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## USER'S GUIDE: STEADY-STATE AERODYNAMIC-LOADS PROGRAM FOR SHUTTLE TPS TILES

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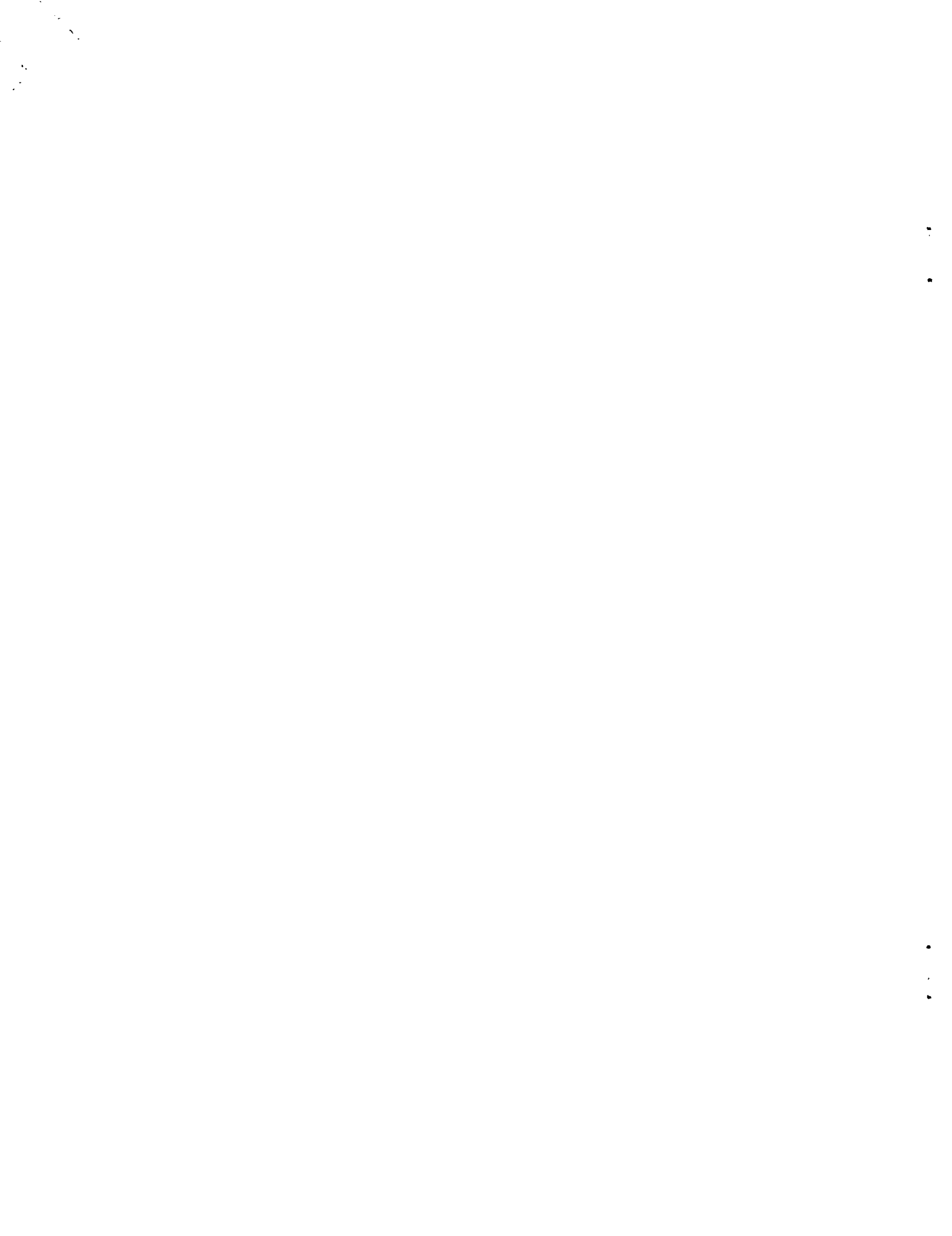
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## LIST OF SYMBOLS

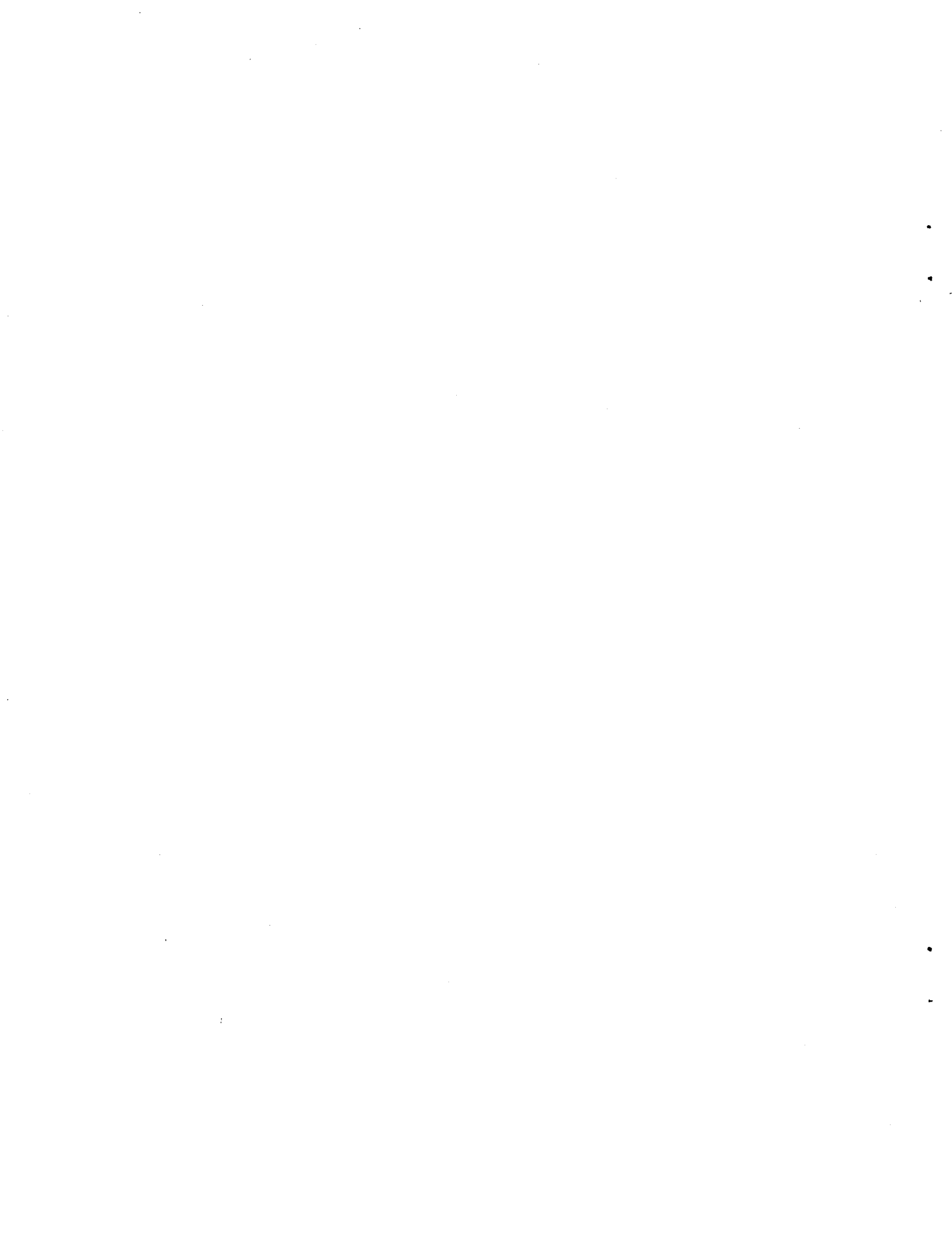
### Mathematical Symbols

$C_p$	specific heat of an ideal diatomic gas measured at a constant pressure, $(7/2)R$ , $(ft-lbf)/(lbm-^{\circ}R)$
$C_v$	specific heat of an ideal diatomic gas measured at a constant volume $(5/2)R$ , $(ft-lbf)/(lbm-^{\circ}R)$
$g$	gravitational constant, $32.2 ft/sec^2$
$k$	nondimensional ratio of $C_p/C_v=1.4$
$P_{\infty}$	free stream pressure, $lbf/ft^2$
$R$	universal gas constant, $53.3 (ft-lbf)/(lbm-^{\circ}R)$
$S$	arbitrary function in diffusion equation
$T$	temperature, $^{\circ}R$
$t$	time, sec
$U_{\infty}$	free stream velocity, $ft/sec$
$X_0$	distance of leading corner of subject tile from the leading edge of the Shuttle or the edge of the structure simulating the Shuttle
$XMACH$	mach number
$x$	x-Cartesian coordinate, in.
$y$	y-Cartesian coordinate, in.
$z$	z-Cartesian coordinate, in.
$\delta_0$	boundary layer thickness of turbulent flow over a flat plate, ft
$\mu_{\infty}$	free stream viscosity coefficient, $lbm/(ft-sec)$
$\rho_{\infty}$	free stream density, $lbm/ft^3$

## Program Parameter Names

B	24 element array of pressures at the top of the gap between tiles, psi
DELTA X	integration step for the skin friction calculation, usually set at .1 inches
DTILE	depth of tile, inches
FLOSIGN	flag indicating direction of flow parallel to the x-axis
FXTOT	total force on subject tile in the x-direction, lbf
FYTOT	total force on subject tile in the y-direction, lbf
FZTOT	total force on subject tile in the z-direction, lbf
G	24 element array of pressures at the bottom of the gap between tiles, psi
GFX	x-force due to gap pressures, lbf
GFY	y-force due to gap pressures, lbf
GMX	moment about the x-axis due to gap pressures, in.-lbf
GMY	moment about the y-axis due to gap pressures, in.-lbf
GMZ	moment about the z-axis due to gap pressures, in.-lbf
ISTA	x-coordinate of the first point of the pressure profile, in.
IEND	x-coordinate of the last point of the pressure profile, in.
KS	tile roughness parameter
MX	moment about the x-axis due to normal forces, in.-lbf
MXTOT	total moment about the x-axis, in.-lbf
MY	moment about the y-axis due to normal forces, in.-lbf
MYTOT	total moment about the y-axis, in.-lbf
MZTOT	total moment about the z-axis, in.-lbf
NRUN	run number
NTEST	flag indicating presence of shock or no shock condition for model simulation

N1,N2      number of pressure measurements on line 1 and 2, respectively  
 P            free stream static pressure,  $\text{lbf/ft}^2$   
 PHI         angle of attack of Shuttle or test panel  
 PRESSURE   pressure measurement, psi  
 PSUR        6 x 6 subject tile surface pressure array, psi  
 PTBL        6 x 6 subject tile bondline pressure array, psi  
 Q            free stream dynamic pressure,  $\text{lbf/ft}^2$   
 RHO         free stream density,  $\text{lbm/ft}^3$   
 SFX         x-force due to skin friction, lbf  
 SMY         moment about the y-axis due to skin friction, in.-lbf  
 TITLE       alphanumeric title identifying a pressure profile data set  
 U            free stream velocity, ft/sec  
 X            x-coordinate of a pressure measurement, in.  
 XC          x-coordinate of the leading corner of the subject tile in the  
              coordinate system of the pressure measurements, in.  
 XMACH      mach number  
 XMU         free stream viscosity coefficient,  $\text{lbm}/(\text{ft-sec})$   
 XSHOCK     distance of the shock from the edge of the Shuttle in the  
              absolute coordinate system, in.  
 XZERO      distance of the leading corner of the subject tile from the  
              edge of the Shuttle in the absolute coordinate system, in.  
 Y            y-coordinate of a pressure measurement, in.  
 YC          y-coordinate of the leading corner of the subject tile in the  
              coordinate system of the pressure measurements, in.



## INTRODUCTION

This report is a user's guide for the computer program that calculates the steady-state aerodynamic loads on the tiles of the Space Shuttle thermal-protection system (TPS). The main element of the program is the Martin Marietta Interactive Thermal Analysis System - Version II (MITAS-II). MITAS-II was designed to solve heat transfer problems using an electrical network analog representation. It can also be used to solve any problem that can be described by diffusion equations of the form  $\frac{\partial T}{\partial t} = \nabla^2 T + S$  and that can be solved using lumped parameter techniques.

In the case of the Shuttle TPS tiles, MITAS-II is used to calculate mass flow. The program built around MITAS-II requires input data describing the model network and the pressure profile over the tiles chosen for analysis. The program calculates the mass flow in the tile matrix using finite-difference techniques until a steady state is achieved. The pressures calculated in and around a representative tile are passed to another block of subroutines. These subroutines integrate the pressure to calculate the normal force and the moments about the x, y, and z axes. This information is used in a nonlinear-stress program to determine whether or not the subject tile will fail.

MITAS-II itself is described in detail in the reference manual (ref. 1) provided by Martin Marietta and will not be covered in this report. Only a description of its basic organization will be presented. This information is required to describe the communication of data into and out of the MITAS-II structure. The construction of the model network is discussed in another report (ref. 2).

The user's guide is intended to provide the user with enough information to execute the program. It is divided into four sections. In the first section, the program and data files needed to execute the program will be discussed. In the second section, the techniques used to process the pressure profile data for input to the program will be described. In the third section, the runstream used to execute the program will be discussed step by step. The methods used to modify the input data and program are also presented in this section. In the fourth section, the output from a sample run is explained. In addition, the procedure file used to execute the program, the MITAS-II model input, a surface pressure profile, and the output of a sample run are listed in the appendices.

#### DESCRIPTION OF SOFTWARE LIBRARIES AND DATA FILES

Several files containing the program software and input data are required for the execution of the loads analysis program. The function of each is briefly described in this section.

MITAS-II is stored on three indirect-access library files: MITABS, ZRJCLIB, ZLIBRY. The MITABS file contains a collection of programs designed to preprocess the model network data to create a FORTRAN source program which performs the flow analysis when executed. The ZRJCLIB file contains the input/output routines used by the preprocessor. These routines are written particularly for the CDC CYBER computers and are not portable to other systems. The ZLIBRY file is a mathematical subroutine library. Routines to manipulate matrices, to interpolate data, and to plot the results are included in this library.



AKCLIB and FTNMLIB are mathematical subroutine libraries. AKCLIB is a special-purpose library containing cubic-spline routines to fit curves and surfaces to data sets requiring interpolation. CURV1, a one-dimensional curve fitting routine, and CURV2, a one-dimensional interpolating routine, (ref. 3) are used from this library to interpolate the pressure data needed to initialize the model. FTNMLIB is the main subroutine library maintained on the computer system and contains routines for a great variety of applications. The bilinear-interpolation routine IBI (ref. 4) from this library is also used in interpolating the surface pressure data.

XEDIT (ref. 5) is one of several text-editor programs maintained at the Langley Research Center and is stored on a direct access file. It provides a convenient way to modify the source program and input data files.

Two data files are required for the loads analysis of the tile system. The file MODEL contains the model representation of the tile matrix to be analyzed. The matrix considered in this report consists of nine 6-inch square tiles arranged in a brick pattern rotated 45° counterclockwise as shown in figure 1. The MITAS-II reference manual describes how to develop the lumped-parameter representation of the tiles and how the file should be formatted. The PROFILE file contains the pressure-profile data defining the surface-pressure distribution over the tiles. The structure of this file is given in the second section. Both data files are stored as indirect access files.

Also, both are renamed locally, i.e., TAPE5=PROFILE and A=MODEL. Other data files and model configurations can be easily substituted and used in the program by simply changing the file name in the GET statements.

#### INPUT DATA

The main forcing function and major input in the model is the pressure distribution existing over the tiles. The model must be initialized with the free-stream steady-state pressures at the tile boundaries. The tile boundaries are defined at the center of the gaps between adjacent tiles. The pressure values are obtained from measurements made in wind-tunnel tests or theoretical models of the flow conditions. The tests and the theoretical models are designed to be representative of actual conditions expected during a Shuttle flight. In both cases, the data is taken or defined on two straight lines parallel to the flow direction on either side of the subject tile (figure 2). The data is then interpolated between the lines to provide the pressures at the boundary points.

The program is designed to accept as many as 50 data points on each line spanning a distance up to 40 inches. The data may be located at unequal increments along the lines. The number of points per line need not be the same. The program fits a cubic spline to each line of data and interpolates the data to provide a value at 1/2-inch increments spanning the range for which data exists on both lines. Outside this range, the data is extrapolated along horizontal straight lines so that the entire 40-inch span of the nine-tile matrix is defined. The new interpolated data forms a regular grid system with dimensions 81 x 2.

The gridded data serves as input to a bilinear-interpolation routine to calculate the pressures at the node points between the data lines. A typical pressure profile is shown in figure 3.

The format of the file TAPE5 containing the pressure measurements is fixed. The first card image or line of the file contains an 80 alphanumeric-character string identifying the profile. The second line contains five parameters describing the test conditions: the run number NRUN, the mach number XMACH, the angle of attack PHI, the free-stream dynamic pressure Q, and the free-stream static pressure P. Both free-stream pressures should be reported in psf. Blanks should be substituted if the value of any or all of these variables is not known or not applicable. The third line contains N1, the number of points to be read for the first line of data. The data set of N1 points follows with one point per line. For each data point the (X,Y) coordinates of the point in inches and its measured value in psi is given. The same format beginning with the number of points in the data set is repeated for the second line of data. The data points must be entered in monotonically increasing order in the x-direction. The y-coordinate of the first data set must be less than the y-coordinate of the second set. The format specifications for the file are given in table 1 and an example of a pressure profile is given in appendix A.

Table 1. Format Specifications for Pressure Profile Data File

Line No.	Variables	Format
1	TITLE	(8A10)
2	NRUN XMACH PHI Q P	(A4,F10.4,F10.2,F10.1,F10.3)
3	N1	(I5)
4	X Y PRESSURE	(2F12.5,F12.3)

The rest of the input is read by the program from the input file through two NAMELIST statements (see the procedure file in appendix A). The first NAMELIST named XYCOOR defines the position of the tile matrix with respect to the pressure profile. The four parameters given are the coordinates (XC,YC) of the leading corner of the subject tile and the x-coordinates of the two endpoints (ISTA,IEND) of the 40-inch span of the tile matrix. These parameters are given in inches and are measured in the same coordinate system as are the pressures. The second NAMELIST named XSHOCK provides additional information about the location of the pressure profile and subject tile relative to the leading edge of the Shuttle structure to be analyzed or the edge of the structure simulating the Shuttle's edge. This information describes the shock wave generated from the leading edges of the Shuttle. It is also used in calculating the loads produced by the drag of skin friction. The parameters listed in XSHOCK are: the free-stream velocity (U), the free-stream density (RHO), viscosity coefficient (XMU), distance of shock from edge of Shuttle (XSHOCK), distance of leading corner of tile from edge of Shuttle (XZERO), tile roughness factor (KS), the integration step for the skin friction calculation (DELTA X) which is usually set at .1 inches, the tile thickness (DTILE), and the flag to indicate the direction of the flow across the test panel (FLOSIGN).

The two coordinate systems mentioned above can be different. The system used to measure the XSHOCK parameters should be thought of as the absolute coordinate system on the Shuttle or in the wind tunnel (figure 4). The other coordinate system used for the pressure profile

can be relative to the edge of the test panel or to the area to be analyzed. All that the program requires is a means to register the position of the test panel with the pressure data. This information is provided in namelist XYCOOR.

The equations to define U, RHO, and XMU are listed in appendix B. The flag FLOSIGN is assigned a value of either +1.0 or -1.0. to indicate the flow direction parallel to the x-axis. It is assigned a value of +1.0 if the flow direction in the model simulation is from left to right across the test panel as indicated in figure 1, and it is assigned a value of -1.0 if the flow is in the opposite direction from right to left. Also, listed in appendix B is the equation for the boundary layer thickness of turbulent flow over a flat plate,  $\delta_0$ . This equation can be used when the boundary layer thickness is known to calculate an equivalent value of the distance of the subject tile from the edge of the Shuttle,  $X_0$  (figure 4).

#### EXECUTION PROCEDURES

This section describes the control-card sequence necessary to execute the program. The procedure file is listed in appendix A.

The first step after the usual JOB card and accounting cards is to attach the software libraries. The indirect-access file MODEL containing the model representation is attached next and called A. The data file PROFILE containing the pressure measurements defining the surface-pressure profile is attached and named TAPE5.

Next, modifications to the model input file A are made if needed using the text editor XEDIT. Changes can be made to the local file A without changing the permanent file MODEL. This is especially useful in performing parameter studies where one parameter at a time is changed. In this way, the program sensitivity to particular parameters can be judged.

The general format of the XEDIT statement is: XEDIT, filename.; character string. The filename referenced in the statement must be a local file. The character string is the list of XEDIT commands to be performed separated with semicolons. The prefix "X" is used with the locate (L), change (C), and quit (Q) commands to eliminate unnecessary output from XEDIT. A complete list of XEDIT commands and options can be found in volume IV of the LaRC Computer Programming Manual.

The binary file MITABS is then executed with A as the input file to produce the FORTRAN source file EXFOR. The output of this module is written on a local file named MOUTPUT. The MITAS-II preprocessor echoes all the input data in the output file. Also, it creates and writes out directories to keep track of the storage locations of all the data. For a large model such as this, the output file is very long (on the order of 70 pages). Usually, this file is not needed, so it is stored as a permanent file rather than being sent to the line printer or terminal screen. The permanent file can be easily accessed or routed to a printer when needed. The MITAS-II preprocessor creates the program source file EXFOR from the input file A. It is this file that is actually executed to produce the solution to the problem. This file is

modified with XEDIT to make changes in the subroutines and to extend the file capability of the program. An input file was added to allow direct communication with the program. Specifically, it was added to allow easy entry of data through a NAMELIST statement.

Next the file EXFOR is compiled and loaded. The compilation listing is written on a local file LIST. The LDSET card follows. It defines all the libraries, presets the core to negative infinity, and creates a load map. The load map is written on a local file LMAP. Both LIST and LMAP are usually not needed and are treated as MOUTPUT is treated. These files are useful in the case of errors. They are stored as permanent files and routed to the printer only when the program has an abnormal exit.

The compiled program is then executed using the LGO statement. After normal execution, the dayfile information is written on a local file DAYTEST. This file is then stored as a permanent file with the same name. If a fatal error occurs, execution stops, and control is passed automatically to the EXIT card. The control statements following the EXIT card are then executed. The dayfile is written, stored, and routed to a printer along with the compilation listing LIST and load map LMAP to aid in the debugging process.

The procedure file is organized this way to make it easy for the user to change data files in order to run different cases using different pressure profiles. Also, it was designed to keep all the changes made in one place. Rather than using a separate file for the XEDIT directives with XEDIT to modify the files, the XEDIT commands are

listed in the procedure file. It is then easy to determine what test conditions were changed before execution. Also, since the names of the files containing the data, dayfiles, and listings are easy to change from run to run, it is easy to identify the files belonging to a particular run. It should also be noted that all files not already saved or replaced before the job ends will be destroyed at the end of the run. Files A, TAPE5, EXFOR, and TEMP are local files that are never saved and are lost at the end of the job. LIST and LMAP also fall in this category unless an error occurs in compilation or execution and causes the statements after the EXIT card to be performed.

#### EXPLANATION OF THE PROGRAM LISTING FROM A SAMPLE RUN

A portion of a sample run of the computer program is given here to aid in the discussion of the program output. A complete list of the procedure file, a model input file, a surface pressure profile data file, and the results of a run for a test tile in the mid-fuselage region of the Shuttle is given in appendix A.

The program output begins with a list of the user-defined constants in the internal flow model. The MITAS-II constants block information with typical input values is shown in figure 5. The constants normally varied in this block to perform parameter studies and to define different cases are constant numbers 100, 102, 103, 106, 109, 110, 115, 117, and NTEST. Constant numbers 109 and 110 should be changed when the SIP thickness is changed. The last number on the right in the equation for constants 109 and 110 is the SIP thickness shown as 0.16 in figure 5. Constant number 117 is the force in pounds required to move a tile



0.05 inches in the plane parallel to the surface of the Shuttle. NTEST is set to either 1 for cases representing conditions for a shock over the subject tile or 0 for cases representing conditions for a raised subject tile with no shock present.

The namelist XYCOOR and the surface pressure data discussed earlier are listed next in the output and are shown in figure 6. Pressures are given along two lines over the surface of the nine-tile array. The x- and y-coordinates are measured in inches, and the pressure is measured in psi.

The next major section of the output is printed by the MITAS-II system as it searches for a steady state solution to the flow problem defined by the user-supplied model. This section consists of three types of information:

1. Convergence information in the form of the maximum changes in pressure from one iteration to the next at the end of each iteration calculating the change in the gap dimensions.
2. Pressures at the model nodes, tile to tile gap deflections, and tile to filler bar clearances calculated by MITAS-II for the last two major iterations that determine the change in gap dimensions. These pressures in units of psi are listed as Txxxx=pressure, where xxxx is the identifying node number. The tile-to-tile gap deflections are listed as two unlabeled numbers. The first one is closure of gap 1-6, and the second

one is closure of gap 7-12. The tile-to-filler bar clearances are labeled as EDGAP(I). The gap deflections and tile to filler bar clearances are given in inches.

