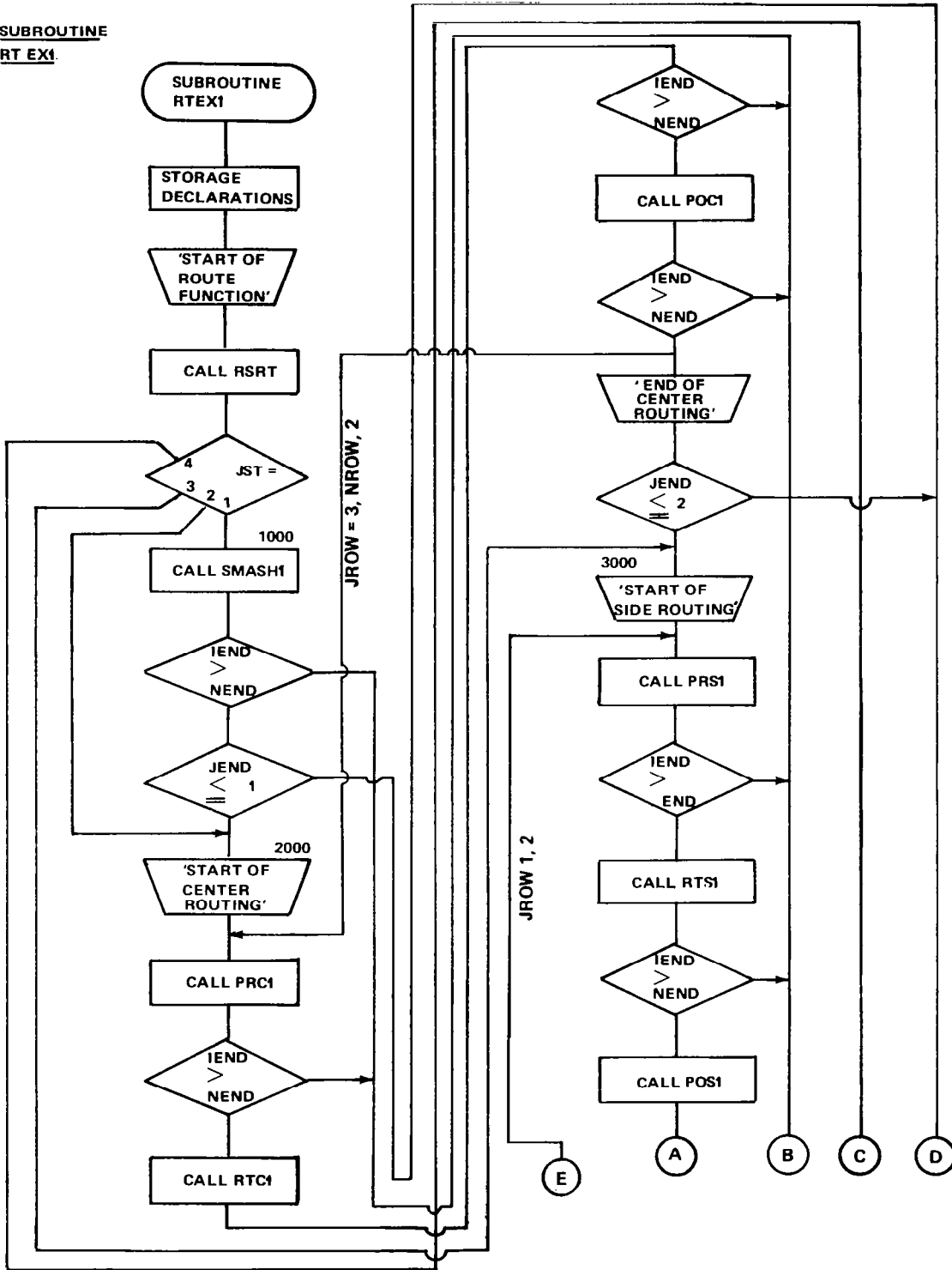


Figure 3. PR2D route executive flowchart.

SUBROUTINE
RT EX1

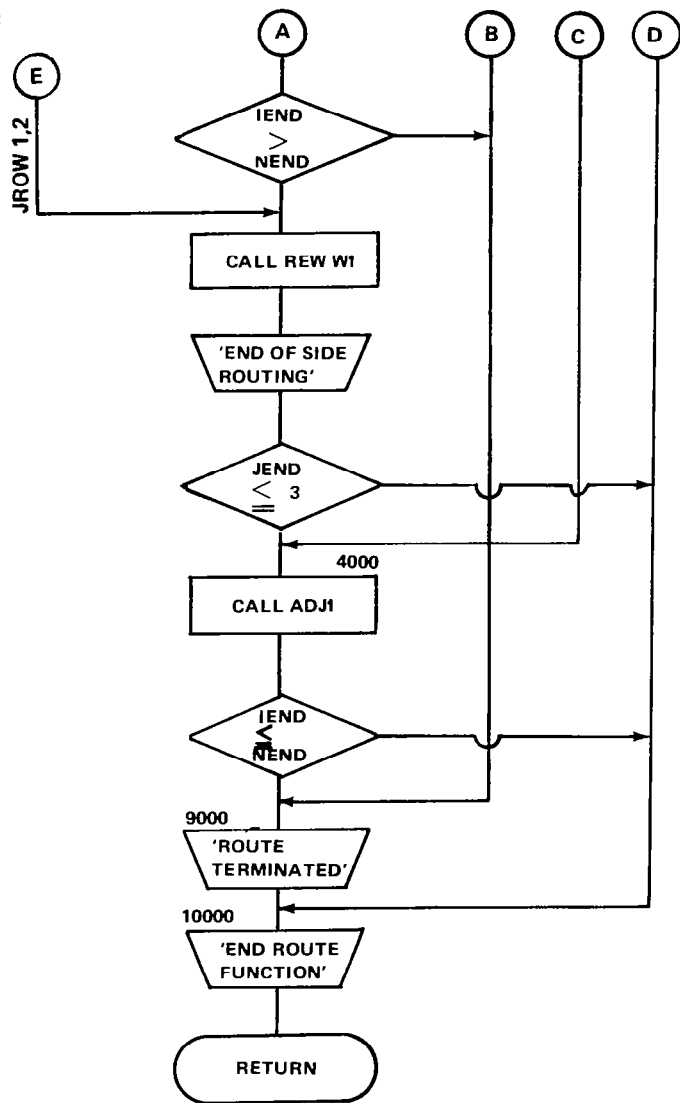


Figure 3. (Concluded).

**SUBROUTINE
ARTEX 1**

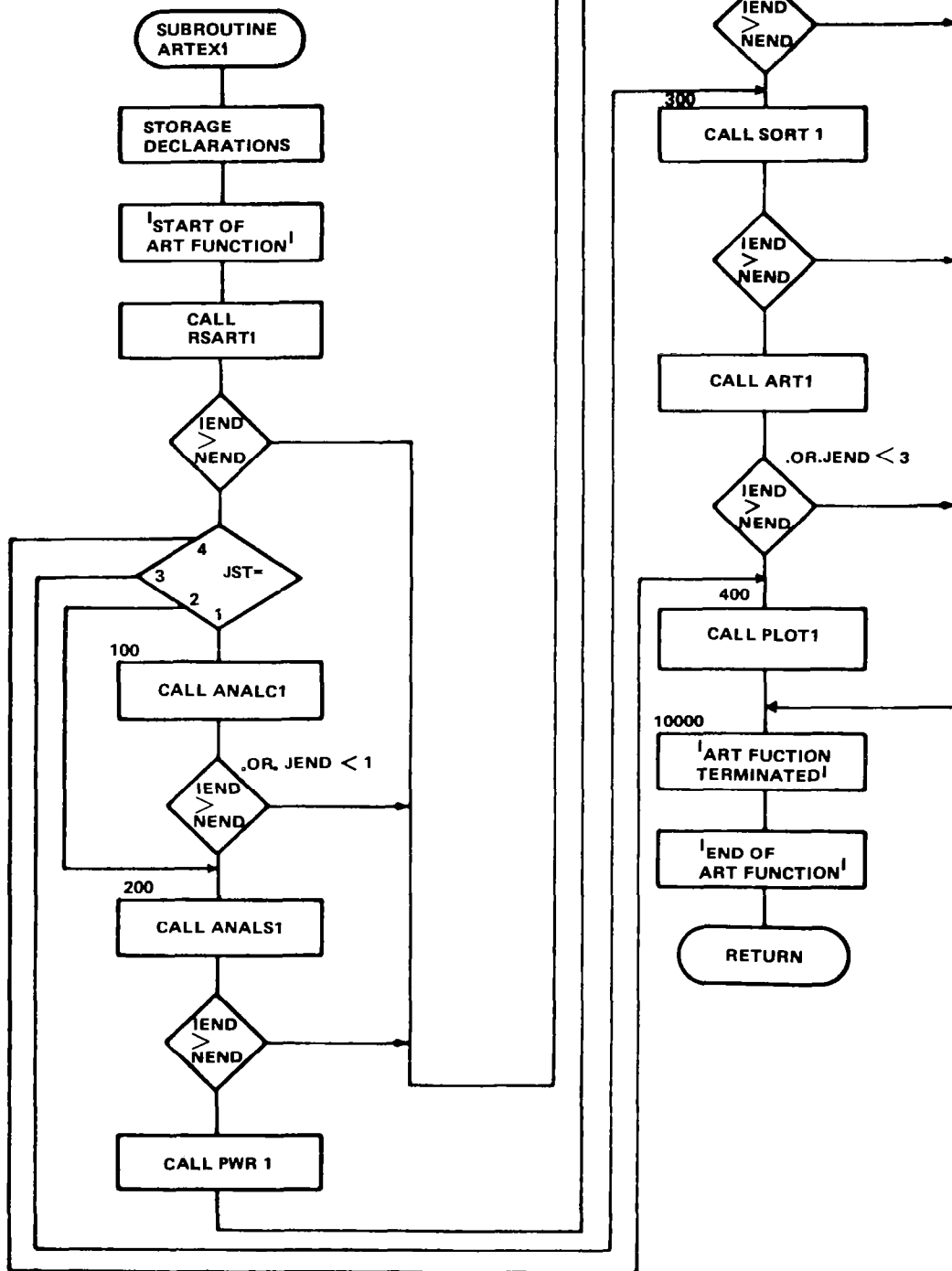


Figure 4. PR2D artwork executive flowchart.

PR2D OVERLAY STRUCTURE

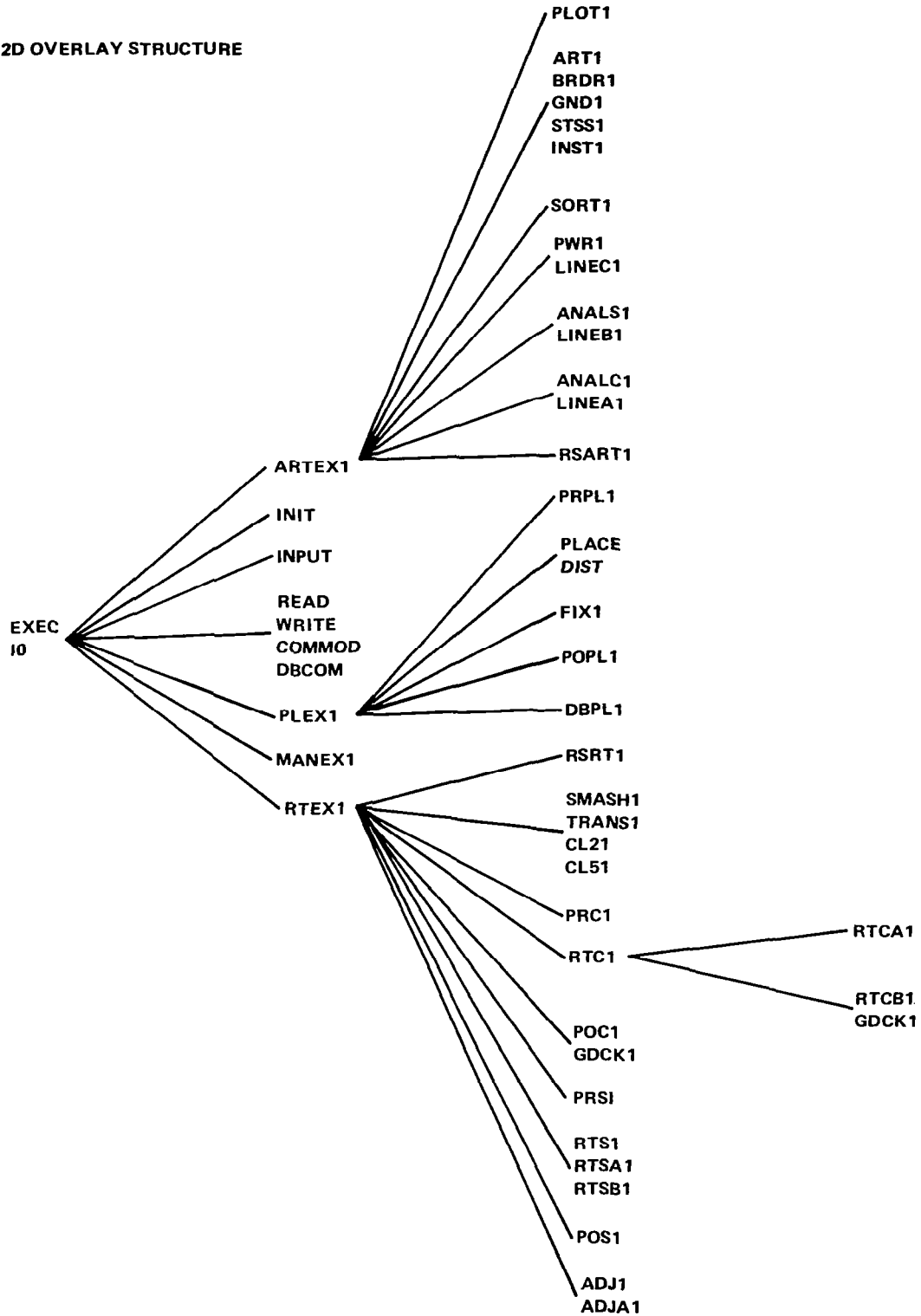


Figure 5. PR2D overlay structure.

GRAN	REC	NAME
4	51	ADJA1
4	55	ADJ1
10	145	ANALC1
5	67	ANALS1
1	8	ARTEX1
3	38	ART1
3	39	BRDR1
2	22	CL21
1	10	CL51
3	34	COMMOD
5	63	DBCOM
2	15	DBPL1
2	15	DEBLOCK
3	45	DIST
1	6	EXEC
6	83	FIX1
1	7	GDCK1
4	51	GND1
8	117	INIT
11	167	INPUT
1	5	INST1
3	34	IO
1	11	LINEA1
1	11	LINEB1
1	11	LINEC1
146	96	LMPR2DC
10	152	MANEX1
4	56	PLACE
1	6	PLEX1
1	6	PLOT1
23	360	POC1
13	202	POPL1
6	93	POS1
3	31	PRC1
6	81	PRPL1
5	70	PRS1
5	139	PR2DCMPLD
1244	30084	PR2DS
4	60	PWR1
2	24	READ
1	11	RSART1
1	9	RSRT1
4	50	RTCA1
7	105	RTCB1
2	17	RTC1
1	12	RTEX1
1	9	RTSA1
4	48	RTSB1
2	28	RTS1
20	325	SMASH1
5	74	SORT1
2	15	STSS1
3	34	TAPES
2	57	TEMP
1	5	TRANS1
3	31	WRITE

Figure 7. PR2D source, object modules and load module disc usage.

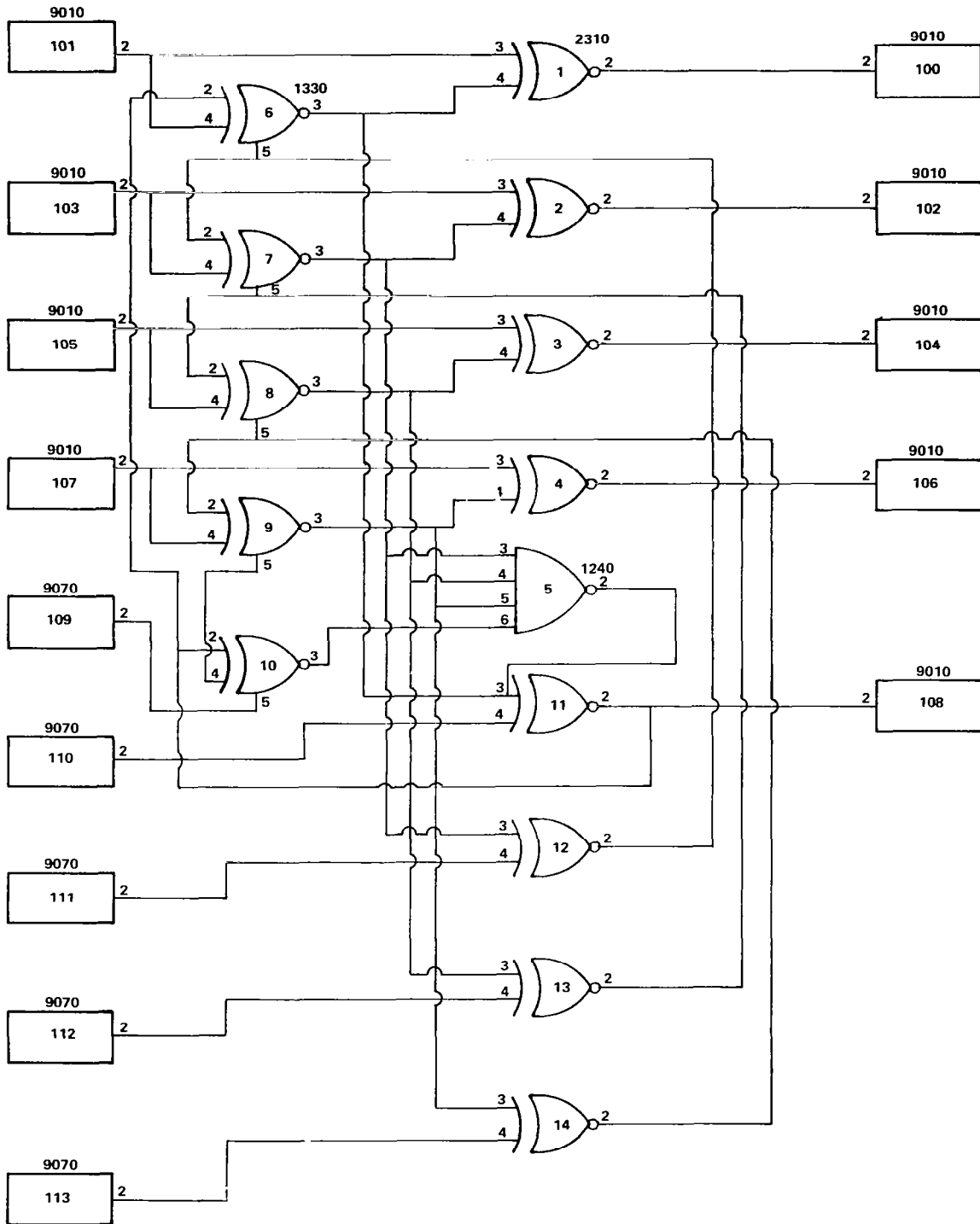
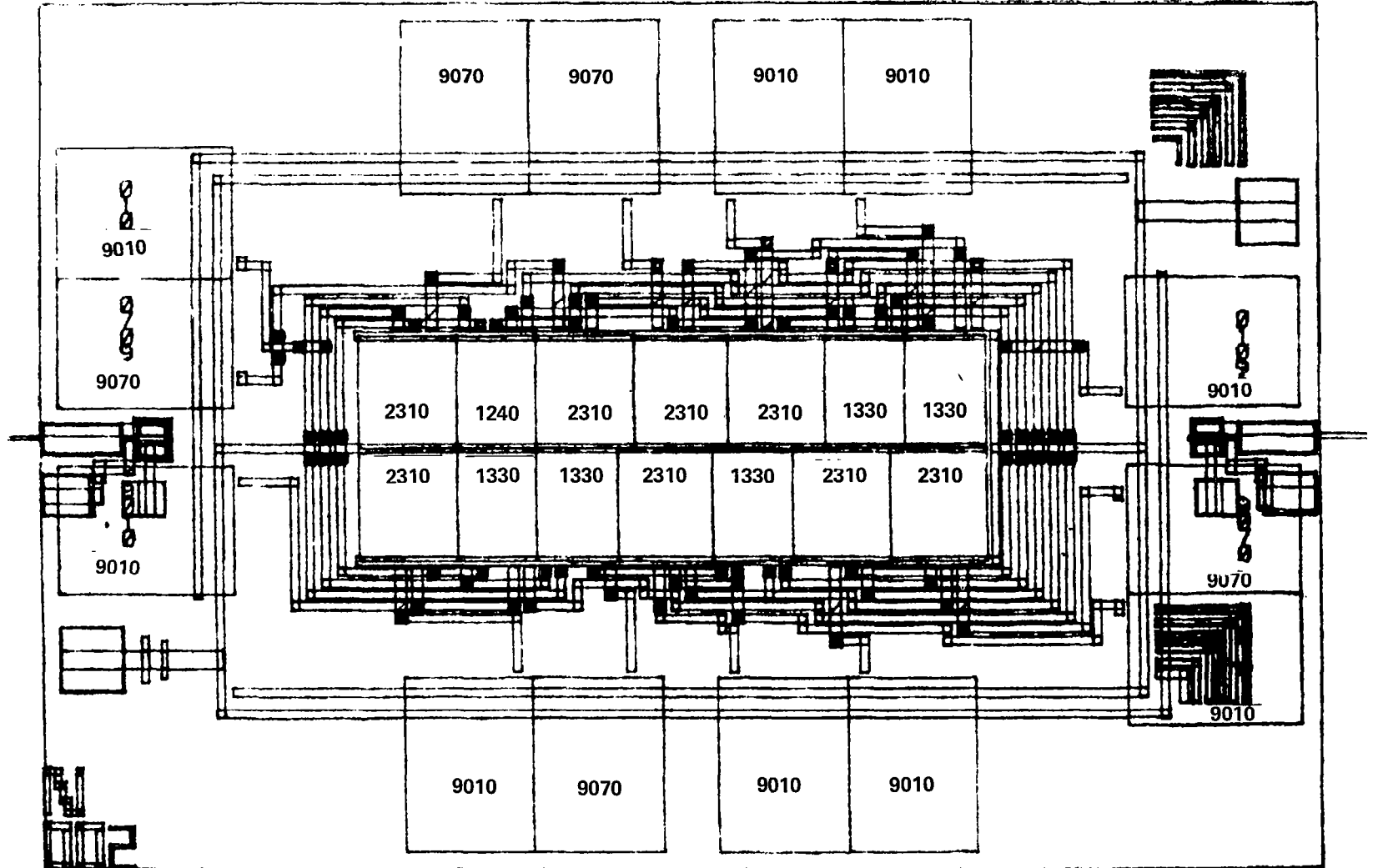


Figure 8. N002 — 4 bit adder partitioned logic diagram.



METAL, POLY AND DUMMY CELLS

Figure 9. N002 - PR2D unmodified layout.

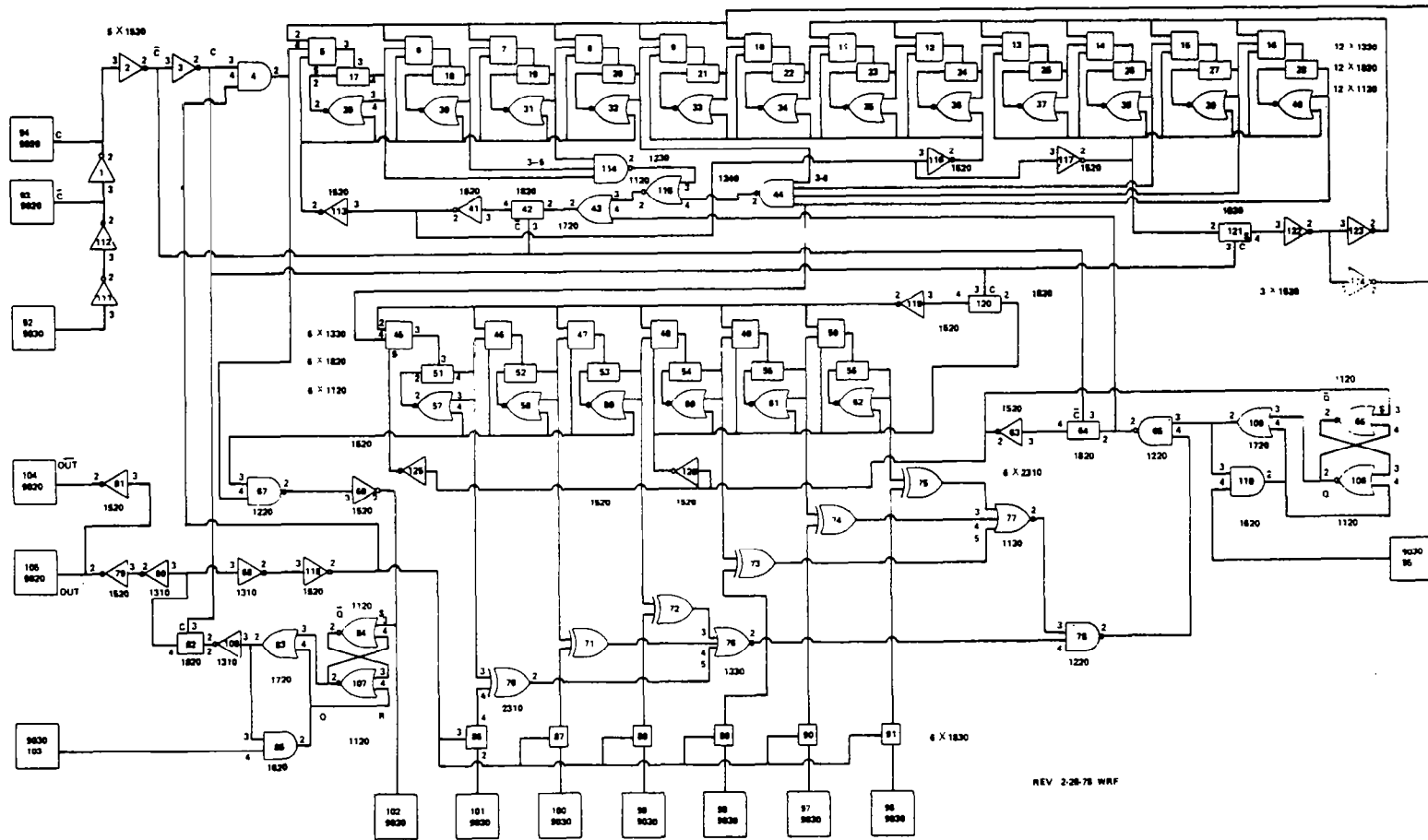
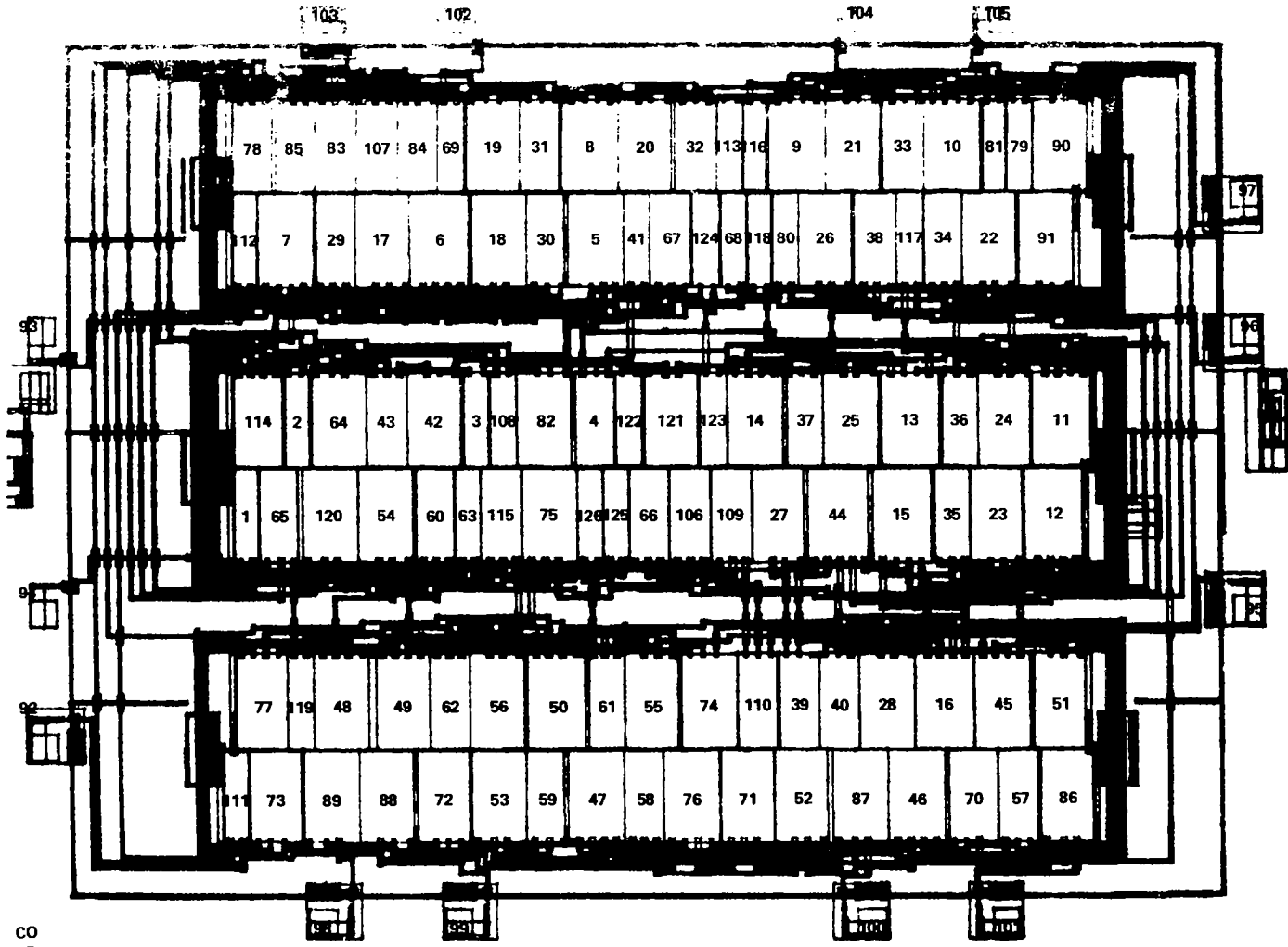


Figure 10. C015 — programmable timer partitioned logic diagram.



C0
15

METAL, DIFFUSION AND DUMMY CELLS

Figure 11. C015 — PR2D unmodified layout.

TABLE 1. EFFECTS OF VARYING THE NUMBER OF LOGIC CELL ROWS
ON THE PR2D LAYOUT OF THE C015 PROGRAMMABLE TIMER

Number of Logic Cell Rows	Step and Repeat (X × Y) Dimensions (mils)	Chip Area (mils ²)	Longest Cell Row (mils)	Total Cell Row Length (mils)	Cell Area (%)	Bonding Pad Area (%)	Wiring Area (%)	Wiring Effect (%)	Inches of Metal	Inches of Tunnel	Number of Tunnel Ends
5	237 × 156	36 972.0	156.3	761.6	28.8	41.7	29.5	29.5	6.75	0.88	313
PR2D Program Choice											
6	213 × 169	35 997.0	129.4	761.6	29.6	41.5	28.9	59.8	6.46	0.90	379
7	201 × 193	38 793.0	110.7	761.6	27.5	39.9	32.7	51.3	6.96	0.86	371
8	187 × 211	39 457.0	97.9	761.6	27.0	39.6	33.3	48.7	6.88	0.83	421

V. PR2D MODE AND LAYOUT CONTROL
PARAMETER DEFINITIONS

```

000 0100
000-0300
C*****000 0400
C
C   AUTHOR      : RICHARD NOTO          000 0600
C
C   DATE WRITTEN: 1972                 000 0700
C
C   COMPANY     : RCA CORP.            000 0800
C   ADDRESS    : MAIL STOP 10-701     000 0900
C               FRONT & COOPER STS.   000 1000
C               CAMDEN, N. J., 08102  000 1100
C
C   PHONE NUMBER: (609) 963-8000      000 1200
C   EXTENSION   : PC6755               000 1300
C
C*****000 1400
C*****000 1500
C*****000 1600
C*****000 1700
C*****000 1800
C*****000 1900
C   THE PURPOSE OF THE PR2D PROGRAM IS TO ASSIST IN THE DESIGN OF LSI 000 2000
C   ARRAYS. BASIC DESIGN DATA (ASSIGNMENT OF ELEMENT NUMBERS TO 000 2100
C   PATTERNS AND NODE CONNECTIVITY DATA) ARE TRANSFORMED TO ARTWORK 000 2200
C   INSTRUCTIONS. THESE INSTRUCTIONS ARE USED BY THE ARTWRK PROGRAM 000 2300
C   TO GENERATE ARTWORK COMMANDS USED FOR PLOTTING FINAL ARTWORK 000 2400
C   MASKS. 000 2500
C
C   THIS PROGRAM PROVIDES TWO-DIMENSIONAL PLACEMENT OF CELLS ON THE 000 2600
C   PLACEMENT SURFACE AND A TWO-DIMENSIONAL ROUTING OF CONNECTIONS 000 2700
C   AMONG THESE CELLS. EACH SUBROUTINE IS MODULAR AND CAN BE 000 2800
C   REPLACED OR MODIFIED. 000 2900
C
C*****000 3000
C*****000 3100
C*****000 3200
C*****000 3300
C   THE PURPOSE OF THE EXEC PROGRAM IS TO CONTROL THE SEQUENCE OF 000 3400
C   EXECUTION OF THE PR2D PROGRAM. THE EXEC PROGRAM ITSELF HAS BEEN 000 3500
C   KEPT TO MINIMUM SIZE AND ALL FUNCTIONS ARE OVERLAID AT THE END 000 3600
C   OF EXEC SO THAT THE STORAGE REQUIREMENTS FOR THE PR2D PROGRAM 000 3700
C   WILL BE MINIMUM. THE EXEC PROGRAM IS CONTROLLED BY THE MODE 000 3800
C   PARAMETERS. THESE PARAMETERS SPECIFY THE START AND END OF 000 3900
C   EXECUTION OF THE PR2D PROGRAM. THIS FEATURE IS CALLED "RESTART". 000 4000
C   THIS FEATURE ALLOWS THE USER TO INTERRUPT THE OPERATION OF THE 000 4100
C   PR2D PROGRAM AND, IF DESIRED, MAKE CHANGES TO THE DATA STORED 000 4200
C   IN COMMON. ALL INTER-FUNCTION (PL,RT,ETC.) DATA ARE TRANSFERRED 000 4300
C   THROUGH COMMON OR THROUGH MAGNETIC TAPE. THOSE ARRAYS THAT ARE 000 4400
C   NOT IN COMMON ARE ONLY USED WITHIN THAT PARTICULAR FUNCTION. 000 4500
C   IF NON-COMMON DATA MUST BE TRANSFERRED, IT WILL EITHER BE WRITTEN 000 4600
C   TEMPORARILY TO COMMON OR TO MAGNETIC TAPE. 000 4700
C
C*****000 4800
C*****000 4900
C*****000 5000
C   RESTART FEATURE: 000 5100
C
C   MODE(1) = ISTART IS THE STARTING FUNCTION PARAMETER. 000 5200
C   (1-2) = 0, 1 START WITH INPUT FUNCTION. 000 5300
C           = 2 START WITH PLACE FUNCTION. 000 5400
C           = 3 START WITH ROUTE FUNCTION. 000 5500
C           = 4 START WITH ART FUNCTION. 000 5600
C
C*****000 5700

```

C	= 5	START WITH MANMOD FUNCTION.	000	5800
C	= 6	ERROR CONDITION SWITCH.	000	5900
C			000	6000
C	MODE(2)	= JST, IS THE SUB-RESTART, WITHIN FUNCTION, START WITH	000	6100
C	(3-4)	PARAMETER. SEE EACH FUNCTION EXECUTIVE FOR	000	6200
C		DETAILED INFORMATION ON JST.	000	6300
C		THIS CONTROL IS ONLY USED FOR DEBUGGING OF THE	000	6400
C		PROGRAM AND CAN ONLY BE EXERCISED WHEN MODE(1) =	000	6500
C		MODE(3).	000	6600
C			000	6700
C	MODE(3)	= JEND IS THE ENDING FUNCTION PARAMETER.	000	6800
C	(5-6)	= 1 END AFTER INPUT FUNCTION IS COMPLETE.	000	6900
C		= 2 END AFTER PLACE FUNCTION IS COMPLETE.	000	7000
C		= 3 END AFTER ROUTE FUNCTION IS COMPLETE.	000	7100
C		= 4, 0 END AFTER ART FUNCTION IS COMPLETE.	000	7200
C		= 5 ERROR CONDITION SWITCH.	000	7300
C			000	7400
C	MODE(4)	= JEND, IS THE SUB-RESTART, WITHIN FUNCTION, STOP	000	7500
C	(7-8)	AFTER PARAMETER. SEE EACH FUNCTION EXECUTIVE FOR	000	7600
C		DETAILED INFORMATION ON JEND.	000	7700
C		THIS CONTROL IS ONLY USED FOR DEBUGGING OF THE	000	7800
C		PROGRAM AND CAN ONLY BE EXERCISED WHEN MODE(1) =	000	7900
C		MODE(3).	000	8000
C			000	8100
C	MODE(5)	= ID IS THE CHIP IDENTIFICATION # (0 < ID < 1000).	000	8200
C	(9-12)	(SEE INPUT, READ & WRITE FUNCTIONS)	000	8300
C			000	8400
C	MODE(6)	= ITECH, IS THE TECHNOLOGY CONTROL SWITCH,	000	8500
C	(13-16)	= 0,1 IS FOR METAL GATE BONDED WIRE.	000	8600
C		= 2 IS FOR BEAM LEAD METAL GATE.	000	8700
C		= 3 IS FOR POLY-SILICON.	000	8800
C		= 4 IS FOR BEAM LEAD POLY-SILICON.	000	8900
C		= 5 IS FOR SOS BONDED WIRE	000	9000
C		= 6 IS FOR SOS BEAM LEAD.	000	9100
C			000	9200
C	MODE(7)	= PIN DATA FILE SWITCH.	000	9300
C	(17-20)	(SEE INPUT FUNCTION).	000	9400
C		= 0, 1 PIN DATA ARE FROM TAPE.	000	9500
C		= 2 PIN DATA ARE FROM TAPE AND FROM CARDS.	000	9600
C		= 3 PIN DATA ARE FROM CARDS.	000	9700
C			000	9800
C	MODE(8)	= PIN DATA VALIDATION KEYS.	000	9900
C	(21-24)	= N1, N2, N3, N4. N1N2 IS THE REVISION LEVEL OF DATA.	000	0000
C		N3N4 IS THE ENGINEERING LEVEL OF DATA.	000	0100
C			000	0200
C	MODE(9)	= ITYPE, IS CHIP DESIGN.	000	0300
C	(25-28)	= 0, 1 IS TYPE 1 DESIGN.	000	0400
C			000	0500
C	MODE(10)	IS USER SPECIFICATION OF NUMBER OF CELL ROWS.	000	0600
C	(29-32)	= 0 PROGRAM DETERMINES NUMBER OF ROWS.	000	0700
C		= N USER SPECIFIES NUMBER OF ROWS, 1 < N < 21.	000	0800
C			000	0900
C	MODE(11)	IS USER SPECIFICATION OF NUMBER OF BONDING PADS	000	1000
C	(33-36)	ON EACH EDGE OF CHIP. MUST BE > # CALCULATED BY	000	1100
C		PROGRAM	000	1200
C			000	1300
C	MODE(12)	IS SPECIAL CHIP DESIGN CONTROL SWITCH.	000	1400
C	(37-40)	= 1 IS PARAMETER MODIFICATION OPTION NO. 1.	000	1500
C		= 2 IS PARAMETER MODIFICATION OPTION NO. 2.	000	1600
C		= 3 IS PARAMETER MODIFICATION OPTION NO. 3.	000	1700
C		= 4 IS PARAMETER MODIFICATION OPTION NO. 4.	000	1800

= 5 IS PARAMETER MODIFICATION OPTION NO. 5.	000 1900
= 6 IS PARAMETER MODIFICATION OPTION NO. 6.	000 2000
= 7 IS PARAMETER MODIFICATION OPTION NO. 7.	000 2100
= 8 IS PARAMETER MODIFICATION OPTION NO. 8.	000 2200
= 9 IS PARAMETER MODIFICATION OPTION NO. 9.	000 2300
	000 2400
MODE(15) IS A DEBUG CONTROL FOR COMMON DATA PRINT IN READ	000 2500
(49-52) AND WRITE.	000 2600
= 1, 2 PRINT COMMON DATA IN READ FUNCTION.	000 2700
= 2, 3 PRINT COMMON DATA IN WRITE FUNCTION.	000 2800
= IDBCOM.	000 2900
	000 3000
MODE(16) = IDBPL, IS DEBUG CONTROL FOR PLACE FUNCTION.	000 3100
(53-56)	000 3200
	000 3300
MODE(17) = IDBRT, IS DEBUG CONTROL FOR ROUTE FUNCTION.	000 3400
(57-60)	000 3500
	000 3600
MODE(18) = IDBART, IS DEBUG CONTROL FOR ARTWORK FUNCTION.	000 3700
(61-64)	000 3800
	000 3900
MODE(19) = IDBMAN, IS DEBUG CONTROL FOR MANMOD FUNCTION.	000 4000
(65-68)	000 4100
	000 4200
*****	000 4300
	000 4400
*****	000 4500
*	000 4600
***	000 4700
*	000 4800
	000 4900
FOR NON-TWO BYTE INTEGER MACHINES, PULL ALL	000 5000
"IMPLICIT INTEGER *2(I-N)" CARDS IN ALL SUBROUTINES.	000 5100
	000 5200
ARRAY: FUNCTION EQUIVALENCE: FUNCTION COMMON:	000 5300
RELATED USED: USED:	000 5400
ARRAY:	000 5500
	000 5600
AL(JX) INPUT NONE NA NO	000 5700
NONE	000 5800
AL(I) COMMOD NONE NA NO	000 5900
NONE	000 6000
AL(I,J) PLOT1 NONE NA NO	000 6100
NONE	000 6200
BETA(JX) INPUT NONE NA NO	000 6300
NONE	000 6400
BL(I) POPL1 NONE NA NO	000 6500
NONE	000 6600
BL(I) PLOT1 NONE NA NO	000 6700
NONE	000 6800
CHIP(I) ALL NONE NA YES	000 6900
NONE	000 7000
CL(I) POPL1 NONE NA NO	000 7100
NONE	000 7200
DES(I,J) INPUT NONE NA NO	000 7300
JPTN(I,J) INPUT NONE NA NO	000 7400
DL(I) PLOT1 NONE NA NO	000 7500
NONE	000 7600
ICAP(I) ALL NONE NA YES	000 7700
NETOT(I) PLACE NONE NA NO	000 7800
NET(I,J) INPUT NONE NA NO	000 7900

INFO(I,J)	ALL	NONE	NA	YES	000	8000
IZ(I)	DIST	NONE	NA	NO	000	8100
IP(I)	ALL	NONE	NA	YES	000	8200
JPAR(I)	INIT	NONE	NA	NO	000	8300
IPIN(I,J)	ALL	NONE	NA	YES	000	8400
JPIN(I,J)	INPUT	NONE	NA	NO	000	8500
IZ(I)	DIST	NONE	NA	NO	000	8600
INFO(I,J)	ALL	NONE	NA	YES	000	8700
JART(I,J)	ART	LCS(I)	NONE	YES	000	8800
NONE					000	8900
JP(I,J)	PLACE	LCS(I)	NA	YES	000	9000
MAP/KP	PLACE	LCS	NONE	YES	000	9100
JPAR(I)	INIT	NONE	NA	NO	000	9200
IP(I)	ALL	NONE	NA	YES	000	9300
JPIN(I,J)	INPUT	NONE	NA	NO	000	9400
IPIN(I,J)	ALL	NONE	NA	YES	000	9500
JPTN(I,J)	INPUT	NONE	NA	NO	000	9600
DES(I,J)	INPUT	NONE	NA	NO	000	9700
KEL(I,J)	INPUT	NONE	NA	NO	000	9800
NONE					000	9900
KLASS(I,J)	ROUTE	JART	ALL (LCS)	YES	000	0000
NONE					000	0100
KP(I,J)	PLACE	LCS(I)	NONE	YES	000	0200
JP/MAP	PLACE	LCS	NONE	YES	000	0300
KP(I,J)	ROUTE	JART	ALL (LCS)	YES	000	0400
NONE					000	0500
KXY(I,J)	FIX1	NONE	NA	NO	000	0600
NONE					000	0700
LC(I,J,K)	ROUTE/ART	LCS(I)	NONE	YES	000	0800
LS(I,J,K)	ROUTE/ART	LCS(I)	NONE	YES	000	0900
LCS(I)	NONE	JP/MAP/LNAD/KP	PLACE	YES	000	1000
		JART(I,J)	ART	YES	000	1100
		LC(I,J,K)	ROUTE,ART	YES	000	1200
		LS(I,J,K)	ROUTE,ART	YES	000	1300
NONE					000	1400
LCS1(I)	CONTINUATION OF LCS(I)				000	1500
LL(I)	ALL	NONE	NA	NO	000	1600
NONE					000	1700
LIM(I)	ALL	NONE	NA	YES	000	1800
NONE					000	1900
LNAD(I)	PLACE	LCS(I)	NA	YES	000	2000
NONE					000	2100
LODE(I)	READ	NONE	NA	NO	000	2200
MODE(I)	ALL	NONE	NA	YES	000	2300
LS(I,J,K)	ROUTE/ART	LCS(I)	NONE	YES	000	2400
LC(I,J,K)	ROUTE/ART	LCS(I)	NONE	YES	000	2500
LT(I,J)	PRS1	NONE	NA	NO	000	2600
LC	ROUTE/ART	LCS(I)			000	2700
NET(I,J)	INPUT	NONE	NA	NO	000	2800
ICAP(I)	ALL	NONE	NA	YES	000	2900
NETOT(I)	PLACE	NONE	NA	NO	000	3000
NETOT(I)	PLACE	NONE	NA	NO	000	3100
ICAP(I)	ALL	NONE	NA	YES	000	3200
NET(I,J)	INPUT	NONE	NA	NO	000	3300
NOD(I)	ROUTE	NODE(I)	UP TO ROUTE	YES	000	3400
NODE(I)	PLACE	NOD(I)	ROUTE	YES	000	3500
NODE(I)	ALL UP	NOD(I)	ROUTE	YES	000	3600
TO ROUTE					000	3700
NOD(I)	ROUTE	NODE(I)	PLACE	YES	000	3800
NR(I,J)	ROUTE	NONE	NA	YES	000	3900
NONE					000	4000

MAP(I,J,K)	PLACE	LCS(I)	NONE	YES	000	4100
JP	PLACE	LCS	NONE	YES	000	4200
KP	PLACE	LCS	NONE	YES	000	4300
MODE(I)	ALL	NONE	NA	YES	000	4400
LODE(I)	READ	NONE	NA	NO	000	4500
					000	4600
TAPE USAGE IN PR2D PROGRAM:						000 4700
SUBROUTINE: TAPES:						000 4800
					000	4900
	N	N	N	N	N	000 5000
	0	0	0	0	0	000 5100
	T	T	T	T	T	000 5200
	0	0	0	0	0	000 5300
	1	1	2	3	4	6 000 5400
	0	5	0	5	0	000 5500
						000 5600
EXEC						000 5700
INIT						000 5800
						000 5900
INPUT			*1		*1 *2	000 6100
READ					X	000 6200
WRITE					X	000 6300
COMMOD						000 6400
DBCOM						000 6500
PLEX1						000 6600
RSPL1						000 6700
PRPL1						000 6800
PLACE						000 6900
DIST						000 7000
FIX1						000 7100
POPL1						000 7200
DBPL1						000 7300
RTEX1						000 7400
RSRT1	X		X			000 7500
SMASHI						X 000 7600
TRANS1						000 7700
CL21						000 7800
CL51						000 7900
PRC1						000 8000
RTC1						000 8100
						000 8200
						000 8300
						000 8400
						000 8500
						000 8600
						000 8700
						000 8800
						000 8900
						000 9000
						000 9100
						000 9200
						000 9300
						000 9400
						000 9500
						000 9600
						000 9700
						000 9800
						000 9900
						000 0000
						000 0100

RTCA1				000 0200
				000 0300
RTCB1				000 0400
				000 0500
GDCK1				000 0600
				000 0700
POC1	X		X	000 0800
				000 0900
PRS1			X	000 1000
				000 1100
RTS1				000 1200
				000 1300
RTSA1				000 1400
				000 1500
RTSB1				000 1600
				000 1700
POS1	X			000 1800
				000 1900
ADJ1	X1	X1		000 2000
				X2000 2100
				000 2200
ADJA1				000 2300
				000 2400
ARTEX1				000 2500
				000 2600
RSART1		X	X	000 2700
				000 2800
ANALC1		X		000 2900
				000 3000
LINEA1			X	000 3100
				000 3200
ANALS1		X		000 3300
				000 3400
LINEB1			X	000 3500
				000 3600
PWR1				000 3700
				000 3800
LINEC1			X	000 3900
				000 4000
SORT1			X	000 4100
				000 4200
ART1				X1 *2000 4300
				000 4400
BRDR1				000 4500
				000 4600
GND1				000 4700
				000 4800
STSS1				X1 *2000 4900
				000 5000
INST1				X1 *2000 5100
				000 5200
PLOT1		X		000 5300
				000 5400
MANEX1				000 5500
				000 5600
* IF REQUIRED.				000 5700
X TAPE IS USED.				000 5800
				000 5900
*****				000 6000
				000 6100
*****				000 6200

							000 6300
							000 6400
							000 6500
							000 6600
							000 6700
							000 6800
							000 6900
							000 7000
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							000 8900
							000 9000
							000 9100
							000 9200
							000 9300
							000 9400
							000 9500
							000 9600
							000 9700
							000 9800
							000 9900
							000 0000
							000 0100
							000 0200
							000 0300
							000 0400
							000 0500
							000 0600
							000 0700
							000 0800
							000 0900
							000 1000
							000 1100
							000 1200
							000 1300
							000 1400
							000 1500
							000 1600
							000 1700
							000 1800
							000 1900
							000 2000
							000 2100
							000 2200
							000 2300

ARRAYS IN COMMON:

IMPLICIT INTEGER (I-N)

INTEGER *4 ICARD, ICORE, IPRT, JDATA, JPDF, KART

DIMENSION CHIP(13), ICAP(400), INFO(500,7),
 1 IP(1000), IPIN(200,3), LCS(12000), LCS1(12000),
 2 LIM(300), MODE(19), NODE(4000), NR(1000,7)

COMMON ICARD, ICORE, IPRT, JDATA, JPDF, KART

COMMON CHIP, ICAP, INFO,
 1 IP, IPIN, LCS, LCS1,
 2 LIM, MODE, NODE, NR

COMMON EQUIVALENCE:

EQUIVALENCE

1 (ISTART,MODE(1)), (JST ,MODE(2)), (IEND ,MODE(3)),
 2 (JEND ,MODE(4)), (ID ,MODE(5)), (ITECH ,MODE(6)),
 3 (IEND ,MODE(3)), (IEND ,MODE(3)), (ITECH ,MODE(6)),
 4 (IDBRT ,MODE(17)), (IDBCOM,MODE(15)), (IDBPL ,MODE(16)),
 5 (IDBRT ,MODE(17)), (IDBART,MODE(18)), (IDBMAN,MODE(19))

EQUIVALENCE

1 (IBYPL ,LIM(1)), (ICAPX ,LIM(2)), (IERR ,LIM(6)),
 2 (IDX ,LIM(4)), (IDY ,LIM(5)), (IGDD ,LIM(9)),
 3 (IGD ,LIM(7)), (IGDCK ,LIM(8)), (IGDD ,LIM(9)),
 4 (IGD1 ,LIM(10)), (IGD2 ,LIM(11)), (INFOX ,LIM(12)),
 5 (INFOY ,LIM(13)), (INFOY1,LIM(14)), (INFOY2,LIM(15)),
 6 (INFOY3,LIM(16)), (INFOY4,LIM(17)), (INFOY5,LIM(18)),
 7 (INFOY6,LIM(19)), (INFOY7,LIM(20)), (IPAD ,LIM(21)),
 8 (IPAGE ,LIM(22)), (IPINX ,LIM(23)), (IPINY ,LIM(24)),
 9 (IPINYC,LIM(25)), (IPINYR,LIM(26)), (IPINYX,LIM(27)),
 A (IPINYY,LIM(28)), (IPX ,LIM(30)),
 B (IROW ,LIM(31)), (ISW1 ,LIM(32)), (ISW2 ,LIM(33)),
 C (IY ,LIM(34)), (IZX ,LIM(35)), (I0 ,LIM(36)),
 D (I1 ,LIM(37)), (I2 ,LIM(38)), (I3 ,LIM(39)),
 E (I4 ,LIM(40)), (I5 ,LIM(41)), (I6 ,LIM(42))

EQUIVALENCE

1 (JA ,LIM(49)), (JARTX ,LIM(50)), (JARTY ,LIM(51)),
 2 (JARTY1,LIM(52)), (JARTY2,LIM(53)), (JARTY3,LIM(54)),
 3 (JARTY4,LIM(55)), (JARTY5,LIM(56)), (JARTY6,LIM(57)),
 4 (JBAD ,LIM(58)), (JDEBUG,LIM(60)),
 5 (JEL ,LIM(61)), (JELR ,LIM(62)),
 6 (JL ,LIM(65)), (JN ,LIM(66)),
 7 (JNGG ,LIM(67)), (JNTG ,LIM(68)), (JO ,LIM(69)),
 8 (JPX ,LIM(70)), (JPY ,LIM(71)), (JROW ,LIM(72)),
 9 (JRSP ,LIM(73)), (JSL ,LIM(74)), (JSWC ,LIM(75)),
 A (JSWPL ,LIM(76)), (JSW1 ,LIM(77)), (JSW2 ,LIM(78)),
 B (JSW3 ,LIM(79)), (JSW4 ,LIM(80)), (JSW5 ,LIM(81)),
 C (JTDAMN,LIM(82)), (JTDAMO,LIM(83)), (JTOT ,LIM(84)),
 D (JU ,LIM(85)), (JX ,LIM(86)), (JY ,LIM(87))

EQUIVALENCE

1 (KBAD ,LIM(95)), (KDATA ,LIM(96)),
 2 (KLASSX,LIM(97)), (KLASSY,LIM(98)), (KNODE ,LIM(99)),
 3 (KNT ,LIM(100)), (KODE ,LIM(101)), (KODEC ,LIM(102)),
 4 (KODEG ,LIM(103)), (KODEM ,LIM(104)), (KODET ,LIM(105)),
 5 (KODEV ,LIM(106)), (KOUNT ,LIM(107)), (KPAD ,LIM(108))

6	(KPADN ,LIM(109)),	(KPAD1 ,LIM(110)),	(KPAD2 ,LIM(111)),	000	2400
7	(KPAD3 ,LIM(112)),	(KPMX ,LIM(113)),	(KPMY ,LIM(114)),	000	2500
8	(KPX ,LIM(115)),	(KPX1 ,LIM(116)),	(KPY ,LIM(117)),	000	2600
9	(KROW ,LIM(118)),	(KSXE ,LIM(119)),	(KSXL ,LIM(120))	000	2700
EQUIVALENCE					
1	(KSXR ,LIM(121)),	(KSXT ,LIM(122)),	(KSX0 ,LIM(123)),	000	2900
2	(KSXB ,LIM(124)),	(KSYT ,LIM(125)),	(KTOT ,LIM(126)),	000	3000
3	(KXLL ,LIM(127)),	(KXLR ,LIM(128)),	(KXUL ,LIM(129)),	000	3100
4	(KXUR ,LIM(130)),	(KXZ ,LIM(131)),	(KX1 ,LIM(132)),	000	3200
5	(KX2 ,LIM(133)),	(KX3 ,LIM(134)),	(KYE ,LIM(135)),	000	3300
6	(KYR ,LIM(136)),	(KYT ,LIM(137)),	(KY0 ,LIM(138)),	000	3400
7	(KY1 ,LIM(139)),	(KY2 ,LIM(140)),	(KY3 ,LIM(141)),	000	3500
8	(K50 ,LIM(142)),	(K100 ,LIM(143)),	(K150 ,LIM(144)),	000	3600
9	(K200 ,LIM(145))			000	3700
EQUIVALENCE					
1	(LCSX ,LIM(154)),	(LCXC ,LIM(155)),	(LCXM ,LIM(156)),	000	3800
2	(LCXRL ,LIM(157)),	(LCXRR ,LIM(158)),	(LCXTL ,LIM(159)),	000	4000
3	(LCXTR ,LIM(160)),	(LCYC ,LIM(161)),	(LCYM ,LIM(162)),	000	4100
4	(LCYEB ,LIM(163)),	(LCYET ,LIM(164)),	(LCYRB ,LIM(165)),	000	4200
5	(LCYRT ,LIM(166)),	(LCYTB ,LIM(167)),	(LCYTT ,LIM(168)),	000	4300
6	(LCY0B ,LIM(169)),	(LCY0T ,LIM(170)),	(LE ,LIM(171)),	000	4400
7	(LEFT ,LIM(172)),	(LIMINT ,LIM(173)),	(LIMX ,LIM(174)),	000	4500
8	(LINE ,LIM(175)),	(LIN1 ,LIM(176)),	(LIN3 ,LIM(177)),	000	4600
9	(LLE ,LIM(178)),	(LNADX ,LIM(179)),	(LROW ,LIM(180)),	000	4700
A	(LSW1 ,LIM(181)),	(LSW2 ,LIM(182)),	(LSW3 ,LIM(183))	000	4800
EQUIVALENCE					
1	(LSW4 ,LIM(184)),	(LSW5 ,LIM(185)),	(LSXC ,LIM(186)),	000	5000
2	(LSXEL ,LIM(187)),	(LSXER ,LIM(188)),	(LSXLL ,LIM(189)),	000	5100
3	(LSXLR ,LIM(190)),	(LSXM ,LIM(191)),	(LSXRL ,LIM(192)),	000	5200
4	(LSXRR ,LIM(193)),	(LSXTL ,LIM(194)),	(LSXTR ,LIM(195)),	000	5300
5	(LSX0L ,LIM(196)),	(LSX0R ,LIM(197)),	(LSYB ,LIM(198)),	000	5400
6	(LSYC ,LIM(199)),	(LSYM ,LIM(200)),	(LSYT ,LIM(201)),	000	5500
7	(LVL ,LIM(202)),	(LX ,LIM(203)),	(LXA ,LIM(204)),	000	5600
8	(LXSN ,LIM(205)),	(LX1 ,LIM(206)),	(LX2 ,LIM(207)),	000	5700
9	(LX3 ,LIM(208)),	(LX4 ,LIM(209)),	(LY ,LIM(210)),	000	5800
A	(LYA ,LIM(211)),	(LYSN ,LIM(212)),	(LY1 ,LIM(213)),	000	5900
B	(LY2 ,LIM(214)),	(LY3 ,LIM(215)),	(LY4 ,LIM(216))	000	6000
EQUIVALENCE					
		(LLX ,LIM(218)),	(LLX2 ,LIM(219))	000	6100
EQUIVALENCE					
1	(MAPX ,LIM(223)),	(MAPY ,LIM(224)),	(MAPZ ,LIM(225)),	000	6300
2	(MAX ,LIM(226)),	(MAXX ,LIM(227)),	(MAXX1 ,LIM(228)),	000	6400
3	(MAXY ,LIM(229)),	(MAXY1 ,LIM(230)),	(MIDX ,LIM(231)),	000	6500
4	(MIDY ,LIM(232)),	(MIN ,LIM(233)),	(MINX ,LIM(234)),	000	6600
5	(MINX1 ,LIM(235)),	(MINY ,LIM(236)),	(MINY1 ,LIM(237)),	000	6700
6	(MODEX ,LIM(238)),	(MPAD ,LIM(239)),	(MROW ,LIM(240)),	000	6800
7	(MXEL ,LIM(241)),	(MXEL1 ,LIM(242)),	(MX1 ,LIM(243)),	000	6900
8	(MZA ,LIM(244)),	(MZB ,LIM(245)),	(M1 ,LIM(246))	000	7000
EQUIVALENCE					
1	(NDXART ,LIM(253)),	(NDX1 ,LIM(254)),	(NDX2 ,LIM(255)),	000	7100
2	(NDX3 ,LIM(256)),	(NDX4 ,LIM(257)),	(NEND ,LIM(258)),	000	7200
3	(NETOTX ,LIM(259)),	(NEW ,LIM(260)),	(NMIX ,LIM(261)),	000	7300
4	(NNODE ,LIM(262)),	(NNODE1 ,LIM(263)),	(NOINT ,LIM(264)),	000	7400
5	(NODEX ,LIM(265)),	(NODEX1 ,LIM(266)),	(NODEX2 ,LIM(267)),	000	7500
6	(NODX ,LIM(268)),	(NPAD ,LIM(269)),	(NPT ,LIM(270)),	000	7600
7	(NROW ,LIM(271)),	(NRX ,LIM(272)),	(NRXM ,LIM(273)),	000	7700
8	(NRY ,LIM(274)),	(NRYM ,LIM(275)),	(NRY1 ,LIM(276)),	000	7800
9	(NRY2 ,LIM(277)),	(NRY3 ,LIM(278)),	(NRY4 ,LIM(279))	000	7900
EQUIVALENCE					
1	(NRY5 ,LIM(280)),	(NRY6 ,LIM(281)),	(NRY7 ,LIM(282)),	000	8100
2	(NS ,LIM(283)),	(NSB ,LIM(284)),	(NSHX ,LIM(285)),	000	8200
3	(NSHY ,LIM(286)),	(NSL ,LIM(287)),	(NSTART ,LIM(288)),	000	8300
				000	8400