3. Mass flow values based on the final pressure solution. The mass-flow rate values in units of lbm/sec are listed as flow between pairs of nodes. The format is: Node-number A, node number B, flow rate, where A and B are the nodes for which the flow is defined. A positive flow rate indicates flow into node-number A.

A sample of the output from this section is shown in figure 7. This particular run was configured so that the strict convergence criterion could not be realistically met. This condition forces the program to iterate the maximum number of times as set by the user. Even though the solution has not "converged" by the set standards, a solution has actually been found. This can be determined by examining the parameters printed out every 600 iterations and noting the small changes from iteration to iteration.

The last section in the output summarizes the loads calculations. The first part of this section is shown in figure 8. The program prints the input data used from the namelist XSHOCK and the pressures calculated by MITAS-II for the subject tile. These pressures are stored in four arrays and are labeled as follows:

B(1-24) = pressure at top of gap, psi  
G(1-24) = pressure at bottom of gap, psi  
ARRAY PSUR= 6 x 6 subject tile surface-pressure array, entry  
(1,1) is T61, entry (1,6) is T66, etc., psi  
ARRAY PTBL = 6 x 6 subject tile bondline pressure array, entry (1,1)  
is T25, entry (1,6) is T30, etc., psi

Next, the results of the force and moment calculation using the pressure information in the arrays B, G, PSUR and PTBL are printed to complete the program output. A typical summary is shown in figure 9.

Included in the summary are the following forces and moments:

FXTOT = total force in the x-direction, lbf  
FYTOT = total force in the y-direction, lbf  
FZTOT = total force in the z-direction, lbf  
MXTOT = total moment about the x-axis, in.-lbf  
MYTOT = total moment about the y-axis, in.-lbf  
MZTOT = total moment about the z-axis, in.-lbf  
GFX = x-force due to gap pressures, lbf  
GFY = y-force due to gap pressures, lbf  
GMX = moment about the x-axis due to gap pressures, in.-lbf  
GMY = moment about the y-axis due to gap pressures, in.-lbf  
GMZ = moment about the z-axis due to gap pressures, in.-lbf  
SFX = x-force due to skin friction, lbf  
SMY = moment about the y-axis due to skin friction, in.-lbf  
MX = moment about the x-axis due to normal forces, in.-lbf  
MY = moment about the y-axis due to normal forces, in.-lbf

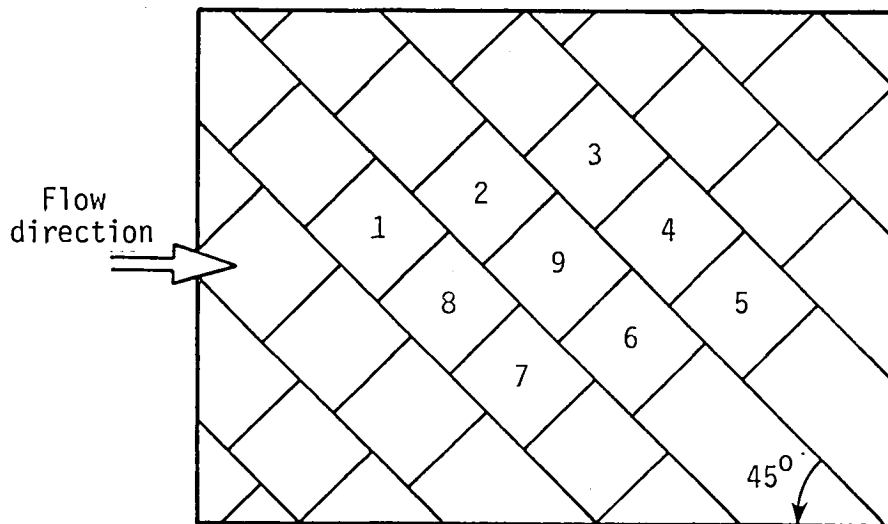


Figure 1. Nine-tile array.

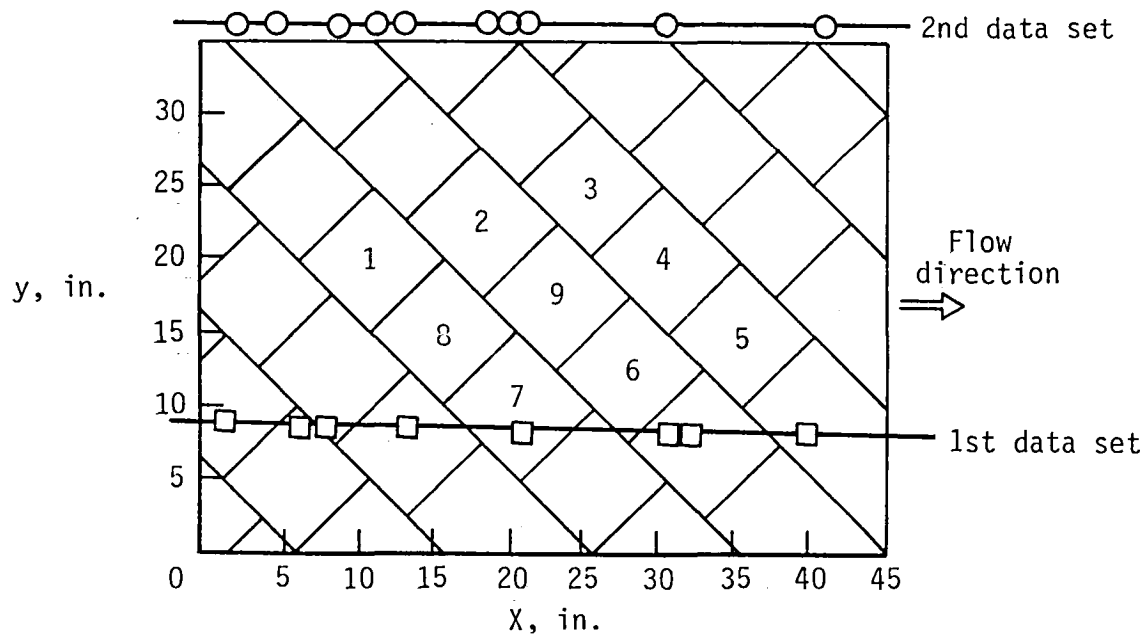


Figure 2. Configuration of text panel used when taking pressure measurements.

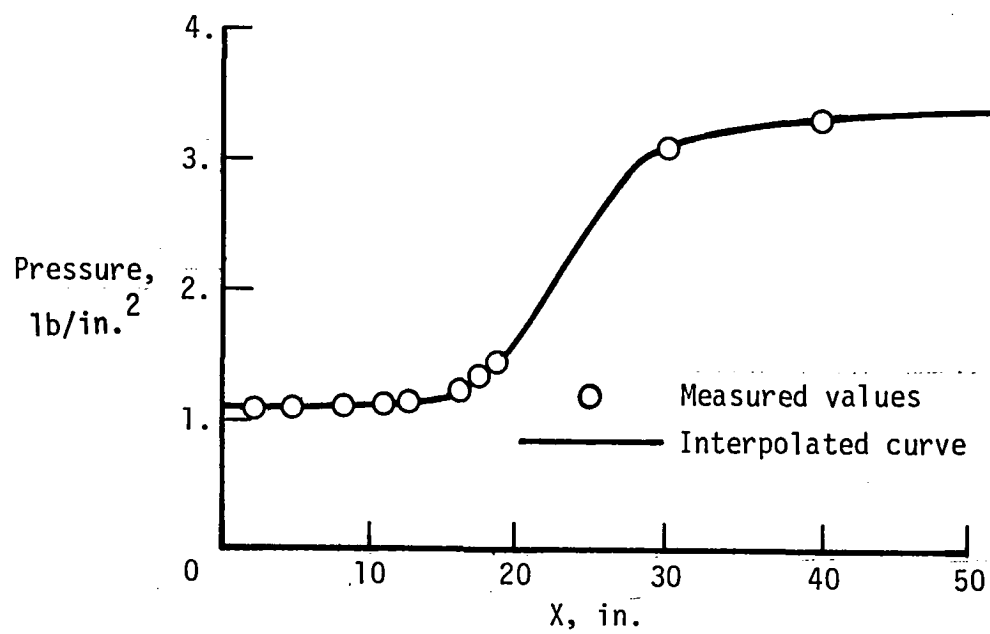


Figure 3. Typical pressure profile.

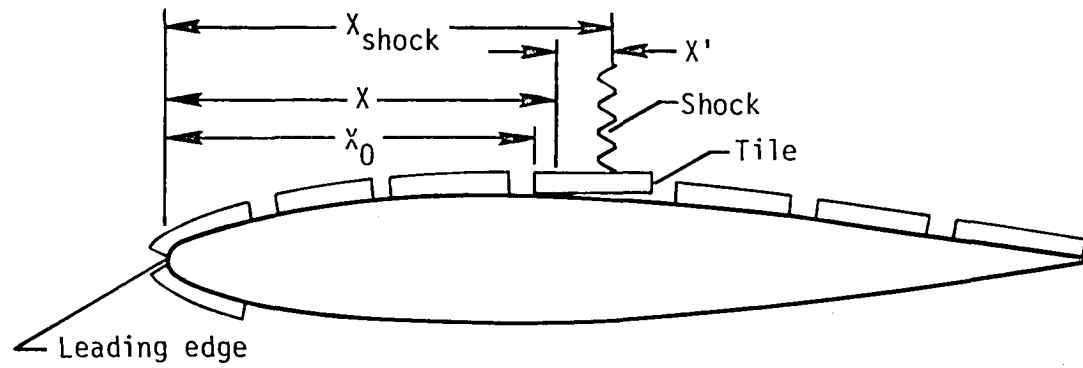


Figure 4. Location of tile and shock from leading edge.

```

BCD 3CONSTANTS DATA
NDSTOR=6500,ITERMX=600 ,DRLXCA=1.E-9,ARLXCA=1.E-9
TIMED=0.,TIMEND=32.,TSTEPD=4.
EXTLIM=.5
100=1.47          $STILE THICKNESS (IN)
101=6.0           $STILE SIDE LENGTH (IN)
102=0.16*10.     $$SIP THICKNESS (IN)
103=.06          $STERMINATOR GAP (IN)
106=.05          $GAP WIDTH (IN)
107=00.0000      $VISCOSITY (LBM/FT-SEC)
108=0.0000       $DENSITY OF GAS (LB/FT**3)
109=1.0/26.7*.16 $$SIP/GAP DP FACTOR (IN/PSI)
110=1.21/26.7*.16 $$SIP/SURFACE DP FACTOR (IN/PSI)
111=0.1          $INITIAL EDGE CLEARANCE (IN)
112=0.1          $EDGE CLEARANCE (IN)
113=.5           $$SIP/TILE DISCHARGE COEFFICIENT
114=.1           $$SIP/FILLER BAR CLEARANCE (IN)
115=115.         $TEMPERATURE (F)
116=0.0          $AVERAGE PRESSURE
117=5.5          $LBF TO MOVE .05 IN Laterally
118=0.0          $CLOSURE OF GAP 1
119=0.0          $CLOSURE OF GAP 2
120=.001         $MINIMUM GAP CLEARANCE (IN)
121=1.E-3        $MINIMUM EDGE CLEARANCE (IN)
123=1.0          $PERMEABILITY FACTOR
1,,2,,3,,4,,5,,6,,7,,8,,9,,10,,11,,12,,13,,14,,15=0.
ITEST=0,JTEST=0,KTEST= EDGAP,LTEST=0,MTEST=0
NTEST=0          $ 0= 3 TILE MOVE; 1= 1 TILE MOVES
END

```

Figure 5. MITAS-II output listing of user-supplied constants.

XYCOORD

XC = .1364E+02,

YC = 0.0,

ISTA = 1,

IFIN = 81,

SEND

MF-6 REGION (REPRESENTATION A)

RUN NUMBER	HACH	PHI DEG.	Q PSF	P PSIA
****	1.8120	49.51	6560.0	285.

RUN NUMBER	X	Y	P-LDC PSIA
MF6	0.00000	-17.00000	3.74000
MF6	10.00000	-17.00000	3.74000
MF6	12.00000	-17.00000	3.74000
MF6	14.00000	-17.00000	3.74000
MF6	16.00000	-17.00000	3.83000
MF6	18.00000	-17.00000	3.92000
MF6	19.00000	-17.00000	3.98000
MF6	19.50000	-17.00000	4.02500
MF6	20.00000	-17.00000	4.10000
MF6	20.50000	-17.00000	4.22000
MF6	22.00000	-17.00000	4.88000
MF6	22.3.00000	-17.00000	5.30000
MF6	22.4.00000	-17.00000	5.54000
MF6	22.5.00000	-17.00000	5.65000
MF6	22.6.00000	-17.00000	5.72000
MF6	28.00000	-17.00000	5.80000
MF6	30.00000	-17.00000	5.96000
MF6	32.00000	-17.00000	6.07000
MF6	34.00000	-17.00000	6.19000
MF6	36.00000	-17.00000	6.30000
MF6	38.00000	-17.00000	6.42000
MF6	40.00000	-17.00000	6.52000
MF6	0.00000	17.00000	3.74000
MF6	10.00000	17.00000	3.74000
MF6	12.00000	17.00000	3.74000
MF6	14.00000	17.00000	3.74000
MF6	16.00000	17.00000	3.83000
MF6	18.00000	17.00000	3.92000
MF6	19.00000	17.00000	3.98000
MF6	19.50000	17.00000	4.02500
MF6	20.00000	17.00000	4.10000
MF6	20.50000	17.00000	4.22000
MF6	22.00000	17.00000	4.88000
MF6	22.3.00000	17.00000	5.30000
MF6	22.4.00000	17.00000	5.54000
MF6	22.5.00000	17.00000	5.65000
MF6	22.6.00000	17.00000	5.72000
MF6	28.00000	17.00000	5.80000
MF6	30.00000	17.00000	5.96000
MF6	32.00000	17.00000	6.07000
MF6	34.00000	17.00000	6.19000
MF6	36.00000	17.00000	6.30000
MF6	38.00000	17.00000	6.42000
MF6	40.00000	17.00000	6.52000
XSTAR1=	0.00000	XSTAR2=	0.00000
XSTOP1=	40.00000	XSTOP2=	40.00000

Figure 6. Listing of pressure profile data required for model initialization.



← CAUTION ← ITERM( 603) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
 PRLXCC( 8025) = -.494811E-04 VS. PRLXCA = .100000E-08 ← convergence information  
 ARLXCC( 8097) = -.491024E-04 VS. ARLXCA = .100000E-08  
 FBALSC = 0. VS. EBALSA = 0.  
 EBALNC( 0) = 0. VS. EBALMA = 0.

TIMEN = 32.0000	EPALSC	CSGMINI	ORLXCC( 8025)
TSTEPU = 4.00000	EBALNC( 0) = 0.	CSGMAXI	ARLXCC( 8097) = -.491024E-04
	ITERCT	DMXTCCI	AMXTCC( 0) = 0.
601			
DIFFUSION NODES			
T 25= 4.49376	T 26= 4.57054	T 27= 4.63778	T 28= 4.69736
T 31= 4.54650	T 32= 4.63247	T 33= 4.70063	T 34= 4.76208
T 37= 4.60153	T 38= 4.68721	T 39= 4.75625	T 40= 4.82001
T 43= 4.66070	T 44= 4.74138	T 45= 4.81084	T 46= 4.87771
T 49= 4.72037	T 50= 4.79422	T 51= 4.86574	T 52= 4.93785
T 55= 4.78157	T 56= 4.84357	T 57= 4.92473	T 58= 5.00788
T 61= 4.83715	T 62= 4.89221	T 63= 4.97768	T 64= 5.07302
T 67= 4.89126	T 68= 4.94725	T 69= 5.03399	T 70= 5.14045
T 73= 4.94573	T 74= 5.00369	T 75= 5.10138	T 76= 5.20988
T 79= 5.00077	T 80= 5.06098	T 81= 5.17160	T 82= 5.28268
T 85= 5.05788	T 86= 5.11973	T 87= 5.23885	T 88= 5.35738
T 91= 5.11571	T 92= 5.17947	T 93= 5.30746	T 94= 5.43428
T 97= 5.17426	T 98= 5.24071	T 99= 5.37867	T 100= 5.51367
T 103= 5.23351	T 104= 5.30356	T 105= 5.45607	T 106= 5.60607
T 109= 5.29346	T 110= 5.36801	T 111= 5.50228	T 112= 5.70407
T 115= 5.35401	T 116= 5.43401	T 117= 5.55228	T 118= 5.80707
T 121= 5.41516	T 122= 5.50056	T 123= 5.60607	T 124= 5.91607
T 127= 5.47691	T 128= 5.56861	T 129= 5.66207	T 130= 6.03107
T 133= 5.53926	T 134= 5.63816	T 135= 5.71407	T 136= 6.15207
T 139= 5.60221	T 140= 5.70921	T 141= 5.79207	T 142= 6.27907
T 145= 5.66576	T 146= 5.78196	T 147= 5.87607	T 148= 6.41207
T 151= 5.73001	T 152= 5.85651	T 153= 5.96107	T 154= 6.55107
T 157= 5.79506	T 158= 5.93256	T 159= 6.04707	T 160= 6.69707
T 163= 5.86081	T 164= 6.01001	T 165= 6.13407	T 166= 6.85007
T 169= 5.92726	T 170= 6.07906	T 171= 6.22207	T 172= 7.01007
T 175= 6.00001	T 176= 6.14401	T 177= 6.31107	T 178= 7.17007
T 181= 6.07006	T 182= 6.21506	T 183= 6.40207	T 184= 7.33907
T 187= 6.14701	T 188= 6.29201	T 189= 6.49507	T 190= 7.51607
T 193= 6.23006	T 194= 6.37506	T 195= 6.59007	T 196= 7.70107
T 199= 6.31901	T 200= 6.46401	T 201= 6.68607	T 202= 7.89407
T 205= 6.41406	T 206= 6.55806	T 207= 6.78407	T 208= 8.09507
T 211= 6.50501	T 212= 6.65801	T 213= 6.88407	T 214= 8.30407
T 217= 6.60206	T 218= 6.76406	T 219= 6.97607	T 220= 8.52007
T 223= 6.70501	T 224= 6.87601	T 225= 7.07007	T 226= 8.74407
T 229= 6.81406	T 230= 6.99406	T 231= 7.16607	T 232= 8.97607
T 235= 6.92901	T 236= 7.11801	T 237= 7.26407	T 238= 9.21607
T 241= 7.05006	T 242= 7.24806	T 243= 7.36407	T 244= 9.46407
T 247= 7.17701	T 248= 7.38301	T 249= 7.46607	T 250= 9.72007
T 253= 7.31006	T 254= 7.51806	T 255= 7.57007	T 256= 10.08407
T 259= 7.44901	T 260= 7.66401	T 261= 7.67607	T 262= 10.45607
T 265= 7.59406	T 266= 7.82106	T 267= 7.78407	T 268= 10.83607
T 271= 7.74501	T 272= 7.98901	T 273= 7.89407	T 274= 11.22407
T 277= 7.90206	T 278= 8.16806	T 279= 7.99607	T 280= 11.62007
T 283= 8.06501	T 284= 8.35801	T 285= 8.09207	T 286= 12.02407
T 289= 8.23406	T 290= 8.55906	T 291= 8.18407	T 292= 12.43607
T 295= 8.40901	T 296= 8.77201	T 297= 8.27207	T 298= 12.85607
T 301= 8.59006	T 302= 8.99606	T 299= 8.35607	T 300= 13.28407
T 307= 8.77701	T 308= 9.23101	T 301= 8.43607	T 302= 13.72007
T 313= 8.97006	T 314= 9.47706	T 303= 8.51207	T 304= 14.16407
T 319= 9.16901	T 320= 9.73401	T 305= 8.58407	T 306= 14.61607
T 325= 9.37406	T 326= 10.00206	T 307= 8.65207	T 308= 15.07607
T 331= 9.58501	T 332= 10.28101	T 309= 8.71607	T 310= 15.54407
T 337= 9.80206	T 338= 10.57106	T 311= 8.77607	T 312= 16.01907
T 343= 10.02501	T 344= 10.87201	T 313= 8.83207	T 314= 16.50107
T 349= 10.25406	T 350= 11.18406	T 315= 8.88407	T 316= 16.99007
T 355= 10.48901	T 356= 11.50701	T 317= 8.93207	T 318= 17.48607
T 361= 10.73006	T 362= 11.84106	T 319= 8.97607	T 320= 17.98907
T 367= 10.97701	T 368= 12.18601	T 321= 9.01607	T 322= 18.50007
T 373= 11.23006	T 374= 12.54206	T 323= 9.05207	T 324= 19.01807
T 379= 11.48901	T 380= 12.90901	T 325= 9.08407	T 326= 19.54307
T 385= 11.75406	T 386= 13.28706	T 327= 9.11207	T 328= 20.07507
T 391= 12.02501	T 392= 13.67601	T 329= 9.13607	T 330= 20.61407
T 397= 12.30206	T 398= 14.07606	T 331= 9.15607	T 332= 21.16007
T 403= 12.58501	T 399= 14.48701	T 333= 9.17207	T 334= 21.71307
T 409= 12.87406	T 400= 14.90906	T 335= 9.18407	T 336= 22.27307
T 415= 13.16901	T 401= 15.34201	T 337= 9.19207	T 338= 22.84007
T 421= 13.47006	T 402= 15.78606	T 339= 9.19607	T 340= 23.41407
T 427= 13.77701	T 403= 16.24101	T 341= 9.19607	T 342= 23.99507
T 433= 14.09006	T 404= 16.70706	T 343= 9.19207	T 344= 24.58307
T 439= 14.40901	T 405= 17.18401	T 345= 9.18407	T 346= 25.17807
T 445= 14.73406	T 406= 17.67206	T 347= 9.17207	T 348= 25.77907
T 451= 15.06501	T 407= 18.17101	T 349= 9.15607	T 350= 26.38607
T 457= 15.40206	T 408= 18.68106	T 351= 9.13607	T 352= 26.99907
T 463= 15.74501	T 409= 19.20201	T 353= 9.11207	T 354= 27.61807
T 469= 16.09406	T 410= 19.73406	T 355= 9.08407	T 356= 28.24307
T 475= 16.44901	T 411= 20.27701	T 357= 9.05207	T 358= 28.87407
T 481= 16.81006	T 412= 20.83106	T 359= 9.01607	T 360= 29.51107
T 487= 17.17701	T 413= 21.39601	T 361= 8.97607	T 362= 30.15407
T 493= 17.55006	T 414= 21.97206	T 363= 8.93207	T 364= 30.80307
T 499= 17.92901	T 415= 22.55901	T 365= 8.88407	T 366= 31.45807
T 505= 18.31406	T 416= 23.15706	T 367= 8.83207	T 368= 32.11907
T 511= 18.70501	T 417= 23.76601	T 369= 8.77607	T 370= 32.78607
T 517= 19.10206	T 418= 24.38606	T 371= 8.71607	T 372= 33.45907
T 523= 19.50501	T 419= 25.01701	T 373= 8.65207	T 374= 34.13807
T 529= 19.91406	T 420= 25.65906	T 375= 8.58407	T 376= 34.82307
T 535= 20.32901	T 421= 26.31201	T 377= 8.51207	T 378= 35.51407
T 541= 20.75006	T 422= 26.97606	T 379= 8.43607	T 380= 36.21107
T 547= 21.17701	T 423= 27.65101	T 381= 8.35607	T 382= 36.91407
T 553= 21.61006	T 424= 28.33706	T 383= 8.27207	T 384= 37.62307
T 559= 22.04901	T 425= 29.03401	T 385= 8.18407	T 386= 38.33807
T 565= 22.49406	T 426= 29.74206	T 387= 8.09207	T 388= 39.05907
T 571= 22.94501	T 427= 30.46101	T 389= 8.01607	T 390= 39.78607
T 577= 23.40206	T 428= 31.19106	T 391= 7.93607	T 392= 40.51907
T 583= 23.86501	T 429= 31.93201	T 393= 7.85207	T 394= 41.25807
T 589= 24.33406	T 430= 32.68406	T 395= 7.76407	T 396= 41.99307
T 595= 24.80901	T 431= 33.44701	T 397= 7.67207	T 398= 42.73407
T 601= 25.29006	T 432= 34.22106	T 399= 7.57607	T 400= 43.48107
T 607= 25.77701	T 433= 35.00601	T 401= 7.47607	T 402= 44.23407
T 613= 26.27006	T 434= 35.80206	T 403= 7.37207	T 404= 44.99307
T 619= 26.76901	T 435= 36.60901	T 405= 7.26407	T 406= 45.75807
T 625= 27.27406	T 436= 37.42706	T 407= 7.15207	T 408= 46.52907
T 631= 27.78501	T 437= 38.25601	T 409= 7.03607	T 410= 47.30607
T 637= 28.30206	T 438= 39.09606	T 411= 6.91607	T 412= 48.08907
T 643= 28.82501	T 439= 39.94701	T 413= 6.79207	T 414= 48.87807
T 649= 29.35406	T 440= 40.80906	T 415= 6.66407	T 416= 49.67307
T 655= 29.88901	T 441= 41.68201	T 417= 6.53207	T 418= 50.47407
T 661= 30.43006	T 442= 42.56606	T 419= 6.39607	T 420= 51.28107
T 667= 30.97701	T 443= 43.46101	T 421= 6.25607	T 422= 52.09407
T 673= 31.53006	T 444= 44.36706	T 423= 6.11207	T 424= 52.91307
T 679= 32.08901	T 445= 45.28401	T 425= 5.96407	T 426= 53.73807
T 685= 32.65406	T 446= 46.21206	T 427= 5.81207	T 428= 54.56907
T 691= 33.22501	T 447= 47.15101	T 429= 5.65607	T 430= 55.40607
T 697= 33.80206	T 448= 48.10106	T 431= 5.49607	T 432= 56.24907
T 703= 34.38501	T 449= 49.06201	T 433= 5.33207	T 434= 57.09807
T 709= 34.97406	T 450= 50.03406	T 435= 5.16407	T 436= 57.95307
T 715= 35.56901	T 451= 51.01701	T 437= 4.99207	T 438= 58.81407
T 721= 36.17006	T 452= 52.01106	T 439= 4.81607	T 440= 59.68107
T 727= 36.77701	T 453= 53.01601	T 441= 4.63607	T 442= 60.55407
T 733= 37.39006	T 454= 54.03206	T 443= 4.45207	T 444= 61.43307
T 739= 38.00901	T 455= 55.05901	T 445= 4.26407	T 446= 62.31807
T 745= 38.63406	T 456= 56.09606	T 447= 4.07207	T 448= 63.20907
T 751= 39.26501	T 457= 57.14301	T 449= 3.87607	T 450= 64.10607
T 757= 39.90206	T 458= 58.19906	T 451= 3.67607	T 452= 65.00907
T 763= 40.54501	T 459= 59.26401	T 453= 3.47207	T 454= 65.91807
T 769= 41.19406	T 460= 60.33806	T 455= 3.26407	T 456= 66.83307
T 775= 41.84901	T 461= 61.42101	T 457= 3.05207	T 458= 67.75407
T 781= 42.51006	T 462= 62.51306	T 459= 2.83607	T 460= 68.68107
T 787= 43.17701	T 463= 63.61401	T 461= 2.61607	T 462= 69.61407
T 793= 43.85006	T 464= 64.72306	T 463= 2.39207	T 464= 70.55307
T 799= 44.52901	T 465= 65.84001	T 465= 2.16407	T 466= 71.49707
T 805= 45.21406	T 466= 66.96406	T 467= 1.93207	T 468= 72.44607
T 811= 45.90501	T 467= 68.09501	T 469= 1.69607	T 470= 73.40007
T 817= 46.60206	T 468= 69.23306	T 471= 1.45607	T 472= 74.35907
T 823= 47.30501	T 469= 70.37801	T 473= 1.21207	T 474= 75.32307
T 829= 48.01406	T 470= 71.52906	T 475= 0.96407	T 476= 76.29207
T 835= 48.72901	T 471= 72.68601	T 477= 0.71207	T 478= 77.26607
T 841= 49.45006	T 472= 73.84906	T 479= 0.46007	T 480= 78.24507
T 847= 50.17701	T 473= 75.01701	T 481= 0.20807	T 482= 79.22907
T 853= 50.91006	T 474= 76.19006	T 483= 0.00007	T 484= 80.21807
T 859= 51.64901	T 475= 77.36		

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      .
      .
      .
#130      8124      -.255312E-04
#131      7101      .397068E-04
#131      8050      -.194343E-04
#131      8130      -.249372E-04
#131      8132      .326541E-04
#131      8125      -.279868E-04
#131      100       .491035E-04
#131      7102      .428413E-04
#131      8060      -.237579E-04
#131      8131      -.326541E-04
#132      8126      -.355321E-04

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← mass flow values

3.26711E-02      -3.61680E-02      ← gap to gap deflections

tile to filler bar clearances

EDGAP ( 1 )	1.00000E-03	EDGAP ( 2 )	1.00000E-03	EDGAP ( 3 )	1.00000E-03	EDGAP ( 4 )	1.00000E-03	EDGAP ( 5 )	1.00000E-03
EDGAP ( 6 )	1.00000E-03	EDGAP ( 7 )	1.00000E-03	EDGAP ( 8 )	1.00000E-03	EDGAP ( 9 )	1.00000E-03	EDGAP ( 10 )	1.00000E-03
EDGAP ( 11 )	1.00000E-03	EDGAP ( 12 )	1.00000E-03	EDGAP ( 13 )	1.00000E-03	EDGAP ( 14 )	1.00000E-03	EDGAP ( 15 )	1.00000E-03
EDGAP ( 16 )	1.00000E-03	EDGAP ( 17 )	1.00000E-03	EDGAP ( 18 )	1.00000E-03	EDGAP ( 19 )	1.00000E-03	EDGAP ( 20 )	1.00000E-03
EDGAP ( 21 )	1.00000E-03	EDGAP ( 22 )	1.00000E-03	EDGAP ( 23 )	1.00000E-03	EDGAP ( 24 )	1.00000E-03	EDGAP ( 25 )	1.00000E-03
EDGAP ( 26 )	1.00000E-03	EDGAP ( 27 )	1.00000E-03	EDGAP ( 28 )	1.00000E-03	EDGAP ( 29 )	1.00000E-03	EDGAP ( 30 )	1.00000E-03
EDGAP ( 31 )	1.00000E-03	EDGAP ( 32 )	1.00000E-03	EDGAP ( 33 )	1.00000E-03	EDGAP ( 34 )	1.00000E-03	EDGAP ( 35 )	1.00000E-03
EDGAP ( 36 )	1.00000E-03	EDGAP ( 37 )	1.00000E-03	EDGAP ( 38 )	1.00000E-03	EDGAP ( 39 )	1.00000E-03	EDGAP ( 40 )	1.00000E-03
EDGAP ( 41 )	1.00000E-03	EDGAP ( 42 )	1.00000E-03	EDGAP ( 43 )	1.00000E-03	EDGAP ( 44 )	1.00000E-03	EDGAP ( 45 )	1.00000E-03
EDGAP ( 46 )	1.00000E-03	EDGAP ( 47 )	1.00000E-03	EDGAP ( 48 )	1.00000E-03	EDGAP ( 49 )	1.00000E-03	EDGAP ( 50 )	1.00000E-03
EDGAP ( 51 )	1.00000E-03	EDGAP ( 52 )	1.00000E-03	EDGAP ( 53 )	1.00000E-03	EDGAP ( 54 )	1.00000E-03	EDGAP ( 55 )	1.00000E-03
EDGAP ( 56 )	1.00000E-03	EDGAP ( 57 )	1.00000E-03	EDGAP ( 58 )	1.00000E-03	EDGAP ( 59 )	9.96881E-02	EDGAP ( 60 )	1.00000E-03
EDGAP ( 61 )	1.00000E-03	EDGAP ( 62 )	1.00000E-03	EDGAP ( 63 )	1.00000E-03	EDGAP ( 64 )	1.00000E-03	EDGAP ( 65 )	1.00000E-03
EDGAP ( 66 )	1.00000E-03	EDGAP ( 67 )	1.00000E-03	EDGAP ( 68 )	9.96326E-02	EDGAP ( 69 )	9.99536E-02	EDGAP ( 70 )	1.00000E-03
EDGAP ( 71 )	1.00000E-03	EDGAP ( 72 )	1.00000E-03	EDGAP ( 73 )	1.00000E-03	EDGAP ( 74 )	1.00000E-03	EDGAP ( 75 )	1.00000E-03
EDGAP ( 76 )	1.00000E-03	EDGAP ( 77 )	9.97298E-02	EDGAP ( 78 )	9.98984E-02	EDGAP ( 79 )	1.00000E-03	EDGAP ( 80 )	1.00000E-03
EDGAP ( 81 )	1.00000E-03	EDGAP ( 82 )	1.00000E-03	EDGAP ( 83 )	1.00000E-03	EDGAP ( 84 )	1.00000E-03	EDGAP ( 85 )	1.00000E-03
EDGAP ( 86 )	9.98300E-02	EDGAP ( 87 )	9.98818E-02	EDGAP ( 88 )	9.95814E-02	EDGAP ( 89 )	1.00000E-03	EDGAP ( 90 )	1.00000E-03
EDGAP ( 91 )	1.00000E-03	EDGAP ( 92 )	1.00000E-03	EDGAP ( 93 )	1.00000E-03	EDGAP ( 94 )	9.92579E-02	EDGAP ( 95 )	9.98812E-02
EDGAP ( 96 )	9.98340E-02	EDGAP ( 97 )	9.96730E-02	EDGAP ( 98 )	1.00000E-03	EDGAP ( 99 )	1.00000E-03	EDGAP ( 100 )	1.00000E-03
EDGAP ( 101 )	1.00000E-03	EDGAP ( 102 )	1.00000E-03	EDGAP ( 103 )	1.00000E-03	EDGAP ( 104 )	1.00000E-03	EDGAP ( 105 )	1.00000E-03
EDGAP ( 106 )	9.97264E-02	EDGAP ( 107 )	1.00000E-03	EDGAP ( 108 )	1.00000E-03	EDGAP ( 109 )	1.00000E-03	EDGAP ( 110 )	1.00000E-03
EDGAP ( 111 )	1.00000E-03	EDGAP ( 112 )	1.00000E-03	EDGAP ( 113 )	9.99305E-02	EDGAP ( 114 )	9.96873E-02	EDGAP ( 115 )	1.00000E-03
EDGAP ( 116 )	1.00000E-03	EDGAP ( 117 )	1.00000E-03	EDGAP ( 118 )	1.00000E-03	EDGAP ( 119 )	1.00000E-03	EDGAP ( 120 )	1.00000E-03
EDGAP ( 121 )	1.00000E-03	EDGAP ( 122 )	9.99754E-02	EDGAP ( 123 )	9.98348E-02	EDGAP ( 124 )	9.95408E-02	EDGAP ( 125 )	1.00000E-03
EDGAP ( 126 )	1.00000E-03	EDGAP ( 127 )	1.00000E-03	EDGAP ( 128 )	1.00000E-03	EDGAP ( 129 )	1.00000E-03	EDGAP ( 130 )	1.00000E-03
EDGAP ( 131 )	9.99065E-02	EDGAP ( 132 )	9.98853E-02	EDGAP ( 133 )	9.94523E-02	EDGAP ( 134 )	1.00000E-03	EDGAP ( 135 )	1.00000E-03
EDGAP ( 136 )	1.00000E-03	EDGAP ( 137 )	1.00000E-03	EDGAP ( 138 )	1.00000E-03	EDGAP ( 139 )	1.00000E-03	EDGAP ( 140 )	9.98193E-02
EDGAP ( 141 )	9.99060E-02	EDGAP ( 142 )	9.93255E-02	EDGAP ( 143 )	1.00000E-03	EDGAP ( 144 )	1.00000E-03	EDGAP ( 145 )	1.00000E-03
EDGAP ( 146 )	1.00000E-03	EDGAP ( 147 )	1.00000E-03	EDGAP ( 148 )	1.00000E-03	EDGAP ( 149 )	9.97722E-02	EDGAP ( 150 )	9.99683E-02
EDGAP ( 151 )	1.00000E-03	EDGAP ( 152 )	1.00000E-03	EDGAP ( 153 )	1.00000E-03	EDGAP ( 154 )	1.00000E-03	EDGAP ( 155 )	1.00000E-03
EDGAP ( 156 )	1.00000E-03	EDGAP ( 157 )	1.00000E-03	EDGAP ( 158 )	9.97380E-02	EDGAP ( 159 )	1.00000E-03	EDGAP ( 160 )	1.00000E-03
EDGAP ( 161 )	1.00000E-03	EDGAP ( 162 )	1.00000E-03	EDGAP ( 163 )	1.00000E-03	EDGAP ( 164 )	1.00000E-03	EDGAP ( 165 )	1.00000E-03
EDGAP ( 166 )	1.00000E-03	EDGAP ( 167 )	1.00000E-03	EDGAP ( 168 )	1.00000E-03	EDGAP ( 169 )	1.00000E-03	EDGAP ( 170 )	1.00000E-03
EDGAP ( 171 )	1.00000E-03	EDGAP ( 172 )	1.00000E-03	EDGAP ( 173 )	1.00000E-03	EDGAP ( 174 )	1.00000E-03	EDGAP ( 175 )	1.00000E-03
EDGAP ( 176 )	1.00000E-03	EDGAP ( 177 )	1.00000E-03	EDGAP ( 178 )	1.00000E-03	EDGAP ( 179 )	1.00000E-03	EDGAP ( 180 )	1.00000E-03
EDGAP ( 181 )	1.00000E-03	EDGAP ( 182 )	1.00000E-03	EDGAP ( 183 )	1.00000E-03	EDGAP ( 184 )	1.00000E-03	EDGAP ( 185 )	1.00000E-03
EDGAP ( 186 )	1.00000E-03	EDGAP ( 187 )	1.00000E-03	EDGAP ( 188 )	1.00000E-03	EDGAP ( 189 )	1.00000E-03	EDGAP ( 190 )	1.00000E-03
EDGAP ( 191 )	1.00000E-03	EDGAP ( 192 )	1.00000E-03	EDGAP ( 193 )	1.00000E-03	EDGAP ( 194 )	1.00000E-03	EDGAP ( 195 )	1.00000E-03
EDGAP ( 196 )	1.00000E-03	EDGAP ( 197 )	1.00000E-03	EDGAP ( 198 )	1.00000E-03	EDGAP ( 199 )	1.00000E-03	EDGAP ( 200 )	1.00000E-03
EDGAP ( 201 )	1.00000E-03	EDGAP ( 202 )	1.00000E-03	EDGAP ( 203 )	1.00000E-03	EDGAP ( 204 )	1.00000E-03	EDGAP ( 205 )	1.00000E-03
EDGAP ( 206 )	1.00000E-03	EDGAP ( 207 )	1.00000E-03	EDGAP ( 208 )	1.00000E-03	EDGAP ( 209 )	1.00000E-03	EDGAP ( 210 )	1.00000E-03
EDGAP ( 211 )	1.00000E-03	EDGAP ( 212 )	1.00000E-03	EDGAP ( 213 )	1.00000E-03	EDGAP ( 214 )	1.00000E-03	EDGAP ( 215 )	1.00000E-03
EDGAP ( 216 )	1.00000E-03								

Figure 7 (cont.). Example of MITAS-II flow related output.

```

SMOCK
U      = .2116F+04,
BMD    = .1E-01,
BMU    = .128E-04,
SMOCK  = .2902E+03,
XZERO  = .28384E+03,
MS     = .36E-01,
DELTAX = .1E+00,
DTILE  = .147E+01,
FLOSIGN = .1E+01,
SEND
G(1-24), TOP OF GAP
      3.73963311      3.76463875      3.79899422      3.83420721      3.86584139      3.89669428
      3.93411633      3.97779004      4.05100748      4.19131744      4.44957763      4.78128213
      4.78128734      4.44958204      4.19131943      4.05100853      3.97779042      3.93411658
      3.89777810      3.86683621      3.83525887      3.79782461      3.76358465      3.73934650
G(1-24), BOTTOM OF GAP
      3.76315110      3.78533574      3.81468761      3.84874537      3.88684009      3.93189097
      4.05372077      4.12186446      4.25656631      4.39304862      4.49693957      4.62072920
      4.54209849      4.40979090      4.25904499      4.13961473      4.06116254      4.02126720
      3.95608785      3.89199254      3.83439378      3.80119420      3.77797455      3.75679989
ARRAY PSUR
      3.75144864      3.78217724      3.81799893      3.85144838      3.88222398      3.91446633
      3.78217939      3.81799710      3.85144672      3.88222239      3.91446461      3.95311980
      3.81799527      3.85144506      3.88222080      3.91446290      3.95311742      4.00672179
      3.85144339      3.88221922      3.91446118      3.95311503      4.00671852      4.10095937
      3.88221763      3.91445947      3.95311265      4.00671525      4.10095065      4.29988419
      3.91445775      3.95311027      4.00671198      4.10094193      4.29987044      4.60187724
ARRAY PTBI
      4.49375718      4.57053951      4.63778196      4.69736158      4.75384345      4.81931356
      4.54649757      4.63247456      4.70062859      4.76208033      4.82102465      4.88326212
      4.60193316      4.68720678      4.75624859      4.82001131      4.88261904      4.95086033
      4.66070120      4.74137614      4.81083980      4.87770792      4.94516205      5.02102113
      4.72037471      4.79421891      4.86574390      4.93784914      5.01151309      5.09450125
      4.78157233      4.84356956      4.92472869      5.00787704      5.09108966      5.17566815

```

Figure 8. Listing of data required for force and moment calculations.

TOTAL FORCES AND TOTAL MOMENTS

FXTOT	FYTOT	FZTOT	MXTOT	MYTOT	MZTOT
-0.50228019E+01	-0.27205698E+00	.30952180E+02	.82696153E+00	-0.43210101E+01	-0.45789313E-01

GAP FORCES			GAP MOMENTS		
GFX	GFY	GMX	GMY	GMZ	
-0.53522744E+01	-0.27205698E+00	.13314665E+00	-0.38881844E+01	-0.45789313E-01	

SKIN FRICTION FORCES AND MOMENTS

SFX	SMY
.32947248E+00	.48432454E+00

NORMAL FORCE FM .30952180E+02

NORMAL FORCE MOMENTS

MX	MY	MZ
.69381489E+00	-0.91715027E+00	0.

Figure 9. Force and moment summary.

## APPENDIX A

## Procedure File for Execution

```
JOB,TOOO,CM000000
USER,USERNO,PASSWD.
CHARGE,CHARGENO,LRC.
DELIVER.
GET,MITABS,ZRJCLIB,ZLIBRY/UN=691425N.
ATTACH,AKCLIB,FTNMLIB/UN=LIBRARY.
ATTACH,XEDIT/UN=LIBRARY.
GET,A=MODEL.
GET,TAPE5=PROFILE.
XEDIT,A.;XL/EXEC;/XL/2.135;/XC/3.74;/XQ
XEDIT,A.;XL/CONSTANTS;/XL/100=;/XC/1.41./1.47./;XQ
XEDIT,A.;XL/CONSTANTS;/XP30;XQ
MITABS,MOUPTUT,,,,,I=A.
RETURN,MITABS.
REPLACE,MOUPTUT.
XEDIT,EXFOR.;XL()/;/XC()/,INPUT,TAPE7=INPUT,TAPE5)/;XQ
FTN(I=EXFOR,R=3,L=LIST)
LDSET(LIB=ZRJCLIB/ZLIBRY/AKCLIB/FTNMLIB,PRESETA=NGINF,
      MAP=SBEX/LMAP)
LGO.
DAYFILE,DAYTEST.
REPLACE,DAYTEST.
EXIT.
DAYFILE,DAYTEST.
REPLACE,DAYTEST.
REPLACE,LIST.
REPLACE,LMAP.
COPYSBF,LIST,TEMP.
COPYSBF,LMAP,TEMP.
REWIND,TEMP.
ROUTE,TEMP,DC=PR.
EOR
$ XYCOOR X=13.64, Y=0.0, ISTA=1, IEND=81$END
$ XSHOCK U=2116.0, RHO=.01, XMU=.128E-4, XSHOCK=290.2,
  XZERO=283.84, KS=.036, DELTAX=.1, DTILE=1.47, FLOSIGN=1.0$END
EOR
EOF
```

## APPENDIX A, CONTINUED

## MITAS-II Model Input File

NOT RESTART  
NGENL=NG  
NDIP=NGCA

## APPENDIX A, CONTINUED

BCD 3TITLE DATA  
BCD 9SHUTTLE TILE INTERNAL FLOW  
END

BCD 3NODE DATA

GEN 97,36,1,0.,-1.

1024,0.,-1.,	1023,0.,-1.,	1022,0.,-1.,	1021,0.,-1.
1020,0.,-1.,	1019,0.,-1.,	8024,0.,-1.,	8023,0.,-1.
8022,0.,-1.,	8021,0.,-1.,	8020,0.,-1.,	8019,0.,-1.
7024,0.,-1.,	7023,0.,-1.,	7022,0.,-1.,	7021,0.,-1.
7020,0.,-1.,	7019,0.,-1.,	1007,0.,-1.,	1008,0.,-1.
1009,0.,-1.,	1010,0.,-1.,	1011,0.,-1.,	1012,0.,-1.
2021,0.,-1.,	2020,0.,-1.,	2019,0.,-1.,	24,0.,-1.
23,0.,-1.,	22,0.,-1.,	21,0.,-1.,	20,0.,-1.
19,0.,-1.,	6024,0.,-1.,	6023,0.,-1.,	6022,0.,-1.
6021,0.,-1.,	6020,0.,-1.,	6019,0.,-1.,	2007,0.,-1.
2008,0.,-1.,	2009,0.,-1.,	2010,0.,-1.,	2011,0.,-1.
2012,0.,-1.,	7,0.,-1.,	8,0.,-1.,	9,0.,-1.
10,0.,-1.,	11,0.,-1.,	12,0.,-1.,	4021,0.,-1.
4020,0.,-1.,	4019,0.,-1.,	5024,0.,-1.,	5023,0.,-1.
5022,0.,-1.,	5021,0.,-1.,	5020,0.,-1.,	5019,0.,-1.
3007,0.,-1.,	3008,0.,-1.,	3009,0.,-1.,	3010,0.,-1.
3011,0.,-1.,	3012,0.,-1.,	4007,0.,-1.,	4008,0.,-1.
4009,0.,-1.,	4010,0.,-1.,	4011,0.,-1.,	4012,0.,-1.
5007,0.,-1.,	5008,0.,-1.,	5009,0.,-1.,	5010,0.,-1.
5011,0.,-1.,	5012,0.,-1.,	1001,0.,-1.,	1002,0.,-1.
1003,0.,-1.,	1004,0.,-1.,	1005,0.,-1.,	1006,0.,-1.
1018,0.,-1.,	1017,0.,-1.,	1016,0.,-1.,	1015,0.,-1.
1014,0.,-1.,	1013,0.,-1.,	7001,0.,-1.,	7002,0.,-1.
7003,0.,-1.,	7004,0.,-1.,	7005,0.,-1.,	7006,0.,-1.
7018,0.,-1.,	7017,0.,-1.,	7016,0.,-1.,	7015,0.,-1.
7014,0.,-1.,	7013,0.,-1.,	2001,0.,-1.,	2002,0.,-1.
2003,0.,-1.,	2004,0.,-1.,	2005,0.,-1.,	2006,0.,-1.
1,0.,-1.,	2,0.,-1.,	3,0.,-1.,	4,0.,-1.
5,0.,-1.,	6,0.,-1.,	18,0.,-1.,	17,0.,-1.
16,0.,-1.,	15,0.,-1.,	14,0.,-1.,	13,0.,-1.
6018,0.,-1.,	6017,0.,-1.,	6016,0.,-1.,	6015,0.,-1.
6014,0.,-1.,	6013,0.,-1.,	3001,0.,-1.,	3002,0.,-1.
3003,0.,-1.,	3004,0.,-1.,	3005,0.,-1.,	3006,0.,-1.
3018,0.,-1.,	3017,0.,-1.,	3016,0.,-1.,	3015,0.,-1.
3014,0.,-1.,	3013,0.,-1.,	4018,0.,-1.,	4017,0.,-1.
4016,0.,-1.,	4015,0.,-1.,	4014,0.,-1.,	4013,0.,-1.
5018,0.,-1.,	5017,0.,-1.,	5016,0.,-1.,	5015,0.,-1.
5014,0.,-1.,	5013,0.,-1.,		
CGS 25,0.,A1,P1,	26,0.,A1,P1,	27,0.,A1,P1,	28,0.,A1,P1
CGS 29,0.,A1,P1,	30,0.,A1,P1,	31,0.,A1,P1,	32,0.,A1,P1
CGS 33,0.,A1,P1,	34,0.,A1,P1,	35,0.,A1,P1,	36,0.,A1,P1
CGS 37,0.,A1,P1,	38,0.,A1,P1,	39,0.,A1,P1,	40,0.,A1,P1
CGS 41,0.,A1,P1,	42,0.,A1,P1,	43,0.,A1,P1,	44,0.,A1,P1
CGS 45,0.,A1,P1,	46,0.,A1,P1,	47,0.,A1,P1,	48,0.,A1,P1
CGS 49,0.,A1,P1,	50,0.,A1,P1,	51,0.,A1,P1,	52,0.,A1,P1
CGS 53,0.,A1,P1,	54,0.,A1,P1,	55,0.,A1,P1,	56,0.,A1,P1
CGS 57,0.,A1,P1,	58,0.,A1,P1,	59,0.,A1,P1,	60,0.,A1,P1
CGS 61,0.,A1,P1,	62,0.,A1,P1,	63,0.,A1,P1,	64,0.,A1,P1
CGS 65,0.,A1,P1,	66,0.,A1,P1,	67,0.,A1,P1,	68,0.,A1,P1
CGS 69,0.,A1,P1,	70,0.,A1,P1,	71,0.,A1,P1,	72,0.,A1,P1
CGS 73,0.,A1,P1,	74,0.,A1,P1,	75,0.,A1,P1,	76,0.,A1,P1
CGS 77,0.,A1,P1,	78,0.,A1,P1,	79,0.,A1,P1,	80,0.,A1,P1
CGS 81,0.,A1,P1,	82,0.,A1,P1,	83,0.,A1,P1,	84,0.,A1,P1
CGS 85,0.,A1,P1,	86,0.,A1,P1,	87,0.,A1,P1,	88,0.,A1,P1
CGS 89,0.,A1,P1,	90,0.,A1,P1,	91,0.,A1,P1,	92,0.,A1,P1
CGS 93,0.,A1,P1,	94,0.,A1,P1,	95,0.,A1,P1,	96,0.,A1,P1
-1224,	3.740,	0.0	
-1223,	3.740,	0.0	
-1222,	3.740,	0.0	