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      4 (NSU ,LIM(289)), (NX ,LIM(290)), (NXL ,LIM(291)), 000 8500
      5 (NXU ,LIM(292)), (NXX ,LIM(293)), (NX1 ,LIM(294)), 000 8600
      6 (NYB ,LIM(295)), (NYT ,LIM(296)), (NI ,LIM(297)) 000 8700
C
C*****000 8800
C*****000 8900
C*****000 9000
C*****000 9100
C * 000 9200
C *** 000 9300
C * 000 9400
C 000 9500
C CALL INIT SUBROUTINE TO READ MODE DATA, CLEAR COMMON AND
C INITIALIZE PROGRAM CONSTANTS AND PARAMETERS. 000 9600
C 000 9700
C 000 9800
C CALL INIT 000 9900
C GO TO (100,1000,1000,1000,1000,9000), ISTART 000 0000
C 000 0100
C*****000 0200
C 000 0300
C CALL INPUT FUNCTION TO READ IN DESIGN DATA AND PIN DATA. 000 0400
C 000 0500
C*****000 0600
C * 000 0700
C *** 000 0800
C * 000 0900
C 000 1000
C 100 CALL INPUT 000 1100
C GO TO (200,200,200,200,9000), IEND 000 1200
C 000 1300
C*****000 1400
C 000 1500
C*****000 1600
C * 000 1700
C *** 000 1800
C * 000 1900
C 000 2000
C CALL PLACE FUNCTION TO GENERATE A TWO DIMENSIONAL PLACEMENT. 000 2100
C 000 2200
C 200 IF(ITYPE.EQ.1) CALL PLEX1 000 2300
C GO TO (9000,2000,300,300,9000), IEND 000 2400
C 000 2500
C*****000 2600
C 000 2700
C CALL ROUTE TO GENERATE A TWO DIMENSIONAL ROUTING
C OF NODES ON THE CHIP. 000 2800
C 000 2900
C*****000 3000
C * 000 3100
C *** 000 3200
C * 000 3300
C 000 3400
C 000 3500
C 300 IF(ITYPE.EQ.1) CALL RTEX1 000 3600
C GO TO (9000,9000,2000,400,9000), IEND 000 3700
C 000 3800
C*****000 3900
C 000 4000
C CALL ART TO WRITE ARTWORK INSTRUCTIONS TO THE OUTPUT TAPE. 000 4100
C 000 4200
C*****000 4300
C * 000 4400
C *** 000 4500

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C      *                                000 4600
C      *                                000 4700
C      400 IF(ITYPE.EQ.1) CALL ARTEX1    000 4800
      GO TO (9000,9000,9000,2000,9000), IEND    000 4900
C      *                                000 5000
C      *                                000 5100
C      *                                000 5200
C      CALL READ TO RECOVER COMMON DATA STORED ON MAGNETIC TAPE. THEN    000 5300
C      GO TO PROPER RESTART FUNCTION.        000 5400
C      *                                000 5500
C      *                                000 5600
C      *                                000 5700
C      ***                                000 5800
C      *                                000 5900
C      *                                000 6000
C      1000 CALL READ                     000 6100
      GO TO (9000,200,300,400,3000,10000), ISTART 000 6200
C      *                                000 6300
C      *                                000 6400
C      *                                000 6500
C      CALL WRITE TO STORE COMMON DATA ON MAGNETIC TAPE.             000 6600
C      *                                000 6700
C      *                                000 6800
C      *                                000 6900
C      ***                                000 7000
C      *                                000 7100
C      *                                000 7200
C      2000 CALL WRITE                     000 7300
      GO TO 10000                            000 7400
C      *                                000 7500
C      *                                000 7600
C      *                                000 7700
C      CALL MANMOD FOR MAKING MANUAL CHANGES TO THE ARTWORK INSTRUCTIONS. 000 7800
C      *                                000 7900
C      *                                000 8000
C      *                                000 8100
C      ***                                000 8200
C      *                                000 8300
C      *                                000 8400
C      3000 CALL MANEX1                   000 8500
      GO TO 2000                              000 8600
C      *                                000 8700
C      *                                000 8800
C      *                                000 8900
C      CALL DBCOM TO PRINT OUT COMMON DATA.                            000 9000
C      *                                000 9100
C      *                                000 9200
C      *                                000 9300
C      ***                                000 9400
C      *                                000 9500
C      *                                000 9600
C      9000 CALL DBCOM                    000 9700
C      *                                000 9800
C      *                                000 9900
C      *                                000 0000
C      10000 STOP                          000 0100
      END                                    000 0200
CSTARTC INIT      VER001 050674      1A      000-0100
      SUBROUTINE INIT.                  000 0200
C      *                                000 0300
C      *                                000 0400

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C		000 0500
C	THE PURPOSE OF THIS FUNCTION IS TO READ & VALIDATE THE MODE	000 0600
C	PARAMETERS, CLEAR COMMON AND PRESET PROGRAM CONSTANTS AND	000 0700
C	PARAMETERS.	000 0800
C		000 0900
C	*****	000 1000
C		000 1100
C	CHIP(IX):	000 1200
C		000 1300
C	THIS ARRAY IS USED TO STORE CHIP DESCRIPTION DATA.	000 1400
C		000 1500
C	ICAP(IX):	000 1600
C		000 1700
C	THIS ARRAY IS USED TO STORE THE NODE CAPACITANCE OF NODE IX.	000 1800
C		000 1900
C	INFO(IX,IY):	000 2000
C		000 2100
C	IX IS THE ELEMENT NUMBER ASSIGNED TO A DEVICE.	000 2200
C		000 2300
C	IY IS USED TO STORE DATA ASSOCIATED WITH ELEMENT IX.	000 2400
C	INFOY1 (=1) IS X-INDEX ON PLACEMENT SURFACE.	000 2500
C	INFOY2 (=2) IS Y-INDEX ON PLACEMENT SURFACE.	000 2600
C	INFOY3 (=3) IN INPUT/PRPL1 USED TO STORE USER	000 2700
C	SPECIFICATION OF POSITION OF FIXED ELEMENT	000 2800
C	IN FIXED ROW.	000 2900
C	IN PLACE, IS ADDRESS (INDEX) IN LNAD(I)	000 3000
C	OF LOWER LIMIT OF LIST OF ADDRESSES IN	000 3100
C	NODE(I) OF THOSE NODES WHICH CONTAIN	000 3200
C	ELEMENT IX.	000 3300
C	IN ROUTE, IS X-COORD. OF ELEMENT IX.	000 3400
C	INFOY4 (=4) IN PLACE, IS UPPER LIMIT OF ADDRESSES IN	000 3500
C	LNAD(I).	000 3600
C	IN ROUTE, IS Y-COORD. OF ELEMENT IX.	000 3700
C	INFOY5 (=5) IN PLACE, IS BAD HISTORY COUNTER AND	000 3800
C	TEMPORARY STORAGE OF CELL WIDTH.	000 3900
C	IN ROUTE, IS B.P. POSITION #, BY ROW TO	000 4000
C	LOCATE B.P. IN PROPER POSITION.	000 4100
C	INFOY6 (=6) IS USED TO STORE ROW NUMBER AND PATTERN	000 4200
C	ORIENTATION.	000 4300
C	IN INPUT/PRPL1 USED TO STORE USER	000 4400
C	SPECIFICATION OF ROW NUMBER OF ELEMENT	000 4500
C	FIXED IN ROW AND/OR POSITION.	000 4600
C	INFOY7 (=7) IS USED TO STORE ADDRESS OF START OF PIN	000 4700
C	DATA FOR PATTERN ASSIGNED TO ELEMENT IX.	000 4800
C		000 4900
C	IP(IX) IS USED TO STORE PARAMETERS USED IN THIS PROGRAM:	000 5000
C	NOTE: ALL MIL VALUES ARE IN 10THS OF MILS, 10 = 1.0 MILS.	000 5100
C	EXCEPT FOR LINEAR WIDTH BREAK POINTS WHICH ARE IN MILS.	000 5200
C		000 5300
C	I0 IS THE STARTING INDEX FOR CONTROL PARAMETERS.	000 5400
C		000 5500
C	IP(I0) IS NUMBER OF I0 DATA.	000 5600
C	IP(I0+ 1) IS NUMBER OF LINES PER PAGE PRINT CONTROL.	000 5700
C	IP(I0+ 2) IS MAXIMUN NUMBER OF BONDING PADS ON CHIP.	000 5800
C	IP(I0+ 3) IS THE LINEAR WIDTH BREAK POINT FOR 3 ROWS.	000 5900
C	IP(I0+ 4) IS THE LINEAR WIDTH BREAK POINT FOR 4 ROWS.	000 6000
C	IP(I0+ 5) IS THE LINEAR WIDTH BREAK POINT FOR 5 ROWS.	000 6100
C	IP(I0+ 6) IS THE LINEAR WIDTH BREAK POINT FOR 6 ROWS.	000 6200
C	IP(I0+ 7) IS THE LINEAR WIDTH BREAK POINT FOR 7 ROWS.	000 6300
C	IP(I0+ 8) IS THE LINEAR WIDTH BREAK POINT FOR 8 ROWS.	000 6400
C	IP(I0+ 9) IS THE LINEAR WIDTH BREAK POINT FOR 9 ROWS.	000 6500


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= 0, BALANCE CHIP IN X. 000 2700
= 1, BYPASS ADJA1 000 2800
IP(I0+36) IS BYPASS CONTROL FOR ALTERNATE INPUT PATTERN 000 2900
OF B.P. ON SIDE OF CHIP 000 3000
= 0, SUBSTITUTE ALTERNATE PATTERN 000 3100
= 1, USE SAME PATTERN 000 3200
IP(I0+37) IS POLY TECHNOLOGY FOR LEVEL 10 GUARD. 000 3300
= 0, NO SECOND TUNNEL OR SHAPE SET. 000 3400
= 1, GENERATE SECONDARY LEVEL OF TUNNELS. 000 3500
= 2, GENERATE SHAPE SET FOR NON-CELL AREA. 000 3600
IP(I0+38) IS TOP ROW (IF ODD #) GROUND FROM SIDE BYPASS. 000 3700
= 0, GND ON TOP, BYPASS SIDE GROUND. 000 3800
= 1, NOT ON TOP, GENERATE ON SIDES VIA 000 3900
IP(I0+14) PARAMETER. 000 4000
IP(I0+39) IS CONTROL TO FORCE B.P. TO BE RELOCATED ON 000 4100
BONDING PAD ROWS, SO THAT ROUTED WIRE WILL 000 4200
MAKE POSITIVE CONTACT WITH B.P. PIN. 000 4300
= 0, DO NOT MOVE B.P. 000 4400
> 0, ADJUST POSITION OF B.P. (NOT MORE THAN 000 4500
IP(I0+39) UNITS. 000 4600
IP(I0+40) IS T.E. AT ZERO ROUTING CHANNEL CONTROL. 000 4700
= 0, NO T.E. IN ZERO CHANNEL. 000 4800
= 1, T.E. FOR CELLS ONLY. 000 4900
= 2, T.E. FOR CELLS & BONDING PADS. 000 5000
IP(I0+41) IS ZERO CHANNEL ROUTING CONTROL. 000 5100
= 0, NO ZERO CHANNEL ROUTING. 000 5200
= 1, ROUTE CLASS 1 AT ZERO CHANNEL. 000 5300
= 2, ROUTE CLASS 1 & 2 AT ZERO CHANNEL. 000 5400
= 3, ROUTE CLASS 2 AT ZERO CHANNEL. 000 5500
IP(I0+42) > 0, IS PAUSE STATEMENT BYPASS. 000 5600
IP(I0+43) IS THE LINEAR WIDTH BREAK POINT FOR 13 ROWS. 000 5700
IP(I0+44) IS THE LINEAR WIDTH BREAK POINT FOR 14 ROWS. 000 5800
IP(I0+45) IS THE LINEAR WIDTH BREAK POINT FOR 15 ROWS. 000 5900
IP(I0+46) IS THE LINEAR WIDTH BREAK POINT FOR 16 ROWS. 000 6000
IP(I0+47) IS THE LINEAR WIDTH BREAK POINT FOR 17 ROWS. 000 6100
IP(I0+48) IS THE LINEAR WIDTH BREAK POINT FOR 18 ROWS. 000 6200
IP(I0+49) IS THE LINEAR WIDTH BREAK POINT FOR 19 ROWS. 000 6300
IP(I0+50) IS THE LINEAR WIDTH BREAK POINT FOR 20 ROWS. 000 6400
IP(I0+51) IS PLACE SURFACE OPTION CONTROL. 000 6500
= 0, C-MOS/SI-GATE OPTION: CXXXCXCXXXC... 000 6600
= 1, SOS OPTION: CXXCCXXCCXXCC... 000 6700
IP(I0+52) > 0 TEST CELL PIN-TO-PIN MULTIPLE OF K200. 000 6800
IP(I0+53) > 0, INTERCHANGE GND/VDD DATA. IF IP(I0+54) 000 6900
> 1, SET IP(I0+53)=1, IF < 2, SET. = 0. 000 7000
IP(I0+54) IS GND/VDD LOCATION CONTROL. 000 7100
= 0, GND BELOW CENTER - VDD ABOVE. 000 7200
= 1, GND ABOVE CENTER - VDD BELOW. 000 7300
= 2, PADS IN CORNNERS. VDD BOTTOM-LEFT, GND 000 7400
TOP-RIGHT. 000 7500
= 3, PADS IN CORNNERS. VDD TOP-LEFT, GND 000 7600
BOTTOM-RIGHT. 000 7700
IP(I0+55) > 0, ROUTE SHORTEST CLASS 1 NODES FIRST. 000 7800
IP(I0+56) > 0, ROUTE CLASS 2 ON ZERO CHANNEL IF IT IS 000 7900
THE END PIN. BYPASS IF IP(I0+41) > 1. 000 8000
IP(I0+57) > 0, BYPASS REROUTE OF LOW-PROFILE METAL. 000 8100
BYPASS IF IP(I4+99) = 0. 000 8200
IP(I0+58) > 0, ROUTE SHORTEST CLASS 5 FIRST. 000 8300
= 1 B.P. ROWS ONLY 000 8400
= 2 ALL ROWS. 000 8500
IP(I0+59) > 0 IS ODD CELL ROW TO TOP B.P. MODIFIED 000 8600
ROUTE (CLASS 2 INSTEAD OF CLASS 3) BYPASS. 000 8700

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	= 0, EXERCISE	000 8800
IP(I0+60)	IS SPECIAL ROUTE FOR CLASS 3 WHERE ROUTE IS BACK-TO-BACK ROW PLUS B.P. THE OPTION, > 0, WILL SMASH NODE INTO CLASS 2 + CLASS 6.	000 8900 000 9000 000 9100
	> 0, EXERCISE OPTION, WHERE IP(I0+60) IS THE NUMBER OF THESE PER SIDE ON ROW PAIR.	000 9200 000 9300
	= 0, BYPASS.	000 9400
IP(I0+61)	> 0, CALCULATE CROSSOVERS FOR EACH NODE. FOR GROUND VIA TUNNEL, = # EQUIV. CROSSOVERS.	000 9500 000 9600
IP(I0+62)	IS ALTERNATE LOCATION OF POWER TO B.P. SEE IP(I2+19).	000 9700 000 9800
IP(I0+63)	> 0, PRINT UNUSED PIN LIST IN INPUT.	000 9900
IP(I0+64)	= 0, BYPASS PIN-TO-TAP IN CENTER ROUTING IF TAP POINT NOT WITHIN ROW LIMITS.	000 0000 000 0100
	> 0, BYPASS THIS OPTION.	000 0200
IP(I0+65)	IS SIDE BONDING PAD ROUTING CONTROL. = 0, BYPASS THIS FEATURE.	000 0300 000 0400
	= 1, PREVENT ROUTE FROM SIDE B.P. TO BE WITHIN PREVIOUSLY ROUTED ROW-TO-ROW ROUTING.	000 0500 000 0600
	= 2, SAME AS 1 + DISABLE PIN-TO-TAP ROUTE OF SIDE B.P.	000 0700 000 0800
	IF > 0, RESET IP(I4+96) = 0.	000 0900
IP(I0+66)	> 0, LIMIT LOW PROFILE METAL TO START/END IN VERTICAL CHANNEL WHICH DOES NOT CONTAIN A TUNNEL.	000 1000 000 1100 000 1200
IP(I0+67)	RE-ROUTE MULTIPLE PINS ON SAME CELL ROW TO LOWER HORIZONTAL CHANNEL CONTROL. = 0, EXECUTE; > 0, BYPASS.	000 1300 000 1400 000 1500
IP(I0+68)	> 0, BYPASS PRINT OF OUTPUT DATA.	000 1600
IP(I0+69)	= 0, FORCE, IF POSSIBLE, ODD CELL ROW TO TOP B.P. (VIA CLASS 2, SEE IP(I0+59)) TO BE ALL METAL AT CELL ROW. IF IP(I0+59) > 0, RESET IP(I0+69) = 1.	000 1700 000 1800 000 1900 000 2000
IP(I0+70)	IS ROW 3/NROW B.P. ROUTING CONTROL. = 0, FORCE ROUTE TO B.P. ORDER AND ROUTE SINGLE STEP NOT TO CROSS EACH OTHER. DOUBLE STEP IS NORMAL ROUTE.	000 2100 000 2200 000 2300 000 2400
	IF IP(I4+99) = 0, FORCE IP(I0+70) = 1. > 0, BYPASS	000 2500 000 2600
IP(I0+71)	IS CONTROL TO OVERRIDE CERTAIN USER OPTIONS, SEE INPUT SUBROUTINE. = 0, EXERCISE.	000 2700 000 2800 000 2900
	> 0, BYPASS THIS CONTROL.	000 3000
IP(I0+72)	IS EXTERNAL SORT CONTROL. = 0, BYPASS.	000 3100 000 3200
	> 0, EXECUTE EXTERNAL SORT OF OUTPUT DATA. SEE SORT1 AND ART FUNCTION.	000 3300 000 3400 000 3500
I1	IS THE STARTING INDEX FOR PLACEMENT PARAMETERS.	000 3600 000 3700
IP(I1)	IS NUMBER OF I1 DATA.	000 3800
IP(I1+ 1)	IS JRSP SWITCH INITIAL VALUE.	000 3900
IP(I1+ 2)	IS JSL SWITCH INITIAL VALUE.	000 4000
IP(I1+ 3)	IS JBAD LIMIT.	000 4100
IP(I1+ 4)	IS LIMINT VALUE.	000 4200
IP(I1+ 5)	IS LE INITIAL VALUE.	000 4300
IP(I1+ 6)	IS FACTOR USED TO DETERMINE LE IF IP(I1+5) ≠ 0	000 4400
IP(I1+ 7)	IS LOWER LIMIT OF LE WHEN IP(I1+5) = 0.	000 4500
IP(I1+ 8)	IS LX SCALING FACTOR.	000 4600
IP(I1+ 9)	IS LY SCALING FACTOR.	000 4700
IP(I1+10)	IS NMIX VALUE.	000 4800

IP(I1+11)	IS JSWC SWITCH VALUE.	000 4900
IP(I1+12)	IS LE INCREMENT VALUE.	000 5000
IP(I1+13)	IS LE DECREMENT VALUE.	000 5100
IP(I1+14)	IS PLACEMENT PRINT CONTROL.	000 5200
IP(I1+15)	IS THE BAD HISTORY INCREMENT VALUE	000 5300
IP(I1+16)	IS THE BAD HISTORY DECREMENT VALUE	000 5400
IP(I1+17)	IS THE DUMMY NODE (FOR SUBDIVIDED CELLS) WEIGHTING FACTOR.	000 5500
IP(I1+18)	IS NODE WEIGHTING FACTOR FOR INPUT B.P.	000 5600
IP(I1+19)	IS NODE WEIGHTING FACTOR FOR OUTPUT B.P.	000 5700
IP(I1+20)	IS FACTOR USED IN DETERMINING UNIT AREA.	000 5800
IP(I1+21)	IS PRESET UNIT AREA.	000 5900
IP(I1+22)	IS USED TO ADJUST ROUND OFF FACTOR FOR SUBDIVISION OF LONG CELLS.	000 6000
IP(I1+23)	IS PRESET ROUND OFF FOR CELL SUBDIVISION.	000 6100
IP(I1+24)	IS NUMBER OF UNIT AREAS BETWEEN FACING ROWS. MUST BE > 1	000 6200
IP(I1+25)	IS NUMBER OF UNIT AREAS BACK-TO-BACK ROWS.	000 6300
IP(I1+26)	IS NUMBER OF UNIT AREAS ON LEFT SIDE OF ALL BACK-TO-BACK ROWS.	000 6400
IP(I1+27)	IS NUMBER OF UNIT AREAS ON RIGHT SIDE OF ALL BACK-TO-BACK ROWS.	000 6500
IP(I1+28)	IS NUMBER OF SLOTS RESEARVED FOR PHOTO KEY ON BOTTOM/TOP B.P. ROWS.	000 6600
IP(I1+29)	IS NUMBER OF SLOTS RESEARVED FOR TEST TRAN- ISTERS ON SIDE B.P. ROWS.	000 6700
IP(I1+30)	IS DEFAULT AVERAGE CELL WIDTH.	000 6800
IP(I1+31)	IS JNTG LIMIT CONTROL. JNTG MUST BE GREATER THAN IP(I1+31) TO ALLOW NEW TRY AT PLACEMENT.	000 6900
IP(I1+32)	IS BYPASS CONTROL ON INTERCHANGE OF ELEMENTS ON EQUALITY IN PLACE. = 0 EXECUTE INTERCHANGE ON EQUALITY. = 1 BYPASS INTERCHANGE ON EQUALITY.	000 7000
IP(I1+33)	IS ODD CELL ROW EXTRA UNIT AREAS.	000 7100
12 IS THE STARTING INDEX FOR ROUTING PARAMETERS.		000 7200
IP(I2)	IS NUMBER OF I2 DATA.	000 7300
IP(I2+ 1)	IS THE METAL-TO-METAL CHANNEL SPACING ON THE ROUTING SURFACE.	000 7400
IP(I2+ 2)	IS THE PIN-TO-PIN SPACING ON ROUTING SURFACE.	000 7500
IP(I2+ 3)	IS BONDING PAD TO BONDING PAD SPACING.	000 7600
IP(I2+ 4)	IS DISTANCE FROM CHIP CENTER TO START OF BONDING PADS ON HORIZONTAL ROWS OF B.P. INITIALLY SET = B.P. ORIGIN TO CENTER OF PAD.	000 7700
IP(I2+ 5)	IS DISTANCE FROM CHIP CENTER TO START OF BONDING PADS ON VERTICAL ROWS OF B.P. INITIALLY SET = B.P. ORIGIN TO CENTER OF PAD, MINUS ADDITIONAL OFFSET FOR TEST TRANSISTOR.	000 7800
IP(I2+ 6)	IS AN ARBITRARY X/Y VALUE OF CENTER OF CHIP.	000 7900
IP(I2+ 7)	IS NUMBER OF TUNNEL CHANNELS TO BE GUARDED.	000 8000
IP(I2+ 8)	IS THE Y-DISTANCE OF THE SIDE GROUND FROM THE CELL ROW ORIGIN.	000 8100
IP(I2+ 9)	IS THE NUMBER OF INDICIES PER STEP USED TO INTERCONNECT B.P. TO NODE IN ADJUSTMENT OF CENTER ROUTING SURFACE DUE TO X SHIFT.	000 8200
IP(I2+10)	IS HEIGHT OF CELLS.	000 8300
IP(I2+11)	IS Y-DISTANCE FROM ORIGIN OF CELL TO CENTER OF PIN.	000 8400
IP(I2+12)	IS Y-DISTANCE FROM ORIGIN OF CELL TO FIRST	000 8500

	METAL CHANNEL.	000 1000
IP(I2+13)	IS DISTANCE OF FIRST RIGHT END-AROUND VERTICAL CHANNEL FROM EDGE OF HORIZONTAL CELL ROWS.	000 1100
IP(I2+14)	IS MINIMUM DISTANCE OF FIRST TUNNEL VERTICAL CHANNEL FROM LAST END-AROUND CHANNEL.	000 1200
IP(I2+15)	IS THE MINIMUM DISTANCE FROM ORIGIN OF B.P. TO NEAREST NON-METAL DEVICE (TUNNEL OR CELL).	000 1300
IP(I2+16)	IS Y-DISTANCE FROM ORIGIN OF B.P. TO FIRST METAL CHANNEL.	000 1400
IP(I2+17)	IS MINIMUM NUMBER OF WIRING CHANNELS FOR CHANGING TUNNEL TO METAL.	000 1500
IP(I2+18)	IS B.P. SHIFT (CCW) FOR BEAM LEAD TECHNOLOGY.	000 1600
IP(I2+19)	IS Y-DISTANCE FROM B.P. ORIGIN TO HORIZONTAL GROUND LINE TO CELL ROWS.	000 1700
IP(I2+20)	IS ADJUSTMENT CONSTANT FOR SIDE ROUTING X-INCREMENT. USED TO SQUEEZE SIDE CHANNELS CLOSER TO EACH OTHER (SHOULD NOT BE GREATER THAN 1 OR LESS THAN 0).	000 1800
IP(I2+21)	IS CORRECTION FOR FIRST SIDE ROUTING CHANNEL.	000 1900
IP(I2+22)	IS CONTROL FOR MINIMIZING CHANNEL SPACING ON SIDE ROUTING SURFACE. SEE POS1.	000 2000
	= 0, MINIMIZE.	000 2100
	= 1, DO NOT MINIMIZE.	000 2200
IP(I2+23)	IS CONTROL FOR CELL REORIENTATION AND PIN REASSIGNMENT. SEE SMASH1.	000 2300
	= 0 EXECUTE.	000 2400
	> 0 BYPASS.	000 2500
IP(I2+24)	IS BYPASS CONTROL ON ORDER OF NROW B.P. ROUTE. SEE SMASH1.	000 2600
	= 0, FORCE ROUTE TO B.P. ORDER.	000 2700
	= 1, BYPASS THIS FORCED ROUTE ORDER.	000 2800
IP(I2+25)	IS BYPASS CONTROL POSSIBLE REDUCTION OF CLASS 3 NODE INTO CLASS 2 & 5, WITH POSSIBLE SMALLER CLASS 3 NODE SEGMENT. SEE SMASH1.	000 2900
	= 0, EXECUTE SUBDIVISION OF CLASS 3 NODE.	000 3000
	= 1, BYPASS EXECUTION.	000 3100
IP(I2+26)	IS B.P. REPOSITIONING SWITCH (POPL1).	000 3200
	= 0, BYPASS THIS FEATURE.	000 3300
	= 1, REPOSITION PADS ON ALL SIDES.	000 3400
	= 2, ALSO SHIFT ALL PADS ON ROW TOWARD CENTER.	000 3500
	= 3, ALSO INTERCHANGE PADS BETWEEN ROWS.	000 3600
	= 4, SAME AS 1 & 3, BUT NOT 2.	000 3700
IP(I2+27)	IS BYPASS CONTROL ON LSI PLACEMENT ALGORITHM WITH RESPECT TO MINIMUM DISTANCE TO NEAREST NEIGHBOR ALGORITHM. SEE PLACE/DIST.	000 3800
	= 0, EXECUTE LSI DIST.	000 3900
	= 1, EXECUTE MINIMUM DIST. NEAREST NEIGHBOR.	000 4000
	= 2, EXECUTE DRIVER CENTERED LSI DIST.	000 4100
IP(I2+28)	IS BYPASS CONTROL ON RESORT OF LINE DATA IN SORT1.	000 4200
	= 0, EXECUTE RESORT.	000 4300
	= 1, BYPASS.	000 4400
IP(I2+29)	IS EXEC/BYPASS CONTROL ON STEP 2B IN POC1.	000 4500
	= 0, EXECUTE FOR ALL CENTER ROWS.	000 4600
	= 1, EXECUTE ONLY FOR B.P. ROWS.	000 4700
	= 2, BYPASS.	000 4800
IP(I2+30)	IS Y-DISTANCE FROM ORIGIN OF B.P. TO CENTER OF PIN.	000 4900
IP(I2+31)	IS DISTANCE OF FIRST LEFT END-AROUND VERTICAL CHANNEL FROM EDGE OF HORIZONTAL CELL ROWS.	000 5000
	IF IP(I0+14) = 3, SET IP(I2+13) = IP(I2+1)	000 5100
		000 5200
		000 5300
		000 5400
		000 5500
		000 5600
		000 5700
		000 5800
		000 5900
		000 6000
		000 6100
		000 6200
		000 6300
		000 6400
		000 6500
		000 6600
		000 6700
		000 6800
		000 6900
		000 7000