## APPENDIX A, CONTINUED

-1221,	3.740,	0.0
-1220,	3.740,	0.0
-1219,	3.739,	0.0
-8224,	3.739,	0.0
-8223,	3.739,	0.0
-8222,	3.739,	0.0
-8221,	3.740,	0.0
-8220,	3.740,	0.0
-8219,	3.741,	0.0
-7224,	3.740,	0.0
-7223,	3.737,	0.0
-7222,	3.734,	0.0
-7221,	3.739,	0.0
-7220,	3.764,	0.0
-7219,	3.798,	0.0
-1207,	3.739,	0.0
-1208,	3.739,	0.0
-1209,	3.739,	0.0
-1210,	3.740,	0.0
-1211,	3.740,	0.0
-1212,	3.741,	0.0
-2221,	3.740,	0.0
-2220,	3.737,	0.0
-2219,	3.734,	0.0
-224,	3.739,	0.0
-223,	3.764,	0.0
-222,	3.798,	0.0
-221,	3.835,	0.0
-220,	3.867,	0.0
-219,	3.899,	0.0
-6224,	3.933,	0.0
-6223,	3.976,	0.0
-6222,	4.048,	0.0
-6221,	4.197,	0.0
-6220,	4.460,	0.0
-6219,	4.792,	0.0
-2207,	3.740,	0.0
-2208,	3.765,	0.0
-2209,	3.799,	0.0
-2210,	3.834,	0.0
-2211,	3.866,	0.0
-2212,	3.897,	0.0
-207,	3.934,	0.0
-208,	3.978,	0.0
-209,	4.051,	0.0
-210,	4.191,	0.0
-211,	4.450,	0.0
-212,	4.781,	0.0
-4221,	5.125,	0.0
-4220,	5.372,	0.0
-4219,	5.533,	0.0
-5224,	5.620,	0.0
-5223,	5.679,	0.0
-5222,	5.724,	0.0
-5221,	5.753,	0.0
-5220,	5.773,	0.0
-5219,	5.818,	0.0
-3207,	4.197,	0.0
-3208,	4.460,	0.0
-3209,	4.792,	0.0
-3210,	5.116,	0.0
-3211,	5.366,	0.0
-3212,	5.529,	0.0
-4207,	5.622,	0.0



## APPENDIX A, CONTINUED

-4208,	5.681,	0.0
-4209,	5.725,	0.0
-4210,	5.752,	0.0
-4211,	5.777,	0.0
-4212,	5.816,	0.0
-5207,	5.876,	0.0
-5208,	5.935,	0.0
-5209,	5.985,	0.0
-5210,	6.024,	0.0
-5211,	6.060,	0.0
-5212,	6.100,	0.0
-1201,	3.740,	0.0
-1202,	3.740,	0.0
-1203,	3.740,	0.0
-1204,	3.740,	0.0
-1205,	3.740,	0.0
-1206,	3.739,	0.0
-1218,	3.739,	0.0
-1217,	3.739,	0.0
-1216,	3.739,	0.0
-1215,	3.740,	0.0
-1214,	3.740,	0.0
-1213,	3.741,	0.0
-7201,	3.740,	0.0
-7202,	3.737,	0.0
-7203,	3.734,	0.0
-7204,	3.739,	0.0
-7205,	3.764,	0.0
-7206,	3.798,	0.0
-7218,	3.835,	0.0
-7217,	3.867,	0.0
-7216,	3.893,	0.0
-7215,	3.933,	0.0
-7214,	3.976,	0.0
-7213,	4.048,	0.0
-2201,	3.740,	0.0
-2202,	3.740,	0.0
-2203,	3.741,	0.0
-2204,	3.740,	0.0
-2205,	3.737,	0.0
-2206,	3.734,	0.0
-201,	3.740,	0.0
-202,	3.765,	0.0
-203,	3.799,	0.0
-204,	3.834,	0.0
-205,	3.866,	0.0
-206,	3.897,	0.0
-218,	3.934,	0.0
-217,	3.979,	0.0
-216,	4.051,	0.0
-215,	4.191,	0.0
-214,	4.450,	0.0
-213,	4.781,	0.0
-6218,	5.125,	0.0
-6217,	5.372,	0.0
-6216,	5.533,	0.0
-6215,	5.620,	0.0
-6214,	5.679,	0.0
-6213,	5.724,	0.0
-3201,	3.835,	0.0
-3202,	3.867,	0.0
-3203,	3.893,	0.0
-3204,	3.933,	0.0
-3205,	3.976,	0.0

## APPENDIX A, CONTINUED

-3206,	4.048,	0.0	
-3218,	4.197,	0.0	
-3217,	4.460,	0.0	
-3216,	4.792,	0.0	
-3215,	5.116,	0.0	
-3214,	5.366,	0.0	
-3213,	5.528,	0.0	
-4218,	5.622,	0.0	
-4217,	5.681,	0.0	
-4216,	5.725,	0.0	
-4215,	5.752,	0.0	
-4214,	5.777,	0.0	
-4213,	5.815,	0.0	
-5218,	5.876,	0.0	
-5217,	5.935,	0.0	
-5216,	5.985,	0.0	
-5215,	6.024,	0.0	
-5214,	6.063,	0.0	
-5213,	6.103,	0.0	
GFN 1097,36,1,0,-1.			
CGS 1025,0.,A1,P1,	1026,0.,A1,P1,	1027,0.,A1,P1,	1028,0.,A1,P1
CGS 1029,0.,A1,P1,	1030,0.,A1,P1,	1031,0.,A1,P1,	1032,0.,A1,P1
CGS 1033,0.,A1,P1,	1034,0.,A1,P1,	1035,0.,A1,P1,	1036,0.,A1,P1
CGS 1037,0.,A1,P1,	1038,0.,A1,P1,	1039,0.,A1,P1,	1040,0.,A1,P1
CGS 1041,0.,A1,P1,	1042,0.,A1,P1,	1043,0.,A1,P1,	1044,0.,A1,P1
CGS 1045,0.,A1,P1,	1046,0.,A1,P1,	1047,0.,A1,P1,	1048,0.,A1,P1
CGS 1049,0.,A1,P1,	1050,0.,A1,P1,	1051,0.,A1,P1,	1052,0.,A1,P1
CGS 1053,0.,A1,P1,	1054,0.,A1,P1,	1055,0.,A1,P1,	1056,0.,A1,P1
CGS 1057,0.,A1,P1,	1058,0.,A1,P1,	1059,0.,A1,P1,	1060,0.,A1,P1
CGS 1061,0.,A1,P1,	1062,0.,A1,P1,	1063,0.,A1,P1,	1064,0.,A1,P1
CGS 1065,0.,A1,P1,	1066,0.,A1,P1,	1067,0.,A1,P1,	1068,0.,A1,P1
CGS 1069,0.,A1,P1,	1070,0.,A1,P1,	1071,0.,A1,P1,	1072,0.,A1,P1
CGS 1073,0.,A1,P1,	1074,0.,A1,P1,	1075,0.,A1,P1,	1076,0.,A1,P1
CGS 1077,0.,A1,P1,	1078,0.,A1,P1,	1079,0.,A1,P1,	1080,0.,A1,P1
CGS 1081,0.,A1,P1,	1082,0.,A1,P1,	1083,0.,A1,P1,	1084,0.,A1,P1
CGS 1085,0.,A1,P1,	1086,0.,A1,P1,	1087,0.,A1,P1,	1088,0.,A1,P1
CGS 1089,0.,A1,P1,	1090,0.,A1,P1,	1091,0.,A1,P1,	1092,0.,A1,P1
CGS 1093,0.,A1,P1,	1094,0.,A1,P1,	1095,0.,A1,P1,	1096,0.,A1,P1
GFN 2097,36,1,0,-1.			
CGS 2025,0.,A1,P1,	2026,0.,A1,P1,	2027,0.,A1,P1,	2028,0.,A1,P1
CGS 2029,0.,A1,P1,	2030,0.,A1,P1,	2031,0.,A1,P1,	2032,0.,A1,P1
CGS 2033,0.,A1,P1,	2034,0.,A1,P1,	2035,0.,A1,P1,	2036,0.,A1,P1
CGS 2037,0.,A1,P1,	2038,0.,A1,P1,	2039,0.,A1,P1,	2040,0.,A1,P1
CGS 2041,0.,A1,P1,	2042,0.,A1,P1,	2043,0.,A1,P1,	2044,0.,A1,P1
CGS 2045,0.,A1,P1,	2046,0.,A1,P1,	2047,0.,A1,P1,	2048,0.,A1,P1
CGS 2049,0.,A1,P1,	2050,0.,A1,P1,	2051,0.,A1,P1,	2052,0.,A1,P1
CGS 2053,0.,A1,P1,	2054,0.,A1,P1,	2055,0.,A1,P1,	2056,0.,A1,P1
CGS 2057,0.,A1,P1,	2058,0.,A1,P1,	2059,0.,A1,P1,	2060,0.,A1,P1
CGS 2061,0.,A1,P1,	2062,0.,A1,P1,	2063,0.,A1,P1,	2064,0.,A1,P1
CGS 2065,0.,A1,P1,	2066,0.,A1,P1,	2067,0.,A1,P1,	2068,0.,A1,P1
CGS 2069,0.,A1,P1,	2070,0.,A1,P1,	2071,0.,A1,P1,	2072,0.,A1,P1
CGS 2073,0.,A1,P1,	2074,0.,A1,P1,	2075,0.,A1,P1,	2076,0.,A1,P1
CGS 2077,0.,A1,P1,	2078,0.,A1,P1,	2079,0.,A1,P1,	2080,0.,A1,P1
CGS 2081,0.,A1,P1,	2082,0.,A1,P1,	2083,0.,A1,P1,	2084,0.,A1,P1
CGS 2085,0.,A1,P1,	2086,0.,A1,P1,	2087,0.,A1,P1,	2088,0.,A1,P1
CGS 2089,0.,A1,P1,	2090,0.,A1,P1,	2091,0.,A1,P1,	2092,0.,A1,P1
CGS 2093,0.,A1,P1,	2094,0.,A1,P1,	2095,0.,A1,P1,	2096,0.,A1,P1
GFN 3097,36,1,0,-1.			
CGS 3025,0.,A1,P1,	3026,0.,A1,P1,	3027,0.,A1,P1,	3028,0.,A1,P1
CGS 3029,0.,A1,P1,	3030,0.,A1,P1,	3031,0.,A1,P1,	3032,0.,A1,P1
CGS 3033,0.,A1,P1,	3034,0.,A1,P1,	3035,0.,A1,P1,	3036,0.,A1,P1
CGS 3037,0.,A1,P1,	3038,0.,A1,P1,	3039,0.,A1,P1,	3040,0.,A1,P1
CGS 3041,0.,A1,P1,	3042,0.,A1,P1,	3043,0.,A1,P1,	3044,0.,A1,P1
CGS 3045,0.,A1,P1,	3046,0.,A1,P1,	3047,0.,A1,P1,	3048,0.,A1,P1

## APPENDIX A, CONTINUED

CGS 3049,0.,A1,P1, 3050,0.,A1,P1, 3051,0.,A1,P1, 3052,0.,A1,P1  
 CGS 3053,0.,A1,P1, 3054,0.,A1,P1, 3055,0.,A1,P1, 3056,0.,A1,P1  
 CGS 3057,0.,A1,P1, 3058,0.,A1,P1, 3059,0.,A1,P1, 3060,0.,A1,P1  
 CGS 3061,0.,A1,P1, 3062,0.,A1,P1, 3063,0.,A1,P1, 3064,0.,A1,P1  
 CGS 3065,0.,A1,P1, 3066,0.,A1,P1, 3067,0.,A1,P1, 3068,0.,A1,P1  
 CGS 3069,0.,A1,P1, 3070,0.,A1,P1, 3071,0.,A1,P1, 3072,0.,A1,P1  
 CGS 3073,0.,A1,P1, 3074,0.,A1,P1, 3075,0.,A1,P1, 3076,0.,A1,P1  
 CGS 3077,0.,A1,P1, 3078,0.,A1,P1, 3079,0.,A1,P1, 3080,0.,A1,P1  
 CGS 3081,0.,A1,P1, 3082,0.,A1,P1, 3083,0.,A1,P1, 3084,0.,A1,P1  
 CGS 3085,0.,A1,P1, 3086,0.,A1,P1, 3087,0.,A1,P1, 3088,0.,A1,P1  
 CGS 3089,0.,A1,P1, 3090,0.,A1,P1, 3091,0.,A1,P1, 3092,0.,A1,P1  
 CGS 3093,0.,A1,P1, 3094,0.,A1,P1, 3095,0.,A1,P1, 3096,0.,A1,P1  
 GEN 4097,36,1,0.,-1.  
 CGS 4025,0.,A1,P1, 4026,0.,A1,P1, 4027,0.,A1,P1, 4028,0.,A1,P1  
 CGS 4029,0.,A1,P1, 4030,0.,A1,P1, 4031,0.,A1,P1, 4032,0.,A1,P1  
 CGS 4033,0.,A1,P1, 4034,0.,A1,P1, 4035,0.,A1,P1, 4036,0.,A1,P1  
 CGS 4037,0.,A1,P1, 4038,0.,A1,P1, 4039,0.,A1,P1, 4040,0.,A1,P1  
 CGS 4041,0.,A1,P1, 4042,0.,A1,P1, 4043,0.,A1,P1, 4044,0.,A1,P1  
 CGS 4045,0.,A1,P1, 4046,0.,A1,P1, 4047,0.,A1,P1, 4048,0.,A1,P1  
 CGS 4049,0.,A1,P1, 4050,0.,A1,P1, 4051,0.,A1,P1, 4052,0.,A1,P1  
 CGS 4053,0.,A1,P1, 4054,0.,A1,P1, 4055,0.,A1,P1, 4056,0.,A1,P1  
 CGS 4057,0.,A1,P1, 4058,0.,A1,P1, 4059,0.,A1,P1, 4060,0.,A1,P1  
 CGS 4061,0.,A1,P1, 4062,0.,A1,P1, 4063,0.,A1,P1, 4064,0.,A1,P1  
 CGS 4065,0.,A1,P1, 4066,0.,A1,P1, 4067,0.,A1,P1, 4068,0.,A1,P1  
 CGS 4069,0.,A1,P1, 4070,0.,A1,P1, 4071,0.,A1,P1, 4072,0.,A1,P1  
 CGS 4073,0.,A1,P1, 4074,0.,A1,P1, 4075,0.,A1,P1, 4076,0.,A1,P1  
 CGS 4077,0.,A1,P1, 4078,0.,A1,P1, 4079,0.,A1,P1, 4080,0.,A1,P1  
 CGS 4081,0.,A1,P1, 4082,0.,A1,P1, 4083,0.,A1,P1, 4084,0.,A1,P1  
 CGS 4085,0.,A1,P1, 4086,0.,A1,P1, 4087,0.,A1,P1, 4088,0.,A1,P1  
 CGS 4089,0.,A1,P1, 4090,0.,A1,P1, 4091,0.,A1,P1, 4092,0.,A1,P1  
 CGS 4093,0.,A1,P1, 4094,0.,A1,P1, 4095,0.,A1,P1, 4096,0.,A1,P1  
 GEN 5097,36,1,0.,-1.  
 CGS 5025,0.,A1,P1, 5026,0.,A1,P1, 5027,0.,A1,P1, 5028,0.,A1,P1  
 CGS 5029,0.,A1,P1, 5030,0.,A1,P1, 5031,0.,A1,P1, 5032,0.,A1,P1  
 CGS 5033,0.,A1,P1, 5034,0.,A1,P1, 5035,0.,A1,P1, 5036,0.,A1,P1  
 CGS 5037,0.,A1,P1, 5038,0.,A1,P1, 5039,0.,A1,P1, 5040,0.,A1,P1  
 CGS 5041,0.,A1,P1, 5042,0.,A1,P1, 5043,0.,A1,P1, 5044,0.,A1,P1  
 CGS 5045,0.,A1,P1, 5046,0.,A1,P1, 5047,0.,A1,P1, 5048,0.,A1,P1  
 CGS 5049,0.,A1,P1, 5050,0.,A1,P1, 5051,0.,A1,P1, 5052,0.,A1,P1  
 CGS 5053,0.,A1,P1, 5054,0.,A1,P1, 5055,0.,A1,P1, 5056,0.,A1,P1  
 CGS 5057,0.,A1,P1, 5058,0.,A1,P1, 5059,0.,A1,P1, 5060,0.,A1,P1  
 CGS 5061,0.,A1,P1, 5062,0.,A1,P1, 5063,0.,A1,P1, 5064,0.,A1,P1  
 CGS 5065,0.,A1,P1, 5066,0.,A1,P1, 5067,0.,A1,P1, 5068,0.,A1,P1  
 CGS 5069,0.,A1,P1, 5070,0.,A1,P1, 5071,0.,A1,P1, 5072,0.,A1,P1  
 CGS 5073,0.,A1,P1, 5074,0.,A1,P1, 5075,0.,A1,P1, 5076,0.,A1,P1  
 CGS 5077,0.,A1,P1, 5078,0.,A1,P1, 5079,0.,A1,P1, 5080,0.,A1,P1  
 CGS 5081,0.,A1,P1, 5082,0.,A1,P1, 5083,0.,A1,P1, 5084,0.,A1,P1  
 CGS 5085,0.,A1,P1, 5086,0.,A1,P1, 5087,0.,A1,P1, 5088,0.,A1,P1  
 CGS 5089,0.,A1,P1, 5090,0.,A1,P1, 5091,0.,A1,P1, 5092,0.,A1,P1  
 CGS 5093,0.,A1,P1, 5094,0.,A1,P1, 5095,0.,A1,P1, 5096,0.,A1,P1  
 GEN 6097,36,1,0.,-1.  
 CGS 6025,0.,A1,P1, 6026,0.,A1,P1, 6027,0.,A1,P1, 6028,0.,A1,P1  
 CGS 6029,0.,A1,P1, 6030,0.,A1,P1, 6031,0.,A1,P1, 6032,0.,A1,P1  
 CGS 6033,0.,A1,P1, 6034,0.,A1,P1, 6035,0.,A1,P1, 6036,0.,A1,P1  
 CGS 6037,0.,A1,P1, 6038,0.,A1,P1, 6039,0.,A1,P1, 6040,0.,A1,P1  
 CGS 6041,0.,A1,P1, 6042,0.,A1,P1, 6043,0.,A1,P1, 6044,0.,A1,P1  
 CGS 6045,0.,A1,P1, 6046,0.,A1,P1, 6047,0.,A1,P1, 6048,0.,A1,P1  
 CGS 6049,0.,A1,P1, 6050,0.,A1,P1, 6051,0.,A1,P1, 6052,0.,A1,P1  
 CGS 6053,0.,A1,P1, 6054,0.,A1,P1, 6055,0.,A1,P1, 6056,0.,A1,P1  
 CGS 6057,0.,A1,P1, 6058,0.,A1,P1, 6059,0.,A1,P1, 6060,0.,A1,P1  
 CGS 6061,0.,A1,P1, 6062,0.,A1,P1, 6063,0.,A1,P1, 6064,0.,A1,P1  
 CGS 6065,0.,A1,P1, 6066,0.,A1,P1, 6067,0.,A1,P1, 6068,0.,A1,P1  
 CGS 6069,0.,A1,P1, 6070,0.,A1,P1, 6071,0.,A1,P1, 6072,0.,A1,P1  
 CGS 6073,0.,A1,P1, 6074,0.,A1,P1, 6075,0.,A1,P1, 6076,0.,A1,P1

## APPENDIX A, CONTINUED

CGS 6077,0.,A1,R1, 6078,0.,A1,R1, 6079,0.,A1,R1, 6080,0.,A1,R1  
 CGS 6081,0.,A1,R1, 6082,0.,A1,R1, 6083,0.,A1,R1, 6084,0.,A1,P1  
 CGS 6085,0.,A1,R1, 6086,0.,A1,R1, 6087,0.,A1,R1, 6088,0.,A1,R1  
 CGS 6089,0.,A1,R1, 6090,0.,A1,R1, 6091,0.,A1,R1, 6092,0.,A1,R1  
 CGS 6093,0.,A1,R1, 6094,0.,A1,R1, 6095,0.,A1,R1, 6096,0.,A1,R1  
 GFN 7097,36,1,0.,-1.  
 CGS 7025,0.,A1,R1, 7026,0.,A1,R1, 7027,0.,A1,P1, 7028,0.,A1,R1  
 CGS 7029,0.,A1,R1, 7030,0.,A1,R1, 7031,0.,A1,R1, 7032,0.,A1,R1  
 CGS 7033,0.,A1,R1, 7034,0.,A1,R1, 7035,0.,A1,R1, 7036,0.,A1,R1  
 CGS 7037,0.,A1,R1, 7038,0.,A1,R1, 7039,0.,A1,R1, 7040,0.,A1,R1  
 CGS 7041,0.,A1,R1, 7042,0.,A1,R1, 7043,0.,A1,R1, 7044,0.,A1,R1  
 CGS 7045,0.,A1,R1, 7046,0.,A1,R1, 7047,0.,A1,R1, 7048,0.,A1,R1  
 CGS 7049,0.,A1,R1, 7050,0.,A1,R1, 7051,0.,A1,P1, 7052,0.,A1,P1  
 CGS 7053,0.,A1,R1, 7054,0.,A1,R1, 7055,0.,A1,R1, 7056,0.,A1,R1  
 CGS 7057,0.,A1,P1, 7058,0.,A1,R1, 7059,0.,A1,R1, 7060,0.,A1,R1  
 CGS 7061,0.,A1,P1, 7062,0.,A1,R1, 7063,0.,A1,P1, 7064,0.,A1,R1  
 CGS 7065,0.,A1,P1, 7066,0.,A1,R1, 7067,0.,A1,R1, 7068,0.,A1,R1  
 CGS 7069,0.,A1,P1, 7070,0.,A1,R1, 7071,0.,A1,P1, 7072,0.,A1,R1  
 CGS 7073,0.,A1,P1, 7074,0.,A1,R1, 7075,0.,A1,P1, 7076,0.,A1,R1  
 CGS 7077,0.,A1,R1, 7078,0.,A1,R1, 7079,0.,A1,P1, 7080,0.,A1,R1  
 CGS 7081,0.,A1,R1, 7082,0.,A1,P1, 7083,0.,A1,R1, 7084,0.,A1,R1  
 CGS 7085,0.,A1,R1, 7086,0.,A1,R1, 7087,0.,A1,P1, 7088,0.,A1,R1  
 CGS 7089,0.,A1,R1, 7090,0.,A1,R1, 7091,0.,A1,R1, 7092,0.,A1,P1  
 CGS 7093,0.,A1,R1, 7094,0.,A1,P1, 7095,0.,A1,R1, 7096,0.,A1,P1  
 GFN 8097,36,1,0.,-1.  
 CGS 8025,0.,A1,R1, 8026,0.,A1,P1, 8027,0.,A1,P1, 8028,0.,A1,R1  
 CGS 8029,0.,A1,R1, 8030,0.,A1,P1, 8031,0.,A1,R1, 8032,0.,A1,P1  
 CGS 8033,0.,A1,P1, 8034,0.,A1,R1, 8035,0.,A1,P1, 8036,0.,A1,P1  
 CGS 8037,0.,A1,R1, 8038,0.,A1,P1, 8039,0.,A1,R1, 8040,0.,A1,R1  
 CGS 8041,0.,A1,P1, 8042,0.,A1,P1, 8043,0.,A1,P1, 8044,0.,A1,R1  
 CGS 8045,0.,A1,R1, 8046,0.,A1,R1, 8047,0.,A1,P1, 8048,0.,A1,P1  
 CGS 8049,0.,A1,P1, 8050,0.,A1,R1, 8051,0.,A1,P1, 8052,0.,A1,R1  
 CGS 8053,0.,A1,P1, 8054,0.,A1,R1, 8055,0.,A1,R1, 8056,0.,A1,R1  
 CGS 8057,0.,A1,P1, 8058,0.,A1,R1, 8059,0.,A1,R1, 8060,0.,A1,R1  
 CGS 8061,0.,A1,P1, 8062,0.,A1,P1, 8063,0.,A1,P1, 8064,0.,A1,R1  
 CGS 8065,0.,A1,P1, 8066,0.,A1,P1, 8067,0.,A1,P1, 8068,0.,A1,R1  
 CGS 8069,0.,A1,P1, 8070,0.,A1,R1, 8071,0.,A1,P1, 8072,0.,A1,R1  
 CGS 8073,0.,A1,R1, 8074,0.,A1,R1, 8075,0.,A1,P1, 8076,0.,A1,P1  
 CGS 8077,0.,A1,P1, 8078,0.,A1,P1, 8079,0.,A1,P1, 8080,0.,A1,R1  
 CGS 8081,0.,A1,P1, 8082,0.,A1,P1, 8083,0.,A1,R1, 8084,0.,A1,R1  
 CGS 8085,0.,A1,P1, 8086,0.,A1,P1, 8087,0.,A1,R1, 8088,0.,A1,R1  
 CGS 8089,0.,A1,P1, 8090,0.,A1,R1, 8091,0.,A1,P1, 8092,0.,A1,P1  
 CGS 8093,0.,A1,P1, 8094,0.,A1,R1, 8095,0.,A1,P1, 8096,0.,A1,R1

END

BCD CONDUCTOR DATA

GEN 1,24,1,201, 1,1,1,1.