IP(I2+32)	IS MINIMUM NUMBER OF WIRING CHANNELS FOR CHANGING TUNNEL AT PIN TO METAL. IP(I2+17) MUST ALSO BE > 0.	000 7100
		000 7200
		000 7300
IP(I2+33)	IS SPACING CONSTANT USED TO ADJUST FIRST METAL CHANNEL FROM ODD CELL ROW.	000 7400
		000 7500
		000 7600
I3	IS THE STARTING INDEX FOR ROW RELATED DATA. THESE DATA ARE STORED ROW BY ROW, IN ROW ORDER. DATA FOR ROW 2 FOLLOWS ROW 1 DATA, ETC. SAME DATA FOR EACH ROW MUST BE IN SAME ORDER. IP(I3) IS THE NUMBER OF DATA STORED FOR EACH ROW. TO EXTRACT, FOR EXAMPLE, DATA ITEM 3 FOR ROW 6, $M3 = I3 + (6-1) * IP(I3) + 3$	000 7700
		000 7800
		000 7900
		000 8000
		000 8100
		000 8200
		000 8300
IP(I3)	IS THE NUMBER OF INDICIES FOR EACH ROW DATA.	000 8400
IP(M3+ 1)	IS THE Y-COORDINATE OF ROW (X FOR ROW 1/2).	000 8500
IP(M3+ 2)	IS THE NORMAL CELL ORIENTATION FOR ROW.	000 8600
IP(M3+ 3)	IS THE REVERSE CELL ORIENTATION FOR ROW.	000 8700
IP(M3+ 4)	IS THE NO. OF LEFT END-AROUND WIRES FOR ROW.	000 8800
IP(M3+ 5)	IS THE NO. OF RIGHT END-AROUND WIRES FOR ROW.	000 8900
IP(M3+ 6)	IS THE X-INDEX OF LEFT END OF ROW(Y FOR 1/2).	000 9000
IP(M3+ 7)	IS THE X-COORD OF LEFT END OF ROW (Y FOR 1/2).	000 9100
IP(M3+ 8)	IS THE X-INDEX OF FIRST LEFT END-AROUND NODE.	000 9200
IP(M3+ 9)	IS THE X-INDEX OF FIRST RIGHT END-AROUND NODE.	000 9300
IP(M3+10)	IS THE X-INDEX OF RIGHT END OF ROW(Y FOR 1/2).	000 9400
IP(M3+11)	IS THE WIDTH OF ALL CELL ON ROW.	000 9500
IP(M3+12)	IS X-COORD OF FIRST LEFT END-AROUND NODE.	000 9600
IP(M3+13)	IS X-COORD OF FIRST RIGHT END-AROUND NODE.	000 9700
IP(M3+14)	IS OPTION IP(I0+60) COUNTER. IF ROW IS EVEN, COUNT IS # TO SIDE ROW 1. IF ROW IS ODD, COUNT IS # TO SIDE ROW 2. SEE OPTION IP(I0+60) FOR FURTHER DETAILS.	000 9800
		000 9900
		000 0000
		000 0100
IP(M3+15)	PLACEMENT Y-INDEX OF ROW (X FOR ROW 1/2).	000 0200
IP(M3+16)	PLACEMENT LEFT X-INDEX OF ROW (Y FOR 1/2).	000 0300
IP(M3+17)	PLACEMENT RIGHT X-INDEX OF ROW(Y FOR 1/2).	000 0400
IP(M3+18)	PLACEMENT NON-VALID ROW Y-INDEX.	000 0500
IP(M3+19)	IS X-COORD. OF LAST LEFT END-AROUND NODE.	000 0600
IP(M3+20)	IS X-COORD. OF LAST RIGHT END-AROUND NODE.	000 0700
		000 0800
I4	IS THE STARTING INDEX FOR CHIP/ARTWORK PARAMETERS.	000 0900
		000 1000
IP(I4)	IS NUMBER OF I4 DATA.	000 1100
IP(I4+ 1)	IS X STEP & REPEAT, INCREMENT OF IP(I4+91)	000 1200
IP(I4+ 2)	IS Y STEP & REPEAT, INCREMENT OF IP(I4+91)	000 1300
IP(I4+ 3)	IS ONE HALF WIDTH OF STREET.	000 1400
IP(I4+ 4)	IS Y-DISTANCE FROM CENTER OF CHIP RESERVED FOR TEST RESISTOR.	000 1500
		000 1600
IP(I4+ 5)	IS Y-DISTANCE ABOVE CENTER OF CHIP TO TOP OF TEST RESISTOR BONDING PAD.	000 1700
		000 1800
IP(I4+ 6)	IS Y-DISTANCE ABOVE CENTER OF CHIP TO BOTTOM OF TEST RESISTOR B.P.	000 1900
		000 2000
IP(I4+ 7)	IS 1/2 WIDTH OF TEST RESISTOR.	000 2100
IP(I4+ 8)	IS MINIMUM Y STEP & REPEAT FOR PHOTO KEY TO BE LOCATED WITHIN MASKING BORDER.	000 2200
		000 2300
IP(I4+ 9)	IS WIDTH OF MASKING BORDER.	000 2400
IP(I4+10)	IS WIDTH OF N+(NOT) INSIDE STREET.	000 2500
IP(I4+11)	IS 1/2 WIDTH/HEIGHT OF PHOTO KEY.	000 2600
IP(I4+12)	IS Y-DISTANCE FROM CENTER OF STREET TO CENTER OF PHOTO KEY, KEY INSIDE CHIP.	000 2700
		000 2800
IP(I4+13)	IS X-DIST OF GND PAD FROM CENTER OF STREET.	000 2900
IP(I4+14)	IS Y-DIST OF GND PAD BELOW CENTER OF CHIP. ALSO Y-DIST. CORRECTION FOR IP(I0+54) > 1	000 3000
		000 3100

IP(I4+15)	IS ORIENTATION OF GND PATTERN.	000 3200
IP(I4+16)	IS X-DIST OF VDD PAD FROM CENTER OF STREET.	000 3300
IP(I4+17)	IS Y-DIST OF VDD PAD ABOVE CENTER OF CHIP.	000 3400
	ALSO Y-DIST. CORRECTION FOR IP(I0+54) > 1	000 3500
IP(I4+18)	IS ORIENTATION OF VDD PATTERN.	000 3600
IP(I4+19)	IS X-DIST OF P-TT FROM CENTER OF STREET.	000 3700
IP(I4+20)	IS Y-DIST OF P-TT ABOVE CENTER OF CHIP.	000 3800
IP(I4+21)	IS ORIENTATION OF P-TT PATTERN.	000 3900
IP(I4+22)	IS X-DIST OF N-TT FROM CENTER OF STREET.	000 4000
IP(I4+23)	IS Y-DIST OF N-TT ABOVE CENTER OF CHIP.	000 4100
IP(I4+24)	IS ORIENTATION OF N-TT PATTERN.	000 4200
IP(I4+25)	IS X/Y-DIST OF CHIP ALIGNMENT KEYS FROM STREET OR FROM EACH OTHER.	000 4300 000 4400
IP(I4+26)	= 0, CHIP IS SQUARE, > 0 FOR RECTANGULAR.	000 4500
IP(I4+27)	IS X-DIST OF RCA PATTERN FROM CENTER OF STREET IF = 0, BYPASS RCA PATTERN.	000 4600 000 4700
IP(I4+28)	IS Y-DIST OF RCA PATTERN FROM CENTER OF STREET	000 4800
IP(I4+29)	IS ORIENTATION OF RCA PATTERN.	000 4900
IP(I4+30)	IS X-DIST OF ATL PATTERN FROM CENTER OF STREET	000 5000
IP(I4+31)	IS Y-DIST OF ATL PATTERN FROM CENTER OF STREET	000 5100
IP(I4+32)	IS ORIENTATION OF ATL PATTERN.	000 5200
IP(I4+33)	IS Y-DIST OF 1ST DIGIT ID FROM CENTER STREET.	000 5300
IP(I4+34)	IS X-INCREMENT BETWEEN DIGITS OF ID.	000 5400
IP(I4+35)	IS X-OFFSET OF CHIP FROM NORMAL CHIP ORIGIN.	000 5500
IP(I4+36)	IS Y-OFFSET OF CHIP FROM NORMAL CHIP ORIGIN.	000 5600
IP(I4+37)	IS X-POSITION (ABSOLUTE) OF START OF SYMBOL DATA FROM LOWER LEFT CORNER STREET CENTER, MODIFIED BY CHIP SCALE FACTORS.	000 5700 000 5800 000 5900
IP(I4+38)	IS Y-POSITION (ABSOLUTE) OF START OF SYMBOL DATA BELOW LOWER LEFT CORNER STREET CENTER, MODIFIED BY CHIP SCALE FACTORS.	000 6000 000 6100 000 6200
IP(I4+39)	IS 1/2 X-STEP	000 6300
IP(I4+40)	IS 1/2 Y-STEP	000 6400
IP(I4+41)	IS HALF WIDTH OF LEVEL 12 BORDER.	000 6500
IP(I4+42)	IS GAP OF VDD LINE TO CROSS GROUND PAD.	000 6600
IP(I4+43)	DISTANCE FROM EDGE OF CELL ROW TO VERTICAL CHANNEL FOR GROUND.	000 6700 000 6800
IP(I4+44)	IS SCALE OF CHIP.	000 6900
IP(I4+45)	IS SCALE FOR ALL LINE SETS.	000 7000
IP(I4+46)	IS SCALE FOR ALL SHAPE SETS.	000 7100
IP(I4+47)	IS APERTURE NUMBER FOR LEVEL 2 P LINES	000 7200
IP(I4+48)	IS APERTURE NUMBER FOR LEVEL 3 N+ (NOT) LINES	000 7300
IP(I4+49)	IS APERTURE NUMBER FOR LEVEL 6 METAL LINES	000 7400
IP(I4+50)	IS APERTURE NUMBER FOR LEVEL 6 GROUND LINES.	000 7500
IP(I4+51)	IS 1/2 X STEP & REPEAT + X-OFFSET.	000 7600
IP(I4+52)	IS 1/2 Y STEP & REPEAT + Y-OFFSET.	000 7700
IP(I4+53)	IS ARTWORK CODE FOR COMPONENTS (MUST=100).	000 7800
IP(I4+54)	IS ARTWORK CODE FOR TUNNELS.	000 7900
IP(I4+55)	IS ARTWORK CODE FOR METAL.	000 8000
IP(I4+56)	IS ARTWORK CODE FOR GROUND.	000 8100
IP(I4+57)	IS ARTWORK CODE FOR VDD.	000 8200
IP(I4+58)	IS RADIUS OF TUNNEL APERTURE	000 8300
IP(I4+59)	IS RADIUS OF GROUND LINE APERTURE.	000 8400
IP(I4+60)	IS NUMBER OF COMPONENTS GENERATED.	000 8500
IP(I4+61)	IS NUMBER OF TUNNEL LINES GENERATED.	000 8600
IP(I4+62)	IS NUMBER OF METAL-LINES GENERATED.	000 8700
IP(I4+63)	IS NUMBER OF GROUND LINES GENERATED.	000 8800
IP(I4+64)	IS NUMBER OF VDD LINES GENERATED.	000 8900
IP(I4+65)		000 9000
IP(I4+66)		000 9100
IP(I4+67)	IS Y-DIST OF CELL VDD FROM CELL ORIGIN.	000 9200

IP(I4+68)	IS APERTURE NUMBER FOR LEVEL 6 VDD LINES.	000 9300
IP(I4+69)	IS Y-DISTANCE FROM CENTER OF STREET TO CENTER OF PHOTO KEY, KEY OUTSIDE CHIP.	000 9400 000 9500
IP(I4+70)	IS DISTANCE OF VDD LINE END POINT FROM GROUND PATTERN ORIGIN.	000 9600 000 9700
IP(I4+71)	IS LEVEL 1 X-OFFSET FOR GROUND SHAPE SET.	000 9800
IP(I4+72)	IS LEVEL 1 Y-OFFSET FOR GROUND SHAPE SET.	000 9900
IP(I4+73)	IS LEVEL 2 X-OFFSET FOR GROUND SHAPE SET.	000 0000
IP(I4+74)	IS LEVEL 2 Y-OFFSET FOR GROUND SHAPE SET.	000 0100
IP(I4+75)	IS LEVEL 3 X-OFFSET FOR GROUND SHAPE SET.	000 0200
IP(I4+76)	IS LEVEL 3 Y-OFFSET FOR GROUND SHAPE SET.	000 0300
IP(I4+77)	IS LEVEL 4 X-OFFSET FOR GROUND SHAPE SET.	000 0400
IP(I4+78)	IS LEVEL 4 Y-OFFSET FOR GROUND SHAPE SET.	000 0500
IP(I4+79)	IS LEVEL 5 X-OFFSET FOR GROUND SHAPE SET.	000 0600
IP(I4+80)	IS LEVEL 5 Y-OFFSET FOR GROUND SHAPE SET.	000 0700
IP(I4+81)	IS CELL-TO-CELL SPACING CONSTANT. CELL DESIGN DEPENDENT (CELL-TO-CELL OVERLAP).	000 0800 000 0900
IP(I4+82)	IS LEFT SIDE END-CAP(CELL DESIGN DEPENDENT) SPACING CONSTANT. FUNCTION OF CELL-TO-CELL OVERLAP.	000 1000 000 1100 000 1200
IP(I4+83)	IS X-DIST OF SIDE GROUND LINE FROM CENTER OF STREET.	000 1300 000 1400
IP(I4+84)	IS Y-DIST OF BOTTOM/TOP GROUND LINE FROM CENTER OF STREET.	000 1500 000 1600
IP(I4+85)	IS X-DIST OF SIDE VDD LINE FROM CENTER OF STREET.	000 1700 000 1800
IP(I4+86)	IS Y-DIST OF BOTTOM/TOP VDD LINE FROM CENTER OF STREET.	000 1900 000 2000
IP(I4+87)	IS X-DIST OF SIDE B.P. ORIGIN FROM CENTER OF STREET.	000 2100 000 2200
IP(I4+88)	IS Y-DIST OF BOTTOM/TOP B.P. ORIGIN FROM CENTER OF STREET.	000 2300 000 2400
IP(I4+89)	IS HALF THE WIDTH OF LEVEL 8 BORDER.	000 2500
IP(I4+90)	IS APERTURE NUMBER FOR SYMBOL DATA.	000 2600
IP(I4+91)	IS STEP & REPEAT INCREMENT	000 2700
IP(I4+92)	IS BYPASS FOR CHIP KEYS. = 0, GENERATE ALL. = 1, BYPASS IP(I5+16). = 2, BYPASS 15 AND 16. = 3, BYPASS 14, 15 & 16. = 4, BYPASS 13, 14, 15, & 16.	000 2800 000 2900 000 3000 000 3100 000 3200 000 3300
IP(I4+93)	IS ATL PATTERN BYPASS. = 0, GENERATE = 1, BYPASS.	000 3400 000 3500 000 3600
IP(I4+94)	IS RTCA1 CONTROL. = 0, SET FOR MINIMUM Y-ROUTE. = 1, SET FOR MINIMUM CROSS ON SIDE ROUTE.	000 3700 000 3800 000 3900
IP(I4+95)	IS PRINT CONTROL OF "PICTURE" OF CHIP. = 0, PRINT = 1, BYPASS	000 4000 000 4100 000 4200
IP(I4+96)	IS BYPASS CONTROL OF REROUTE OF SIDE B.P. IN POS1. = 0, BYPASS. = 1, EXECUTE.	000 4300 000 4400 000 4500 000 4600
IP(I4+97)	IS CONTROL FOR EXECUTION OF TONGUE-IN-GROOVE FIT OF FACING CENTER ROWS. = 0, EXECUTE MINIMUM Y-DIST. BETWEEN ROWS. = 1, BYPASS THIS FEATURE.	000 4700 000 4800 000 4900 000 5000
IP(I4+98)	IS CONTROL FOR GENERATING WIDE TUNNEL SEGMENTS = 0, BYPASS. > 0, WIDEN SIDE OF TUNNEL BY RADIUS, IP(I4+58),	000 5100 000 5200 000 5300

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      OF TUNNEL APERTURE, WHEN TUNNEL SEGMENT 000 5400
      IS IP(I4+98) UNITS LONG OR LONGER.      000 5500
IP(I4+99) IS LOW PROFILE METAL ON ROW FOR POSSIBLE 000 5600
      REDUCTION OF TUNNEL LENGTHS.           000 5700
      = 0, BYPASS                             000 5800
      > 0, MOVE METAL, IP(I4+99) INDICIES OR 000 5900
      WIDER, CLOSER TO CELL ROW.            000 6000
      IF = 0, SET IP(I0+57) = 1 AND IP(I0+70) = 1. 000 6100
      000 6200
15 IS THE STARTING INDEX FOR PATTERN DATA PARAMETERS. 000 6300
      000 6400
IP(I5 ) IS NUMBER OF I5 DATA.                 000 6500
IP(I5+ 1) IS THE BASIC INPUT PAD PATTERN NUMBER 000 6600
IP(I5+ 2) IS THE INPUT PAD PATTERN # FOR SIDE ROWS. 000 6700
IP(I5+ 3) IS BONDING PAD PATTERN NO. LOWER LIMIT. 000 6800
IP(I5+ 4) IS LOWER LIMIT FOR OUTPUT BONDING PADS. 000 6900
IP(I5+ 5) IS PATTERN NUMBER FOR VDD SUBSTRATE TAP. 000 7000
IP(I5+ 6) IS PATTERN NUMBER FOR TUNNEL END       000 7100
IP(I5+ 7) IS PATTERN NUMBER FOR PHOTO ALIGNMENT KEY 000 7200
IP(I5+ 8) IS PATTERN NUMBER FOR END CAP          000 7300
      IF = 0, BYPASS END CAP GENERATION.      000 7400
IP(I5+ 9) IS PATTERN NUMBER FOR GROUND B.P.     000 7500
IP(I5+ 10) IS PATTERN NUMBER FOR VDD B.P.       000 7600
IP(I5+ 11) IS PATTERN NUMBER FOR P-TEST TRANSISTOR 000 7700
IP(I5+ 12) IS PATTERN NUMBER FOR N-TEST TRANSISTOR 000 7800
IP(I5+ 13) IS PATTERN NUMBER FOR CHIP ALIGNMENT KEY # 1 000 7900
IP(I5+ 14) IS PATTERN NUMBER FOR CHIP ALIGNMENT KEY # 2 000 8000
IP(I5+ 15) IS PATTERN NUMBER FOR CHIP ALIGNMENT KEY # 3 000 8100
IP(I5+ 16) IS PATTERN NUMBER FOR CHIP ALIGNMENT KEY # 4 000 8200
IP(I5+ 17) IS PATTERN NUMBER FOR RCA            000 8300
IP(I5+ 18) IS PATTERN NUMBER FOR ATL           000 8400
IP(I5+ 19) IS PATTERN NUMBER FOR BASIC ID DATA 000 8500
      000 8600
16 IS STARTING INDEX FOR CAPACITIVE PARMETERS. 000 8700
      000 8800
IP(I6 ) IS NUMBER OF I6 DATA.                 000 8900
IP(I6+ 1) IS CAPACITANCE PER LINEAR 10TH MIL OF METAL. 000 9000
IP(I6+ 2) IS CAPACITANCE PER LINEAR 10TH MIL OF TUNNEL. 000 9100
IP(I6+ 3) IS 1/2 CAPACITANCE OF A TUNNEL END.   000 9200
IP(I6+ 4) IS TOTAL LENGTH OF METAL LINES (MAXIMUM = MAX) 000 9300
IP(I6+ 5) IS OVERFLOW OF IP(I6+4) = # OF MAX   000 9400
IP(I6+ 6) IS TOTAL LENGTH OF TUNNEL LINES (MAXIMUM = MAX) 000 9500
IP(I6+ 7) IS OVERFLOW OF IP(I6+6) = # OF MAX   000 9600
IP(I6+ 8) IS TUNNEL END COUNT                   000 9700
      000 9800
      000 9900
IPIN(IX,IY):
      THIS ARRAY IS USED TO STORE PIN DATA FOR EACH PATTERN USED 000 0000
      IN THE DESIGN OF THE CHIP. IX IS A RUNNING INDEX. PIN DATA 000 0100
      ARE STORED ONE AFTER ANOTHER. THE LAST PIN OF THE PATTERN 000 0200
      IS A NON-ACTIVE PIN AND SPECIFIES THE X/Y SPAN OF THE PATTERN 000 0300
      WITH RESPECT TO THE PATTERN ORIGIN. THE REFERENCE PIN (NON- 000 0400
      ACTIVE) MUST HAVE A PIN REASSIGNMENT OF ZERO. THE FORMAT OF 000 0500
      THE PIN DATA READ FROM CARDS OR TAPE IS (5I4,10A4,I4). THE 000 0600
      DATA READ IN ARE: PATTERN NO., PIN NUMBER, PIN REASSIGNMENT 000 0700
      FLAG, PIN X-COORDINATE FROM PATTERN ORIGIN, PIN Y-COORDINATE 000 0800
      FROM PATTERN ORIGIN/ PIN CAPACITANCE, PATTERN DESCRIPTION AND 000 0900
      TECHNOLOGY CODE.                                000 1000
      000 1100
      FOR THE I PATTERN, STORAGE STARTING AT POSITION IX:
      IPIN(IX,1) IS PATTERN NUMBER FOR I PATTERN.    000 1200
      IPIN(IX,2) IS # OF PINS IN PATTERN I, ACTIVE PINS + I. 000 1300
      000 1400

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C	IPIN(IX,3) INDEX LOCATION OF START OF I+1 PATTERN.	000 1500
C	IPIN(IX+J,1) REASSIGNMENT FLAG FOR PIN J.	000 1600
C	FOR REF. PIN MAY BE USED TO INDICATE NUMBER	000 1700
C	OF DEVICES ON CELL = - # DEVICES.	000 1800
C	IPINJR = 1	000 1900
C	IPIN(IX+J,2) X-COORDINATE OF PIN J FROM PATTERN ORIGIN.	000 2000
C	IPINYX = 2	000 2100
C	IPIN(IX+J,3) IMPEDANCE OF PIN J / REF. PIN Y-COORD.	000 2200
C	FOR IMPEDANCE:	000 2300
C	FIRST TWO DIGITS ARE PIN RESISTANCE IN X.X K-OHMS.	000 2400
C	SECOND TWO DIGITS ARE PIN CAPACITANCE IN .XX PICO-F.	000 2500
C	IPINYC = 3	000 2600
C	IPINYY = 3	000 2700
C		000 2800
C	LIM(IX):	000 2900
C	LIM(IX) IS USED TO STORE PROGRAM CONSTANTS. SEE EQUIVALENCE	000 3000
C	STATEMENT.	000 3100
C		000 3200
C	MODE(IX):	000 3300
C	SEE EXEC.	000 3400
C		000 3500
C	NODE(IX):	000 3600
C		000 3700
C	NODE(IX) CONTAINS NODE DATA AS WELL AS ELEMENT-PIN CONNECT-	000 3800
C	IVITY AMONG DEVICES FOR THE NODE. ALL NODE DATA ARE STACKED	000 3900
C	ONE AFTER THE OTHER IN THE NODE(IX) ARRAY.	000 4000
C	AS AN EXAMPLE, SAY THE J NODE HAS A STARTING ADDRESS OF K	000 4100
C	IN ARRAY NODE(IX). THEN:	000 4200
C	NODE(K) CONTAINS THE "OLD" LENGTH OF NODE J.	000 4300
C	NODE(K+1) CONTAINS THE "NEW" LENGTH OF NODE J.	000 4400
C	NODE(K+2) CONTAINS THE ADDRESS OF THE LAST	000 4500
C	ELEMENT OF NODE J. SAY THIS IS LOCATION L.	000 4600
C	NODE(K+3) CONTAINS THE WEIGHTING FACTOR FOR NODE J.	000 4700
C	NODE(K+4) THROUGH NODE(L+1) CONTAINS THOSE ELEMENT-PIN	000 4800
C	CONNECTIVITY DATA (IN ELEM-PIN PAIRS) OF NODE J	000 4900
C	NODE(L+2) IS THE STARTING ADDRESS OF NODE J+1.	000 5000
C		000 5100
C	*****	000 5200
C		000 5300
C	NOTE:	000 5400
C	IN ORDER TO CHANGE THE UPPER LIMITS OF ANY ARRAY IN THIS	000 5500
C	PROGRAM, EACH AFFECTED DIMENSION STATEMENT MUST BE	000 5600
C	CHANGED AND THE AFFECTED UPPER LIMIT VARIABLES MUST BE	000 5700
C	CHANGED. IN ORDER TO HELP MAKE THESE CHANGES, COMMENT	000 5800
C	CARDS HAVE BEEN WRITTEN AT STATEMENTS SETTING UPPER LIMITS	000 5900
C	OF ARRAYS. THE FORM OF THESE COMMENTS ARE (FOR EXAMPLE):	000 6000
C		000 6100
C	POSSIBLE OTHER POSSIBLE OTHER UPPER ARRAY	000 6200
C	LIMITS AFFECTED ARRAYS AFFECTED: LIMIT: NAME:	000 6300
C		000 6400
C	JPX JP MAPX MAP	000 6500
C		000 6600
C		000 6700
C	*****	000 6800
C		000 6800

VI. PR2D EXAMPLE DESIGN LAYOUTS

A. N002 – 4-Bit Adder

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23120 MAY 10 178 ID=0088
JOB MARTIN,EC45020(CAST/CAD),1
LIMIT (TIME,15),(CORE,60)
ASSIGN F16,(DEVICE,L8)
ASSIGN F11,(FILE,DECODE),(OUTIN),(SAVE)
ASSIGN F15,(DEVICE,CR)
ASSIGN F110,(FILE,NOT010),(OUTIN),(SAVE)
ASSIGN F115,(FILE,NOT015),(OUTIN),(SAVE)
ASSIGN F120,(FILE,NOT020),(OUTIN),(SAVE)
ASSIGN F125,(FILE,NOT025),(OUTIN),(SAVE)
ASSIGN F130,(FILE,DESIGN),(IN)
ASSIGN F135,(FILE,COMMON1),(OUT),(SAVE)
ASSIGN F140,(FILE,COMMON2),(IN)
ASSIGN F145,(FILE,S0SBWPDF,GOULD),(IN)
ASSIGN F150,(FILE,S0SBWPDFM),(OUT),(SAVE)
ASSIGN F155,(FILE,AWRK1X),(OUTIN),(SAVE)
ASSIGN F160,(FILE,AWRK2C),(OUTIN),(SAVE)
PCL

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COPY NO02 TO LP
JOB MARTIN,EC45020(CAST/CAD),1
LIMIT (TIME,15),(CORE,60)
ASSIGN F16,(DEVICE,L8)
ASSIGN F11,(FILE,DECODE),(OUTIN),(SAVE)
ASSIGN F15,(DEVICE,CR)
ASSIGN F110,(FILE,NOT010),(OUTIN),(SAVE)
ASSIGN F115,(FILE,NOT015),(OUTIN),(SAVE)
ASSIGN F120,(FILE,NOT020),(OUTIN),(SAVE)
ASSIGN F125,(FILE,NOT025),(OUTIN),(SAVE)
ASSIGN F130,(FILE,DESIGN),(IN)
ASSIGN F135,(FILE,COMMON1),(OUT),(SAVE)
ASSIGN F140,(FILE,COMMON2),(IN)
ASSIGN F145,(FILE,S0SBWPDF,GOULD),(IN)
ASSIGN F150,(FILE,S0SBWPDFM),(OUT),(SAVE)
ASSIGN F155,(FILE,AWRK1X),(OUTIN),(SAVE)
ASSIGN F160,(FILE,AWRK2C),(OUTIN),(SAVE)
PCL

```

```

COPY NO02 TO LP
END
RUN (LMN,LMPR2DC,GOULD)

```

```

DATA
1 1 4 4 02 5 1 101 1 0 0
0 1 50 1
2 4 102 1
2 5 62 1
2 13 12 1
4 1 300 1
4 2 300 1
4 3 25 1
4 9 500 1
4 25 105 1
4 26 1 1
4 27 0 1
4 30 25 1

```

BEGIN PR2D INPUT DATA

MODE CARD
SEE SECTION IV.A

LAYOUT CONTROL PARAMETERS
SEE SECTION IV.A (18) AND SECTION V.
FOR FORMAT AND EFFECTS OF EACH PARAMETER.

4	31	60	1
4	33	25	1
4	47	17	1
4	49	14	1
4	50	14	1
4	68	14	1
4	83	137	1
4	84	137	1
4	85	124	1
4	86	124	1
4	91	10	1
4	98	50	1
5	179450		1
5	189440		1
5	199800		0

LAYOUT CONTROL PARAMETERS (CONTINUED)

TITLE CARD

ELEMENT TO PATTERN
ASSIGNMENTS
SEE SECTION IV.E

BIT ADDR	PR2D TEST RIIN			
12310	22310	92310	42310	
51240	61330	71330	81330	
91330	101330	112310	122310	
139310	142310	1009010	1019010	
1029010	1039010	1049010	1059010	
1069010	1079010	1089010	1099070	
1109070	1119070	1129070	1139070	

1	1	4	6	3	11	3	5	2
1	2	4	7	3	12	3	5	2
1	3	4	8	3	13	3	5	2
1	4	4	9	3	14	3	5	2
1	5	6	10	3				
1	6	5	12	2	7	2		
1	7	5	13	2	8	2		
1	8	5	14	2	9	2		
1	9	5	10	4				
1	10	5	109	2				
1	11	4	110	2				
1	12	4	111	2				
1	13	4	112	2				
1	14	4	113	2				
1	101	2	1	3	6	4		
1	103	2	2	3	7	4		
1	105	2	3	3	8	4		
1	107	2	4	3	9	4		
1	100	2	1	2				
1	102	2	2	2				
1	104	2	3	2				
1	106	2	4	2				
1	108	2	6	2	11	2	10	2

BLANK CARD

NODE LIST
SEE SECTION IV.F

PBD
 PCL
 DELETE N0T010
 DELETE N0T015
 DELETE N0T020
 DELETE DECODE
 END PR2D INPUT DATA

DELETE AWRK2C
END
EOD
END
PCL PROCESSING TERMINATED

RUN (LMN,LMPR,DC,GOULD)

START OF INITI

TWO-DIMENSIONAL PLACEMENT & ROUTING OF LSI CHIPS.

WRITTEN BY: RICHARD NOTO
COMPANY : RCA CORP.
ADDRESS : FRANT & COOPER SYS.
 CAMDEN, N. J. 08102
PHONE NO. : (609) 963-8000
EXT. NO. : PC 6755

PR2D REVISION B, FEB. 1974.

IP(I0+ 1) *	50
IP(I2+ 4) *	102
IP(I2+ 5) *	42
IP(I2+ 13) *	12
IP(I4+ 1) *	300
IP(I4+ 2) *	300
IP(I4+ 3) *	25
IP(I4+ 9) *	500
IP(I4+ 25) *	105
IP(I4+ 26) *	1
IP(I4+ 27) *	0
IP(I4+ 30) *	25
IP(I4+ 31) *	60
IP(I4+ 33) *	25
IP(I4+ 47) *	17
IP(I4+ 49) *	14
IP(I4+ 50) *	14
IP(I4+ 48) *	14
IP(I4+ 83) *	137
IP(I4+ 84) *	137

IP(14, 25) = 124
IP(14, 26) = 124
IP(14, 27) = 10
IP(14, 28) = 50
IP(15, 17) = 9480
IP(15, 18) = 9440
IP(15, 19) = 9800

END OF INIT
START OF INPUT FUNCTION

PIN DATA FOR PATTERNS USED ON CHIP:

PATTERN 1240 *1

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	1	5	0
3	1	15	0
4	1	25	0
5	1	35	0
6	10	45	0
7	-8	50	70

PATTERN 1336 *1

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	1	5	0
3	2	15	0
4	3	25	0
5	10	45	0
6	-6	50	70

PATTERN 2310 *1

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	1	25	0
3	1	35	0
4	10	45	0
5	-5	60	70

PIN DATA FOR PATTERNS USED ON CHIPS

PATTERN 9010 *1

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	10	0
3	0	80	90

PATTERN 9070 *1

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	20	0
3	*2	80	90

ELEMENT TO PATTERN ASSIGNMENT:

ELEM	PTRN	ORD.	ROW	ELEM	PTRN	ORD.	ROW	...
1	2310	0	0	2	2310	0	0	
3	2310	0	0	4	2310	0	0	
5	1240	0	0	6	1330	0	0	
7	1330	0	0	8	1330	0	0	
9	1330	0	0	10	1330	0	0	
11	2310	0	0	12	2310	0	0	
13	2310	0	0	14	2310	0	0	
15	U	0	0	16	U	0	0	
17	U	0	0	18	U	0	0	
19	U	0	0	20	U	0	0	
21	U	0	0	22	U	0	0	
23	U	0	0	24	U	0	0	
25	U	0	0	26	U	0	0	
27	U	0	0	28	U	0	0	
29	U	0	0	30	U	0	0	
31	U	0	0	32	U	0	0	
33	U	0	0	34	U	0	0	
35	U	0	0	36	U	0	0	
37	U	0	0	38	U	0	0	
39	U	0	0	40	U	0	0	
41	U	0	0	42	U	0	0	
43	U	0	0	44	U	0	0	
45	U	0	0	46	U	0	0	
47	U	0	0	48	U	0	0	
49	U	0	0	50	U	0	0	
51	U	0	0	52	U	0	0	
53	U	0	0	54	U	0	0	
55	U	0	0	56	U	0	0	
57	U	0	0	58	U	0	0	
59	U	0	0	60	U	0	0	
61	U	0	0	62	U	0	0	
63	U	0	0	64	U	0	0	
65	U	0	0	66	U	0	0	
67	U	0	0	68	U	0	0	
69	U	0	0	70	U	0	0	
71	U	0	0	72	U	0	0	
73	U	0	0	74	U	0	0	
75	U	0	0	76	U	0	0	
77	U	0	0	78	U	0	0	
79	U	0	0	80	U	0	0	
81	U	0	0	82	U	0	0	
83	U	0	0	84	U	0	0	
85	U	0	0	86	U	0	0	
87	U	0	0	88	U	0	0	

ELEMENT TO PATTERN ASSIGNMENT:

ELEM PTRN	ORD.	ROW	ELEM PTRN	ORD.	ROW	...
89	0	0	90	0	0	91 U 0 0 92 0 0 0
93	0	0	94	0	0	95 U 0 0 96 0 0 0
97	0	0	98	0	0	99 U 0 0 100 9010 0 0
101 9010	0	0	102 9010	0	0	103 9010 0 0 104 9010 0 0
105 9010	0	0	106 9010	0	0	107 9010 0 0 108 9010 0 0
109 9070	0	0	110 9070	0	0	111 9070 0 0 112 9070 0 0
113 9070	0	0				

NODE LIST:											
NODE NO.	NODE WT.	ELEM	PIN	ELEM	PIN	ELEM	PIN	ELEM	PIN	...	
1	1	1	4	4	3	11	3	5	2		
2	1	2	4	7	3	12	3	5	3		
3	1	3	4	2	3	13	3	5	4		
4	1	4	4	9	3	14	3	5	5		
5	1	5	6	10	3						
6	1	6	5	11	2	7	2				
7	1	7	5	12	2	8	2				
8	1	8	5	13	2	9	2				
9	1	9	5	14	4						
10	1	10	5	10	2						
11	1	11	4	11	2						
12	1	12	4	12	2						
13	1	13	4	13	2						
14	1	14	4	14	2						
15	1	101	2	1	3	6	4				
16	1	103	2	3	3	7	4				
17	1	105	2	5	3	8	4				
18	1	107	2	7	3	9	4				
19	1	100	2	1	2						
20	1	102	2	3	2						
21	1	104	2	5	2						
22	1	106	2	7	2						
23	1	108	2	9	2	11	2	10	2		

NOE ERRORS!

END OF INPUT FUNCTION.

4 BIT ADDER PR2D TEST RUN

PAGE NO. 6

START OF PRPL1 SUBROUTINE:

END OF PRPL1 SUBROUTINE:

START OF PLACEMENT:

LENGTH: 12, # INT.: 71, JRR#2, TOTAL DIST.: 0, # GOOD INT.: 0, # EQU INT.: 71

PLACEMENT:

0	0	0	107	0	108	0	109	0	104	0	0	0
0	0	0	0	0	0	0	0	U	0	0	0	103
0	0	0	0	0	0	0	0	U	0	0	0	0
102	0	0	11	12	13	14	10	2	8	0	0	105
0	0	0	4	5	6	7	3	9	1	0	0	0
110	0	0	0	0	0	0	0	U	0	0	0	106
101	0	0	0	0	0	0	0	U	0	0	0	0
0	0	0	111	0	112	0	113	0	100	0	0	0

TOTAL WIRE UNITS BY NODE:

0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

4 BIT ADDER PR2D TEST RUN

PAGE NO. 8

LENGTHS 6, # INT. = 128, JRESP=2, TOTAL DIST. = 0, # GOOD INT. = 5, # ECU INT. = 118

PLACEMENT:

0	0	0	108	0	109	0	104	U	105	C	0	0
0	0	0	0	0	0	0	0	U	0	0	0	103
0	0	0	0	0	0	0	0	U	0	0	0	0
101	0	0	12	10	5	1	2	1*	4	0	0	106
0	0	0	6	13	11	8	9	J	7	0	0	0
111	0	0	0	0	0	0	0	U	0	0	0	107
110	0	0	0	0	0	0	0	U	0	0	0	0
0	0	0	112	0	113	0	100	U	102	C	0	0

TOTAL WIRE UNITS BY NODE:

0	0	C	0	0	0	0	0	0	0	0
0	0	C	0	0	0	0	0	0	0	0
0	0	C								

LENGTH: 1, # INT. = 244, JRC=4, TOTAL DIST. = 402, # GOOD INT. = 29, # EQU INT. = 152

PLACEMENT:

0	0	0	108	0	109	0	106	0	104	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	107
0	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	1	4	10	4	9	3	14	0	0	105
0	0	0	11	5	13	12	2	8	7	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	103
110	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	112	0	111	0	102	0	113	0	0	0

TOTAL WIRE UNITS BY NBDPI:

3	5	7	8	4	8	4	4	1	24
18	24	26	38	8	10	18	24	18	24
24	24	78							

54	667	1	119	2	46	2	47	2	48	2	49	2	50	2	45	2
55	52	1	45	3	51	3										
56	1031	1	175	2	46	5	57	4	58	4	67	3	47	5	59	4
57	107	1	46	3	52	3										
58	177	1	51	4	46	4	57	3	70	3						

LENGTH: 0, # INT. = 401, JRS# = 4, TOTAL DIST. = 627, # GOOD INT. = 29, # EQU INT. = 159

PLACEMENT:

0	0	0	108	0	109	0	106	0	104	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	107
0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	1	6	10	4	9	3	14	0	0	105
0	0	0	11	5	13	12	2	4	7	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	103
101	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	110	0	111	0	102	0	113	0	0	0

TOTAL WIRE UNITS BY NODE:

10	6	16	15	11	15	5	11	2	36
36	38	24	52	46	24	32	38	1	36
38	38	92							

ACTUAL WIRE UNITS • 143 143

TOTAL WIRE UNITS BY NODE:

5	6	9	10	6	10	5	6	2	3
3	4	7	6	8	7	11	9	4	3
4	4	11							

END OF PLACEMENT.

4 BIT ADDER PR20 TEST RUN

PAGE NO. 11
START OF FIX1 SUBROUTINE:
END OF FIX1 SUBROUTINE.

START OF POST-PLACE SUBROUTINE:

Y DIMENSION --->

R	R	R	R	R	R	R	R	R	R	R	R
0	P	0	P	0	A	0	0	0	0	0	0
W	W	W	W	W	W	W	W	W	W	W	W
#	#	#	#	#	#	#	#	#	#	#	#
3	4	5	6	7	8	9	10	11	12	13	14 15

Row # 11

VDD 101 112 10R

0	1 11	110
	4 5	
9	10 13	111
	4 12	
6	9 2	102
	3 8	
4	14 7	103

107 119 105 000

ROW # 2.

END OF POST-PLACE SUBROUTINE.

4 BIT ADDER PR2D TEST RUN

PAGE NO. 13

START OF ROUTE FUNCTION:

START SMASH1:

CELL RE-ORIENTATION / PIN RE-ASSIGNMENT:

ELEMENT NUMBER	ROW / ORIENT.	PIN RE-ASSIGNMENT WAS CHANGED TO	
2	-5	2	3
		3	2
5	-5	2	5
		5	2
7	-5		
9	-4		
12	-5		
13	-5		

END SHASHI.

START OF CENTER ROUTING:

END OF CENTER ROUTING.

START OF SIDE ROUTING:

END OF SIDE ROUTING.

END ROUTE FUNCTION.

4 BIT ADDER PR2D TEST RUN

PAGE NO. 15
START OF ART FUNCTION;

* BIT ADDER PR2D TEST RUN

PAGE NO. 16

START ANALC3
END ANALC3.

4 BIT ADDER PR2D TEST RUN

PAGE NO. 17

START ANALSI
END ANALSI.

4 BIT ADDER PR2D TEST RUN

PAGE NO. 18

START PWRI
END PWRI.

4 BIT ADDER PR2D TEST RUN

PAGE NO. 19

START SORT1
END SORT1.

4 BIT ADDER PR20 TEST RUN

PAGE NO. 20

START ART1

ARTWORK INSTRUCTION DATA:

00250	400	*115	0	1
09800	0	0	0	2
09800	20	0	0	3
09820	40	0	0	4
09440	0	35	0	5
29010	307	101	100	6
29070	387	101	109	7
59010	423	101	106	8
59010	503	101	104	9
09210	695	105	0	10
09500	495	144	21	11
09500	575	151	14	12
09500	225	158	19	13
09500	435	158	18	14
09500	235	165	15	15
09500	295	165	15	16
09500	305	165	6	17
09500	385	165	22	18
09500	565	165	4	19
79110	101	172	0	20
09500	355	172	10	21
09500	405	172	4	22
09500	515	172	3	23
19010	699	172	107	24
09500	265	179	23	25
09500	395	179	18	26
09500	435	179	18	27
09500	555	179	8	28
09500	245	186	1	29
09500	275	186	1	30
09500	315	186	23	31
09500	325	186	5	32
09500	345	186	9	33
09500	425	186	9	34
09500	435	186	18	35
09500	455	186	4	36
09500	465	186	8	37
09500	505	186	17	38
09310	200	193	1	39
01330	240	193	6	40
01330	310	193	10	41
02310	360	193	4	42
41330	470	193	9	43
02310	470	193	3	44
02310	530	193	14	45
79010	101	252	101	46

19070	699	252	113	47
09500	169	254	5	48
09500	179	254	23	49
09500	189	254	1	50
09500	602	254	17	51
09500	612	254	8	52
09500	622	254	3	53
09500	632	254	4	54
09500	642	254	6	55
09500	169	270	5	56
09500	179	270	23	57

ARTWORK INSTRUCTION DATA:

00500	189	270	1	58
00500	602	270	17	59
00500	612	270	8	60
00500	622	270	3	61
00500	632	270	4	62
00500	642	270	6	63
39070	101	288	112	64
69010	699	288	105	65
70320	91	290	0	66
10310	709	290	0	67
00500	149	319	13	68
00500	162	326	23	69
00500	179	326	23	70
00500	602	326	17	71
00500	649	326	17	72
00500	149	333	13	73
50310	200	333	11	74
21240	310	333	5	75
20310	370	333	13	76
20310	430	333	12	77
20310	490	333	2	78
51330	490	333	8	79
21330	590	333	7	80
00500	235	340	1	81
00500	275	340	1	82
00500	285	340	3	83
00500	335	340	3	84
00500	395	340	2	85
00500	445	340	2	86
00500	445	340	16	87
00500	555	340	16	88
00500	225	347	23	89
00500	265	347	5	90
00500	295	347	2	91
00500	495	347	7	92
00500	505	347	3	93
00500	525	347	17	94
00500	305	354	4	95
00500	335	354	3	96
00500	345	354	7	97
00500	535	354	8	98
39010	101	368	108	99
00500	245	368	11	100
64100	699	368	0	101
00500	325	375	13	102
00500	385	375	12	103

00500	405	375	6	104
00500	495	375	7	105
00500	545	375	6	106
00500	445	382	2	107
00500	545	382	7	108
00500	575	382	2	109
00500	455	386	20	110
00500	555	396	16	111
00220	695	435	0	112
40070	307	439	110	113
40070	387	439	111	114

ARTWORK INSTRUCTION DATA:

09010	423	439			102	115
09010	503	439			103	116
09250	400	655			0	117
				END COMPONENTS		118
				SYMBOL		119
0	-196016H51ATL	27FVL=1	* BIT ADDER	PR2D TEST RUN		
				END LEVEL1		121
				SYMBOL		122
0	-196016H51ATL	27FVL=2	* BIT ADDER	PR2D TEST RUN		
				END LEVEL2		124
				LINE SET		125
17	10					126
1	149	349			13	127
1	149	333			13	128
2	169	270			5	129
2	169	256			5	130
3	179	256			23	131
3	179	270			23	132
4	189	270			1	133
4	189	256			1	134
5	225	158			19	135
5	225	1A6			19	136
6	225	340			23	137
6	225	347			23	138
7	235	1A6			15	139
7	235	1A5			15	140
8	245	340			11	141
8	245	348			11	142
9	265	347			5	143
9	265	340			5	144
10	265	1A6			23	145
10	265	179			23	146
11	295	1A5			15	147
11	295	1A6			15	148
12	295	340			2	149
12	295	347			2	150
13	305	354			4	151
13	305	340			4	152
14	305	1A6			6	153
14	305	1A5			6	154
15	325	340			13	155
15	325	375			13	156
16	335	354			3	157
16	335	340			3	158
17	345	340			7	159
17	345	354			7	160

18	355	186
18	355	172
19	385	165
19	385	186
20	385	340
20	385	375
21	395	186
21	395	179
22	405	172
22	405	186
23	405	340
23	405	375

10	161
10	162
22	163
22	164
12	165
12	166
18	167
18	168
4	169
4	170
6	171
6	172

ARTWORK INSTRUCTION DATA

24	435	179	18	173
24	435	158	18	174
25	445	340	2	175
25	445	3A2	2	176
26	455	3A9	20	177
26	455	340	20	178
27	495	144	21	179
27	495	1A6	21	180
28	495	340	7	181
28	495	375	7	182
29	505	347	3	183
29	505	340	3	184
30	515	172	3	185
30	515	1A6	3	186
31	525	347	17	187
31	525	340	17	188
32	535	340	8	189
32	535	3A4	8	190
33	545	3A2	7	191
33	545	340	7	192
34	555	179	8	193
34	555	1A6	8	194
35	555	340	16	195
35	555	396	16	196
36	565	1A6	4	197
36	565	1A5	4	198
37	575	151	14	199
37	575	1A6	14	200
38	575	340	2	201
38	575	3A2	2	202
39	585	375	6	203
39	585	340	6	204
40	602	256	17	205
40	602	270	17	206
41	612	270	8	207
41	612	256	8	208
42	622	256	3	209
42	622	270	3	210
43	632	270	4	211
43	632	256	4	212
44	642	256	6	213
44	642	270	6	214
45	162	326	23	215
45	179	326	23	216
46	602	326	17	217
46	649	326	17	218

				END LINE SET	219
				SYMBOL	220
0	-196016H51ATL	27VL-3,	4 BIT ADDER	PK2D TEST RUN	
				END LEVEL3	222
				SYMBOL	223
0	-196016H51ATL	27VL-4,	4 BIT ADDER	PK2D TEST RUN	
				END LEVEL4	225
				SHAPE SET	226
1		10			227
1	0				228
2	-50				229

ARTWORK INSTRUCTION DATA:

3	050	590			230
4	850	590			231
5	850	249			232
6	800	249			233
7	800	540			234
8	0	540			235
SHAPE SET					
1	0	271			236
2	0	271			237
3	050	050			238
4	850	050			239
5	850	271			240
6	800	271			241
7	800	0			242
8	0	0			243
SYMBOL					
END LEVELS					
LINE SET					
0	0196016H51ATL	271VL=5,	4 BIT ADDER	PR2D TEST RUN	244
14	127	305		13	245
1	127	308		13	246
2	127	378		23	247
2	127	378		23	248
3	142	378		23	249
3	142	326		23	250
4	149	305		13	251
4	149	319		13	252
5	149	323		13	253
5	149	361		13	254
6	189	242		15	255
6	189	145		15	256
7	169	172		5	257
7	169	256		5	258
8	169	270		5	259
8	169	356		5	260
9	179	347		23	261
9	179	270		23	262
10	179	254		23	263
10	179	179		23	264
11	189	126		1	265
11	189	256		1	266
12	189	270		1	267
12	189	340		1	268
13	265	356		5	269
13	265	347		5	270

14	287	348
14	287	413
15	295	375
15	295	341
16	297	127
16	297	158
17	305	348
17	305	354
18	315	179
18	315	186

11	277
11	278
13	279
13	280
19	281
19	282
4	283
4	284
23	285
23	286

ARTWORK INSTRUCTION DATA:

19	325	1A6	5	287
19	325	172	5	288
20	335	1A5	6	289
20	335	179	6	290
21	335	354	3	291
21	335	3A1	3	292
22	367	413	12	293
22	367	375	12	294
23	367	172	10	295
23	367	127	10	296
24	375	172	6	297
24	375	179	6	298
25	385	1A5	22	299
25	385	1A8	22	300
26	395	1A5	6	301
26	395	172	6	302
27	395	3A0	2	303
27	395	3A7	2	304
28	415	354	7	305
28	415	3A7	7	306
29	425	1A1	22	307
29	425	1A8	22	308
30	425	354	3	309
30	425	3A1	3	310
31	433	413	20	311
31	433	3A9	20	312
32	433	1A1	22	313
32	433	127	22	314
33	435	179	18	315
33	435	1A6	18	316
34	435	3A1	4	317
34	435	3A8	4	318
35	455	1A6	4	319
35	455	172	4	320
36	465	179	8	321
36	465	1A6	8	322
37	465	3A8	6	323
37	465	375	6	324
38	475	1A8	18	325
38	475	1A1	18	326
39	485	1A8	6	327
39	485	1A5	6	328
40	485	3A2	2	329
40	485	3A9	2	330
41	495	3A2	7	331
41	495	375	7	332

42	505	145
42	505	172
43	505	347
43	505	354
44	505	368
44	505	375
45	513	413
45	513	396
46	513	144
46	513	127
47	515	341
47	515	368

4	333
4	334
3	335
3	336
6	337
6	338
16	339
16	340
21	341
21	342
4	343
4	344

ARTWORK INSTRUCTION DATA:

48	525	341	3	345
48	525	344	3	346
49	565	144	18	347
49	565	151	18	348
50	575	349	2	349
50	575	342	2	350
51	602	146	17	351
51	602	246	17	352
52	602	270	17	353
52	602	347	17	354
53	612	354	8	355
53	612	270	8	356
54	612	246	8	357
54	612	179	8	358
55	622	172	3	359
55	622	246	3	360
56	622	270	3	361
56	622	341	3	362
57	632	348	4	363
57	632	270	4	364
58	632	246	4	365
58	632	145	4	366
59	642	158	6	367
59	642	246	6	368
60	642	270	6	369
60	642	375	6	370
61	652	326	17	371
61	652	248	17	372
62	652	235	14	373
62	652	151	14	374
63	659	144	18	375
63	659	145	18	376
64	673	235	14	377
64	673	232	14	378
65	673	145	18	379
65	673	142	18	380
66	495	144	21	381
66	513	144	21	382
67	565	144	18	383
67	659	144	18	384
68	652	151	14	385
68	575	151	14	386
69	565	151	18	387
69	475	151	18	388
70	433	151	22	389
70	425	151	22	390

71	225	158	19	391
71	297	158	19	392
72	385	158	22	393
72	425	158	22	394
73	435	158	18	395
73	475	158	18	396
74	485	158	6	397
74	642	158	6	398
75	673	145	18	399
75	689	145	18	400
76	612	145	4	401
76	805	145	4	402

ARTWORK INSTRUCTION DATA

77	485	145	6	403
77	395	145	6	404
78	335	145	6	405
78	305	145	6	406
79	295	145	15	407
79	159	145	15	408
80	169	172	5	409
80	325	172	5	410
81	355	172	10	411
81	367	172	10	412
82	375	172	6	413
82	395	172	6	414
83	405	172	4	415
83	505	172	4	416
84	515	172	3	417
84	622	172	3	418
85	612	179	8	419
85	465	179	8	420
86	435	179	18	421
86	395	179	18	422
87	375	179	6	423
87	335	179	6	424
88	315	179	23	425
88	179	179	23	426
89	189	1A6	1	427
89	275	1A6	1	428
90	345	1A6	9	429
90	425	1A6	9	430
91	505	1A6	17	431
91	602	1A6	17	432
92	673	235	14	433
92	652	235	14	434
93	127	242	15	435
93	159	242	15	436
94	673	298	17	437
94	652	298	17	438
95	127	305	13	439
95	149	305	13	440
96	652	326	17	441
96	649	326	17	442
97	142	326	23	443
97	142	326	23	444
98	189	340	1	445
98	275	340	1	446
99	285	340	3	447
99	335	340	3	448

100	395	340
100	445	340
101	445	340
101	555	340
102	602	347
102	525	347
103	495	347
103	415	347
104	395	347
104	295	347
105	225	347
105	179	347

2	449
2	450
16	451
16	452
17	453
17	454
7	455
7	456
2	457
2	458
23	459
23	460

ARTWORK INSTRUCTION DATA:

106	169	354	5	461
106	265	354	5	462
107	345	354	7	463
107	415	354	7	464
108	425	354	3	465
108	525	354	3	466
109	535	354	8	467
109	612	354	8	468
110	622	341	3	469
110	525	341	3	470
111	515	341	4	471
111	435	341	4	472
112	425	341	3	473
112	335	341	3	474
113	295	341	13	475
113	149	341	13	476
114	245	348	11	477
114	287	348	11	478
115	305	348	4	479
115	435	348	4	480
116	465	348	6	481
116	505	348	6	482
117	515	348	4	483
117	632	348	4	484
118	642	375	6	485
118	505	375	6	486
119	465	375	6	487
119	405	375	6	488
120	385	375	12	489
120	367	375	12	490
121	325	375	13	491
121	295	375	13	492
122	142	375	23	493
122	127	375	23	494
123	445	3A2	2	495
123	485	3A2	2	496
124	495	3A2	7	497
124	545	3A2	7	498
125	575	3A9	2	499
125	485	3A9	2	500
126	455	3A9	20	501
126	433	3A9	20	502
127	513	396	16	503
127	555	396	16	504

END LINE SET
LINE SET

14

10

1	99	172
1	99	441
2	595	193
2	595	333
3	688	112
3	688	441
4	122	112
4	688	112
5	200	193
5	595	193

0
0
0
0
0
0
0
0
0
0

507
508
509
510
511
512
513
514
515
516
517

ARTWORK INSTRUCTION DATA:

6	595	243
6	688	243
7	200	373
7	595	373
8	99	441
8	688	441

0	518
0	519
0	520
0	521
0	522
0	523

END LINE SET
LINE SET

14 10

1	112	49
1	112	428
2	701	49
2	701	348
3	112	49
3	701	49
4	112	243
4	587	243
5	112	428
5	678	428

0	524
0	525
0	526
0	527
0	528
0	529
0	530
0	531
0	532
0	533
0	534
0	535
0	536

END LINE SET
SYMBOL

0 =196016H51ATL 27VL=6,

4 BIT ADDER PR2D TEST RUN

END LEVEL 6
SHAPE SET

537
538

8 10

1	0	249
2	-50	249
3	-50	590
4	850	590
5	850	249
6	800	249
7	800	540
8	0	540

540
541
542
543
544
545
546
547
548
549
550

SHAPE SET

8 10

1	0	271
2	-50	271
3	-50	-50
4	850	-50
5	850	271
6	800	271
7	800	0
8	0	0

551
552
553
554
555
556
557
558
559
560
561

0 =196016H51ATL 27VL=7,

4 BIT ADDER PR2D TEST RUN

END LEVEL 7

563

END ART1.

CHIP STATISTICS:

X-STEP = 45; Y-STEP = 59

.65 INCHES OF METAL, .10 INCHES OF TUNNEL, AND 77 TUNNEL S

CELL ROW: LINEAR MILS: TOTAL LINEAR MILS:

4 39.0

5 39.0

78.0

CHIP AREA	CELL AREA	B.P. AREA	WIRING AREA	WIRING EFFECT
SQ. MILS	SQ. MILS O/U	SQ. MILS O/U	SQ. MILS O/U	SQ. MILS O/U
5015.0	546.0 10.9	2993.8 59.7	1475.2 29.4	553.4 37.5

PATTERN NUMBER	NUMBER DEVICES	TIMES USED	TOTAL DEVICES
1240	8	1	
1330	6	8	
2310	8	8	
9010	0	9	
9070	2	5	

NODE LIST

NODE NO.	CAP. PF	NODE WT.	FLEM	PIN	ELEM	PIN	ELEM	PIN	...
1	95	1	1	4	6	3	11	3	5 5
2	143	1	2	4	7	3	12	3	5 3
3	190	1	3	4	8	3	13	3	5 4
4	225	1	4	4	9	3	14	3	5 2
5	115	1	5	4	10	3			
6	258	1	6	R	12	2	7	2	
7	122	1	7	R	13	2	8	2	
8	122	1	8	R	14	2	9	2	
9	24	1	9	R	10	4			
10	25	2	10	R	109	2			
11	41	2	11	4	110	2			
12	40	2	12	4	111	2			
13	97	2	13	4	112	2			
14	65	2	14	4	113	2			
15	86	2	101	9	1	3	6	4	
16	80	2	103	9	2	2	7	4	
17	148	2	105	9	3	3	8	4	
18	99	2	107	9	4	3	9	4	
19	44	2	100	9	1	2			
20	47	2	102	9	2	3			
21	40	2	104	9	3	2			
22	36	2	106	9	4	2			
23	147	2	108	9	6	2	11	2 10 2	

355	
367	160 2 MM
375	
385	
395	
405	
415	
425	
433	106 2 MM
445	
455	
465	
475	
485	
495	
505	
513	106 2 MM
525	
535	
545	
555	
565	
575	
585	
595	
605	
615	

CENTER SECTION 4

																				ELEM PIN			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	5	5	6			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	4	1	8			
																					M		169
																					M	MMMM	169
																					M	M	179
																					M	M	189
																					M	M	195
																					M	M	205
																					M	M	215
																					M	M	225
																					M	M	235
																					M	M	245
																					M	M	255
																					M	M	265
																					M	M	275
																					M	M	285
																					M	M	295
																					M	M	305
																					M	M	315
																					M	M	325
																					M	M	335
																					M	M	

602 M M M M M
 MMM M M M M
 M M M M
 612 MMMM M M M
 M M M
 622 MMMMMMM M M
 M M
 632 MMMMMMMMM M
 M
 642 MMMMMMMMMMM
 642

0
 3 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
 3 4 4 5 6 6 7 8 9 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 3 0 7 4 1 2 5 2 9 6 3 0 7 7 7 7 7 7 7 7 7 7 7 7

NODE CROSSOVER COUNT:

NODE NUMBER	NUMBER CROSSEVERS
1	7
2	18
3	20
4	22
5	8
6	23
7	15
8	13
9	4
10	2
11	3
12	4
13	5
14	5
15	6
16	11
17	15
18	5
19	4
20	5

NO. CROSSOVER COUNT:

NO. NUMBER

NUMBER CROSSOVERS

22

2

23

9

END OF PLOT.
END OF ART FUNCTION.

4 BIT ADDER PR20 TEST RUN

PAGE NO. 42
START OF WRITE FUNCTION.

CAP(I,X):

I + I	1	2	3	4	5	6	7	8	9	10
0	7	18	20	22	8	23	15	13	4	2
10	3	4	5	5	6	11	15	5	4	5
20	4	2	9	0	0	0	0	0	0	0

NFS(I,X,Y):

I	J *	1	2	3	4	5	6	7
1		4	4	4800	4921	0	4	16
2		8	5	5090	5021	0	-5	16
3		9	4	5070	4921	0	4	16
4		7	4	4960	4921	0	4	16
5		5	5	4910	5021	0	-5	1
6		5	4	4860	4921	0	4	9
7		10	5	5190	5021	0	-5	9
8		9	5	5090	5021	0	5	9
9		8	4	5070	4921	0	-4	9
10		6	4	4910	4921	0	4	9
11		4	5	4800	5021	0	5	16
12		7	5	5030	5021	0	-5	16
13		6	5	4970	5021	0	-5	16
14		10	4	5130	4921	0	4	16
100		4	1	4927	4829	1	-3	22
101		1	4	4701	4920	2	-1	22
102		8	8	5023	5127	3	6	22
103		10	8	5123	5127	4	6	22
104		10	1	5123	4829	4	3	22
105		13	6	5229	5016	3	2	22
106		8	1	5023	4829	3	3	22
107		13	2	5229	4900	1	-2	22
108		1	7	4701	5026	4	1	22
109		6	1	4927	4829	2	-3	26
110		4	8	4927	5127	1	-6	26
111		6	8	4927	5127	2	-8	26
112		1	6	4701	5016	3	1	26
113		13	4	5229	4920	2	-2	26

IP(IX)

I + T	1	2	3	4	5	6	7	8	9	10
0	100	50	120	215	330	480	670	900	1250	1750
10	2400	3700	4100	2	4	10000	5	35	0	45
20	50	10	15	20	25	55	60	0	0	7
30	0	2	6	3	5	1	1	0	0	0
40	1	0	2790	5040	6000	7000	7500	8000	8500	9000
50	10000	1	1	1	2	1	0	0	2	1
60	2	1	55	0	0	2	1	0	0	1
100	40	2	1	2	3	0	2	10	1	6
110	0	1	4	5	1	1	2	4	2	3
120	100	0	5	0	2	0	2	2	0	1
130	100	0	0	0	0	0	0	0	0	0
140	50	7	10	40	98	98	5000	1	20	3
150	70	7	14	12	10	34	32	4	0	10
160	0	0	0	0	0	0	3	2	0	0
170	26	11	3	7	0	0	0	0	0	0
190	20	4701	3	7	0	0	175	4823	0	0
200	225	356	0	0	0	1	2	7	0	0
210	0	5299	6	1	0	0	175	4823	0	0
220	225	356	0	0	0	13	2	7	0	0
230	0	4829	5	2	0	0	82	4820	0	0
240	117	356	0	0	0	1	4	10	0	0
250	0	4921	0	4	3	5	80	4800	78	121
260	119	390	4789	5202	1	4	4	10	3	4769
270	5242	5061	5	2	3	5	80	4800	78	121
280	119	390	4789	5202	1	5	4	10	6	4769
290	5242	5167	0	4	0	0	82	4820	0	0
300	117	356	0	0	0	0	4	10	0	0
310	0	0	5	2	0	0	0	0	0	0
330	0	0	0	4	0	0	0	0	0	0
350	0	0	5	2	0	0	0	0	0	0
370	0	0	0	4	0	0	0	0	0	0
390	0	0	5	2	0	0	0	0	0	0
410	0	0	0	4	0	0	0	0	0	0
430	0	0	5	2	0	0	0	0	0	0
450	0	0	0	4	0	0	0	0	0	0
470	0	0	5	2	0	0	0	0	0	0
490	0	0	0	4	0	0	0	0	0	0
510	0	0	5	2	0	0	0	0	0	0
530	0	0	0	4	0	0	0	0	0	0
550	0	0	5	2	0	0	0	0	0	0
570	0	0	0	4	0	0	0	0	0	0
590	0	0	5	2	0	0	0	0	0	0
610	0	0	0	4	0	0	0	0	0	0
630	0	0	5	2	0	0	0	0	0	0
650	0	0	0	4	0	0	0	0	0	0
680	120	850	590	85	170	150	100	10	9000	500

690	18	30	60	126	0	6	126	0	7	116
700	20	1	116	20	7	105	1	0	0	1
710	25	60	0	25	20	0	0	0	270	425
720	295	0	60	14	80	10	10	17	70	14
730	14	425	295	100	230	360	461	562	5	2
740	117	54	157	11	8	0	0	0	14	90
750	0	3	3	8	8	12	12	3	3	2
760	2	0	0	17	137	124	124	126	126	0
770	16	10	2	0	1	0	0	0	50	5
800	40	9010	9010	9040	9100	9510	9500	9250	0	9100
810	9110	9310	9320	9210	9220	0	0	9450	9440	9800
840	20	2	7	38	6465	0	1009	0	77	0

IPIN(IX,IY)I

I	J #	1	2	3
1		1240	7	9
3		1	0	0
4		1	10	0
5		1	20	0
6		1	30	0
7		10	40	0
8		8	50	70
9		1230	6	16
11		1	0	0
12		2	10	0
13		3	30	0
14		10	40	0
15		6	50	70
16		2310	5	22
18		1	20	0
19		1	30	0
20		10	40	0
21		8	60	70
22		9010	3	26
24		10	10	0
25		0	80	90
26		9070	3	0
28		10	20	0
29		2	80	90

0	0	400	0	0	0	0	10000	0	1	10000
10	0	500	7	1	2	3	4	5	6	7
20	9000	43	200	3	3	1	2	3	0	1000
30	0	1	01	0	0	500	1	101	141	681
40	801	841	0	0	0	0	0	0	9	4000
50	6	1	2	3	4	5	6	2	0	1
60	0	103	0	0	0	271	0	29	0	100
70	70	3	4	2	1	0	2	0	2	0
80	0	80	56	143	291	81	4	0	0	0
90	0	0	0	0	1	0	100	24	13	8
100	0	100	441	300	230	562	563	0	5167	4701
110	5999	4829	100	70	100	99	24	6	29	2
120	28	1	28	175	225	143	80	119	82	118
130	3	147	2	5185	58	56	59	31	177	213
140	5124	3	7	5	10	0	0	0	0	0
150	0	0	0	12000	100	200	2	198	1	199
160	30	60	2	58	4	56	1	59	3	57
170	28	0	3	300	14	256	57	3	2000	3
180	0	2	1	0	0	15	1	29	3	2
190	30	28	27	29	1	2	28	1	200	400
200	199	8	4600	111	1	288	289	28	5980	4728
210	9	-1	207	399	207	209	0	40	80	0
220	0	0	100	70	1	10000	5290	5237	510	0
230	5000	4998	0	4701	4764	0	0	19	4	5
240	113	113	10	2	4	29	0	0	0	0
250	0	0	303	47	28	29	14	4	400	0
260	0	23	23	401	4000	17	217	4000	14	8
270	6	1000	38	7	7	1	2	3	4	5
280	6	7	4820	3605	-5	255	4800	5	4820	82
290	80	82	3	171	1	399	3	0	0	0

MDDF(IX):

I + 1	1	2	3	4	5	6	7	8	9	10
0	1	1	4	4	2	5	1	101	1	0
10	0	0	0	0	3	0	0	0	0	0

MDDG(IX) / MDD(IX):

I + 1	1	2	3	4	5	6	7	8	9	10
0	10	5	11	1	1	4	6	3	11	3
10	8	8	6	6	23	1	2	4	7	3

12	3	5	3	14	9	35	1	3
8	3	13	3	5	4	15	10	47
4	4	9	3	14	3	5	2	11
55	1	5	6	10	3	15	10	65
6	5	12	2	7	2	5	5	75
7	5	13	2	8	2	11	6	85
8	5	14	2	9	2	2	2	95
9	5	10	4	36	6	101	2	10
109	2	36	6	109	2	11	4	110
38	8	117	2	12	4	111	2	24
125	2	13	4	112	2	52	12	133
14	4	113	2	46	16	143	2	101
1	3	6	4	24	14	153	2	109
2	2	7	4	32	22	163	2	105
3	3	8	4	38	18	173	2	107
4	3	9	4	8	8	181	2	100
1	2	36	4	189	2	102	2	2
38	8	197	6	104	2	3	2	38
205	2	106	2	4	2	92	22	217
108	2	6	2	11	2	10	2	0

END OF DEBUG SUBROUTINE.
END OF WRITE FUNCTION.

PCL
DELETE NOT010
.. 1 FILES DELETED, 204 GRANULES
DELETE NOT015
.. 1 FILES DELETED, 204 GRANULES
DELETE NOT020
.. 1 FILES DELETED, 2 GRANULES
DELETE DECODE
.. 1 FILES DELETED, 1 GRANULES
DELETE AWRK2C
.. 1 FILES DELETED, 9 GRANULES
END
PCL PROCESSING TERMINATED

EOD

HONEYWELLHONEYWELLHONEYWEI HONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEY
HONEYWELLHONEYWELLHONEYWEI HONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEY

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23:40 MAY 10, 1978 ID#0088
ELAPSED JOB TIME          00:20:00
PARTITION NUMBER         12
TOTAL CPU TIME           5.4609
  PROCESSOR EXECUTION TIME    .1102
  PROCESSOR SERVICE TIME     .0357
  USER EXECUTION TIME        5.4922
  USER SERVICE TIME          .4229
CARDS: CARDS READ          91
PAGES: PROCESSOR PAGES      9
       USER PAGES           73
CORE:  PEAK CORE(PAGES)     112
       PAGE-MINUTES         619.7688
I/O:   OPERATIONS           2230
       CALLS                 17504
FILE SPACE
  AVLBL RAD PERMANENT       64
  NET DISK PERMANENT       53
  AVLBL DISK PERMANENT     7030
RESOURCES ALLCATED
C0*120(PAGES)