GFN 25,23,1,2,1,1,1,1.

48,24,1,1.

GEN 53,6,1,1,1,25,1,1.

GEN 50,6,1,7,1,30,6,1.

GEN 65,6,1,13,1,60,-1,1.

GEN 71,6,1,19,1,55,-6,1.

C CONDUCTORS IN TILE

CGS	77,	1,	25,A2,P2,	78,	2,	26,A2,R2
CGS	79,	3,	27,A2,R2,	80,	4,	28,A2,R2
CGS	81,	5,	29,A2,R2,	82,	6,	30,A2,P2
CGS	83,	7,	30,A2,R2,	84,	8,	36,A2,P2
CGS	85,	9,	42,A2,R2,	86,	10,	48,A2,R2
CGS	87,	11,	54,A2,R2,	88,	12,	60,A2,R2
CGS	89,	13,	60,A2,R2,	90,	14,	59,A2,P2
CGS	91,	15,	58,A2,R2,	92,	16,	57,A2,R2
CGS	93,	17,	56,A2,R2,	94,	18,	55,A2,R2
CGS	95,	19,	55,A2,R2,	96,	20,	49,A2,P2
CGS	97,	21,	43,A2,R2,	98,	22,	37,A2,R2

## APPENDIX A, CONTINUED

CGS 99,	23,	31,A2,R2,	100,	24,	25,A2,R2
CGS 101,	25,	26,A3,R3,	102,	26,	27,A3,R3
CGS 103,	27,	28,A3,R3,	104,	28,	29,A3,R3
CGS 105,	29,	30,A3,R3,	106,	31,	32,A3,R3
CGS 107,	32,	33,A3,R3,	108,	33,	34,A3,R3
CGS 109,	34,	35,A3,P3,	110,	35,	36,A3,R3
CGS 111,	37,	38,A3,R3,	112,	38,	39,A3,R3
CGS 113,	39,	40,A3,R3,	114,	40,	41,A3,R3
CGS 115,	41,	42,A3,R3,	116,	43,	44,A3,P3
CGS 117,	44,	45,A3,R3,	118,	45,	46,A3,P3
CGS 119,	46,	47,A3,P3,	120,	47,	48,A3,P3
CGS 121,	49,	50,A3,R3,	122,	50,	51,A3,P3
CGS 123,	51,	52,A3,R3,	124,	52,	53,A3,P3
CGS 125,	53,	54,A3,R3,	126,	55,	56,A3,R3
CGS 127,	56,	57,A3,R3,	128,	57,	58,A3,P3
CGS 129,	58,	59,A3,R3,	130,	59,	60,A3,P3
CGS 131,	25,	31,A3,R3,	132,	31,	37,A3,R3
CGS 133,	37,	43,A3,P3,	134,	43,	49,A3,P3
CGS 135,	49,	55,A3,R3,	136,	26,	32,A3,R3
CGS 137,	32,	38,A3,R3,	138,	38,	44,A3,R3
CGS 139,	44,	50,A3,R3,	140,	50,	56,A3,R3
CGS 141,	27,	33,A3,R3,	142,	33,	39,A3,R3
CGS 143,	39,	45,A3,P3,	144,	45,	51,A3,P3
CGS 145,	51,	57,A3,R3,	146,	28,	34,A3,P3
CGS 147,	34,	40,A3,P3,	148,	40,	46,A3,P3
CGS 149,	46,	52,A3,R3,	150,	52,	58,A3,P3
CGS 151,	29,	35,A3,R3,	152,	35,	41,A3,P3
CGS 153,	41,	47,A3,P3,	154,	47,	53,A3,R3
CGS 155,	53,	59,A3,R3,	156,	30,	36,A3,R3
CGS 157,	36,	42,A3,R3,	158,	42,	48,A3,R3
CGS 159,	48,	54,A3,R3,	160,	54,	60,A3,P3
CGS 161,	61,	62,A3,R3,	162,	62,	63,A3,R3
CGS 163,	63,	64,A3,P3,	164,	64,	65,A3,P3
CGS 165,	65,	66,A3,R3,	166,	67,	68,A3,R3
CGS 167,	68,	69,A3,R3,	168,	69,	70,A3,P3
CGS 169,	70,	71,A3,P3,	170,	71,	72,A3,R3
CGS 171,	73,	74,A3,R3,	172,	74,	75,A3,P3
CGS 173,	75,	76,A3,P3,	174,	76,	77,A3,P3
CGS 175,	77,	78,A3,P3,	176,	79,	80,A3,R3
CGS 177,	80,	81,A3,R3,	178,	81,	82,A3,R3
CGS 179,	82,	83,A3,R3,	180,	83,	84,A3,P3
CGS 181,	85,	86,A3,P3,	182,	86,	87,A3,P3
CGS 183,	87,	88,A3,P3,	184,	88,	89,A3,R3
CGS 185,	89,	90,A3,R3,	186,	91,	92,A3,R3
CGS 187,	92,	93,A3,R3,	188,	93,	94,A3,R3
CGS 189,	94,	95,A3,R3,	190,	95,	96,A3,R3
CGS 191,	61,	67,A3,P3,	192,	67,	73,A3,P3
CGS 193,	73,	79,A3,R3,	194,	79,	85,A3,R3
CGS 195,	85,	91,A3,P3,	196,	62,	68,A3,R3
CGS 197,	68,	74,A3,R3,	198,	74,	80,A3,R3
CGS 199,	80,	86,A3,R3,	200,	86,	92,A3,P3
CGS 201,	63,	69,A3,R3,	202,	69,	75,A3,R3
CGS 203,	75,	81,A3,R3,	204,	81,	87,A3,P3
CGS 205,	87,	93,A3,P3,	206,	64,	70,A3,R3
CGS 207,	70,	76,A3,P3,	208,	76,	82,A3,P3
CGS 209,	82,	88,A3,R3,	210,	88,	94,A3,R3
CGS 211,	65,	71,A3,R3,	212,	71,	77,A3,P3
CGS 213,	77,	83,A3,R3,	214,	83,	89,A3,R3
CGS 215,	89,	95,A3,P3,	216,	66,	72,A3,R3
CGS 217,	72,	78,A3,R3,	218,	78,	84,A3,P3
CGS 219,	84,	90,A3,P3,	220,	90,	96,A3,P3
CGS 221,	25,	61,A3,P4,	222,	26,	62,A3,R4
CGS 223,	27,	63,A3,P4,	224,	28,	64,A3,P4
CGS 225,	29,	65,A2,R4,	226,	30,	66,A3,P4

## APPENDIX A, CONTINUED

CGS	227,	31,	67,A3,R4,	228,	32,	68,A3,R4
CGS	229,	33,	69,A3,R4,	230,	34,	70,A3,R4
CGS	231,	35,	71,A3,R4,	232,	36,	72,A3,R4
CGS	233,	37,	73,A3,R4,	234,	38,	74,A3,R4
CGS	235,	39,	75,A3,R4,	236,	40,	76,A3,R4
CGS	237,	41,	77,A3,R4,	238,	42,	78,A3,R4
CGS	239,	43,	79,A3,R4,	240,	44,	80,A3,R4
CGS	241,	45,	81,A3,R4,	242,	46,	82,A3,R4
CGS	243,	47,	83,A3,R4,	244,	48,	84,A3,P4
CGS	245,	49,	85,A3,R4,	246,	50,	86,A3,P4
CGS	247,	51,	87,A3,R4,	248,	52,	88,A3,P4
CGS	249,	53,	89,A3,R4,	250,	54,	90,A3,R4
CGS	251,	55,	91,A3,R4,	252,	56,	92,A3,R4
CGS	253,	57,	93,A3,P4,	254,	58,	94,A3,P4
CGS	255,	59,	95,A3,R4,	256,	60,	96,A3,R4
GFN	257,6,1,	25,	1,97,1,1.			
GEN	263,4,1,	36,	6,108,6,1.			
GEN	267,6,1,	60,	-1,132,-1,1.			
GEN	273,4,1,	49,	-6,121,-6,1.			
CGS	277,	97,	98,A4,P5,	278,	98,	99,A4,P5
CGS	279,	99,	100,A4,P5,	280,	100,	101,A4,P5
CGS	281,	101,	102,A4,P5,	282,	103,	104,A4,P5
CGS	283,	104,	105,A4,R5,	284,	105,	106,A4,P5
CGS	285,	106,	107,A4,P5,	286,	107,	108,A4,P5
CGS	287,	109,	110,A4,R5,	288,	110,	111,A4,P5
CGS	289,	111,	112,A4,P5,	290,	112,	113,A4,P5
CGS	291,	113,	114,A4,R5,	292,	115,	116,A4,P5
CGS	293,	116,	117,A4,R5,	294,	117,	118,A4,P5
CGS	295,	118,	119,A4,R5,	296,	119,	120,A4,P5
CGS	297,	121,	122,A4,P5,	298,	122,	123,A4,P5
CGS	299,	123,	124,A4,R5,	300,	124,	125,A4,P5
CGS	301,	125,	126,A4,R5,	302,	127,	128,A4,P5
CGS	303,	128,	129,A4,R5,	304,	129,	130,A4,R5
CGS	305,	130,	131,A4,R5,	306,	131,	132,A4,P5
CGS	307,	97,	103,A4,R5,	308,	103,	109,A4,R5
CGS	309,	109,	115,A4,R5,	310,	115,	121,A4,P5
CGS	311,	121,	127,A4,R5,	312,	98,	104,A4,P5
CGS	313,	104,	110,A4,R5,	314,	110,	116,A4,P5
CGS	315,	116,	122,A4,R5,	316,	122,	128,A4,P5
CGS	317,	99,	105,A4,P5,	318,	105,	111,A4,P5
CGS	319,	111,	117,A4,R5,	320,	117,	123,A4,P5
CGS	321,	123,	129,A4,R5,	322,	100,	106,A4,R5
CGS	323,	106,	112,A4,R5,	324,	112,	118,A4,P5
CGS	325,	118,	124,A4,P5,	326,	124,	130,A4,P5
CGS	327,	101,	107,A4,P5,	328,	107,	113,A4,R5
CGS	329,	113,	119,A4,R5,	330,	119,	125,A4,R5
CGS	331,	125,	131,A4,R5,	332,	102,	108,A4,R5
CGS	333,	108,	114,A4,P5,	334,	114,	120,A4,R5
CGS	335,	120,	126,A4,R5,	336,	126,	132,A4,R5
CGS	500,1120,2097,	45,P6,	501,1126,2103,	45,P6,	502,1132,2109,	45,P6
CGS	503,8102,2115,	45,P6,	504,8108,2121,	45,P6,	505,8114,2127,	45,P6
CGS	506,8120,97,	45,P6,	507,8126,103,	45,P6,	508,8132,109,	45,P6
CGS	509,7102,115,	45,P6,	510,7108,121,	45,P6,	511,7114,127,	45,P6
CGS	512,7120,6097,	45,P6,	513,7126,6103,	45,P6,	514,7132,6109,	45,P6
CGS	515,2120,3097,	45,P6,	516,2126,3103,	45,P6,	517,2132,3109,	45,P6
CGS	518,102,3115,	45,P6,	519,108,3121,	45,P6,	520,114,3127,	45,P6
CGS	521,120,4097,	45,P6,	522,126,4103,	45,P6,	523,132,4109,	45,P6
CGS	524,6102,4115,	45,P6,	525,6108,4121,	45,P6,	526,6114,4127,	45,P6
CGS	527,6120,5097,	45,P6,	528,6126,5103,	45,P6,	529,6132,5109,	45,P6
CGS	530,1127,8097,	45,P6,	531,1128,8098,	45,P6,	532,1129,8099,	45,P6
CGS	533,1130,8100,	45,P6,	534,1131,8101,	45,P6,	535,1132,8102,	45,P6
CGS	536,2127,97,	45,P6,	537,2128,98,	45,P6,	538,2129,99,	45,P6
CGS	539,2130,100,	45,P6,	540,2131,101,	45,P6,	541,2132,102,	45,P6
CGS	542,3127,4097,	45,P6,	543,3128,4098,	45,P6,	544,3129,4099,	45,P6

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CGS 545,3130,4100,A5,R6, 546,3131,4101,A5,R6, 547,3132,4102,A5,R6  
 CGS 548,8127,7097,A5,R6, 549,8128,7098,A5,R6, 550,8129,7099,A5,R6  
 CGS 551,8130,7100,A5,R6, 552,8131,7101,A5,R6, 553,8132,7102,A5,R6  
 CGS 554,127,6097, A5,R6, 555,128,6098, A5,R6, 556,129,6099, A5,R6  
 CGS 557,130,6100, A5,R6, 558,131,6101, A5,R6, 559,132,6102, A5,R6  
 CGS 560,4127,5097,A5,R6, 561,4128,5098,A5,R6, 562,4129,5099,A5,R6  
 CGS 563,4130,5100,A5,R6, 564,4131,5101,A5,R6, 565,4132,5102,A5,R6  
 GEN 1001,24,1,1201,1,1001,1,1.  
 GEN 1025,23,1,1001,1,1002,1,1.  
 1048,1024,1001,1.  
 GEN 1053,6,1,1001,1,1025,1,1.  
 GEN 1059,6,1,1007,1,1030,6,1.  
 GEN 1065,6,1,1013,1,1060,-1,1.  
 GEN 1071,6,1,1019,1,1055,-6,1.

## C CONDUCTORS IN TILE

CGS 1077,1001,1025,A2,R2,	1078,1002,1026,A2,R2
CGS 1079,1003,1027,A2,R2,	1080,1004,1028,A2,R2
CGS 1081,1005,1029,A2,R2,	1082,1006,1030,A2,R2
CGS 1083,1007,1030,A2,R2,	1084,1008,1036,A2,R2
CGS 1085,1009,1042,A2,R2,	1086,1010,1048,A2,R2
CGS 1087,1011,1054,A2,R2,	1088,1012,1060,A2,R2
CGS 1089,1013,1060,A2,R2,	1090,1014,1059,A2,R2
CGS 1091,1015,1058,A2,R2,	1092,1016,1057,A2,R2
CGS 1093,1017,1056,A2,R2,	1094,1018,1055,A2,R2
CGS 1095,1019,1055,A2,R2,	1096,1020,1049,A2,R2
CGS 1097,1021,1043,A2,R2,	1098,1022,1037,A2,R2
CGS 1099,1023,1031,A2,R2,	1100,1024,1025,A2,R2
CGS 1101,1025,1026,A3,R3,	1102,1026,1027,A3,R3
CGS 1103,1027,1028,A3,R3,	1104,1028,1029,A3,R3
CGS 1105,1029,1030,A3,R3,	1106,1031,1032,A3,R3
CGS 1107,1032,1033,A3,R3,	1108,1033,1034,A3,R3
CGS 1109,1034,1035,A3,R3,	1110,1035,1036,A3,R3
CGS 1111,1037,1038,A3,R3,	1112,1038,1039,A3,R3
CGS 1113,1039,1040,A3,R3,	1114,1040,1041,A3,R3
CGS 1115,1041,1042,A3,R3,	1116,1043,1044,A3,R3
CGS 1117,1044,1045,A3,R3,	1118,1045,1046,A3,R3
CGS 1119,1046,1047,A3,R3,	1120,1047,1048,A3,R3
CGS 1121,1049,1050,A3,R3,	1122,1050,1051,A3,R3
CGS 1123,1051,1052,A3,R3,	1124,1052,1053,A3,R3
CGS 1125,1053,1054,A3,R3,	1126,1055,1056,A3,R3
CGS 1127,1056,1057,A3,R3,	1128,1057,1058,A3,R3
CGS 1129,1058,1059,A3,R3,	1130,1059,1060,A3,R3
CGS 1131,1025,1031,A3,R3,	1132,1031,1037,A3,R3
CGS 1133,1037,1043,A3,R3,	1134,1043,1049,A3,R3
CGS 1135,1049,1055,A3,R3,	1136,1026,1032,A3,R3
CGS 1137,1032,1038,A3,R3,	1138,1038,1044,A3,R3
CGS 1139,1044,1050,A3,R3,	1140,1050,1056,A3,R3
CGS 1141,1027,1033,A3,R3,	1142,1033,1039,A3,R3
CGS 1143,1039,1045,A3,R3,	1144,1045,1051,A3,R3
CGS 1145,1051,1057,A3,R3,	1146,1028,1034,A3,R3
CGS 1147,1034,1040,A3,R3,	1148,1040,1046,A3,R3
CGS 1149,1046,1052,A3,R3,	1150,1052,1058,A3,R3
CGS 1151,1029,1035,A3,R3,	1152,1035,1041,A3,R3
CGS 1153,1041,1047,A3,R3,	1154,1047,1053,A3,R3
CGS 1155,1053,1059,A3,R3,	1156,1030,1036,A3,R3
CGS 1157,1036,1042,A3,R3,	1158,1042,1048,A3,R3
CGS 1159,1048,1054,A3,R3,	1160,1054,1060,A3,R3
CGS 1161,1061,1062,A3,R3,	1162,1062,1063,A3,R3
CGS 1163,1063,1064,A3,R3,	1164,1064,1065,A3,R3
CGS 1165,1065,1066,A3,R3,	1166,1067,1068,A3,R3
CGS 1167,1068,1069,A3,R3,	1168,1069,1070,A3,R3
CGS 1169,1070,1071,A3,R3,	1170,1071,1072,A3,R3
CGS 1171,1073,1074,A3,R3,	1172,1074,1075,A3,R3
CGS 1173,1075,1076,A3,R3,	1174,1076,1077,A3,R3

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CGS 1175,1077,1078,A3,R3, 1176,1079,1080,A3,R3  
 CGS 1177,1080,1081,A3,R3, 1178,1081,1082,A3,R3  
 CGS 1179,1082,1083,A3,R3, 1180,1083,1084,A3,R3  
 CGS 1181,1085,1086,A3,R3, 1182,1086,1087,A3,R3  
 CGS 1183,1087,1088,A3,R3, 1184,1088,1089,A3,R3  
 CGS 1185,1089,1090,A3,R3, 1186,1091,1092,A3,R3  
 CGS 1187,1092,1093,A3,R3, 1188,1093,1094,A3,R3  
 CGS 1189,1094,1095,A3,R3, 1190,1095,1096,A3,R3  
 CGS 1191,1061,1067,A3,R3, 1192,1067,1073,A3,R3  
 CGS 1193,1073,1079,A3,R3, 1194,1079,1085,A3,R3  
 CGS 1195,1085,1091,A3,R3, 1196,1062,1068,A3,R3  
 CGS 1197,1068,1074,A3,R3, 1198,1074,1080,A3,R3  
 CGS 1199,1080,1086,A3,R3, 1200,1086,1092,A3,R3  
 CGS 1201,1063,1069,A3,R3, 1202,1069,1075,A3,R3  
 CGS 1203,1075,1081,A3,R3, 1204,1081,1087,A3,R3  
 CGS 1205,1087,1093,A3,R3, 1206,1064,1070,A3,R3  
 CGS 1207,1070,1076,A3,R3, 1208,1076,1082,A3,R3  
 CGS 1209,1082,1088,A3,R3, 1210,1088,1094,A3,R3  
 CGS 1211,1065,1071,A3,R3, 1212,1071,1077,A3,R3  
 CGS 1213,1077,1083,A3,R3, 1214,1083,1089,A3,R3  
 CGS 1215,1089,1095,A3,R3, 1216,1066,1072,A3,R3  
 CGS 1217,1072,1078,A3,R3, 1218,1078,1084,A3,R3  
 CGS 1219,1084,1090,A3,R3, 1220,1090,1096,A3,R3  
 CGS 1221,1025,1061,A3,R4, 1222,1026,1062,A3,R4  
 CGS 1223,1027,1063,A3,R4, 1224,1028,1064,A3,R4  
 CGS 1225,1029,1065,A3,R4, 1226,1030,1066,A3,R4  
 CGS 1227,1031,1067,A3,R4, 1228,1032,1068,A3,R4  
 CGS 1229,1033,1069,A3,R4, 1230,1034,1070,A3,R4  
 CGS 1231,1035,1071,A3,R4, 1232,1036,1072,A3,R4  
 CGS 1233,1037,1073,A3,R4, 1234,1038,1074,A3,R4  
 CGS 1235,1039,1075,A3,R4, 1236,1040,1076,A3,R4  
 CGS 1237,1041,1077,A3,R4, 1238,1042,1078,A3,R4  
 CGS 1239,1043,1079,A3,R4, 1240,1044,1080,A3,R4  
 CGS 1241,1045,1081,A3,R4, 1242,1046,1082,A3,R4  
 CGS 1243,1047,1083,A3,R4, 1244,1048,1084,A3,R4  
 CGS 1245,1049,1085,A3,R4, 1246,1050,1086,A3,R4  
 CGS 1247,1051,1087,A3,R4, 1248,1052,1088,A3,R4  
 CGS 1249,1053,1089,A3,R4, 1250,1054,1090,A3,R4  
 CGS 1251,1055,1091,A3,R4, 1252,1056,1092,A3,R4  
 CGS 1253,1057,1093,A3,R4, 1254,1058,1094,A3,R4  
 CGS 1255,1059,1095,A3,R4, 1256,1060,1096,A3,R4  
 GEN 1257,6,1,1025,1,1097,1,1.  
 GEN 1263,4,1,1036,5,1108,6,1.  
 GEN 1267,6,1,1060,-1,1132,-1,1.  
 GEN 1273,4,1,1049,-6,1121,-6,1.  
 CGS 1277,1097,1098,A4,R5, 1278,1098,1099,A4,R5  
 CGS 1279,1099,1100,A4,R5, 1280,1100,1101,A4,R5  
 CGS 1281,1101,1102,A4,R5, 1282,1103,1104,A4,R5  
 CGS 1283,1104,1105,A4,R5, 1284,1105,1106,A4,R5  
 CGS 1285,1106,1107,A4,R5, 1286,1107,1108,A4,R5  
 CGS 1287,1109,1110,A4,R5, 1288,1110,1111,A4,R5  
 CGS 1289,1111,1112,A4,R5, 1290,1112,1113,A4,R5  
 CGS 1291,1113,1114,A4,R5, 1292,1115,1116,A4,R5  
 CGS 1293,1116,1117,A4,R5, 1294,1117,1118,A4,R5  
 CGS 1295,1118,1119,A4,R5, 1296,1119,1120,A4,R5  
 CGS 1297,1121,1122,A4,R5, 1298,1122,1123,A4,R5  
 CGS 1299,1123,1124,A4,R5, 1300,1124,1125,A4,R5  
 CGS 1301,1125,1126,A4,R5, 1302,1127,1128,A4,R5  
 CGS 1303,1128,1129,A4,R5, 1304,1129,1130,A4,R5  
 CGS 1305,1130,1131,A4,R5, 1306,1131,1132,A4,R5  
 CGS 1307,1097,1103,A4,R5, 1308,1103,1109,A4,R5  
 CGS 1309,1109,1115,A4,R5, 1310,1115,1121,A4,R5  
 CGS 1311,1121,1127,A4,R5, 1312,1098,1104,A4,R5  
 CGS 1313,1104,1110,A4,R5, 1314,1110,1116,A4,R5



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CGS 1315,1116,1122,A4,R5,  
 CGS 1317,1099,1105,A4,R5,  
 CGS 1319,1111,1117,A4,R5,  
 CGS 1321,1123,1129,A4,R5,  
 CGS 1323,1106,1112,A4,R5,  
 CGS 1325,1118,1124,A4,R5,  
 CGS 1327,1101,1107,A4,R5,  
 CGS 1329,1113,1119,A4,R5,  
 CGS 1331,1125,1131,A4,R5,  
 CGS 1333,1108,1114,A4,R5,  
 CGS 1335,1120,1126,A4,R5,  
 GEN 2001,12,1,2201,1,2001,1,1.  
 GEN 2019,3,1,2219,1,2019,1,1.  
 GEN 2025,11,1,2001,1,2002,1,1.  
 2036,2012,6,1.  
 2042,1,2019,1.  
 GEN 2043,2,1,2019,1,2020,1,1.  
 2048,1010,2001,1.  
 2045,2021,1012,1.  
 GEN 2053,6,1,2001,1,2025,1,1.  
 GEN 2059,6,1,2007,1,2030,6,1.  
 GEN 2065,6,1,6,-1,2060,-1,1.  
 GEN 2071,3,1,2019,1,2055,-6,1.  
 GEN 2074,3,1,1012,-1,2037,-6,1.

## C CONDUCTORS IN FILE

CGS 2077,2001,2025,A2,R2,  
 CGS 2079,2003,2027,A2,R2,  
 CGS 2081,2005,2029,A2,R2,  
 CGS 2083,2007,2030,A2,R2,  
 CGS 2085,2009,2042,A2,R2,  
 CGS 2087,2011,2054,A2,R2,  
 CGS 2089, 6,2060,A2,R2,  
 CGS 2091, 4,2058,A2,R2,  
 CGS 2093, 2,2056,A2,R2,  
 CGS 2095,2019,2055,A2,R2,  
 CGS 2097,2021,2043,A2,R2,  
 CGS 2099,1011,2031,A2,R2,  
 CGS 2101,2025,2026,A3,R3,  
 CGS 2103,2027,2028,A3,R3,  
 CGS 2105,2029,2030,A3,R3,  
 CGS 2107,2032,2033,A3,R3,  
 CGS 2109,2034,2035,A3,R3,  
 CGS 2111,2037,2038,A3,R3,  
 CGS 2113,2039,2040,A3,R3,  
 CGS 2115,2041,2042,A3,R3,  
 CGS 2117,2044,2045,A3,R3,  
 CGS 2119,2046,2047,A3,R3,  
 CGS 2121,2049,2050,A3,R3,  
 CGS 2123,2051,2052,A3,R3,  
 CGS 2125,2053,2054,A3,R3,  
 CGS 2127,2056,2057,A3,R3,  
 CGS 2129,2058,2059,A3,R3,  
 CGS 2131,2025,2031,A3,R3,  
 CGS 2133,2037,2043,A3,R3,  
 CGS 2135,2049,2055,A3,R3,  
 CGS 2137,2032,2038,A3,R3,  
 CGS 2139,2044,2050,A3,R3,  
 CGS 2141,2027,2033,A3,R3,  
 CGS 2143,2039,2045,A3,R3,  
 CGS 2145,2051,2057,A3,R3,  
 CGS 2147,2034,2040,A3,R3,  
 CGS 2149,2046,2052,A3,R3,  
 CGS 2151,2029,2035,A3,R3,  
 CGS 2153,2041,2047,A3,R3,  
 2078,2002,2026,A2,R2  
 2080,2004,2028,A2,R2  
 2082,2006,2030,A2,R2  
 2084,2008,2036,A2,R2  
 2086,2010,2048,A2,R2  
 2088,2012,2060,A2,R2  
 2090, 5,2059,A2,R2  
 2092, 3,2057,A2,R2  
 2094, 1,2055,A2,R2  
 2096,2020,2049,A2,R2  
 2098,1012,2037,A2,R2  
 2100,1010,2025,A2,R2  
 2102,2026,2027,A3,R3  
 2104,2028,2029,A3,R3  
 2106,2031,2032,A3,R3  
 2108,2033,2034,A3,R3  
 2110,2035,2036,A3,R3  
 2112,2038,2039,A3,R3  
 2114,2040,2041,A3,R3  
 2116,2043,2044,A3,R3  
 2118,2045,2046,A3,R3  
 2120,2047,2048,A3,R3  
 2122,2050,2051,A3,R3  
 2124,2052,2053,A3,R3  
 2126,2055,2056,A3,R3  
 2128,2057,2058,A3,R3  
 2130,2059,2060,A3,R3  
 2132,2031,2037,A3,R3  
 2134,2043,2049,A3,R3  
 2136,2026,2032,A3,R3  
 2138,2038,2044,A3,R3  
 2140,2050,2056,A3,R3  
 2142,2033,2039,A3,R3  
 2144,2045,2051,A3,R3  
 2146,2028,2034,A3,R3  
 2148,2040,2046,A3,R3  
 2150,2052,2058,A3,R3  
 2152,2035,2041,A3,R3  
 2154,2047,2053,A3,R3

## APPENDIX A, CONTINUED

CGS 2155,2053,2059,A3,R3,	2156,2030,2036,A3,P3
CGS 2157,2036,2042,A3,R3,	2158,2042,2048,A3,P3
CGS 2159,2048,2054,A3,R3,	2160,2054,2060,A3,R3
CGS 2161,2061,2062,A3,R3,	2162,2062,2063,A3,R3
CGS 2163,2063,2064,A3,R3,	2164,2064,2065,A3,R3
CGS 2165,2065,2066,A3,R3,	2166,2067,2068,A3,R3
CGS 2167,2068,2069,A3,R3,	2168,2069,2070,A3,P3
CGS 2169,2070,2071,A3,R3,	2170,2071,2072,A3,P3
CGS 2171,2073,2074,A3,R3,	2172,2074,2075,A3,R3
CGS 2173,2075,2076,A3,R3,	2174,2076,2077,A3,P3
CGS 2175,2077,2078,A3,R3,	2176,2079,2080,A3,R3
CGS 2177,2080,2081,A3,R3,	2178,2081,2082,A3,P3
CGS 2179,2082,2083,A3,P3,	2180,2083,2084,A3,P3
CGS 2181,2085,2086,A3,R3,	2182,2086,2087,A3,R3
CGS 2183,2087,2088,A3,R3,	2184,2088,2089,A3,R3
CGS 2185,2089,2090,A3,R3,	2186,2091,2092,A3,R3
CGS 2187,2092,2093,A3,P3,	2188,2093,2094,A3,R3
CGS 2189,2094,2095,A3,R3,	2190,2095,2096,A3,P3
CGS 2191,2061,2067,A3,R3,	2192,2067,2073,A3,R3
CGS 2193,2073,2079,A3,R3,	2194,2079,2085,A3,P3
CGS 2195,2085,2091,A3,R3,	2196,2062,2068,A3,R3
CGS 2197,2068,2074,A3,R3,	2198,2074,2080,A3,R3
CGS 2199,2080,2086,A3,R3,	2200,2086,2092,A3,P3
CGS 2201,2063,2069,A3,P3,	2202,2069,2075,A3,R3
CGS 2203,2075,2081,A3,R3,	2204,2081,2087,A3,P3
CGS 2205,2087,2093,A3,R3,	2206,2064,2070,A3,P3
CGS 2207,2070,2076,A3,R3,	2208,2076,2082,A3,R3
CGS 2209,2082,2088,A3,P3,	2210,2088,2094,A3,P3
CGS 2211,2065,2071,A3,R3,	2212,2071,2077,A3,P3
CGS 2213,2077,2083,A3,R3,	2214,2083,2089,A3,P3
CGS 2215,2089,2095,A3,R3,	2216,2066,2072,A3,P3
CGS 2217,2072,2078,A3,R3,	2218,2078,2084,A3,R3
CGS 2219,2084,2090,A3,R3,	2220,2090,2096,A3,R3
CGS 2221,2025,2061,A3,R4,	2222,2026,2062,A3,R4
CGS 2223,2027,2063,A3,R4,	2224,2028,2064,A3,P4
CGS 2225,2029,2065,A3,R4,	2226,2030,2066,A3,P4
CGS 2227,2031,2067,A3,R4,	2228,2032,2068,A3,P4
CGS 2229,2033,2069,A3,R4,	2230,2034,2070,A3,P4
CGS 2231,2035,2071,A3,R4,	2232,2036,2072,A3,P4
CGS 2233,2037,2073,A3,P4,	2234,2038,2074,A3,R4
CGS 2235,2039,2075,A3,R4,	2236,2040,2076,A3,P4
CGS 2237,2041,2077,A3,R4,	2238,2042,2078,A3,P4
CGS 2239,2043,2079,A3,R4,	2240,2044,2080,A3,R4
CGS 2241,2045,2081,A3,R4,	2242,2046,2082,A3,P4
CGS 2243,2047,2083,A3,P4,	2244,2048,2084,A3,P4
CGS 2245,2049,2085,A3,P4,	2246,2050,2086,A3,P4
CGS 2247,2051,2087,A3,R4,	2248,2052,2088,A3,R4
CGS 2249,2053,2089,A3,R4,	2250,2054,2090,A3,R4
CGS 2251,2055,2091,A3,P4,	2252,2056,2092,A3,P4
CGS 2253,2057,2093,A3,P4,	2254,2058,2094,A3,P4
CGS 2255,2059,2095,A3,P4,	2256,2060,2096,A3,R4
GFN 2257,4,1,2025,1,2097,1,1.	
GEN 2263,4,1,2036,5,2108,6,1.	
GFN 2267,6,1,2060,-1,2132,-1,1.	
GFN 2273,4,1,2049,-6,2121,-6,1.	
CGS 2277,2097,2098,A4,P5,	2278,2098,2099,A4,P5
CGS 2279,2099,2100,A4,R5,	2280,2100,2101,A4,P5
CGS 2281,2101,2102,A4,R5,	2282,2103,2104,A4,P5
CGS 2283,2104,2105,A4,R5,	2284,2105,2106,A4,P5
CGS 2285,2106,2107,A4,R5,	2286,2107,2108,A4,P5
CGS 2287,2109,2110,A4,R5,	2288,2110,2111,A4,R5
CGS 2289,2111,2112,A4,R5,	2290,2112,2113,A4,P5
CGS 2291,2113,2114,A4,R5,	2292,2115,2116,A4,R5
CGS 2293,2116,2117,A4,R5,	2294,2117,2118,A4,P5

## APPENDIX A, CONTINUED

CGS 2295,2118,2119,A4,R5,	2296,2119,2120,A4,R5
CGS 2297,2121,2122,A4,R5,	2298,2122,2123,A4,R5
CGS 2299,2123,2124,A4,R5,	2300,2124,2125,A4,R5
CGS 2301,2125,2126,A4,R5,	2302,2127,2128,A4,R5
CGS 2303,2128,2129,A4,R5,	2304,2129,2130,A4,R5
CGS 2305,2130,2131,A4,R5,	2306,2131,2132,A4,R5
CGS 2307,2097,2103,A4,P5,	2308,2103,2109,A4,R5
CGS 2309,2109,2115,A4,R5,	2310,2115,2121,A4,R5
CGS 2311,2121,2127,A4,R5,	2312,2098,2104,A4,P5
CGS 2313,2104,2110,A4,R5,	2314,2110,2116,A4,R5
CGS 2315,2116,2122,A4,R5,	2316,2122,2128,A4,R5
CGS 2317,2099,2105,A4,R5,	2318,2105,2111,A4,P5
CGS 2319,2111,2117,A4,R5,	2320,2117,2123,A4,R5
CGS 2321,2123,2129,A4,R5,	2322,2100,2106,A4,R5
CGS 2323,2106,2112,A4,R5,	2324,2112,2118,A4,P5
CGS 2325,2118,2124,A4,R5,	2326,2124,2130,A4,R5
CGS 2327,2101,2107,A4,R5,	2328,2107,2113,A4,P5
CGS 2329,2113,2119,A4,R5,	2330,2119,2125,A4,P5
CGS 2331,2125,2131,A4,R5,	2332,2102,2108,A4,P5
CGS 2333,2108,2114,A4,P5,	2334,2114,2120,A4,R5
CGS 2335,2120,2126,A4,R5,	2336,2126,2132,A4,R5
GFN 3001,18,1,3001,1,3001,1,1.	
GFN 3025,17,1,3001,1,3002,1,1.	
3042,3018,9,1.	
3045,7,2012,1.	
3048,2010,3001,1.	
GFN 3053,6,1,3001,1,3025,1,1.	
GEN 3059,6,1,3007,1,3030,6,1.	
GEN 3065,6,1,3013,1,3060,-1,1.	
GFN 3071,3,1,9,-1,3055,-6,1.	
GFN 3074,3,1,2012,-1,3037,-6,1.	

## C CONDUCTORS IN TILE

CGS 3077,3001,3025,A2,R2,	3078,3002,3026,A2,R2
CGS 3079,3003,3027,A2,R2,	3080,3004,3028,A2,R2
CGS 3081,3005,3029,A2,R2,	3082,3006,3030,A2,P2
CGS 3083,3007,3030,A2,R2,	3084,3008,3036,A2,R2
CGS 3085,3009,3042,A2,R2,	3086,3010,3048,A2,R2
CGS 3087,3011,3054,A2,R2,	3088,3012,3060,A2,P2
CGS 3089,3013,3060,A2,R2,	3090,3014,3059,A2,R2
CGS 3091,3015,3058,A2,P2,	3092,3016,3057,A2,P2
CGS 3093,3017,3056,A2,P2,	3094,3018,3055,A2,P2
CGS 3095, 9,3055,A2,R2,	3096, 8,3049,A2,R2
CGS 3097, 7,3043,A2,R2,	3098,2012,3037,A2,R2
CGS 3099,2011,3031,A2,R2,	3100,2010,3025,A2,R2
CGS 3101,3025,3026,A3,R3,	3102,3026,3027,A3,P3
CGS 3103,3027,3028,A3,R3,	3104,3028,3029,A3,R3
CGS 3105,3029,3030,A3,R3,	3106,3031,3032,A3,R3
CGS 3107,3032,3033,A3,R3,	3108,3033,3034,A3,P3
CGS 3109,3034,3035,A3,R3,	3110,3035,3036,A3,R3
CGS 3111,3037,3038,A3,R3,	3112,3038,3039,A3,R3
CGS 3113,3039,3040,A3,R3,	3114,3040,3041,A3,P3
CGS 3115,3041,3042,A3,R3,	3116,3043,3044,A3,R3
CGS 3117,3044,3045,A3,R3,	3118,3045,3046,A3,R3
CGS 3119,3046,3047,A3,R3,	3120,3047,3048,A3,P3
CGS 3121,3049,3050,A3,P3,	3122,3050,3051,A3,P3
CGS 3123,3051,3052,A3,P3,	3124,3052,3053,A3,R3
CGS 3125,3053,3054,A3,R3,	3126,3055,3056,A3,P3
CGS 3127,3056,3057,A3,R3,	3128,3057,3058,A3,P3
CGS 3129,3058,3059,A3,R3,	3130,3059,3060,A3,P3
CGS 3131,3025,3031,A3,R3,	3132,3031,3037,A3,P3
CGS 3133,3037,3043,A3,R3,	3134,3043,3049,A3,P3
CGS 3135,3049,3055,A3,R3,	3136,3026,3032,A3,R3
CGS 3137,3032,3038,A3,R3,	3138,3038,3044,A3,P3
CGS 3139,3044,3050,A3,R3,	3140,3050,3056,A3,P3

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CGS 3141,3027,3033,A3,R3,  
 CGS 3143,3039,3045,A3,R3,  
 CGS 3145,3051,3057,A3,R3,  
 CGS 3147,3034,3040,A3,R3,  
 CGS 3149,3046,3052,A3,R3,  
 CGS 3151,3029,3035,A3,R3,  
 CGS 3153,3041,3047,A3,R3,  
 CGS 3155,3053,3059,A3,R3,  
 CGS 3157,3036,3042,A3,R3,  
 CGS 3159,3048,3054,A3,R3,  
 CGS 3161,3061,3062,A3,R3,  
 CGS 3163,3063,3064,A3,R3,  
 CGS 3165,3065,3066,A3,R3,  
 CGS 3167,3068,3069,A3,R3,  
 CGS 3169,3070,3071,A3,P3,  
 CGS 3171,3073,3074,A3,R3,  
 CGS 3173,3075,3076,A3,R3,  
 CGS 3175,3077,3078,A3,R3,  
 CGS 3177,3080,3081,A3,P3,  
 CGS 3179,3082,3083,A3,R3,  
 CGS 3181,3085,3086,A3,R3,  
 CGS 3183,3087,3088,A3,R3,  
 CGS 3185,3089,3090,A3,P3,  
 CGS 3197,3092,3093,A3,R3,  
 CGS 3189,3094,3095,A3,R3,  
 CGS 3191,3061,3067,A3,R3,  
 CGS 3193,3073,3079,A3,R3,  
 CGS 3195,3085,3091,A3,R3,  
 CGS 3197,3068,3074,A3,R3,  
 CGS 3199,3080,3086,A3,R3,  
 CGS 3201,3063,3069,A3,R3,  
 CGS 3203,3075,3081,A3,R3,  
 CGS 3205,3087,3093,A3,P3,  
 CGS 3207,3070,3076,A3,R3,  
 CGS 3209,3082,3088,A3,R3,  
 CGS 3211,3065,3071,A3,R3,  
 CGS 3213,3077,3083,A3,R3,  
 CGS 3215,3089,3095,A3,R3,  
 CGS 3217,3072,3078,A3,R3,  
 CGS 3219,3084,3090,A3,R3,  
 CGS 3221,3025,3061,A3,R4,  
 CGS 3223,3027,3063,A3,R4,  
 CGS 3225,3029,3065,A3,R4,  
 CGS 3227,3031,3067,A3,R4,  
 CGS 3229,3033,3069,A3,R4,  
 CGS 3231,3035,3071,A3,R4,  
 CGS 3233,3037,3073,A3,R4,  
 CGS 3235,3039,3075,A3,R4,  
 CGS 3237,3041,3077,A3,R4,  
 CGS 3239,3043,3079,A3,R4,  
 CGS 3241,3045,3081,A3,R4,  
 CGS 3243,3047,3083,A3,R4,  
 CGS 3245,3049,3085,A3,R4,  
 CGS 3247,3051,3087,A3,R4,  
 CGS 3249,3053,3089,A3,R4,  
 CGS 3251,3055,3091,A3,R4,  
 CGS 3253,3057,3093,A3,R4,  
 CGS 3255,3059,3095,A3,R4,  
 GFN 3257,6,1,3025,1,3097,1,1.  
 GEN 3263,4,1,3036,6,3108,6,1.  
 GFN 3267,6,1,3060,-1,3132,-1,1.  
 GFN 3273,4,1,3049,-6,3121,-6,1.  
 CGS 3277,3097,3098,A4,R5,  
 CGS 3279,3099,3100,A4,R5,  
 3142,3033,3039,A3,R3  
 3144,3045,3051,A3,R3  
 3146,3028,3034,A3,P3  
 3148,3040,3046,A3,P3  
 3150,3052,3058,A3,P3  
 3152,3035,3041,A3,R3  
 3154,3047,3053,A3,P3  
 3156,3030,3036,A3,R3  
 3158,3042,3048,A3,R3  
 3160,3054,3060,A3,P3  
 3162,3062,3063,A3,R3  
 3164,3064,3065,A3,R3  
 3166,3067,3068,A3,R3  
 3168,3069,3070,A3,R3  
 3170,3071,3072,A3,R3  
 3172,3074,3075,A3,R3  
 3174,3076,3077,A3,P3  
 3176,3079,3080,A3,R3  
 3178,3081,3082,A3,R3  
 3180,3083,3084,A3,R3  
 3182,3086,3087,A3,P3  
 3184,3088,3089,A3,R3  
 3186,3091,3092,A3,P3  
 3188,3093,3094,A3,R3  
 3190,3095,3096,A3,R3  
 3192,3067,3073,A3,P3  
 3194,3079,3085,A3,R3  
 3196,3062,3068,A3,R3  
 3198,3074,3080,A3,R3  
 3200,3086,3092,A3,R3  
 3202,3069,3075,A3,R3  
 3204,3081,3087,A3,P3  
 3206,3064,3070,A3,R3  
 3208,3076,3082,A3,R3  
 3210,3088,3094,A3,R3  
 3212,3071,3077,A3,P3  
 3214,3083,3089,A3,P3  
 3216,3066,3072,A3,P3  
 3218,3078,3084,A3,P3  
 3220,3090,3096,A3,R3  
 3222,3026,3062,A3,P4  
 3224,3028,3064,A3,P4  
 3226,3030,3066,A3,R4  
 3228,3032,3068,A3,R4  
 3230,3034,3070,A3,R4  
 3232,3036,3072,A3,P4  
 3234,3038,3074,A3,P4  
 3236,3040,3076,A3,P4  
 3238,3042,3078,A3,P4  
 3240,3044,3080,A3,P4  
 3242,3046,3082,A3,P4  
 3244,3048,3084,A3,R4  
 3246,3050,3086,A3,R4  
 3248,3052,3088,A3,R4  
 3250,3054,3090,A3,R4  
 3252,3056,3092,A3,R4  
 3254,3058,3094,A3,R4  
 3256,3060,3096,A3,P4  
 3278,3098,3099,A4,R5  
 3280,3100,3101,A4,R5

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CGS 3281,3101,3102,A4,R5,	3282,3103,3104,A4,R5
CGS 3283,3104,3105,A4,R5,	3284,3105,3106,A4,P5
CGS 3285,3106,3107,A4,R5,	3286,3107,3108,A4,R5
CGS 3287,3109,3110,A4,R5,	3288,3110,3111,A4,R5
CGS 3289,3111,3112,A4,R5,	3290,3112,3113,A4,R5
CGS 3291,3113,3114,A4,R5,	3292,3115,3116,A4,R5
CGS 3293,3116,3117,A4,R5,	3294,3117,3118,A4,R5
CGS 3295,3118,3119,A4,R5,	3296,3119,3120,A4,R5
CGS 3297,3121,3122,A4,R5,	3298,3122,3123,A4,R5
CGS 3299,3123,3124,A4,R5,	3300,3124,3125,A4,R5
CGS 3301,3125,3126,A4,R5,	3302,3127,3128,A4,R5
CGS 3303,3128,3129,A4,R5,	3304,3129,3130,A4,P5
CGS 3305,3130,3131,A4,R5,	3306,3131,3132,A4,P5
CGS 3307,3097,3103,A4,R5,	3308,3103,3109,A4,P5
CGS 3309,3109,3115,A4,R5,	3310,3115,3121,A4,R5
CGS 3311,3121,3127,A4,R5,	3312,3098,3104,A4,R5
CGS 3313,3104,3110,A4,R5,	3314,3110,3116,A4,R5
CGS 3315,3116,3122,A4,R5,	3316,3122,3128,A4,R5
CGS 3317,3099,3105,A4,R5,	3318,3105,3111,A4,P5
CGS 3319,3111,3117,A4,R5,	3320,3117,3123,A4,P5
CGS 3321,3123,3129,A4,P5,	3322,3100,3106,A4,P5
CGS 3323,3106,3112,A4,P5,	3324,3112,3118,A4,R5
CGS 3325,3118,3124,A4,R5,	3326,3124,3130,A4,R5
CGS 3327,3101,3107,A4,R5,	3328,3107,3113,A4,R5
CGS 3329,3113,3119,A4,R5,	3330,3119,3125,A4,R5
CGS 3331,3125,3131,A4,R5,	3332,3102,3108,A4,R5
CGS 3333,3108,3114,A4,P5,	3334,3114,3120,A4,P5
CGS 3335,3120,3126,A4,R5,	3336,3126,3132,A4,P5
GFN 4007,15,1,4207,1,4007,1,1.	
4030,3013,4007,1.	
GEN 4031,14,1,4007,1,4008,1,1.	
4045,4021,12,1.	
404P,10,301P,1.	
GEN 4053,6,1,301R,-1,4025,1,1.	
GEN 4059,6,1,4007,1,4030,6,1.	
GFN 4065,6,1,4013,1,4060,-1,1.	
GFN 4071,3,1,4019,1,4055,-6,1.	
GFN 4074,3,1,12,-1,4037,-6,1.	
C CONDUCTORS IN TILE	
CGS 4077,3018,4025,A2,R2,	407R,3017,4026,A2,R2
CGS 4079,3016,4027,A2,P2,	4080,3015,4028,A2,R2
CGS 4081,3014,4029,A2,R2,	4082,3013,4030,A2,P2
CGS 4083,4007,4030,A2,R2,	4084,4008,4036,A2,P2
CGS 4085,4009,4042,A2,R2,	4086,4010,4048,A2,P2
CGS 4087,4011,4054,A2,P2,	4088,4012,4060,A2,R2
CGS 4089,4013,4060,A2,R2,	4090,4014,4059,A2,P2
CGS 4091,4015,4058,A2,R2,	4092,4016,4057,A2,P2
CGS 4093,4017,4056,A2,P2,	4094,4018,4055,A2,P2
CGS 4095,4019,4055,A2,R2,	4096,4020,4049,A2,R2
CGS 4097,4021,4043,A2,R2,	4098, 12,4037,A2,P2
CGS 4099, 11,4031,A2,R2,	4100, 10,4025,A2,R2
CGS 4101,4025,4026,A3,P3,	4102,4026,4027,A3,R3
CGS 4103,4027,4028,A3,P3,	4104,4028,4029,A3,R3
CGS 4105,4029,4030,A3,R3,	4106,4031,4032,A3,R3
CGS 4107,4032,4033,A3,P3,	4108,4033,4034,A3,P3
CGS 4109,4034,4035,A3,R3,	4110,4035,4036,A3,R3
CGS 4111,4037,4038,A3,R3,	4112,4038,4039,A3,R3
CGS 4113,4039,4040,A3,R3,	4114,4040,4041,A3,R3
CGS 4115,4041,4042,A3,P3,	4116,4043,4044,A3,P3
CGS 4117,4044,4045,A3,R3,	4118,4045,4046,A3,R3
CGS 4119,4046,4047,A3,R3,	4120,4047,4048,A3,R3
CGS 4121,4049,4050,A3,R3,	4122,4050,4051,A3,P3
CGS 4123,4051,4052,A3,R3,	4124,4052,4053,A3,P3
CGS 4125,4053,4054,A3,R3,	4126,4055,4056,A3,R3