```


B. C015 – Programmable Timer

```

08:32 JUL 13, '78 ID#068A
JOB M801,EC45020(OAST/CAD),1
LIMIT (TIME,30),(CORE,60),(7T,1),(9T,1)
ASSIGN F:6,(DEVICE,LO)
ASSIGN F:1,(FILE,DECODE),(OUTIN)
ASSIGN F:5,(DEVICE,SI)
ASSIGN F:10,(FILE,NOTO10),(OUTIN)
ASSIGN F:15,(FILE,NOTO15),(OUTIN)
ASSIGN F:20,(FILE,NOTO20),(OUTIN)
ASSIGN F:25,(FILE,NOTO25),(OUTIN)
ASSIGN F:30,(FILE,DESIGN),(IN)
ASSIGN F:35,(FILE,COMMON1),(OUT),(SAVE)
ASSIGN F:40,(FILE,COMMON2),(IN)
ASSIGN F:45,(FILE,MGBWPDFE,GOULD),(IN)
ASSIGN F:50,(FILE,MGBWPDFM),(OUT),(SAVE)
ASSIGN F:55,(FILE,AWRK1X),(OUTIN),(SAVE)
ASSIGN F:60,(FILE,AWRK2C),(OUTIN),(SAVE)
PCL

```

```

COPY C015 TO LP
!JOB M801,EC45020(OAST/CAD),1
!LIMIT (TIME,30),(CORE,60),(7T,1),(9T,1)
!ASSIGN F:6,(DEVICE,LO)
!ASSIGN F:1,(FILE,DECODE),(OUTIN)
!ASSIGN F:5,(DEVICE,SI)
!ASSIGN F:10,(FILE,NOTO10),(OUTIN)
!ASSIGN F:15,(FILE,NOTO15),(OUTIN)
!ASSIGN F:20,(FILE,NOTO20),(OUTIN)
!ASSIGN F:25,(FILE,NOTO25),(OUTIN)
!ASSIGN F:30,(FILE,DESIGN),(IN)
!ASSIGN F:35,(FILE,COMMON1),(OUT),(SAVE)
!ASSIGN F:40,(FILE,COMMON2),(IN)
!ASSIGN F:45,(FILE,MGBWPDFE,GOULD),(IN)
!ASSIGN F:50,(FILE,MGBWPDFM),(OUT),(SAVE)
!ASSIGN F:55,(FILE,AWRK1X),(OUTIN),(SAVE)
!ASSIGN F:60,(FILE,AWRK2C),(OUTIN),(SAVE)
!PCL

```

COPY C015 TO LP

END

IRUN (LMN,LMPR2DC,GOULD)

IDATA

1	1	4	4	15	1	1	102	1	0	0	1	1
0	1	50		1								
0	27	1		1								
0	34	1		1								
0	53	1		1								
0	54	3		1								
0	68	1		1								
2	3	200		1								
2	4	50		1								
2	5	50		1								
2	26	4		1								
4	11000			1								
4	21000			1								
4	3	50		1								
4	9	200		1								
4	13	300		1								
4	14	260		1								
4	16	120		1								
4	17	260		1								
4	19	170		1								
4	20	150		1								

4 22 170 1
 4 23 100 1
 4 26 1 1
 4 27 0 1
 4 30 100 1
 4 31 100 1
 4 33 100 1
 4 47 17 1
 4 49 14 1
 4 50 14 1
 4 68 14 1
 4 83 210 1
 4 84 210 1
 4 85 210 1
 4 86 210 1
 4 87 221 1
 4 88 221 1
 4 91 10 1
 5 179450 1
 5 189440 1
 5 199800 0

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-78, FELTNER - GOULD

11520	21520	31520	41620
51330	61330	71330	81330
91330	101330	111330	121330
131330	141330	151330	161330
171820	181820	191820	201820
211820	221820	231820	241820
251820	261820	271820	281820
291120	301120	311120	321120
331120	341120	351120	361120
371120	381120	391120	401120
411520	421820	431720	441240
451330	461330	471330	481330
491330	501330	511820	521820
531820	541820	551820	561820
571120	581120	591120	601120
611120	621120	631520	641820
651220	661120	671220	681310
691520	702310	712310	722310
732310	742310	752310	761130
771130	781220	791520	801310
811520	821820	831720	841120
851620	861830	871830	881830
891830	901830	911830	929030
939020	949020	959030	969030
979030	989030	999030	1009030
1019030	1029020	1039030	1049020
1059020	1061120	1071120	1081310
1091720	1101620	1111520	1121520
1131520	1141230	1151120	1161520
1171520	1181520	1191520	1201820
1211820	1221520	1231520	1241520
1251520	1261520		

1	1	2	2	3	94	2													
1	1	3	112	2	93	2													
1	2	2	3	3	42	3	64	3											
1	3	2	4	3	82	3	120	3	121	3									
1	4	2	5	4	67	4													
1	4	4	118	2	86	3	87	3	88	3	89	3	90	3	91	3			
1	5	2	6	2	7	2	8	2	9	2	10	2	124	2					

1	11	2	12	2	13	2	14	2	15	2	16	2	125	2			
1	5	3	17	3													
1	6	3	18	3													
1	7	3	19	3													
1	8	3	20	3													
1	9	3	21	3													
1	10	3	22	3													
1	11	3	23	3													
1	12	3	24	3													
1	13	3	25	3													
1	14	3	26	3													
1	15	3	27	3													
1	16	3	28	3													
1	5	5	6	5	7	5	8	5	29	4	30	4	31	4	32	4	113
1	6	4	17	4	29	3	114	5									
1	7	4	18	4	30	3	114	4									
1	8	4	19	4	31	3	114	3									
1	9	4	20	4	32	3	44	3									
1	9	5	10	5	11	5	12	5	33	4	34	4	35	4	36	4	116
1	10	4	21	4	33	3											
1	11	4	22	4	34	3											
1	12	4	23	4	35	3											
1	13	4	24	4	36	3											
1	13	5	14	5	15	5	16	5	37	4	38	4	39	4	40	4	117
1	14	4	25	4	37	3											
1	15	4	26	4	38	3	44	4									
1	16	4	27	4	39	3	44	5									
1	17	2	29	2													
1	18	2	30	2													
1	19	2	31	2													
1	20	2	32	2													
1	21	2	33	2													
1	22	2	34	2													
1	23	2	35	2													
1	24	2	36	2													
1	25	2	37	2													
1	26	2	38	2													
1	27	2	39	2													
1	28	2	40	2													
1	28	4	40	3	44	6	45	4									
1	41	2	113	3	116	3	117	3									
1	41	3	42	4													
1	42	2	43	2													
1	43	3	115	2													
1	64	2	43	4	65	2											
1	44	2	115	4													
1	45	2	46	2	47	2	48	2	49	2	50	2	119	2			
1	45	3	51	3													
1	45	5	46	5	57	4	58	4	67	3	47	5	59	4	125	2	
1	46	3	52	3													
1	46	4	51	4	57	3	70	3									
1	47	3	53	3													
1	47	4	52	4	58	3	71	3									
1	48	3	54	3													
1	48	4	53	4	59	3	72	3									
1	49	3	55	3													
1	49	4	54	4	60	3	73	3									
1	49	5	50	5	61	4	62	4	48	5	60	4	126	2	120	2	

1	50	3	56	3				
1	50	4	55	4	61	3	74	3
1	56	4	62	3	75	3		
1	51	2	57	2				
1	52	2	58	2				
1	53	2	59	2				
1	54	2	60	2				
1	55	2	61	2				
1	56	2	62	2				
1	63	2	66	3	125	3	126	3
1	63	3	64	4				
1	65	3	109	2	110	3		
1	65	4	78	2				
1	66	2	106	3				
1	66	4	106	2	109	3		
1	67	2	69	3				
1	68	2	118	3				
1	68	3	80	3	82	4		
1	69	2	84	3	102	2		
1	70	2	76	5				
1	70	4	86	4				
1	71	2	76	4				
1	71	4	87	4				
1	72	2	76	3				
1	72	4	88	4				
1	73	2	77	5				
1	73	4	89	4				
1	74	2	77	4				
1	74	4	90	4				
1	75	2	77	3				
1	75	4	91	4				
1	76	2	78	4				
1	77	2	78	3				
1	79	2	105	2	81	3		
1	81	2	104	2				
1	82	2	108	2				
1	83	2	85	3	108	3		
1	83	3	107	2	84	4		
1	83	4	107	4	85	2		
1	84	2	107	3				
1	85	4	103	2				
1	86	2	101	2				
1	87	2	100	2				
1	88	2	99	2				
1	89	2	98	2				
1	90	2	97	2				
1	91	2	96	2				
1	92	2	111	3				
1	110	4	95	2				
1	106	4	109	4	110	2		
1	111	2	112	3				
1	114	2	115	3				
1	121	4	122	3				
1	122	2	123	3	124	3		
1	119	3	120	4				
1	79	3	80	2				

TEOD

IPCL

DELETE NOT010

DELETE NOT015

DELETE NOT020


```
DELETE NOT025  
DELETE DECODE  
DELETE AWRK2C  
END  
IEQ0  
END  
PCL PROCESSING TERMINATED
```

RUN (LMN,LMPR2DC,GOULD)

START OF INIT:

TWO-DIMENSIONAL PLACEMENT & ROUTING OF LSI CHIPS.

WRITTEN BY: RICHARD NOTO
COMPANY : RCA CORP.
ADDRESS : FRONT & COOPER STS.
 CAMDEN, N. J. 08102
PHONE NO. : (609) 963-8000
EXT. NO. : PC 6755

PR2D REVISION 8, FEB. 1974.

IP(I0+ 1) = 50
IP(I0+ 27) = 1
IP(I0+ 34) = 1
IP(I0+ 53) = 1
IP(I0+ 54) = 3
IP(I0+ 68) = 1
IP(I2+ 3) = 200
IP(I2+ 4) = 50
IP(I2+ 5) = 50
IP(I2+ 26) = 4
IP(I4+ 1) = 1000
IP(I4+ 2) = 1000
IP(I4+ 3) = 50
IP(I4+ 9) = 200
IP(I4+ 13) = 300
IP(I4+ 14) = 260
IP(I4+ 16) = 120
IP(I4+ 17) = 260
IP(I4+ 19) = 170
IP(I4+ 20) = 150
IP(I4+ 22) = 170
IP(I4+ 23) = 100
IP(I4+ 26) = 1
IP(I4+ 27) = 0

IP(I4+ 30) = 100
IP(I4+ 31) = 100
IP(I4+ 33) = 100
IP(I4+ 47) = 17
IP(I4+ 49) = 14
IP(I4+ 50) = 14
IP(I4+ 68) = 14
IP(I4+ 83) = 210
IP(I4+ 84) = 210
IP(I4+ 85) = 210
IP(I4+ 86) = 210
IP(I4+ 87) = 221
IP(I4+ 88) = 221
IP(I4+ 91) = 10
IP(I5+ 17) = 9450
IP(I5+ 18) = 9440
IP(I5+ 19) = 9800

END OF INIT.
START OF INPUT FUNCTION:

PIN DATA FOR PATTERNS USED ON CHIP:

PATTERN 112F

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	12	820
3	1	31	1300
4	1	50	1300
5	-4	60	140

PATTERN 1130

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	10	1180
3	1	29	1710
4	1	48	1710
5	1	67	1710
6	-6	81	140

PATTERN 1220

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	13	1040
3	1	32	1170
4	1	51	1170
5	-4	63	140

PATTERN 1230

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	10	500
3	1	29	1000
4	1	48	1000
5	1	67	1000
6	-6	77	140

PIN DATA FOR PATTERNS USED ON CHIP:

PATTERN 1240

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	10	850
3	1	29	1540
4	1	48	1540
5	1	67	1540
6	1	86	1540
7	-8	96	140

PATTERN 1310

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	10	1200
3	1	29	1800
4	-2	39	140

PATTERN 1330

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	1	13	1370
3	10	32	1340
4	2	51	1370
5	3	70	2320
6	-6	85	140

PATTERN 1520

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	10	1790
3	1	29	3940
4	-2	39	140

PIN DATA FOR PATTERNS USED ON CHIP:

PATTERN 1620

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	13	1270
3	1	32	1170
4	1	51	1170
5	-6	63	140

PATTERN 1720

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	12	1270
3	1	31	1310
4	1	50	1310
5	-6	60	140

PATTERN 1820

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	1	30	500
3	2	49	1000
4	10	73	350
5	-14	84	140

PATTERN 1830

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	1	30	1500
3	2	49	600
4	10	73	1200
5	-10	84	140

PIN DATA FOR PATTERNS USED ON CHIP:

PATTERN 2310

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	13	900
3	1	32	1550
4	1	51	1550
5	-8	80	140

PATTERN 9020

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	1	12	300
3	0	76	80

PATTERN 9030

PIN NO.	RESN FLAG	X DIST	PIN IMP.
1	0	0	0
2	10	12	300
3	0	76	80

ELEMENT TO PATTERN ASSIGNMENT:

ELEM PTRN ORD. ROW ELEM PTRN ORD. ROW ...

1	1520	0	0	2	1520	0	0	3	1520	0	0	4	1620	0	0
5	1330	0	0	6	1330	0	0	7	1330	0	0	8	1330	0	0
9	1330	0	0	10	1330	0	0	11	1330	0	0	12	1330	0	0
13	1330	0	0	14	1330	0	0	15	1330	0	0	16	1330	0	0
17	1820	0	0	18	1820	0	0	19	1820	0	0	20	1820	0	0
21	1820	0	0	22	1820	0	0	23	1820	0	0	24	1820	0	0
25	1820	0	0	26	1820	0	0	27	1820	0	0	28	1820	0	0
29	1120	0	0	30	1120	0	0	31	1120	0	0	32	1120	0	0
33	1120	0	0	34	1120	0	0	35	1120	0	0	36	1120	0	0
37	1120	0	0	38	1120	0	0	39	1120	0	0	40	1120	0	0
41	1520	0	0	42	1820	0	0	43	1720	0	0	44	1240	0	0
45	1330	0	0	46	1330	0	0	47	1330	0	0	48	1330	0	0
49	1330	0	0	50	1330	0	0	51	1820	0	0	52	1820	0	0
53	1820	0	0	54	1820	0	0	55	1820	0	0	56	1820	0	0
57	1120	0	0	58	1120	0	0	59	1120	0	0	60	1120	0	0
61	1120	0	0	62	1120	0	0	63	1520	0	0	64	1820	0	0
65	1220	0	0	66	1120	0	0	67	1220	0	0	68	1310	0	0
69	1520	0	0	70	2310	0	0	71	2310	0	0	72	2310	0	0
73	2310	0	0	74	2310	0	0	75	2310	0	0	76	1130	0	0
77	1130	0	0	78	1220	0	0	79	1520	0	0	80	1310	0	0
81	1520	0	0	82	1820	0	0	83	1720	0	0	84	1120	0	0
85	1620	0	0	86	1830	0	0	87	1830	0	0	88	1830	0	0

ELEMENT TO PATTERN ASSIGNMENT:

ELEM PTRN ORD. ROW ELEM PTRN ORD. ROW ...

89	1830	0	0	90	1830	0	0	91	1830	0	0	92	9030	0	0
93	9020	0	0	94	9020	0	0	95	9030	0	0	96	9030	0	0
97	9030	0	0	98	9030	0	0	99	9030	0	0	100	9030	0	0
101	9030	0	0	102	9020	0	0	103	9030	0	0	104	9020	0	0
105	9020	0	0	106	1120	0	0	107	1120	0	0	108	1310	0	0
109	1720	0	0	110	1920	0	0	111	1520	0	0	112	1520	0	0
113	1520	0	0	114	1230	0	0	115	1120	0	0	116	1520	0	0
117	1520	0	0	118	1520	0	0	119	1520	0	0	120	1820	0	0
121	1820	0	0	122	1520	0	0	123	1520	0	0	124	1520	0	0
125	1520	0	0	126	1520	0	0								

NODE LIST:	NODE NO.	NODE NO.	ELEM	PIN	ELEM	PIN	ELEM	PIN	ELEM	PIN	...
	1	1	1	2	2	3	94	2			
	2	1	1	3	112	2	93	2			
	3	1	2	2	3	3	42	3	64	3	
	4	1	3	2	4	3	82	3	120	3	121
	5	1	4	2	5	4	67	4			
	6	1	4	4	118	2	86	3	87	3	88
	7	1	5	2	6	2	7	2	8	2	9
	8	1	11	2	12	2	13	2	14	2	15
	9	1	5	3	17	3					
	10	1	6	3	18	3					
	11	1	7	3	19	3					
	12	1	8	3	20	3					
	13	1	9	3	21	3					
	14	1	10	3	22	3					
	15	1	11	3	23	3					
	16	1	12	3	24	3					
	17	1	13	3	25	3					
	18	1	14	3	26	3					
	19	1	15	3	27	3					
	20	1	16	3	28	3					
	21	1	5	5	6	5	7	5	8	5	29
	22	1	6	4	17	4	29	3	114	3	
	23	1	7	4	18	4	30	3	114	4	
	24	1	8	4	19	4	31	3	114	3	
	25	1	9	4	20	4	32	3	44	3	
	26	1	9	5	10	5	11	5	12	5	33
	27	1	10	4	21	4	33	3			
	28	1	11	4	22	4	34	3			
	29	1	12	4	23	4	35	3			
	30	1	13	4	24	4	36	3			
	31	1	13	5	14	5	15	5	16	5	37
	32	1	14	4	25	4	37	3			
	33	1	15	4	26	4	38	3	44	4	
	34	1	16	4	27	4	39	3	44	5	
	35	1	17	2	29	2					
	36	1	18	2	30	2					
	37	1	19	2	31	2					
	38	1	20	2	32	2					
	39	1	21	2	33	2					
	40	1	22	2	34	2					
	41	1	23	2	35	2					
	42	1	24	2	36	2					
	43	1	25	2	37	2					
	44	1	26	2	38	2					
	45	1	27	2	39	2					
	46	1	28	2	40	2					
	47	1	28	4	40	3	44	6	45	4	
	48	1	41	2	113	3	116	3	117	3	
	49	1	41	3	42	4					
	50	1	42	2	43	2					
	51	1	43	3	115	2					
	52	1	64	2	43	4	65	2			

53	1	44	2	115	4												
54	1	45	2	46	2	47	2	48	2	49	2	50	2	119	2		
55	1	45	3	51	3												
56	1	45	5	46	5	57	4	58	4	67	3	47	5	59	4	125	2
57	1	46	3	52	3												
58	1	46	4	51	4	57	3	70	3								

NODE LIST:

NODE NO.	NODE WT.	ELEM	PIN	ELEM	PIN	ELEM	PIN	ELEM	PIN	...
59	1	47	3	53	3					
60	1	47	4	52	4	58	3	71	3	
61	1	48	3	54	3					
62	1	48	4	53	4	59	3	72	3	
63	1	49	3	55	3					
64	1	49	4	54	4	60	3	73	3	
65	1	49	5	50	5	61	4	62	4	48 5 60 4 126 2 120 2
66	1	50	3	56	3					
67	1	50	4	55	4	61	3	74	3	
68	1	56	4	62	3	75	3			
69	1	51	2	57	2					
70	1	52	2	58	2					
71	1	53	2	59	2					
72	1	54	2	60	2					
73	1	55	2	61	2					
74	1	56	2	62	2					
75	1	63	2	66	3	125	3	126	3	
76	1	63	3	64	4					
77	1	65	3	109	2	110	3			
78	1	65	4	78	2					
79	1	66	2	106	3					
80	1	66	4	106	2	109	3			
81	1	67	2	69	3					
82	1	68	2	118	3					
83	1	68	3	80	3	82	4			
84	1	69	2	84	3	102	2			
85	1	70	2	76	5					
86	1	70	4	86	4					
87	1	71	2	76	4					
88	1	71	4	87	4					
89	1	72	2	76	3					
90	1	72	4	88	4					
91	1	73	2	77	5					
92	1	73	4	89	4					
93	1	74	2	77	4					
94	1	74	4	90	4					
95	1	75	2	77	3					
96	1	75	4	91	4					
97	1	76	2	78	4					
98	1	77	2	78	3					
99	1	79	2	105	2	81	3			
100	1	81	2	104	2					
101	1	82	2	108	2					
102	1	83	2	85	3	108	3			
103	1	83	3	107	2	84	4			
104	1	83	4	107	4	85	2			
105	1	84	2	107	3					
106	1	85	4	103	2					
107	1	86	2	101	2					
108	1	87	2	100	2					
109	1	88	2	99	2					
110	1	89	2	98	2					

111	1	90	2	97	2		
112	1	91	2	96	2		
113	1	92	2	111	3		
114	1	110	4	95	2		
115	1	106	4	109	4	110	2
116	1	111	2	112	3		

NODE LIST:

NODE NO.	WT.	ELEM	PIN	ELEM	PIN	ELEM	PIN	ELEM	PIN	...
117	1	114	2	115	3					
118	1	121	4	122	3					
119	1	122	2	123	3	124	3			
120	1	119	3	120	4					
121	1	79	3	80	2					

NODE ERRORS:

END OF INPUT FUNCTION.

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-78,

PAGE NO. 10

START OF PRPLI SUBROUTINE:

END OF PRPLI SUBROUTINE.

START OF PLACEMENT:

LENGTH= 32, # INT.= 830, JRSP=2, TOTAL DIST.= 0, # GOOD INT.= 0, # EQU INT = 830

PLACEMENT:

0	0	0	99	0	0	0	98	0	0	0	0	0	0	0	0	0	0	0	0	101	0	0	0	100	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	80	112	2	20	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	113	3	21	39	0	0	0	0	0	0	0	95
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	4	22	40	58	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	81	82	83	84	85	86	87	88	89	90	91	106	107	108	109	23	41	59	77	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	114	115	116	117	118	119	120	121	122	123	124	125	126	0	0	42	60	78	110	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	61	79	111	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	103	0	0	0	102	0	0	0	0	0	0	0	0	0	0	105	0	0	0	104	0	0	0	0	0	0	0

TOTAL WIRE UNITS BY NODE:

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TIMING CIRCUIT FOR JIM CURRIE, Z-X-76, REV 2-28-78, PAGE NO. 12

LENGTH= 28, # INT.= 1660, JRSP=2, TOTAL DIST.= 0, # GOOD INT.= 0, # EQU INT = 1660

PLACEMENT:

0	0	0	98	0	0	0	99	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	101	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	47	48	49	50	51	52	53	54	55	56	57	113	3	21	39	117	7	25	43	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	66	67	68	69	70	71	72	73	74	75	76	4	22	40	58	8	26	44	62	0	0	95	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	85	86	87	88	89	90	91	106	107	108	109	23	41	59	77	27	45	63	81	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	118	119	120	121	122	123	124	125	126	0	0	42	60	78	110	46	64	82	114	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	9	10	11	12	13	14	15	16	17	18	19	61	79	111	1	65	83	115	5	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96
0	0	0	28	29	30	31	32	33	34	35	36	37	38	80	112	2	20	84	116	6	24	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
0	0	0	102	0	0	0	103	0	0	0	0	0	0	0	0	0	104	0	0	0	105	0	0	0	0	0	0

TOTAL WIRE UNITS BY NODE:

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

LENGTH= 25, # INT.= 2490, JRSP=2, TOTAL DIST.= 0, # GOOD INT.= 0, # EQU INT = 2490

PLACEMENT:

0	0	0	99	0	0	0	98	0	0	0	0	0	0	0	0	0	0	0	101	0	0	0	100	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	70	71	72	73	74	75	76	4	22	40	58	8	26	44	62	12	30	48	66	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	89	90	91	106	107	108	109	23	41	59	77	27	45	63	81	31	49	67	85	0	0	0	0	0	95
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	122	123	124	125	126	0	0	42	60	78	110	46	64	82	114	50	68	86	118	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	13	14	15	16	17	18	19	61	79	111	1	65	83	115	5	69	87	119	9	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	32	33	34	35	36	37	38	80	112	2	20	84	116	6	24	88	120	10	28	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
0	0	0	51	52	53	54	55	56	57	113	3	21	39	117	7	25	43	121	11	29	47	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96
0	0	0	103	0	0	0	102	0	0	0	0	0	0	0	0	0	0	105	0	0	0	104	0	0	0	0	0

TOTAL WIRE UNITS BY NODE:

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

LENGTH= 22, # INT.= 3320,JRSP=2, TOTAL DIST.= 0, # GOOD INT.= 0, # EQU INT = 3320

PLACEMENT:

0	0	0	98	0	0	0	99	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	101	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	107	108	109	23	41	59	77	27	45	63	81	31	49	67	85	35	53	71	89	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	126	0	0	42	60	78	110	46	64	82	114	50	68	86	118	54	72	90	122	0	0	0	0	95
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	17	18	19	61	79	111	1	65	83	115	5	69	87	119	9	73	91	123	13	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	56	57	38	80	112	2	20	84	116	6	24	88	120	10	28	106	124	14	32	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	55	56	57	113	3	21	39	117	7	25	43	121	11	29	47	125	15	33	51	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96
0	0	0	74	75	76	4	22	40	58	8	26	44	62	12	30	48	66	16	34	52	70	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
0	0	0	102	0	0	0	103	0	0	0	0	0	0	0	0	0	0	104	0	0	0	105	0	0	0	0

TOTAL WIRE UNITS BY NODE:

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

LENGTH= 16, # INT.= 4929, JRSP=2, TOTAL DIST.= 0, # GOOD INT.= 6, # EQU INT = 4840

PLACEMENT:

0	0	0	98	0	0	0	99	0	0	0	0	0	0	0	0	0	0	100	0	0	0	101	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	78	115	5	50	87	119	9	73	72	123	112	4	109	0	108	126	117	63	83	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
93	0	0	65	82	24	88	120	10	28	106	124	14	32	23	0	69	68	17	36	18	22	0	0	95	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	1	25	43	121	11	29	47	125	15	33	51	42	19	113	46	59	77	55	79	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	26	39	62	12	21	48	66	16	34	52	70	61	38	114	7	40	110	41	122	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	45	44	81	84	49	86	85	35	53	71	89	111	57	58	107	74	56	3	116	0	0	0	
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	
0	0	0	8	27	2	31	30	67	118	54	91	90	13	80	76	6	64	20	75	37	60	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	
0	0	0	102	0	0	0	103	0	0	0	0	0	0	0	0	0	104	0	0	0	105	0	0	0	

TOTAL WIRE UNITS BY NODE:

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-26-78,

PAGE NO. 17

LENGTH= 13, # INT.= 7926, JRSP=2, TOTAL DIST.= 0, # GOOD INT.= 63, # EQU INT = 6785

PLACEMENT:

0	0	0	98	0	0	0	99	0	0	0	0	0	0	0	0	0	0	101	0	0	0	100	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	115	17	77	0	1	53	18	45	57	52	59	33	124	76	46	21	122	125	58	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	72	3	6A	23	123	41	11	62	65	78	44	64	5	16	83	70	49	107	71	0	0	0	95
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	112	8	51	6	34	86	63	66	110	119	121	47	88	75	126	79	28	91	56	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	114	0	30	2	84	36	43	73	31	48	81	80	10	61	39	74	35	14	25	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	20	42	19	82	60	15	24	106	108	4	54	32	38	90	37	22	117	85	109	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	102	0	0	0	103	0	0	0	0	0	0	0	0	0	104	0	0	0	105	0	0	0	0

TOTAL WIRE UNITS BY NODE:

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

LENGTH= 10, # INT.= 10486, JRSP=2, TOTAL DIST.= 0, # GOOD INT.= 157, # EQU INT = 7833

PLACEMENT:

0	0	0	99	0	0	0	98	0	0	0	0	0	0	0	0	0	0	0	101	0	0	0	100	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	112	111	126	63	18	119	115	57	72	62	47	50	76	74	51	75	56	23	52	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	53	43	120	0	64	70	49	88	108	121	59	4	46	40	86	55	16	58	123	0	0	95	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	60	6	41	48	9	27	66	44	124	89	122	110	87	35	39	91	67	71	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	7	50	78	42	17	114	2	77	15	125	61	45	11	34	85	12	90	37	81	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	73	0	54	3	82	8	118	65	5	84	38	28	33	117	107	22	14	83	13	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	0
0	0	0	20	31	68	32	29	10	19	113	36	69	80	116	26	79	21	109	25	106	24	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
0	0	0	102	0	0	0	103	0	0	0	0	0	0	0	0	0	0	0	104	0	0	0	105	0	0	0

TOTAL WIRE UNITS BY NODE:

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

LENGTH= 4, # INT.= 18675, JRSP=2, TOTAL DIST.= 421, # GOOD INT.= 427, # EQU INT * 9637

PLACEMENT:

0	0	0	98	0	0	0	99	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	101	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	62	61	89	50	88	55	53	59	52	45	47	76	51	28	70	87	86	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	111	56	60	73	75	48	49	77	119	72	78	58	46	57	71	40	39	16	27	0	0	0	0	0	95
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	112	2	54	126	43	120	74	65	125	121	44	109	106	123	15	110	23	35	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	108	18	42	64	82	63	3	115	4	66	67	122	25	124	11	14	13	91	12	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	107	30	31	114	7	6	41	5	80	68	118	117	38	26	34	36	37	24	22	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96
0	0	0	85	83	29	17	84	19	8	69	113	32	20	116	79	9	10	21	81	90	33	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
0	0	0	103	0	0	0	102	0	0	0	0	0	0	0	0	0	105	0	0	0	104	0	0	0	0	0	0

TOTAL WIRE UNITS BY NODE:

38	0	0	2	0	70	18	12	0	0
0	0	0	0	0	0	0	0	0	0
4	0	0	0	24	27	0	0	0	0
39	0	12	3	0	0	0	0	0	0
0	0	0	0	0	0	12	1	0	0
0	1	0	3	0	24	0	0	J	0
0	0	0	0	12	0	12	0	J	0
0	0	0	0	1	0	4	0	J	0
12	0	1	0	0	0	0	0	0	0
0	0	0	30	0	21	0	0	0	0
0	12	0	0	0	0	0	0	0	0
0	12	12	2	0	0	0	0	0	0
0									

LENGTH= 1, # INT.= 23734, JRSP=3, TOTAL DIST.= 1978, # GOOD INT.= 598, # EQU INT = 9896

PLACEMENT:

0	0	0	48	0	0	0	99	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	101	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	111	73	89	0	0	88	72	53	59	47	58	52	71	87	46	76	70	86	57	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	112	119	49	48	62	56	50	55	61	77	74	78	110	39	16	28	40	45	51	0	0	0	95	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	1	115	120	54	60	63	126	75	125	66	106	65	109	27	44	15	23	35	12	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	114	2	64	43	3	42	67	4	82	122	121	123	14	37	25	13	24	36	11	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	7	29	17	6	18	30	5	108	41	124	68	118	80	26	38	117	22	34	91	0	0	0	0	
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	
0	0	0	85	83	107	84	69	19	31	8	20	32	113	116	9	21	33	10	81	79	90	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	
0	0	0	103	0	0	0	102	0	0	0	0	0	0	0	0	0	104	0	0	0	105	0	0	0	0	

TOTAL WIRE UNITS BY NODE:

82	44	3	19	18	115	31	46	3	0
12	0	0	12	9	9	0	18	1	0
23	20	22	38	57	55	1	19	1	1
77	1	40	18	0	0	0	0	0	0
0	0	0	0	18	0	20	25	20	1
11	21	12	33	0	78	2	11	1	2
18	18	4	39	23	0	3	20	7	0
0	0	0	0	3	14	18	18	0	2
41	0	21	36	0	0	2	0	8	0
17	0	0	75	19	42	17	1	38	38
18	15	1	1	0	36	36	36	36	38
30	6	30	18	19	7	8	0	19	18
14									

LENGTH= 0, # INT.= 24585, JRSP#3, TOTAL DIST.= 2581, # GOOD INT.= 599, # ECU INT. = 9932

PLACEMENT:

0	0	0	98	0	0	0	99	0	0	0	0	0	0	0	0	0	100	0	0	0	101	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	111	73	89	0	0	88	72	59	53	47	58	52	71	46	87	76	70	57	86	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	112	48	119	49	62	56	50	55	61	77	74	78	110	39	16	28	40	45	51	0	0	95
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	115	120	54	60	63	126	125	66	75	106	65	109	27	44	15	23	35	12	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	2	114	64	43	42	3	108	82	4	122	121	123	37	14	25	13	24	36	11	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	7	29	17	6	18	30	5	67	124	41	80	68	118	26	38	117	22	34	91	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96
0	0	0	85	83	107	84	69	19	31	8	20	32	113	116	9	21	33	10	81	79	90	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
0	0	0	103	0	0	0	102	0	0	0	0	0	0	0	0	0	104	0	0	0	105	0	0	0

TOTAL WIRE UNITS BY NODE:

94	58	5	26	26	120	37	53	4	1
19	1	1	19	16	16	1	24	2	1
30	26	29	46	64	62	2	26	2	2
84	2	47	25	1	1	1	1	1	1
1	1	2	1	24	1	27	31	29	1
18	28	13	40	1	110	2	19	1	3
26	23	4	47	31	1	4	29	15	1
1	1	1	1	3	21	25	24	2	4
25	1	28	50	1	2	3	2	9	1
24	1	1	82	24	47	24	2	52	52
1	45	2	2	1	48	48	48	58	58
44	20	44	20	26	14	16	1	27	24
23									

ACTUAL WIRE UNITS * 901 901

TOTAL WIRE UNITS BY NODE:

12	9	5	16	6	50	27	23	4	1
9	1	1	9	6	6	1	4	2	1
20	6	9	16	24	22	2	6	2	2
34	2	17	5	1	1	1	1	1	1
1	1	2	1	4	1	7	21	9	1
8	18	13	30	1	50	2	9	1	3
6	13	4	17	11	1	4	9	5	1
1	1	1	1	3	11	5	4	2	4
15	1	8	5	1	2	3	2	9	1
14	1	1	22	4	17	14	2	6	6
1	15	2	2	1	4	4	4	5	6
7	5	7	10	6	4	6	1	7	4
13									

END OF PLACEMENT.

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-76,

PAGE NO. 23

START OF FIX1 SUBROUTINE:

END OF FIX1 SUBROUTINE.

TIMING CIRCUIT FOR JIM CURRIE, 2-8-76, REV 2-28-78,

PAGE NO. 24

START OF FIX1 SUBROUTINE:

END OF FIX1 SUBROUTINE.

START OF PLACEMENT:

LENGTH= 0, # INT.= 25738, JRSP=3, TOTAL DIST.= 2899, # GOOD INT.= 612, # EQU INT = 10037

PLACEMENT:

0	0	0	98	0	0	0	99	0	0	0	0	0	0	0	0	100	0	0	0	101	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	111	73	89	0	88	0	72	53	59	47	58	76	71	52	87	46	70	57	86	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	77	119	48	49	62	56	50	61	55	74	0	110	39	40	28	16	45	51	0	95
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	65	120	54	60	63	115	75	126	125	66	106	109	27	44	15	35	23	12	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	114	2	64	43	42	3	108	82	4	122	121	123	14	37	25	13	36	24	11	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	112	7	29	17	6	18	30	5	41	67	124	68	118	80	26	38	117	34	22	91	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96
0	0	78	85	83	107	84	69	19	31	8	20	32	113	116	9	21	33	10	81	79	90	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
0	0	0	103	0	0	0	102	0	0	0	0	0	0	0	0	104	0	0	0	105	0	0	0

TOTAL WIRE UNITS BY NODE:

96	130	4	26	26	121	40	51	4	1
21	1	1	18	15	15	1	25	2	1
32	27	29	46	64	65	2	26	2	2
84	2	47	27	1	1	1	1	1	1
1	1	1	1	24	1	27	33	27	1
23	18	8	39	1	106	2	17	2	4
24	25	5	48	30	1	3	26	15	3
1	1	1	1	5	21	35	51	1	2
28	1	29	50	5	2	1	2	5	2
16	1	9	82	30	49	97	75	52	52
1	46	2	2	1	48	48	48	48	52
44	20	44	20	25	74	20	1	26	24
21									

ACTUAL WIRE UNITS = 963 963

TOTAL WIRE UNITS BY NODE:

13	15	4	16	6	51	30	21	4	1
11	1	1	8	5	5	1	5	2	1
22	7	9	16	24	25	2	6	2	2
34	2	17	7	1	1	1	1	1	1
1	1	1	1	4	1	7	23	7	1
13	8	8	29	1	46	2	7	2	4
4	15	5	18	10	1	3	6	5	3
1	1	1	1	5	11	15	11	1	2
18	1	9	5	5	2	1	2	5	2
6	1	9	22	10	19	27	15	6	6
1	16	2	2	1	4	4	4	4	6
7	5	7	10	5	14	10	1	6	4
11									

END OF PLACEMENT.

START OF POST-PLACE SUBROUTINE:

ORIGIN

I
T
V

X

Y DIMENSION ---->

R O W	R O W	R O W	R O W	R O W	R O W	R O W	R O W	R O W	R O W	R O W
#	#	#	#	#	#	#	#	#	#	#
3	4	5	6	7	8	9	10	11		

ROW # 1:

	92	94		93	VDD
				112	78
X	98	111	1	114	7
		73	77	65	2
D		89	119	120	64
I			48	54	43
M	99	88	49	60	42
E			62	63	3
N		72	56	115	108
S		53	50	75	82
I		59	61	126	4
O		47	55	125	122
N		58	74	66	121
		76		106	123
I		71	110	109	14
I		52	39	27	37
I	100	87	40	44	25
					38
					33
					103
					102
					104

V	46	28	15	13	117	10	
	70	16	35	36	34	81	
	57	45	23	24	22	79	
101	86	51	12	11	91	90	105
GND		95			96		97

ROW # 2.

END OF POST-PLACE SUBROUTINE.

START OF ROUTE FUNCTION

START SMASHI

CELL RE-ORIENTATION / PIN RE-ASSIGNMENT:

ELEMENT NUMBER	ROW / ORIENT.	PIN RE-ASSIGNMENT WAS CHANGED TO	
2	-7		
3	-7		
5	-8		
6	-8		
8	-9		
9	-9		
11	-7		
12	-6		
16	-5		
18	-8		
19	-9		
29	-8		
36	-7	3 4	4 3
37	-7		
40	-5		
41	-8		
43	-7		
44	6	3 4 5 6	5 6 3 4
47	-4		
49	-5		
53	-4		
57	-4		

58	-4
61	-5
62	-5

CELL RE-ORIENTATION / PIN RE-ASSIGNMENT:

ELEMENT NUMBER	ROW / ORIENT.	PIN RE-ASSIGNMENT WAS CHANGED TO	
63	-6		
64	-7		
65	6	3 4	4 3
66	-6	3 4	4 3
72	-4		
77	5	3 4 5	4 5 3
80	-8		
83	9	3 4	4 3
84	9	4 4	4 3
85	-9		
86	-4		
87	-4		
89	-4		
107	-9		
108	-7		
116	-9		
118	-8		
119	-5		
120	-6		
121	-7		

123

-7

END SMASHI.

START OF CENTER ROUTING:

END OF CENTER ROUTING.

START OF SIDE ROUTING:

END OF SIDE ROUTING.

END ROUTE FUNCTION.

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-78,

PAGE NO. 30

START OF ART FUNCTION

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-78,

PAGE NO. 31

START ANALC1
END ANALC1.

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-78,

PAGE NO. 32

START ANALSI
END ANALSI.

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-78,

PAGE NO. 33

START PWR1
END PWR1.

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-78,

PAGE NO. 34

START SORT1
END SORT1.

TIMING CIRCUIT FOR JIM CURRIE, 2-X-76, REV 2-28-78,

PAGE NO. 35
START ART1

TIMING CIRCUIT FOR JIM GURRIE, 2-X-76, REV 2-28-78,
ARTWORK INSTRUCTION DATA:

PAGE NO. 36

END ART1.

CHIP STATISTICS:

X-STEP = 213, Y-STEP = 169

6.46 INCHES OF METAL, .90 INCHES OF TUNNEL, AND 379 TUNNEL ENDS.

CELL ROW:	LINEAR MILS:	TOTAL LINEAR MILS:
4	129.4	
5	126.4	
6	126.1	
7	127.4	
8	125.1	
9	127.2	

761.6

CHIP AREA SQ. MILS	CFLL ---- SQ. MILS	AREA 0/0	R.P. ---- SQ. MILS	AREA 0/0	WIRING -- SQ. MILS	AREA 0/0	WIRING EFFECT SQ. MILS	EFFECT 0/0
35997.0	10662.4	29.6	14930.8	41.5	10403.9	28.9	6226.1	59.8

PATTERN NUMBER	NUMBER DEVICES	TIMES USED	TOTAL DEVICES
1120	4	23	
1130	6	2	
1220	4	3	
1230	6	1	
1240	8	1	
1310	2	3	
1330	6	18	
1520	2	20	
1620	6	3	
1720	6	3	
1820	14	23	
1830	10	6	
2310	8	6	
9020	0	5	
9030	0	9	

750

NODE LIST:

NODE NO.	MODF NO.	CAP. PF	NODE WT.	ELEM	PIN	ELEM	PIN	ELEM	PIN	...
1	180	2	1	2	2	3	94	2		
2	283	2	112	2	1	3	93	2		
3	68	1	2	2	3	3	42	3	64	3
4	336	1	3	2	4	3	82	3	120	3
5	128	1	4	2	5	4	67	4		
6	985	1	118	2	4	4	86	3	87	3
7	623	1	124	2	6	2	7	2	8	2
8	529	1	123	2	12	2	13	2	14	2
9	124	1	5	3	17	3				
10	94	1	6	3	18	3				
11	163	1	7	3	19	3				
12	23	1	8	3	20	3				
13	23	1	9	3	21	3				
14	174	1	10	3	22	3				
15	106	1	11	3	23	3				
16	136	1	12	3	24	3				
17	34	1	13	3	25	3				
18	115	1	14	3	26	3				
19	39	1	15	3	27	3				
20	98	1	16	3	28	3				
21	413	1	113	2	6	5	7	5	8	5
22	230	1	17	4	6	4	29	5	114	5
23	195	1	18	4	7	4	30	5	114	4
24	371	1	19	4	8	4	31	5	114	3
25	553	1	20	4	9	4	32	5	44	5
26	587	1	116	2	10	5	11	5	12	5
27	41	1	21	4	10	4	33	5		
28	179	1	22	4	11	4	34	5		
29	82	1	23	4	12	4	35	3		
30	50	1	24	4	13	4	36	4		
31	557	1	117	2	14	5	15	5	16	5
32	50	1	25	4	14	4	37	5		
33	389	1	26	4	15	4	38	5	44	6
34	193	1	27	4	16	4	39	5	44	3
35	67	1	29	2	17	2				
36	47	1	30	2	18	2				
37	13	1	31	2	19	2				
38	52	1	32	2	20	2				
39	42	1	33	2	21	2				
40	45	1	34	2	22	2				
41	20	1	35	2	23	2				
42	38	1	36	2	24	2				
43	38	1	37	2	25	2				
44	47	1	38	2	26	2				
45	95	1	39	2	27	2				
46	87	1	40	2	28	2				
47	170	1	28	4	40	3	44	4	45	4
48	427	1	41	2	113	3	116	3	117	3
49	150	1	42	4	41	3				
50	43	1	43	2	42	2				
51	254	1	115	2	43	3				
52	157	1	65	2	43	4	64	2		
53	121	1	44	2	115	4				

54	667	1	119	2	46	2	47	2	48	2	49	2	50	2	45	2		
55	52	1	45	3	51	3												
56	1031	1	125	2	46	5	57	4	58	4	67	3	47	5	59	4	45	5
57	107	1	46	3	52	3												
58	177	1	51	4	46	4	57	3	70	3								

NODE LIST:

NODE NO.	CAP. PF	NODE WT.	ELEM	PIN	ELEM	PIN	ELEM	PIN	...
59	83	1	47	3	53	3			
60	140	1	52	4	47	4	58	3	71 3
61	109	1	48	3	54	3			
62	282	1	53	4	48	4	59	3	72 3
63	105	1	49	3	55	3			
64	316	1	54	4	49	4	60	3	73 3
65	355	1	126	2	50	5	61	4	62 4 48 5 60 4 49 5 120 2
66	80	1	50	3	56	3			
67	147	1	55	4	50	4	61	3	74 3
68	176	1	56	4	62	3	75	3	
69	103	1	57	2	51	2			
70	119	1	58	2	52	2			
71	38	1	59	2	53	2			
72	82	1	60	2	54	2			
73	47	1	61	2	55	2			
74	77	1	62	2	56	2			
75	120	1	63	2	66	4	125	3	126 3
76	223	1	64	4	63	3			
77	252	1	109	2	65	4	110	3	
78	590	1	78	2	65	3			
79	57	1	66	2	106	3			
80	85	1	106	2	66	3	109	3	
81	316	1	67	2	69	3			
82	15	1	68	2	118	3			
83	171	1	82	4	80	3	68	3	
84	69	2	69	2	84	4	102	2	
85	76	1	70	2	76	5			
86	91	1	86	4	70	4			
87	77	1	71	2	76	4			
88	96	1	87	4	71	4			
89	70	1	72	2	76	3			
90	16	1	88	4	72	4			
91	90	1	73	2	77	3			
92	16	1	89	4	73	4			
93	126	1	74	2	77	5			
94	450	1	90	4	74	4			
95	175	1	75	2	77	4			
96	404	1	91	4	75	4			
97	628	1	76	2	78	4			
98	388	1	77	2	78	3			
99	68	2	79	2	105	2	81	3	
100	94	2	81	2	104	2			
101	11	1	108	2	82	2			
102	353	1	83	2	85	3	108	3	
103	108	1	107	2	83	4	84	3	
104	139	1	85	2	107	4	83	3	
105	87	1	84	2	107	3			
106	71	2	103	2	85	4			
107	70	2	101	2	86	2			
108	52	2	100	2	87	2			
109	69	2	99	2	88	2			
110	38	2	98	2	89	2			
111	136	2	97	2	90	2			

112	100	2	96	2	91	2		
113	132	2	92	2	111	3		
114	177	2	95	2	110	4		
115	132	1	110	2	109	4	106	4
116	370	1	111	2	112	3		

NODE LIST:

NODE NO.	CAP. PF	NODE WT.	ELEM	PIN	ELEM	PIN	ELEM	PIN	...
117	190	1	114	2	115	3			
118	13	1	121	4	122	3			
119	128	1	122	2	123	3	124	3	
120	109	1	120	4	119	3			
121	237	1	80	2	79	3			

	MMMM M M M MMM	72	2	739
	M M M M M			
	M MMMM M ETTT	53	4	763
	M M M M M			
MM	M MMMM M M			774
	M M M M M			
	M M E T X X X T T T T	53	3	787
	M M M M M			
	M M M M E T T T T	53	2	806
	M M M M M M			
	M M M M M M			831
	M M M M M M			
	M M M M E T T T T	59	2	848
	M M M M M			
	M M M M M E T T T T	59	3	867
	M M M M M			
	M M M M M M	59	4	886
	M M M M M M			
	M M M M M E T T T E	47	5	911
	M M M M M			
	M M M M E T T T T	47	4	930
	M M M M M M			
	M M E T T T T T T T T	47	3	949
	M M M M M M			
	M M E T T T T T T T T	47	2	968
	M M M M M M			
	M M M E T T T T T	58	4	991
	M M M M M M			
	M M M M E T T T T	58	3	1010
	M M M M M M			
	E T T T T T T T T T T T T	58	2	1029
	M M M M M M M			
	M M M M M M M			1040
	M M M M M M M			
	M E T T T T T T T T T T T	76	2	1051
	M M M M M M			
	M M M M M M M M	76	3	1070
	M M M M M			
	M E T T T T T T T T T T T	76	4	1089
	M M M M M M			
	M M M M M M M M M	76	5	1108
	M M M M M M M			
	M E T T T T T T T T T T T	71	2	1135
	M M M M M M			
	M M M M E T T T T	71	3	1154
	M M M M M M			
	M E T T T T T T T T T T T	71	4	1173
	M M M M M M M			
	M M M M M M M			1192
	M M M M M M M			
	M M M M M M M			1211
	M M M M M M M			
	E T T T T T T T T T T T T	52	2	1232
	M M M M M M			
	E T T T T T T T T T T T T	52	3	1251
	M M M M M M M			
	M M M M M E T T T T	52	4	1275
	M M M M M M			
	M M M M M M M			1287
	M M M M M M			
MM	M E T T T X X X T T T T T	87	4	1297


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742 62 2 TTTTTTTTTTTE M V
      M M M M M M M V
755    M M M M M M M V
      M M M M M M M V
774    M M M M M M M V
      M M M M M M M V
784 56 2 TTTTTTTTTTTE M V
      M M M M M M M V
803 56 3 TTTTTTTTTTTE M V
      M M M M M M M V
827 56 4 TTTTTTTTTTETTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
      M M M M M M M V
851 50 2 TTTTTTTE M ETTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
      M M M M M M V
870 50 3 TTTTTTTTTTEMM VVV
      M M M M M V
889 50 4 TTTTTTTTTTE VVV
      M M M M M V
908 50 5 M M M M M M M V
      M M M M M M M V
933 61 4 TTTTTETTTTTTEMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
      M M M M M V
952 61 3 TTTTTTTTTTE V
      M M M M M V
971 61 2 TTTTTTE M M V
      M M M M M V
983    M M M M M E
      M M M M M V
1002   M M M M M V
      M M M M M V
1013 55 2 TTTTTTE M M V
      M M M M M V
1032 55 3 TTTTE MMM M V
      M M M M V
1056 55 4 TTTTETTEMM V
      M M M M V
1080 74 2 MMM M M V
      M M M M V
1099 74 3 MMMMM M VVV
      M M M M V
1118 74 4 MMMMETTTEMMM V
      M M M M V
1135   MMM M V
      M M M V
1160 110 2 MMMMMMETTTTTTTTTTEMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
      M M M M V
1179 110 3 MMMMMMETTTTTTTTTTEMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
      M M M M V
1198 110 4 MMMMMMETTTE M V
      M M M M V
1211   M M M M V
      M M M M V
1222 39 2 MMMMMMETTTTTTTTTTEMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
      M M M M V
1241 39 3 MMMMMMETTTTTTTTTTEMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
      M M M M V
1260 39 4 M M M M M V
      M M M M M V
1280 40 4 MMMMM M M M M V
      M M M M M V
1299 40 3 MMETTTTTTTTTTTXXTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT

```


8 9 0 0 1 2 2 3 4 5 5 6 6
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 4 1 8 5 2 9 6 3 0 7 4 2

CENTER SECTION * 7

ELEM PIN

```

0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0
9 9 9 9 9 9 9 9 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9
4 4 4 5 6 6 7 8 8 9 0 1 1 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 9
2 0 7 4 1 8 5 2 9 6 3 0 7 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 6
348                               M M
                               M M
348       MMMMMMMMMMMMMM M M E
                               M M M V
355       MMMMMMMMMMMMMM M M M V
                               M M M M V
362       MMMMMMMMMM M M M M V
                               M M M M M V
369       MMMMMMMM M M M M M V
                               M M M M M M V
376       MMMMM M M M M M M M V
                               M M M M M M M V
383       MMM M M M M M M M M V
                               M M M M M M M M V
394       M M M M M M M M M V
                               M M M M M M M M V
414 114   2 TTTTTE M M M M M V
                               M M M M M M M M V
433 114   3 TTTTTXXXTTTTE M V
                               M M M M M M M V
452 114   4 TTTTTTTXXXTTE M V
                               M M M M M M M V
471 114   5 TTTTTTTTTXXXTTTTTTEMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
                               M M M M M M M M V
491 2     3 MMM M M M M ETTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
                               M M M M M M M M V
510 2     2 MMM M M M M MMMM V
                               M M M M M M V
531 64    4 TTTTTTE M M M VVVVV
                               M M M M M M V
555 64    3 MMM M MMM M M V
                               M M M M M M V
574 64    2 TTTTE M MMM M V
                               M M M M M M V
584       M M M M MMM V
                               M M M M M M V
603       M M M M M VVV
                               M M M M M M V
614 43    4 TTTTE M M M V
                               M M M M M M V
633 43    3 TTTTEMM M M V
                               M M M M M M V
652 43    2 TTTTE M M V
                               M M M M M M V
679       M M M M V
                               M M M M V

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4 4 4 5 6 6 7 8 8 9 0 1 1 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 9
2 0 7 4 1 8 5 2 9 6 3 0 7 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 6