## APPENDIX A, CONTINUED

CGS 4127,4056,4057,A3,R3,	4128,4057,4058,A3,R3
CGS 4129,4058,4059,A3,R3,	4130,4059,4060,A3,P3
CGS 4131,4025,4031,A3,R3,	4132,4031,4037,A3,R3
CGS 4133,4037,4043,A3,R3,	4134,4043,4049,A3,R3
CGS 4135,4049,4055,A3,R3,	4136,4026,4032,A3,R3
CGS 4137,4032,4038,A3,R3,	4138,4038,4044,A3,R3
CGS 4139,4044,4050,A3,R3,	4140,4050,4056,A3,R3
CGS 4141,4027,4033,A3,R3,	4142,4033,4039,A3,R3
CGS 4143,4039,4045,A3,R3,	4144,4045,4051,A3,R3
CGS 4145,4051,4057,A3,R3,	4146,4028,4034,A3,R3
CGS 4147,4034,4040,A3,R3,	4148,4040,4046,A3,P3
CGS 4149,4046,4052,A3,R3,	4150,4052,4058,A3,R3
CGS 4151,4029,4035,A3,R3,	4152,4035,4041,A3,R3
CGS 4153,4041,4047,A3,R3,	4154,4047,4053,A3,R3
CGS 4155,4053,4059,A3,R3,	4156,4030,4036,A3,R3
CGS 4157,4036,4042,A3,R3,	4158,4042,4048,A3,P3
CGS 4159,4048,4054,A3,P3,	4160,4054,4060,A3,P3
CGS 4161,4061,4062,A3,R3,	4162,4062,4063,A3,R3
CGS 4163,4063,4064,A3,R3,	4164,4064,4065,A3,P3
CGS 4165,4065,4066,A3,R3,	4166,4067,4068,A3,P3
CGS 4167,4068,4069,A3,R3,	4168,4069,4070,A3,R3
CGS 4169,4070,4071,A3,R3,	4170,4071,4072,A3,R3
CGS 4171,4073,4074,A3,R3,	4172,4074,4075,A3,R3
CGS 4173,4075,4076,A3,R3,	4174,4076,4077,A3,R3
CGS 4175,4077,4078,A3,R3,	4176,4079,4080,A3,R3
CGS 4177,4080,4081,A3,R3,	4178,4081,4082,A3,P3
CGS 4179,4082,4083,A3,R3,	4180,4083,4084,A3,P3
CGS 4181,4085,4086,A3,P3,	4182,4086,4087,A3,P3
CGS 4183,4087,4088,A3,R3,	4184,4088,4089,A3,P3
CGS 4185,4089,4090,A3,P3,	4186,4091,4092,A3,P3
CGS 4187,4092,4093,A3,R3,	4188,4093,4094,A3,P3
CGS 4189,4094,4095,A3,R3,	4190,4095,4096,A3,P3
CGS 4191,4061,4067,A3,R3,	4192,4067,4073,A3,P3
CGS 4193,4073,4079,A3,R3,	4194,4079,4085,A3,P3
CGS 4195,4085,4091,A3,R3,	4196,4062,4068,A3,R3
CGS 4197,4068,4074,A3,R3,	4198,4074,4080,A3,P3
CGS 4199,4080,4086,A3,P3,	4200,4086,4092,A3,P3
CGS 4201,4063,4069,A3,R3,	4202,4069,4075,A3,P3
CGS 4203,4075,4081,A3,P3,	4204,4081,4087,A3,R3
CGS 4205,4087,4093,A3,R3,	4206,4064,4070,A3,P3
CGS 4207,4070,4076,A3,R3,	4208,4076,4082,A3,P3
CGS 4209,4087,4088,A3,R3,	4210,4088,4094,A3,P3
CGS 4211,4065,4071,A3,P3,	4212,4071,4077,A3,P3
CGS 4213,4077,4083,A3,R3,	4214,4083,4089,A3,R3
CGS 4215,4089,4095,A3,R3,	4216,4066,4072,A3,P3
CGS 4217,4072,4078,A3,R3,	4218,4078,4084,A3,R3
CGS 4219,4084,4090,A3,P3,	4220,4090,4096,A3,P3
CGS 4221,4025,4061,A3,R4,	4222,4026,4062,A3,P4
CGS 4223,4027,4063,A3,P4,	4224,4028,4064,A3,P4
CGS 4225,4029,4065,A3,P4,	4226,4030,4066,A3,P4
CGS 4227,4031,4067,A3,R4,	4228,4032,4068,A3,P4
CGS 4229,4033,4069,A3,R4,	4230,4034,4070,A3,P4
CGS 4231,4035,4071,A3,R4,	4232,4036,4072,A3,P4
CGS 4233,4037,4073,A3,P4,	4234,4038,4074,A3,P4
CGS 4235,4039,4075,A3,R4,	4236,4040,4076,A3,P4
CGS 4237,4041,4077,A3,R4,	4238,4042,4078,A3,R4
CGS 4239,4043,4079,A3,R4,	4240,4044,4080,A3,P4
CGS 4241,4045,4081,A3,R4,	4242,4046,4082,A3,R4
CGS 4243,4047,4083,A3,R4,	4244,4048,4084,A3,R4
CGS 4245,4049,4085,A3,R4,	4246,4050,4086,A3,R4
CGS 4247,4051,4087,A3,R4,	4248,4052,4088,A3,P4
CGS 4249,4053,4089,A3,R4,	4250,4054,4090,A3,P4
CGS 4251,4055,4091,A3,P4,	4252,4056,4092,A3,R4
CGS 4253,4057,4093,A3,R4,	4254,4058,4094,A3,P4

## APPENDIX A, CONTINUED

CGS 4255,4059,4095,A3,R4,	4256,4060,4096,A3,P4
GEN 4257,6,1,4025,1,4097,1,1.	
GEN 4263,4,1,4036,6,4108,6,1.	
GEN 4267,6,1,4060,-1,4132,-1,1.	
GEN 4273,4,1,4049,-6,4121,-6,1.	
CGS 4277,4097,4098,A4,R5,	4278,4098,4099,A4,R5
CGS 4279,4099,4100,A4,R5,	4280,4100,4101,A4,P5
CGS 4281,4101,4102,A4,R5,	4282,4103,4104,A4,R5
CGS 4283,4104,4105,A4,R5,	4284,4105,4106,A4,R5
CGS 4285,4106,4107,A4,R5,	4286,4107,4108,A4,R5
CGS 4287,4109,4110,A4,R5,	4288,4110,4111,A4,P5
CGS 4289,4111,4112,A4,R5,	4290,4112,4113,A4,R5
CGS 4291,4113,4114,A4,R5,	4292,4115,4116,A4,R5
CGS 4293,4116,4117,A4,R5,	4294,4117,4118,A4,R5
CGS 4295,4118,4119,A4,R5,	4296,4119,4120,A4,R5
CGS 4297,4121,4122,A4,R5,	4298,4122,4123,A4,R5
CGS 4299,4123,4124,A4,R5,	4300,4124,4125,A4,P5
CGS 4301,4125,4126,A4,R5,	4302,4127,4128,A4,R5
CGS 4303,4128,4129,A4,R5,	4304,4129,4130,A4,R5
CGS 4305,4130,4131,A4,P5,	4306,4131,4132,A4,R5
CGS 4307,4097,4103,A4,R5,	4308,4103,4109,A4,R5
CGS 4309,4109,4115,A4,R5,	4310,4115,4121,A4,R5
CGS 4311,4121,4127,A4,R5,	4312,4098,4104,A4,P5
CGS 4313,4104,4110,A4,P5,	4314,4110,4116,A4,R5
CGS 4315,4116,4122,A4,R5,	4316,4122,4128,A4,R5
CGS 4317,4099,4105,A4,R5,	4318,4105,4111,A4,P5
CGS 4319,4111,4117,A4,R5,	4320,4117,4123,A4,R5
CGS 4321,4123,4129,A4,R5,	4322,4100,4106,A4,P5
CGS 4323,4106,4112,A4,P5,	4324,4112,4118,A4,P5
CGS 4325,4118,4124,A4,P5,	4326,4124,4130,A4,P5
CGS 4327,4101,4107,A4,R5,	4328,4107,4113,A4,P5
CGS 4329,4113,4119,A4,R5,	4330,4119,4125,A4,R5
CGS 4331,4125,4131,A4,R5,	4332,4102,4108,A4,P5
CGS 4333,4108,4114,A4,P5,	4334,4114,4120,A4,R5
CGS 4335,4120,4126,A4,R5,	4336,4126,4132,A4,R5
GEN 5007,18,1,5207,1,5007,1,1.	
5030,4013,5007,1.	
GEN 5031,17,1,5007,1,5008,1,1.	
5048,5024,4018,1.	
GEN 5053,6,1,4018,-1,5025,1,1.	
GFN 5059,6,1,5007,1,5030,6,1.	
GEN 5065,6,1,5013,1,5060,-1,1.	
GFN 5071,6,1,5019,1,5055,-6,1.	
C CONDUCTORS IN TILE	
CGS 5077,4018,5025,A2,R2,	5078,4017,5026,A2,P2
CGS 5079,4016,5027,A2,R2,	5080,4015,5028,A2,R2
CGS 5081,4014,5029,A2,P2,	5082,4013,5030,A2,R2
CGS 5083,5007,5030,A2,R2,	5084,5008,5036,A2,R2
CGS 5085,5009,5042,A2,R2,	5086,5010,5048,A2,P2
CGS 5087,5011,5054,A2,R2,	5088,5012,5060,A2,P2
CGS 5089,5013,5060,A2,R2,	5090,5014,5059,A2,R2
CGS 5091,5015,5058,A2,R2,	5092,5016,5057,A2,R2
CGS 5093,5017,5056,A2,R2,	5094,5018,5055,A2,R2
CGS 5095,5019,5055,A2,P2,	5096,5020,5049,A2,R2
CGS 5097,5021,5043,A2,R2,	5098,5022,5037,A2,P2
CGS 5099,5023,5031,A2,R2,	5100,5024,5025,A2,R2
CGS 5101,5025,5026,A3,P3,	5102,5026,5027,A3,P3
CGS 5103,5027,5028,A3,P3,	5104,5028,5029,A3,P3
CGS 5105,5029,5030,A3,R3,	5106,5031,5032,A3,P3
CGS 5107,5032,5033,A3,P3,	5108,5033,5034,A3,P3
CGS 5109,5034,5035,A3,R3,	5110,5035,5036,A3,R3
CGS 5111,5037,5038,A3,R3,	5112,5038,5039,A3,R3
CGS 5113,5039,5040,A3,P3,	5114,5040,5041,A3,R3
CGS 5115,5041,5042,A3,P3,	5116,5043,5044,A3,R3

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CGS 5117,5044,5045,A3,R3,	5118,5045,5046,A3,R3
CGS 5119,5046,5047,A3,R3,	5120,5047,5048,A3,R3
CGS 5121,5049,5050,A3,R3,	5122,5050,5051,A3,P3
CGS 5123,5051,5052,A3,R3,	5124,5052,5053,A3,P3
CGS 5125,5053,5054,A3,P3,	5126,5055,5056,A3,R3
CGS 5127,5056,5057,A3,R3,	5128,5057,5058,A3,R3
CGS 5129,5058,5059,A3,R3,	5130,5059,5060,A3,P3
CGS 5131,5025,5031,A3,R3,	5132,5031,5037,A3,P3
CGS 5133,5037,5043,A3,R3,	5134,5043,5049,A3,P3
CGS 5135,5049,5055,A3,R3,	5136,5026,5032,A3,P3
CGS 5137,5032,5038,A3,R3,	5138,5038,5044,A3,R3
CGS 5139,5044,5050,A3,R3,	5140,5050,5056,A3,R3
CGS 5141,5027,5033,A3,R3,	5142,5033,5039,A3,R3
CGS 5143,5039,5045,A3,P3,	5144,5045,5051,A3,R3
CGS 5145,5051,5057,A3,R3,	5146,5028,5034,A3,R3
CGS 5147,5034,5040,A3,R3,	5148,5040,5046,A3,R3
CGS 5149,5046,5052,A3,R3,	5150,5052,5058,A3,R3
CGS 5151,5029,5035,A3,P3,	5152,5035,5041,A3,R3
CGS 5153,5041,5047,A3,P3,	5154,5047,5053,A3,R3
CGS 5155,5053,5059,A3,R3,	5156,5030,5036,A3,R3
CGS 5157,5036,5042,A3,P3,	5158,5042,5048,A3,R3
CGS 5159,5048,5054,A3,R3,	5160,5054,5060,A3,R3
CGS 5161,5061,5062,A3,R3,	5162,5062,5063,A3,R3
CGS 5163,5063,5064,A3,R3,	5164,5064,5065,A3,P3
CGS 5165,5065,5066,A3,R3,	5166,5067,5068,A3,P3
CGS 5167,5068,5069,A3,R3,	5168,5069,5070,A3,P3
CGS 5169,5070,5071,A3,R3,	5170,5071,5072,A3,R3
CGS 5171,5073,5074,A3,R3,	5172,5074,5075,A3,R3
CGS 5173,5075,5076,A3,R3,	5174,5076,5077,A3,P3
CGS 5175,5077,5078,A3,R3,	5176,5079,5080,A3,R3
CGS 5177,5080,5081,A3,R3,	5178,5081,5082,A3,P3
CGS 5179,5082,5083,A3,R3,	5180,5083,5084,A3,P3
CGS 5181,5085,5086,A3,P3,	5182,5086,5087,A3,R3
CGS 5183,5087,5088,A3,R3,	5184,5088,5089,A3,R3
CGS 5185,5089,5090,A3,R3,	5186,5091,5092,A3,P3
CGS 5187,5092,5093,A3,R3,	5188,5093,5094,A3,P3
CGS 5189,5094,5095,A3,R3,	5190,5095,5096,A3,P3
CGS 5191,5061,5067,A3,R3,	5192,5067,5073,A3,R3
CGS 5193,5073,5079,A3,P3,	5194,5079,5085,A3,R3
CGS 5195,5085,5091,A3,R3,	5196,5062,5068,A3,P3
CGS 5197,5068,5074,A3,R3,	5198,5074,5080,A3,P3
CGS 5199,5080,5086,A3,R3,	5200,5086,5092,A3,P3
CGS 5201,5063,5069,A3,R3,	5202,5069,5075,A3,R3
CGS 5203,5075,5081,A3,R3,	5204,5081,5087,A3,P3
CGS 5205,5087,5093,A3,R3,	5206,5064,5070,A3,R3
CGS 5207,5070,5076,A3,R3,	5208,5076,5082,A3,P3
CGS 5209,5082,5088,A3,P3,	5210,5088,5094,A3,R3
CGS 5211,5065,5071,A3,R3,	5212,5071,5077,A3,R3
CGS 5213,5077,5083,A3,R3,	5214,5083,5089,A3,R3
CGS 5215,5089,5095,A3,R3,	5216,5066,5072,A3,P3
CGS 5217,5072,5078,A3,R3,	5218,5078,5084,A3,R3
CGS 5219,5084,5090,A3,R3,	5220,5090,5096,A3,P3
CGS 5221,5025,5061,A3,R4,	5222,5026,5062,A3,P4
CGS 5223,5027,5063,A3,P4,	5224,5028,5064,A3,P4
CGS 5225,5029,5065,A3,R4,	5226,5030,5066,A3,R4
CGS 5227,5031,5067,A3,R4,	5228,5032,5068,A3,R4
CGS 5229,5033,5069,A3,R4,	5230,5034,5070,A3,P4
CGS 5231,5035,5071,A3,R4,	5232,5036,5072,A3,R4
CGS 5233,5037,5073,A3,R4,	5234,5038,5074,A3,R4
CGS 5235,5039,5075,A3,R4,	5236,5040,5076,A3,R4
CGS 5237,5041,5077,A3,R4,	5238,5042,5078,A3,R4
CGS 5239,5043,5079,A3,R4,	5240,5044,5080,A3,P4
CGS 5241,5045,5081,A3,P4,	5242,5046,5082,A3,P4
CGS 5243,5047,5083,A3,R4,	5244,5048,5084,A3,P4



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CGS 5245,5049,5085,A3,R4,	5246,5050,5086,A3,R4
CGS 5247,5051,5087,A3,R4,	5248,5052,5088,A3,R4
CGS 5249,5053,5089,A3,R4,	5250,5054,5090,A3,R4
CGS 5251,5055,5091,A3,R4,	5252,5056,5092,A3,P4
CGS 5253,5057,5093,A3,R4,	5254,5058,5094,A3,R4
CGS 5255,5059,5095,A3,R4,	5256,5060,5096,A3,R4
GEN 5257,6,1,5025,1,5097,1,1.	
GEN 5263,4,1,5036,5,5108,6,1.	
GEN 5267,6,1,5060,-1,5132,-1,1.	
GEN 5273,4,1,5049,-6,5121,-6,1.	
CGS 5277,5097,5098,A4,R5,	5278,5098,5099,A4,R5
CGS 5279,5099,5100,A4,R5,	5280,5100,5101,A4,R5
CGS 5281,5101,5102,A4,R5,	5282,5103,5104,A4,R5
CGS 5283,5104,5105,A4,R5,	5284,5105,5106,A4,R5
CGS 5285,5106,5107,A4,R5,	5286,5107,5108,A4,R5
CGS 5287,5109,5110,A4,R5,	5288,5110,5111,A4,R5
CGS 5289,5111,5112,A4,R5,	5290,5112,5113,A4,R5
CGS 5291,5113,5114,A4,R5,	5292,5115,5116,A4,R5
CGS 5293,5116,5117,A4,R5,	5294,5117,5118,A4,R5
CGS 5295,5118,5119,A4,R5,	5296,5119,5120,A4,R5
CGS 5297,5121,5122,A4,R5,	5298,5122,5123,A4,R5
CGS 5299,5123,5124,A4,R5,	5300,5124,5125,A4,R5
CGS 5301,5125,5126,A4,R5,	5302,5127,5128,A4,R5
CGS 5303,5128,5129,A4,R5,	5304,5129,5130,A4,R5
CGS 5305,5130,5131,A4,R5,	5306,5131,5132,A4,R5
CGS 5307,5097,5103,A4,R5,	5308,5103,5109,A4,R5
CGS 5309,5109,5115,A4,R5,	5310,5115,5121,A4,R5
CGS 5311,5121,5127,A4,R5,	5312,5098,5104,A4,R5
CGS 5313,5104,5110,A4,R5,	5314,5110,5116,A4,R5
CGS 5315,5116,5122,A4,R5,	5316,5122,5128,A4,R5
CGS 5317,5099,5105,A4,R5,	5318,5105,5111,A4,R5
CGS 5319,5111,5117,A4,R5,	5320,5117,5123,A4,R5
CGS 5321,5123,5129,A4,R5,	5322,5100,5106,A4,R5
CGS 5323,5106,5112,A4,R5,	5324,5112,5118,A4,R5
CGS 5325,5118,5124,A4,R5,	5326,5124,5130,A4,R5
CGS 5327,5101,5107,A4,R5,	5328,5107,5113,A4,R5
CGS 5329,5113,5119,A4,R5,	5330,5119,5125,A4,R5
CGS 5331,5125,5131,A4,R5,	5332,5102,5108,A4,R5
CGS 5333,5108,5114,A4,R5,	5334,5114,5120,A4,R5
CGS 5335,5120,5126,A4,R5,	5336,5126,5132,A4,R5
GEN 6013,12,1,6213,1,6013,1,1.	
6030,13,4021,1.	
6033,4019,5024,1.	
6036,6013,5022,1.	
GEN 6037,11,1,6013,1,6014,1,1.	
6048,6024,18,1.	
GEN 6053,6,1,18,-1,6025,1,1.	
GEN 6059,3,1,4021,-1,6030,6,1.	
GEN 6062,3,1,5024,-1,6048,6,1.	
GEN 6065,6,1,6013,1,6060,-1,1.	
GEN 6071,6,1,6019,1,6055,-6,1.	
C CONDUCTORS IN TILE	
CGS 6077,18,6025,A2,P2,	6078,17,6026,A2,P2
CGS 6079,16,6027,A2,P2,	6080,15,6028,A2,R2
CGS 6081,14,6029,A2,P2,	6082,13,6030,A2,P2
CGS 6083,4021,6030,A2,R2,	6084,4020,6036,A2,P2
CGS 6085,4019,6042,A2,P2,	6086,5024,6048,A2,P2
CGS 6087,5023,6054,A2,R2,	6088,5022,6060,A2,R2
CGS 6089,6013,6060,A2,R2,	6090,6014,6059,A2,R2
CGS 6091,6015,6058,A2,R2,	6092,6016,6057,A2,R2
CGS 6093,6017,6056,A2,R2,	6094,6018,6055,A2,P2
CGS 6095,6019,6055,A2,R2,	6096,6020,6049,A2,R2
CGS 6097,6021,6043,A2,R2,	6098,6022,6037,A2,P2
CGS 6099,6023,6031,A2,P2,	6100,6024,6025,A2,P2

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CGS 6101,6025,6026,A3,R3, 6102,6026,6027,A3,P3  
 CGS 6103,6027,6028,A3,R3, 6104,6028,6029,A3,R3  
 CGS 6105,6029,6030,A3,R3, 6106,6031,6032,A3,R3  
 CGS 6107,6032,6033,A3,R3, 6108,6033,6034,A3,R3  
 CGS 6109,6034,6035,A3,R3, 6110,6035,6036,A3,R3  
 CGS 6111,6037,6038,A3,R3, 6112,6038,6039,A3,R3  
 CGS 6113,6039,6040,A3,P3, 6114,6040,6041,A3,R3  
 CGS 6115,6041,6042,A3,P3, 6116,6043,6044,A3,R3  
 CGS 6117,6044,6045,A3,R3, 6118,6045,6046,A3,R3  
 CGS 6119,6046,6047,A3,R3, 6120,6047,6048,A3,P3  
 CGS 6121,6049,6050,A3,R3, 6122,6050,6051,A3,R3  
 CGS 6123,6051,6052,A3,R3, 6124,6052,6053,A3,R3  
 CGS 6125,6053,6054,A3,R3, 6126,6055,6056,A3,R3  
 CGS 6127,6056,6057,A3,R3, 6128,6057,6058,A3,R3  
 CGS 6129,6058,6059,A3,R3, 6130,6059,6060,A3,R3  
 CGS 6131,6025,6031,A3,P3, 6132,6031,6037,A3,P3  
 CGS 6133,6037,6043,A3,R3, 6134,6043,6049,A3,R3  
 CGS 6135,6049,6055,A3,P3, 6136,6026,6032,A3,R3  
 CGS 6137,6032,6038,A3,R3, 6138,6038,6044,A3,P3  
 CGS 6139,6044,6050,A3,R3, 6140,6050,6056,A3,P3  
 CGS 6141,6027,6033,A3,R3, 6142,6033,6039,A3,R3  
 CGS 6143,6039,6045,A3,P3, 6144,6045,6051,A3,P3  
 CGS 6145,6051,6057,A3,R3, 6146,6028,6034,A3,R3  
 CGS 6147,6034,6040,A3,R3, 6148,6040,6046,A3,R3  
 CGS 6149,6046,6052,A3,P3, 6150,6052,6058,A3,R3  
 CGS 6151,6029,6035,A3,R3, 6152,6035,6041,A3,P3  
 CGS 6153,6041,6047,A3,R3, 6154,6047,6053,A3,R3  
 CGS 6155,6053,6059,A3,R3, 6156,6030,6036,A3,P3  
 CGS 6157,6036,6042,A3,P3, 6158,6042,6048,A3,P3  
 CGS 6159,6048,6054,A3,P3, 6160,6054,6060,A3,P3  
 CGS 6161,6061,6062,A3,R3, 6162,6062,6063,A3,P3  
 CGS 6163,6063,6064,A3,P3, 6164,6064,6065,A3,P3  
 CGS 6165,6065,6066,A3,P3, 6166,6067,6068,A3,P3  
 CGS 6167,6068,6069,A3,P3, 6168,6069,6070,A3,R3  
 CGS 6169,6070,6071,A3,R3, 6170,6071,6072,A3,R3  
 CGS 6171,6073,6074,A3,R3, 6172,6074,6075,A3,P3  
 CGS 6173,6075,6076,A3,P3, 6174,6076,6077,A3,P3  
 CGS 6175,6077,6078,A3,P3, 6176,6079,6080,A3,R3  
 CGS 6177,6080,6081,A3,R3, 6178,6081,6082,A3,R3  
 CGS 6179,6082,6083,A3,P3, 6180,6083,6084,A3,R3  
 CGS 6181,6085,6086,A3,R3, 6182,6086,6087,A3,R3  
 CGS 6183,6087,6088,A3,P3, 6184,6088,6089,A3,P3  
 CGS 6185,6089,6090,A3,R3, 6186,6091,6092,A3,R3  
 CGS 6187,6092,6093,A3,R3, 6188,6093,6094,A3,R3  
 CGS 6189,6094,6095,A3,R3, 6190,6095,6096,A3,R3  
 CGS 6191,6061,6067,A3,R3, 6192,6067,6073,A3,R3  
 CGS 6193,6073,6079,A3,R3, 6194,6079,6085,A3,R3  
 CGS 6195,6085,6091,A3,P3, 6196,6062,6068,A3,P3  
 CGS 6197,6068,6074,A3,P3, 6198,6074,6080,A3,R3  
 CGS 6199,6080,6086,A3,P3, 6200,6086,6092,A3,P3  
 CGS 6201,6063,6069,A3,R3, 6202,6069,6075,A3,P3  
 CGS 6203,6075,6081,A3,R3, 6204,6081,6087,A3,P3  
 CGS 6205,6087,6093,A3,R3, 6206,6064,6070,A3,P3  
 CGS 6207,6070,6076,A3,P3, 6208,6076,6082,A3,P3  
 CGS 6209,6082,6088,A3,R3, 6210,6088,6094,A3,R3  
 CGS 6211,6065,6071,A3,R3, 6212,6071,6077,A3,P3  
 CGS 6213,6077,6083,A3,R3, 6214,6083,6089,A3,R3  
 CGS 6215,6089,6095,A3,P3, 6216,6066,6072,A3,P3  
 CGS 6217,6072,6078,A3,R3, 6218,6078,6084,A3,R3  
 CGS 6219,6084,6090,A3,R3, 6220,6090,6096,A3,P3  
 CGS 6221,6025,6061,A3,R4, 6222,6026,6062,A3,P4  
 CGS 6223,6027,6063,A3,R4, 6224,6028,6064,A3,P4  
 CGS 6225,6029,6065,A3,R4, 6226,6030,6066,A3,R4  
 CGS 6227,6031,6067,A3,R4, 6228,6032,6068,A3,P4