CENTER SECTION = 9

ELEM PIN

```

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
3 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
4 4 4 5 6 7 7 8 9 9 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
4 2 9 6 3 0 7 4 1 8 5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

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348

M M M M M

362

MMMMMMMMM M M M M M

M M M M M M

369

MMMMMMMMM M M M M M M

M M M M M M M

376

MMMMM M M M M M M M

M M M M M M M M

383

MMM M M M M M M M M

M M M M M M M M M

394

M M M M M M M M M

M M M M M M M M M

417 78

2 TTTTTTTTTTTTTTE M M

M M M M M M M M M

436 78

3 TTTTTTTTTTTTTTE M M M

M M M M M M M M M

455 78

4 TTTTTTTTTTTTTTE M M M M

M M M M M M M M M

479 85

4 TTTTTTTTTTTTTTE M M

M M M M M M M M M

498 85

3 TTTTTTTTTTE M M

M M M M M M M M M

517 85

2 TTTTTTTTTTTTTTE M

M M M M M M M M M

527

M M M M M M M M M

M M M M M M M M M

542 83

2 TTTTTTTTTTE M M M

M M M M M M M M M

561 83

3 TTTTTTTTTTTTTTE M

M M M M M M M M M

580 83

4 TTTTTTTTTTE M M

MM

M M M M M M M M M

600 107

4 TTTTTTTTTTTTTTE

M M M M M M M M M

619 107

3 TTTTTTTTTTTTTTE

M M M M M M M M M

638 107

2 TTTTTTTTTTE M M

M M M M M M M M M

662 84

2 TTTTTTTTTTTTTTE

M M M M M M M M M

681 84

3 TTTTTTTTTTE M

M M M M M M M M M

700 84

4 M M M M M M

M M M M M M M M M

720 69

2 TTTTTTTTTTTTTTE

M M M M M M M M M

739	69	3	TTTTTTE	M	M	M
				M	M	M
760	19	4	TTTTTTE	TTTE	MM	M
				M	M	M
774				M	M	M
				M	M	M
784	19	3	MMM	M	M	M
				M	M	M
803	19	2	MMM	M	M	M
				M	M	M
831				M	M	M
				M	M	M
845	31	2	MMM	M	M	M
				M	M	M
864	31	3	MMETTE	M		
				M	M	M
883	31	4	M	M	M	MM
				M	M	M
908	8	5	TTTT	M		
				M	M	M
927	8	4	MMM	M	M	
				M	M	
946	8	3	MMM	M	M	
				M	M	M
965	8	2	TTTTTE			
				M	M	M
983				M	M	MM
				M	M	M
1008	20	2	TTTTTE	M		
				M	M	M
1027	20	3	MMM	M	M	M
				M	M	M
1040				M	M	M
				M	M	M
1051	20	4	MMM	M	M	M
				M	M	M
1074	32	2	TTTTTE	M		
				M	M	M
1093	32	3	MMM	M	MM	
				M	M	M
1112	32	4	TTTT	M		
				M	M	M
1132	113	2	M	M	M	
				M	M	
1151	113	3	M	M	M	
				M	M	M
1171	116	3	TTTTTTTE			
				M	M	M
1190	116	2	M	M	M	M
				M	M	M
1215	9	5	TTTT	M	M	
				M	M	M
1234	9	4	MMETTTTTTE	MM		
				M	M	M
1253	9	3	MMM	M	M	MM
				M	M	M
1272	9	2	TTTTTE	MM	M	M
				M	M	M
1287				M	MM	M
				M	M	M
1315	21	2	TTTT	M	M	M
				MM		

		739	
		760	
MM	102	2	778
		784	
		803	
		831	
		845	
		864	
		883	
		908	
		927	
		946	
		965	
		983	
		1008	
		1027	
		1040	
		1051	
		1074	
		1093	
		1112	
		1132	
		1151	
		1171	
		1190	
		1215	
		1234	
		1253	
		1272	
		1287	
MM	104	2	1302

1268	M M M	M M M	1268
1261	M M M	M M M	1261
1254	M M M	M M V	1254
1247	M M M	M M V	1247
1240	M M M	M M V	1240
1233	M M M	M M V	1233
1226	M M M	M M V	1226
1219	M M M	M M V	1219
1212	M M M	M M V	1212
1205	M M M	M M V	1205
1198	M M M	M M V	1198
1191	M M M	M M V	1191
1184	M M M	M M V	1184
1177	M M M	M M V	1177
1170	M M M	M M V	1170
1163	M M M	M M V	1163
1156	M M M	M M V	1156
1149	M M M	M M V	1149
1142	E E E	E E E	1142
1135	T T T	T T T	1135
1128	E E E	E E E	1128
1122	M M M	M M M	1122
1115	M M M	M M M	1115
1108	M M M	M M M	1108
1101	M M M	M M M	1101
1094	M M M	M M M	1094
1087	M M M	M M M	1087
1080	M M M	M M M	1080
1073	M M M	M M M	1073
1066	M M M	M M M	1066
1059	M M M	M M M	1059

416	M M M	V	416
409	M M M	V	409
402	M M M	V	402
395	M M M	V	395
388	M M M	V	388
381	M M M	V	381
374	M M M	V	374
367	M M M	V	367
360	M M M	V	360
353	M M M	V	353
346	M M M	V	346
339	M M M	V	339
332	M M M	V	332
325	M M M		325
318	M M M		318
311	M M M		311
304	M M M		304
297	M M M		297
290	M M M		290
283	M M M		283
276	M M M		276
269	M M M		269
262	M M M		262
255	M M M		255
248	M M M		248
241	M M M		241
234	M M M		234
227	M M M		227
220	M M	MMMMMMMMMMMMMMMM	220
213	M	MMMMMMMMMMMMMMMMMMMM	213
206	M	MMMMMMMMMMMMMMMMMMMM	206

RIGHT SIDE, ROW = 2

ELEM PIN

	1 1	
	7 7 7 7 7 8	
	2 3 5 7 9 1 2 3 5 6 5	
	6 9 7 5 3 1 9 6 4 1 9	
1433		1433
1426		1426
1419		1419
1412		1412
1405		1405
1398	MMMMMMMMMMMMMM M	1398
1391	MMMMMMMMMMMMMM M	1391
	M M	
1384	MMMMMMMMMMMM M M	1384
1373	M M M	1373
	M M M	
1366	M M M	1366
	M M M	
1359	M M M	1359
	M M M	
1352	M M M	1352
	M M M	
1345	M M M	1345
	M M M	
1338	M M M	1338
	M M M	
1331	M M M	1331
	M M M	
1324	M M M	1324
	M M M	
1317	M M M	1317
	M M M	
1310	M M M	1310
	M M M	
1303	M M M	1303
	M M M	
1296	M M M	1296
	M M M	
1289	M M M	1289
	M M M	
1282	M M M	1282
	M M M	
1275	M M M	1275
	M M M	
1268	M M M	1268
	M M M	

409	V	M	409
	V	M	
402	V	M	402
	V	M	
395	V	M	395
	V	M	
388	V	M	388
	V	M	
381	V	M	381
	V	M	
374	V	M	374
	V	M	
367	V	M	367
	V	M	
360	V	M	360
	V	M	
353	V	M	353
	V	M	
346	V	M	346
	V	M	
339	V	M	339
	V	M	
332	V	M	332
		M	
325		M	325
		M	
318		M	318
		M	
311		M	311
		M	
304		M	304
		M	
297		M	297
		M	
290		M	290
		M	
283		M	283
		M	
276		M	276
		M	
269		M	269
		M	
262		M	262
		M	
255		M	255
		M	
248		M	248
		M	
241		M	241
		M	
234		M	234
		M	
227		M	227
		M	
220		M	220
		M	
213	MMMMMMMM		213
206			206
199			199

NODE CROSSOVER COUNT:

NODE NUMBER	NUMBER CROSSOVERS
1	16
2	20
3	7
4	19
5	14
6	60
7	52
8	28
9	14
10	12
11	21
12	2
13	2
14	12
15	7
16	7
17	2
18	9
19	7
20	11
21	42

NODE CROSSOVER COUNT:

NODE NUMBER	NUMBER CROSSOVERS
64	30
65	40
66	10
67	10
68	20
69	6
70	12
71	2
72	12
73	4
74	10
75	12
76	21
77	35
78	16
79	6
80	9
81	40
82	1
83	16
84	5

NODE CROSSOVER COUNT:

NODE NUMBER	NUMBER CROSSOVERS
85	13
86	9
87	9
88	12
89	13
90	0
91	4
92	0
93	24
94	23
95	13
96	23
97	22
98	14
99	4
100	4
101	0
102	21
103	15
104	17
105	12

NODE CROSSOVER COUNT:

NODE NUMBER	NUMBER CROSSOVERS
106	6
107	5
108	5
109	4
110	3
111	5
112	8
113	5
114	12
115	11
116	16
117	19
118	0
119	7
120	11
121	16

END OF PLOT.
END OF ART FUNCTION.

START OF DEBUG SUBROUTINE.

ICAP(IX):

I + I	1	2	3	4	5	6	7	8	9	10
0	16	20	7	19	14	60	52	28	14	12
10	21	2	2	12	7	7	2	9	7	11
20	42	28	28	25	21	35	4	18	5	5
30	34	4	14	15	8	12	0	4	2	4
40	2	2	2	4	7	12	19	27	13	2
50	21	10	19	61	3	75	12	9	6	14
60	13	18	16	30	40	10	10	20	6	12
70	2	12	4	10	12	21	35	16	6	9
80	40	1	16	5	13	9	9	12	13	0
90	4	0	24	23	13	23	22	14	4	4
100	0	21	15	17	12	6	5	5	4	3
110	5	8	5	12	11	16	19	0	7	11
120	16	0	0	0	0	0	0	0	0	0

INFO(IX,IY):

I	J =	1	2	3	4	5	6	7
1		4	11	4386	4865	0	6	47
2		5	13	4502	5145	0	-7	47
3		9	13	4769	5145	0	-7	47
4		12	13	4892	5145	0	7	52
5		10	17	4968	5267	0	-8	40
6		7	17	4739	5267	0	-8	40
7		4	17	4425	5267	0	8	40
8		11	19	4960	5547	0	-9	40
9		16	19	5267	5547	0	-9	40
10		19	19	5411	5547	0	9	40
11		22	13	5660	5145	0	-7	40
12		22	11	5647	4865	0	-6	40
13		19	13	5346	5145	0	7	40
14		16	13	5117	5145	0	7	40
15		19	11	5333	4865	0	6	40
16		20	7	5481	4729	0	-5	40
17		6	17	4570	5267	0	8	64
18		8	17	4823	5267	0	-8	64
19		9	19	4815	5547	0	-9	64
20		12	19	4960	5547	0	9	64
21		17	19	5267	5547	0	9	64
22		21	17	5469	5267	0	8	64
23		21	11	5478	4865	0	6	64
24		21	13	5491	5145	0	7	64
25		18	13	5262	5145	0	7	64
26		17	17	5228	5267	0	8	64
27		17	11	5153	4865	0	6	64
28		19	7	5312	4729	0	5	64

29	5	17	4570	5267	0	-8	1
30	9	17	4823	5267	0	8	1
31	10	19	4815	5547	0	9	1
32	13	19	5044	5547	0	9	1
33	18	19	5351	5547	0	9	1
34	20	17	5409	5267	0	8	1
35	20	11	5418	4865	0	6	1
36	20	13	5491	5145	0	-7	1
37	17	13	5262	5145	0	-7	1
38	18	17	5310	5267	0	8	1
39	17	7	5192	4729	0	5	1
40	18	7	5312	4729	0	-5	1
41	11	17	5007	5267	0	-8	47
42	8	13	4646	5145	0	7	64
43	7	13	4646	5145	0	-7	58
44	18	11	5237	4865	0	6	27
45	21	7	5481	4729	0	5	40
46	19	5	5352	4449	0	4	40
47	13	5	4963	4449	0	-4	40
48	7	7	4506	4729	0	5	40
49	8	7	4676	4729	0	-5	40
50	11	7	4820	4729	0	5	40
51	22	7	5566	4729	0	5	64
52	17	5	5184	4449	0	4	64
53	11	5	4818	4449	0	-4	64
54	7	11	4572	4865	0	6	64
55	13	7	4965	4729	0	5	64
56	10	7	4736	4729	0	5	64
57	21	5	5577	4449	0	-4	1
58	14	5	5023	4449	0	-4	1
59	12	5	4818	4449	0	4	1
60	8	11	4656	4865	0	6	1
61	12	7	4965	4729	0	-5	1
62	9	7	4736	4729	0	-5	1
63	9	11	4755	4865	0	-6	47
64	6	13	4586	5145	0	-7	64
65	5	11	4425	4865	0	6	14
66	14	11	5033	4865	0	-6	1
67	12	17	5007	5267	0	8	14
68	14	17	5109	5267	0	8	35
69	8	19	4692	5547	0	9	47
70	20	5	5437	4449	0	4	76
71	16	5	5104	4449	0	4	76
72	10	5	4734	4449	0	-4	76
73	5	5	4406	4449	0	4	76
74	14	7	5049	4729	0	5	76
75	11	11	4815	4865	0	6	76
76	15	5	5023	4449	0	4	7
77	5	7	4386	4729	0	5	7
78	3	19	4386	5547	0	9	14
79	21	19	5535	5547	0	9	47
80	16	17	5226	5267	0	-8	35
81	20	19	5496	5547	0	9	47
82	11	13	4808	5145	0	7	64
83	5	19	4512	5547	0	9	58
84	7	19	4632	5547	0	9	1
85	4	19	4512	5547	0	-9	52
86	22	5	5661	4449	0	-4	70
87	18	5	5352	4449	0	-4	70
88	8	5	4570	4449	0	4	70
89	6	5	4570	4449	0	-4	70

90	22	19	5574	5547	0	9	70
91	22	17	5553	5267	0	8	70
92	1	2	4153	4648	1	-1	86
93	1	18	4153	5148	3	1	82
94	1	7	4153	4848	2	-1	82
95	25	7	5841	4848	2	-2	86
96	25	18	5841	5148	3	2	86
97	25	22	5841	5348	4	2	86
98	4	1	4572	4374	1	-3	86
99	8	1	4772	4374	2	-3	86
100	18	1	5272	4374	3	3	86
101	22	1	5472	4374	4	3	86
102	8	23	4772	5622	2	-10	82
103	4	23	4572	5622	1	-10	86
104	18	23	5272	5622	3	10	82
105	22	23	5472	5622	4	10	82
106	15	11	5033	4865	0	6	1
107	6	19	4632	5547	0	-9	1
108	10	13	4808	5145	0	-7	35
109	16	11	5093	4865	0	6	58
110	16	7	5129	4729	0	5	52
111	4	5	4367	4449	0	4	47
112	3	17	4386	5267	0	8	47
113	14	19	5104	5547	0	9	47
114	4	13	4386	5145	0	7	20
115	10	11	4755	4865	0	6	1
116	15	19	5182	5547	0	-9	47
117	19	17	5370	5267	0	8	47
118	15	17	5187	5267	0	-8	47
119	6	7	4506	4729	0	-5	47
120	6	11	4572	4865	0	-6	64
121	14	13	5078	5145	0	-7	64
122	13	13	4955	5145	0	7	47
123	15	13	5117	5145	0	-7	47
124	13	17	5078	5267	0	8	47
125	13	11	4934	4865	0	6	47
126	12	11	4895	4865	0	6	47

IP(1x):

I + J	1	2	3	4	5	6	7	8	9	10
0	100	50	120	215	330	480	670	900	1250	1750
10	2400	3200	4100	1	1	5400	5	35	0	45
20	50	10	15	20	25	55	60	2	-1	7
30	0	3	6	2	1	1	1	0	1	0
40	0	0	2700	0	0	0	0	0	0	0
50	0	0	0	1	3	0	1	0	1	1
60	2	1	60	0	0	2	0	0	1	1
100	40	2	1	2	4	0	2	10	1	6
110	0	1	4	3	1	1	2	4	2	3
120	100	0	5	0	3	1	2	2	1	1
130	100	0	0	0	0	0	0	0	0	0
140	50	7	19	200	450	350	5000	2	90	5
150	140	2	5	21	8	26	6	5	0	10
160	1	6	0	0	0	0	4	0	0	0
170	2	21	3	7	0	0	0	0	0	0

190	20	4153	3	7	0	0	121	4445	0	0
200	279	1100	0	0	0	1	2	22	0	0
210	0	5841	6	1	0	0	121	4445	0	0
220	279	1100	0	0	0	25	2	22	0	0
230	0	4374	5	2	0	0	54	4313	0	0
240	131	1300	0	0	0	1	4	22	0	0
250	0	4449	0	4	3	4	66	4367	64	136
260	134	1294	4346	5681	0	5	4	22	4	4332
270	5702	4729	5	2	3	3	67	4366	64	136
280	133	1264	4346	5681	0	4	4	22	8	4332
290	5702	4885	0	4	6	5	67	4386	65	136
300	133	1261	4365	5680	1	11	4	22	10	4330
310	5708	5145	5	2	6	5	67	4386	65	136
320	134	1274	4365	5680	0	13	4	22	14	4330
330	5708	5267	0	4	4	5	67	4386	65	136
340	132	1251	4365	5678	0	17	3	22	16	4344
350	5706	5547	5	2	4	5	67	4386	65	136
360	133	1272	4365	5678	0	19	3	22	20	4344
370	5706	5622	0	4	0	0	64	4313	0	0
380	131	1300	0	0	0	23	4	22	0	0
390	0	0	5	2	0	0	0	0	0	0
410	0	0	0	4	0	0	0	0	0	0
430	0	0	5	2	0	0	0	0	0	0
450	0	0	0	4	0	0	0	0	0	0
470	0	0	5	2	0	0	0	0	0	0
490	0	0	0	4	0	0	0	0	0	0
510	0	0	5	2	0	0	0	0	0	0
530	0	0	0	4	0	0	0	0	0	0
550	0	0	5	2	0	0	0	0	0	0
570	0	0	0	4	0	0	0	0	0	0
590	0	0	5	2	0	0	0	0	0	0
610	0	0	0	4	0	0	0	0	0	0
630	0	0	5	2	0	0	0	0	0	0
650	0	0	0	4	0	0	0	0	0	0
680	120	2130	1690	50	170	150	100	10	2200	200
690	18	30	60	300	260	4	120	260	0	170
700	150	1	170	100	7	50	1	0	30	1
710	100	100	0	100	20	0	0	0	270	1065
720	845	0	60	14	80	10	10	17	70	14
730	14	1065	845	100	220	360	461	562	5	2
740	537	309	733	4	68	0	0	0	14	90
750	0	3	3	8	8	12	12	3	3	2
760	2	1	0	210	210	210	210	221	221	0
770	16	10	0	0	1	0	0	0	0	5
800	40	9030	9030	9000	9100	9510	9500	9250	9600	9100
810	9110	9310	9320	9210	9220	9230	9240	9450	9440	9800
840	20	2	7	38	4638	6	8955	0	379	0

IPIN(IX, IY):

I	J	1	2	3
1		1120	5	7
3		10	3	820
4		1	22	1300
5		1	41	1300
6		48	60	140

7			
9	1130	6	14
10	10	1	1180
11	1	20	1710
12	1	39	1710
13	1	58	1710
14	-6	61	140
16	1220	5	20
17	10	4	1040
18	1	23	1170
19	1	42	1170
20	-4	63	140
22	1230	6	27
23	10	1	500
24	1	20	1000
25	1	39	1000
26	1	58	1000
27	-6	77	140
29	1240	7	35
30	10	1	850
31	1	20	1540
32	1	39	1540
33	1	58	1540
34	1	77	1540
35	-8	96	140
37	1310	4	40
38	10	1	1200
39	1	20	1800
40	-2	39	140
42	1330	6	47
43	1	4	1370
44	10	23	1340
45	2	42	1370
46	3	61	2320
47	-6	85	140
49	1520	4	52
50	10	1	1790
51	1	20	3940
52	-2	39	140
54	1620	5	58
55	10	4	1270
56	1	23	1170
57	1	42	1170
58	-6	63	140
60	1720	5	64
61	10	3	1270
62	1	22	1310
63	1	41	1310
64	-6	60	140
66	1820	5	70
67	1	21	500
68	2	40	1000
69	10	64	350
70	-14	84	140
72	1830	5	76
73	1	21	1500
74	2	40	600
75	10	64	1200
76	-10	84	140
78	2310	5	82
79	10	4	900
	1	23	1550

80	1	42	1550
81	-8	80	140
82	9020	3	80
84	1	12	300
85	0	76	80
86	9030	3	0
88	10	12	300
89	0	76	80

LIM(IX):

I + I	1	2	3	4	5	6	7	8	9	10
0	0	400	0	0	4000	0	10000	0	2	10000
10	10000	500	7	1	2	3	4	5	6	7
20	9000	59	200	3	3	1	2	3	0	1000
30	0	1	0	0	500	1	101	141	191	241
40	801	841	0	0	0	0	0	0	9	4000
50	6	1	2	3	4	5	6	7	0	1
60	0	105	0	0	351	0	612	0	44	100
70	70	3	3	2	1	1	2	0	0	0
80	0	104	104	963	371	81	4	0	0	0
90	0	0	0	0	1	0	100	24	94	8
100	0	100	461	360	220	562	3714	0	5622	4153
110	5841	4374	100	70	100	99	24	10	29	2
120	28	1	28	121	279	963	67	133	66	134
130	4	237	0	198	58	56	59	31	112	291
140	5601	3	7	9	19	0	0	0	0	0
150	0	0	0	12000	100	200	2	198	1	199
160	30	60	2	58	4	56	1	59	3	57
170	29	-3	4	300	42	2528	72	8	2000	3
180	0	2	1	0	0	18	1	29	3	2
190	30	28	27	29	1	2	28	1	200	400
200	399	8	3982	124	-1	1425	1426	28	6859	4203
210	8	41	59	57	58	286	0	40	80	0
220	0	0	100	70	1	10000	5812	5683	1384	0
230	4997	4998	0	4133	4305	-20	0	19	4	9
240	126	126	110	2	4	29	0	0	0	0
250	0	0	1497	48	50	89	112	4	400	0
260	0	121	121	25738	4000	17	1183	4000	14	8
270	10	1000	198	7	7	1	2	3	4	5
280	6	7	4313	3605	-25	682	4370	5	4351	64
290	67	68	3	1889	1	399	3	0	0	0

MODE(IX):

I + I	1	2	3	4	5	6	7	8	9	10
0	1	1	0	4	15	1	1	102	1	0
10	0	0	0	0	3	0	0	0	0	0

NODE(IX) / NOD(IX)

	1	2	3	4	5	6	7	8	9	10
0	96	26	9	2	1	2	2	3	94	2
10	130	30	19	2	112	2	1	3	93	2
20	4	4	31	1	2	2	3	3	42	3
30	64	3	26	16	45	1	3	2	4	3
40	82	3	120	3	121	3	26	6	55	1
50	4	2	5	4	47	4	121	51	75	1
60	118	2	4	4	86	3	87	3	88	3
70	89	3	90	3	91	3	40	30	93	1
80	124	2	6	2	7	2	8	2	9	2
90	10	2	5	2	51	21	111	1	123	2
100	12	2	13	2	14	2	15	2	16	2
110	11	2	4	4	119	1	5	3	17	3
120	1	1	127	1	6	3	18	3	21	11
130	135	1	7	3	19	3	1	1	143	1
140	8	3	20	3	1	1	151	1	9	3
150	21	3	18	8	159	1	10	3	22	3
160	15	5	167	1	11	3	23	3	15	5
170	175	1	12	3	24	3	1	1	183	1
180	13	3	25	3	25	5	191	1	14	3
190	26	3	2	2	199	1	15	3	27	3
200	1	1	207	1	16	3	28	3	32	22
210	229	1	113	2	6	5	7	5	8	5
220	29	4	30	4	31	4	32	4	5	5
230	27	7	241	1	17	4	6	4	29	3
240	114	5	29	9	253	1	18	4	7	4
250	30	3	114	4	46	16	245	1	19	4
260	8	4	31	3	114	3	84	24	277	1
270	20	4	9	4	32	3	44	5	65	25
280	299	1	116	2	10	5	11	5	12	5
290	33	4	34	4	35	4	36	3	9	5
300	2	2	309	1	21	4	10	4	33	3
310	26	6	319	1	22	4	11	4	34	3
320	2	2	329	1	23	4	12	4	35	3
330	2	2	339	1	24	4	13	4	36	4
340	84	34	363	1	117	2	14	5	15	5
350	16	5	37	4	38	4	39	4	40	4
360	13	5	121	2	2	2	373	1	25	4
370	14	4	37	3	47	17	385	1	26	4
380	15	4	38	3	44	6	27	7	397	1
390	27	4	16	4	39	3	44	3	1	1
400	405	1	29	2	17	2	1	1	413	1
410	30	2	18	2	1	1	421	1	31	2
420	19	2	1	1	429	1	32	2	20	2
430	1	1	437	1	33	2	21	2	1	1
440	445	1	34	2	22	2	1	1	453	1
450	35	2	23	2	1	1	461	1	36	2
460	24	2	1	1	469	1	37	2	25	2
470	1	1	477	1	38	2	26	2	24	4
480	485	1	39	2	27	2	1	1	493	1
490	40	2	28	2	27	7	505	1	28	4
500	40	3	44	4	45	4	33	23	517	1
510	41	2	113	3	116	3	117	3	27	7
520	525	1	42	4	41	3	1	1	533	1
530	43	2	42	2	23	13	541	1	115	2
540	43	3	18	8	591	1	89	2	48	4

550	64	2	8	8	559	1	44	2	115	4
560	39	20	577	1	119	2	46	2	47	2
570	48	2	49	2	56	2	45	2	1	1
580	585	1	45	3	91	3	106	46	605	1
590	125	2	46	5	57	4	58	4	67	3
600	47	5	59	4	45	5	2	2	613	1
610	46	3	52	3	17	7	625	1	51	4
620	46	4	57	3	70	3	2	2	633	1
630	47	3	53	3	4	4	645	1	52	4
640	47	4	58	3	71	3	24	4	653	1
650	48	3	54	3	25	15	665	1	53	4
660	48	4	59	3	72	3	5	5	673	1
670	49	3	55	3	48	18	685	1	54	4
680	49	4	60	3	73	3	30	10	705	1
690	126	2	50	5	61	4	62	4	48	5
700	60	4	49	5	120	2	1	1	713	1
710	50	3	56	3	3	3	725	1	55	4
720	50	4	61	3	74	3	26	6	735	1
730	56	4	62	3	75	3	15	5	743	1
740	57	2	51	2	3	3	751	1	58	2
750	52	2	1	1	759	1	59	2	53	2
760	1	1	767	1	60	2	54	2	1	1
770	775	1	61	2	55	2	1	1	783	1
780	62	2	56	2	5	5	795	1	63	2
790	66	4	125	3	126	3	21	11	803	1
800	64	4	63	3	35	15	813	1	109	2
810	65	4	110	3	51	11	821	1	78	2
820	65	3	1	1	829	1	66	2	106	3
830	2	2	839	1	106	2	66	3	109	3
840	28	18	847	1	67	2	69	3	1	1
850	855	1	68	2	118	3	29	9	865	1
860	82	4	80	3	68	3	50	10	875	2
870	69	2	84	4	102	2	5	5	883	1
880	70	2	76	5	2	2	891	1	86	4
890	70	4	1	1	899	1	71	2	76	4
900	2	2	907	1	87	4	71	4	5	5
910	915	1	72	2	76	3	2	2	923	1
920	88	4	72	4	16	6	931	1	73	2
930	77	3	1	1	939	1	89	4	73	4
940	9	9	947	1	74	2	77	5	82	22
950	955	1	90	4	74	4	30	10	963	1
960	75	2	77	4	49	19	971	1	91	4
970	75	4	97	27	979	1	76	2	78	4
980	75	15	987	1	77	2	78	3	52	12
990	997	2	79	2	105	2	61	3	52	12
1000	1005	2	81	2	104	2	1	1	1013	1
1010	108	2	82	2	46	16	1023	1	83	2
1020	85	3	108	3	2	2	1033	1	107	2
1030	83	4	84	3	2	2	1043	1	85	2
1040	107	4	83	3	1	1	1051	1	84	2
1050	107	3	48	8	1059	2	103	2	85	4
1060	48	8	1067	2	101	2	86	2	48	8
1070	1075	2	100	2	87	2	48	8	1083	2
1080	99	2	88	2	52	12	1091	2	98	2
1090	89	2	44	14	1099	2	97	2	90	2
1100	20	10	1107	2	96	2	91	2	44	14
1110	1115	2	92	2	111	3	20	20	1123	2
1120	95	2	110	4	25	5	1133	1	110	2
1130	109	4	108	4	74	14	1141	1	111	2
1140	112	3	80	18	1149	1	114	2	115	3
1150		1	1197	1	121	4	122	3	26	8

1160
1170
1180

1167
1175
80

1
1
2

122
120
79

2
4
3

123
119
0

3
3
0

124
21
0

3
11
0

24
1183
0

4
1
0

END OF DEBUG SUBROUTINE.
END OF WRITE FUNCTION.

STOP 0

```
PCL
DELETE NOT010
.. 1 FILES DELETED, 305 GRANULES
DELETE NOT015
.. 1 FILES DELETED, 305 GRANULES
DELETE NOT020
.. 1 FILES DELETED, 4 GRANULES
DELETE NOT025
.. 1 FILES DELETED, 140 GRANULES
DELETE DECODE
.. 1 FILES DELETED, 1 GRANULES
DELETE AWRK2C
.. 1 FILES DELETED, 9 GRANULES
END
PCL PROCESSING TERMINATED
```

EOD.

HONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELL
HONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELLHONEYWELL

09:56 JUL 13, '78 ID#068A

ELAPSED JOB TIME	01:24:00
PARTITION NUMBER	7
TOTAL CPU TIME	14.3803
PROCESSOR EXECUTION TIME	.0121
PROCESSOR SERVICE TIME	.0494
USER EXECUTION TIME	13.4790
USER SERVICE TIME	.8399
CARDS: CARDS READ	231
PAGES: PROCESSOR PAGES	11
USER PAGES	139
TAPES: DRIVES ALLOCATED	2
CORE: PEAK CORE(PAGES)	112
PAGE.MINUTES	1497
I/O: OPERATIONS	4040
CALS	35036

FILE SPACE

AVLBL RAD PERMANENT	64
NET DISK PERMANENT	154
AVLBL DISK PERMANENT	2834
NUMBER OF SWAPS	78
RESOURCES ALLOCATED	
7T* 1 9T* 1 CO#120(PAGES)	

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