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CGS 6229,6033,6069,A3,R4,  
 CGS 6231,6035,6071,A3,R4,  
 CGS 6233,6037,6073,A3,R4,  
 CGS 6235,6039,6075,A3,R4,  
 CGS 6237,6041,6077,A3,R4,  
 CGS 6239,6043,6079,A3,R4,  
 CGS 6241,6045,6081,A3,R4,  
 CGS 6243,6047,6083,A3,P4,  
 CGS 6245,6049,6085,A3,R4,  
 CGS 6247,6051,6087,A3,P4,  
 CGS 6249,6053,6089,A3,R4,  
 CGS 6251,6055,6091,A3,R4,  
 CGS 6253,6057,6093,A3,R4,  
 CGS 6255,6059,6095,A3,R4,  
 GEN 6257,6,1,6025,1,6097,1,1.  
 GEN 6263,4,1,6036,5,6108,6,1.  
 GFN 6267,6,1,6060,-1,6132,-1,1.  
 GEN 6273,4,1,6049,-6,6121,-6,1.  
 CGS 6277,6097,6098,A4,R5,  
 CGS 6279,6099,6100,A4,R5,  
 CGS 6281,6101,6102,A4,R5,  
 CGS 6283,6104,6105,A4,R5,  
 CGS 6285,6106,6107,A4,R5,  
 CGS 6287,6109,6110,A4,R5,  
 CGS 6289,6111,6112,A4,R5,  
 CGS 6291,6113,6114,A4,R5,  
 CGS 6293,6116,6117,A4,R5,  
 CGS 6295,6118,6119,A4,R5,  
 CGS 6297,6121,6122,A4,R5,  
 CGS 6299,6123,6124,A4,R5,  
 CGS 6301,6125,6126,A4,R5,  
 CGS 6303,6128,6129,A4,P5,  
 CGS 6305,6130,6131,A4,P5,  
 CGS 6307,6097,6103,A4,R5,  
 CGS 6309,6109,6115,A4,P5,  
 CGS 6311,6121,6127,A4,R5,  
 CGS 6313,6104,6110,A4,P5,  
 CGS 6315,6116,6122,A4,R5,  
 CGS 6317,6099,6105,A4,R5,  
 CGS 6319,6111,6117,A4,R5,  
 CGS 6321,6123,6129,A4,R5,  
 CGS 6323,6106,6112,A4,R5,  
 CGS 6325,6118,6124,A4,P5,  
 CGS 6327,6101,6107,A4,R5,  
 CGS 6329,6113,6119,A4,R5,  
 CGS 6331,6125,6131,A4,P5,  
 CGS 6333,6108,6114,A4,R5,  
 CGS 6335,6120,6126,A4,R5,  
 GFN 7001,6,1,7201,1,7001,1,1.  
 GEN 7013,12,1,7213,1,7013,1,1.  
 GEN 7025,5,1,7001,1,7002,1,1.  
 7030,7006,21,1.  
 7033,19,6024,1.  
 7036,6022,7013,1.  
 GFN 7037,11,1,7013,1,7014,1,1.  
 7048,7024,7001,1.  
 GFN 7053,6,1,7001,1,7025,1,1.  
 GFN 7059,3,1,21,-1,7030,6,1.  
 GFN 7062,3,1,6024,-1,7048,6,1.  
 GEN 7065,6,1,7013,1,7060,-1,1.  
 GEN 7071,6,1,7019,1,7055,-6,1.  
 C CONDUCTORS IN TILE  
 CGS 7077,7001,7025,A2,R2,  
 CGS 7079,7003,7027,A2,R2,  
 6230,6034,6070,A3,R4  
 6232,6036,6072,A3,R4  
 6234,6038,6074,A3,R4  
 6236,6040,6076,A3,R4  
 6238,6042,6078,A3,R4  
 6240,6044,6080,A3,R4  
 6242,6046,6082,A3,R4  
 6244,6048,6084,A3,R4  
 6246,6050,6086,A3,R4  
 6248,6052,6088,A3,P4  
 6250,6054,6090,A3,R4  
 6252,6056,6092,A3,P4  
 6254,6058,6094,A3,R4  
 6256,6060,6096,A3,R4  
 6278,6098,6099,A4,R5  
 6280,6100,6101,A4,R5  
 6282,6103,6104,A4,P5  
 6284,6105,6106,A4,R5  
 6286,6107,6108,A4,R5  
 6288,6110,6111,A4,P5  
 6290,6112,6113,A4,P5  
 6292,6115,6116,A4,R5  
 6294,6117,6118,A4,P5  
 6296,6119,6120,A4,R5  
 6298,6122,6123,A4,R5  
 6300,6124,6125,A4,P5  
 6302,6127,6128,A4,R5  
 6304,6129,6130,A4,R5  
 6306,6131,6132,A4,P5  
 6308,6103,6109,A4,P5  
 6310,6115,6121,A4,R5  
 6312,3098,6104,A4,P5  
 6314,6110,6116,A4,P5  
 6316,6122,6128,A4,R5  
 6318,6105,6111,A4,R5  
 6320,6117,6123,A4,R5  
 6322,6100,6106,A4,R5  
 6324,6112,6118,A4,R5  
 6326,6124,6130,A4,R5  
 6328,6107,6113,A4,P5  
 6330,6110,6125,A4,P5  
 6332,6102,6108,A4,P5  
 6334,6114,6120,A4,R5  
 6336,6126,6132,A4,P5  
 7078,7002,7026,A2,P2  
 7080,7004,7028,A2,R2

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CGS 7081,7005,7029,A2,P2,	7082,7006,7030,A2,P2
CGS 7083, 21,7030,A2,R2,	7084, 20,7036,A2,R2
CGS 7085, 19,7042,A2,R2,	7086,6024,7048,A2,P2
CGS 7087,6023,7054,A2,R2,	7088,6022,7060,A2,P2
CGS 7089,7013,7060,A2,R2,	7090,7014,7059,A2,R2
CGS 7091,7015,7058,A2,R2,	7092,7016,7057,A2,R2
CGS 7093,7017,7056,A2,R2,	7094,7018,7055,A2,P2
CGS 7095,7019,7055,A2,R2,	7096,7020,7049,A2,R2
CGS 7097,7021,7043,A2,R2,	7098,7022,7037,A2,R2
CGS 7099,7023,7031,A2,R2,	7100,7024,7025,A2,P2
CGS 7101,7025,7026,A3,R3,	7102,7026,7027,A3,P3
CGS 7103,7027,7028,A3,R3,	7104,7028,7029,A3,P3
CGS 7105,7029,7030,A3,R3,	7106,7031,7032,A3,P3
CGS 7107,7032,7033,A3,R3,	7108,7033,7034,A3,P3
CGS 7109,7034,7035,A3,R3,	7110,7035,7036,A3,R3
CGS 7111,7037,7038,A3,R3,	7112,7038,7039,A3,P3
CGS 7113,7039,7040,A3,R3,	7114,7040,7041,A3,R3
CGS 7115,7041,7042,A3,P3,	7116,7043,7044,A3,R3
CGS 7117,7044,7045,A3,P3,	7118,7045,7046,A3,R3
CGS 7119,7046,7047,A3,R3,	7120,7047,7048,A3,R3
CGS 7121,7049,7050,A3,R3,	7122,7050,7051,A3,R3
CGS 7123,7051,7052,A3,R3,	7124,7052,7053,A3,P3
CGS 7125,7053,7054,A3,R3,	7126,7055,7056,A3,R3
CGS 7127,7056,7057,A3,R3,	7128,7057,7058,A3,P3
CGS 7129,7058,7059,A3,R3,	7130,7059,7060,A3,R3
CGS 7131,7025,7031,A3,R3,	7132,7031,7037,A3,R3
CGS 7133,7027,7043,A3,R3,	7134,7043,7049,A3,R3
CGS 7135,7049,7055,A3,P3,	7136,7026,7032,A3,P3
CGS 7137,7032,7038,A3,R3,	7138,7038,7044,A3,R3
CGS 7139,7044,7050,A3,R3,	7140,7050,7056,A3,P3
CGS 7141,7027,7033,A3,R3,	7142,7033,7039,A3,R3
CGS 7143,7039,7045,A3,R3,	7144,7045,7051,A3,P3
CGS 7145,7051,7057,A3,R3,	7146,7028,7034,A3,P3
CGS 7147,7034,7040,A3,R3,	7148,7040,7046,A3,P3
CGS 7149,7046,7052,A3,P3,	7150,7052,7058,A3,P3
CGS 7151,7029,7035,A3,P3,	7152,7035,7041,A3,P3
CGS 7153,7041,7047,A3,P3,	7154,7047,7053,A3,R3
CGS 7155,7053,7059,A3,R3,	7156,7030,7036,A3,P3
CGS 7157,7036,7042,A3,P3,	7158,7042,7048,A3,R3
CGS 7159,7048,7054,A3,P3,	7160,7054,7060,A3,P3
CGS 7161,7061,7062,A3,R3,	7162,7062,7063,A3,P3
CGS 7163,7063,7064,A3,R3,	7164,7064,7065,A3,P3
CGS 7165,7065,7066,A3,R3,	7166,7067,7068,A3,P3
CGS 7167,7068,7069,A3,R3,	7168,7069,7070,A3,R3
CGS 7169,7070,7071,A3,R3,	7170,7071,7072,A3,P3
CGS 7171,7073,7074,A3,R3,	7172,7074,7075,A3,P3
CGS 7173,7075,7076,A3,R3,	7174,7076,7077,A3,R3
CGS 7175,7077,7078,A3,R3,	7176,7079,7080,A3,P3
CGS 7177,7080,7081,A3,R3,	7178,7081,7082,A3,P3
CGS 7179,7082,7083,A3,R3,	7180,7083,7084,A3,R3
CGS 7181,7085,7086,A3,R3,	7182,7086,7087,A3,R3
CGS 7183,7087,7088,A3,R3,	7184,7088,7089,A3,R3
CGS 7185,7089,7090,A3,R3,	7186,7091,7092,A3,R3
CGS 7187,7092,7093,A3,R3,	7188,7093,7094,A3,P3
CGS 7189,7094,7095,A3,P3,	7190,7095,7096,A3,R3
CGS 7191,7061,7067,A3,P3,	7192,7067,7073,A3,R3
CGS 7193,7073,7079,A3,P3,	7194,7079,7085,A3,P3
CGS 7195,7085,7091,A3,P3,	7196,7062,7068,A3,P3
CGS 7197,7068,7074,A3,R3,	7198,7074,7080,A3,R3
CGS 7199,7080,7086,A3,P3,	7200,7086,7092,A3,P3
CGS 7201,7063,7069,A3,R3,	7202,7069,7075,A3,R3
CGS 7203,7075,7081,A3,P3,	7204,7081,7087,A3,P3
CGS 7205,7067,7093,A3,P3,	7206,7064,7070,A3,P3
CGS 7207,7070,7076,A3,P3,	7208,7076,7082,A3,R3

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CGS 7209,7082,7088,A3,R3,      7210,7088,7094,A3,R3  
 CGS 7211,7065,7071,A3,R3,      7212,7071,7077,A3,R3  
 CGS 7213,7077,7083,A3,R3,      7214,7083,7089,A3,R3  
 CGS 7215,7089,7095,A3,R3,      7216,7066,7072,A3,R3  
 CGS 7217,7072,7078,A3,R3,      7218,7078,7084,A3,R3  
 CGS 7219,7084,7090,A3,R3,      7220,7090,7096,A3,R3  
 CGS 7221,7025,7061,A3,R4,      7222,7026,7062,A3,R4  
 CGS 7223,7027,7063,A3,R4,      7224,7028,7064,A3,R4  
 CGS 7225,7029,7065,A3,R4,      7226,7030,7066,A3,R4  
 CGS 7227,7031,7067,A3,R4,      7228,7032,7068,A3,R4  
 CGS 7229,7033,7069,A3,R4,      7230,7034,7070,A3,R4  
 CGS 7231,7035,7071,A3,R4,      7232,7036,7072,A3,R4  
 CGS 7233,7037,7073,A3,R4,      7234,7038,7074,A3,R4  
 CGS 7235,7039,7075,A3,R4,      7236,7040,7076,A3,R4  
 CGS 7237,7041,7077,A3,R4,      7238,7042,7078,A3,R4  
 CGS 7239,7043,7079,A3,R4,      7240,7044,7080,A3,R4  
 CGS 7241,7045,7081,A3,R4,      7242,7046,7082,A3,R4  
 CGS 7243,7047,7083,A3,R4,      7244,7048,7084,A3,R4  
 CGS 7245,7049,7085,A3,R4,      7246,7050,7086,A3,R4  
 CGS 7247,7051,7087,A3,R4,      7248,7052,7088,A3,R4  
 CGS 7249,7053,7089,A3,R4,      7250,7054,7090,A3,R4  
 CGS 7251,7055,7091,A3,R4,      7252,7056,7092,A3,R4  
 CGS 7253,7057,7093,A3,R4,      7254,7058,7094,A3,R4  
 CGS 7255,7059,7095,A3,R4,      7256,7060,7096,A3,R4  
 GEN 7257,6,1,7025,1,7097,1,1.  
 GEN 7263,4,1,7036,6,7108,6,1.  
 GEN 7267,6,1,7060,-1,7132,-1,1.  
 GEN 7273,4,1,7049,-6,7121,-6,1.  
 CGS 7277,7097,7098,A4,P5,      7278,7098,7099,A4,P5  
 CGS 7279,7099,7100,A4,P5,      7280,7100,7101,A4,P5  
 CGS 7281,7101,7102,A4,P5,      7282,7103,7104,A4,P5  
 CGS 7283,7104,7105,A4,P5,      7284,7105,7106,A4,P5  
 CGS 7285,7106,7107,A4,P5,      7286,7107,7108,A4,P5  
 CGS 7287,7109,7110,A4,P5,      7288,7110,7111,A4,P5  
 CGS 7289,7111,7112,A4,P5,      7290,7112,7113,A4,P5  
 CGS 7291,7113,7114,A4,P5,      7292,7115,7116,A4,P5  
 CGS 7293,7116,7117,A4,P5,      7294,7117,7118,A4,P5  
 CGS 7295,7119,7119,A4,P5,      7296,7119,7120,A4,P5  
 CGS 7297,7121,7122,A4,P5,      7298,7122,7123,A4,P5  
 CGS 7299,7123,7124,A4,P5,      7300,7124,7125,A4,P5  
 CGS 7301,7125,7126,A4,P5,      7302,7127,7128,A4,P5  
 CGS 7303,7128,7129,A4,P5,      7304,7129,7130,A4,P5  
 CGS 7305,7130,7131,A4,P5,      7306,7131,7132,A4,P5  
 CGS 7307,7097,7103,A4,P5,      7308,7103,7109,A4,P5  
 CGS 7309,7109,7115,A4,P5,      7310,7115,7121,A4,P5  
 CGS 7311,7121,7127,A4,P5,      7312,7098,7104,A4,P5  
 CGS 7313,7104,7110,A4,P5,      7314,7110,7116,A4,P5  
 CGS 7315,7116,7122,A4,P5,      7316,7122,7128,A4,P5  
 CGS 7317,7099,7105,A4,P5,      7318,7105,7111,A4,P5  
 CGS 7319,7111,7117,A4,P5,      7320,7117,7123,A4,P5  
 CGS 7321,7123,7129,A4,P5,      7322,7100,7106,A4,P5  
 CGS 7323,7106,7112,A4,P5,      7324,7112,7118,A4,P5  
 CGS 7325,7118,7124,A4,P5,      7326,7124,7130,A4,P5  
 CGS 7327,7101,7107,A4,P5,      7328,7107,7113,A4,P5  
 CGS 7329,7113,7119,A4,P5,      7330,7119,7125,A4,P5  
 CGS 7331,7125,7131,A4,P5,      7332,7102,7108,A4,P5  
 CGS 7333,7108,7114,A4,P5,      7334,7114,7120,A4,P5  
 CGS 7335,7120,7126,A4,P5,      7336,7126,7132,A4,P5  
 GEN 8019,6,1,8019,1,8019,1,1.  
 8030,1013,2021,1.  
 8033,2019,24,1.  
 8036,22,7006,1.  
 8042,7001,8019,1.  
 GEN 8043,5,1,8019,1,8020,1,1.

## APPENDIX A, CONTINUED

8048,8024,1018,1.  
 GEN 8053,6,1,1018,-1,8025,1,1.  
 GEN 8059,3,1,2021,-1,8030,6,1.  
 GEN 8062,3,1,24,-1,8048,6,1.  
 GFN 8065,6,1,7006,-1,8060,-1,1.  
 GEN 8071,6,1,8019,1,8055,-6,1.

## C CONDUCTORS IN TILE

CGS 8077,1018,8025,A2,R2,	8078,1017,8026,A2,R2
CGS 8079,1016,8027,A2,R2,	8080,1015,8028,A2,R2
CGS 8081,1014,8029,A2,R2,	8082,1013,8030,A2,R2
CGS 8083,2021,8030,A2,R2,	8084,2020,8036,A2,P2
CGS 8085,2019,8042,A2,R2,	8086, 24,8048,A2,P2
CGS 8087, 23,8054,A2,R2,	8088, 22,8060,A2,R2
CGS 8089,7006,8060,A2,R2,	8090,7005,8059,A2,R2
CGS 8091,7004,8058,A2,R2,	8092,7003,8057,A2,R2
CGS 8093,7002,8056,A2,R2,	8094,7001,8055,A2,R2
CGS 8095,8019,8055,A2,R2,	8096,8020,8049,A2,P2
CGS 8097,8021,8043,A2,R2,	8098,8022,8037,A2,R2
CGS 8099,8023,8031,A2,R2,	8100,8024,8025,A2,R2
CGS 8101,8025,8026,A3,P3,	8102,8026,8027,A3,P3
CGS 8103,8027,8028,A3,P3,	8104,8028,8029,A3,P3
CGS 8105,8029,8030,A3,P3,	8106,8031,8032,A3,P3
CGS 8107,8032,8033,A3,P3,	8108,8033,8034,A3,P3
CGS 8109,8034,8035,A3,P3,	8110,8035,8036,A3,P3
CGS 8111,8037,8038,A3,P3,	8112,8038,8039,A3,P3
CGS 8113,8039,8040,A3,P3,	8114,8040,8041,A3,P3
CGS 8115,8041,8042,A3,P3,	8116,8043,8044,A3,P3
CGS 8117,8044,8045,A3,P3,	8118,8045,8046,A3,P3
CGS 8119,8046,8047,A3,P3,	8120,8047,8048,A3,P3
CGS 8121,8049,8050,A3,P3,	8122,8050,8051,A3,P3
CGS 8123,8051,8052,A3,P3,	8124,8052,8053,A3,P3
CGS 8125,8053,8054,A3,P3,	8126,8055,8056,A3,P3
CGS 8127,8056,8057,A3,P3,	8128,8057,8058,A3,P3
CGS 8129,8058,8059,A3,P3,	8130,8059,8060,A3,P3
CGS 8131,8025,8031,A3,P3,	8132,8031,8037,A3,P3
CGS 8133,8037,8043,A3,P3,	8134,8043,8049,A3,P3
CGS 8135,8049,8055,A3,P3,	8136,8026,8032,A3,P3
CGS 8137,8032,8038,A3,P3,	8138,8038,8044,A3,P3
CGS 8139,8044,8050,A3,P3,	8140,8050,8056,A3,P3
CGS 8141,8027,8033,A3,P3,	8142,8033,8039,A3,P3
CGS 8143,8039,8045,A3,P3,	8144,8045,8051,A3,P3
CGS 8145,8051,8057,A3,P3,	8146,8028,8034,A3,P3
CGS 8147,8034,8040,A3,P3,	8148,8040,8046,A3,P3
CGS 8149,8046,8052,A3,P3,	8150,8052,8058,A3,P3
CGS 8151,8029,8035,A3,P3,	8152,8035,8041,A3,P3
CGS 8153,8041,8047,A3,P3,	8154,8047,8053,A3,P3
CGS 8155,8053,8059,A3,P3,	8156,8030,8036,A3,P3
CGS 8157,8036,8042,A3,P3,	8158,8042,8048,A3,P3
CGS 8159,8048,8054,A3,P3,	8160,8054,8060,A3,P3
CGS 8161,8061,8062,A3,P3,	8162,8062,8063,A3,P3
CGS 8163,8063,8064,A3,P3,	8164,8064,8065,A3,P3
CGS 8165,8065,8066,A3,P3,	8166,8067,8068,A3,P3
CGS 8167,8068,8069,A3,P3,	8168,8069,8070,A3,P3
CGS 8169,8070,8071,A3,P3,	8170,8071,8072,A3,P3
CGS 8171,8073,8074,A3,P3,	8172,8074,8075,A3,P3
CGS 8173,8075,8076,A3,P3,	8174,8076,8077,A3,P3
CGS 8175,8077,8078,A3,P3,	8176,8079,8080,A3,P3
CGS 8177,8080,8081,A3,P3,	8178,8081,8082,A3,P3
CGS 8179,8082,8083,A3,P3,	8180,8083,8084,A3,P3
CGS 8181,8085,8086,A3,P3,	8182,8086,8087,A3,P3
CGS 8183,8087,8088,A3,P3,	8184,8088,8089,A3,P3
CGS 8185,8089,8090,A3,P3,	8186,8091,8092,A3,P3
CGS 8187,8092,8093,A3,P3,	8188,8093,8094,A3,P3
CGS 8189,8094,8095,A3,P3,	8190,8095,8096,A3,P3

## APPENDIX A, CONTINUED

CGS 8191,8061,8067,A3,R3,  
 CGS 8193,8073,8079,A3,R3,  
 CGS 8195,8085,8091,A3,R3,  
 CGS 8197,8068,8074,A3,R3,  
 CGS 8199,8080,8086,A3,R3,  
 CGS 8201,8063,8069,A3,R3,  
 CGS 8203,8075,8081,A3,R3,  
 CGS 8205,8087,8093,A3,R3,  
 CGS 8207,8070,8076,A3,R3,  
 CGS 8209,8082,8088,A3,R3,  
 CGS 8211,8065,8071,A3,R3,  
 CGS 8213,8077,8083,A3,R3,  
 CGS 8215,8089,8095,A3,R3,  
 CGS 8217,8072,8078,A3,R3,  
 CGS 8219,8084,8090,A3,R3,  
 CGS 8221,8025,8061,A3,P4,  
 CGS 8223,8027,8063,A3,P4,  
 CGS 8225,8029,8065,A3,P4,  
 CGS 8227,8031,8067,A3,P4,  
 CGS 8229,8033,8069,A3,P4,  
 CGS 8231,8035,8071,A3,P4,  
 CGS 8233,8037,8073,A3,P4,  
 CGS 8235,8039,8075,A3,P4,  
 CGS 8237,8041,8077,A3,P4,  
 CGS 8239,8043,8079,A3,P4,  
 CGS 8241,8045,8081,A3,P4,  
 CGS 8243,8047,8083,A3,P4,  
 CGS 8245,8049,8085,A3,P4,  
 CGS 8247,8051,8087,A3,P4,  
 CGS 8249,8053,8089,A3,P4,  
 CGS 8251,8055,8091,A3,P4,  
 CGS 8253,8057,8093,A3,P4,  
 CGS 8255,8059,8095,A3,P4,  
 GEN 8257,6,1,8025,1,8097,1,1.  
 GEN 8263,4,1,8036,5,8108,6,1.  
 GEN 8267,6,1,8060,-1,8132,-1,1.  
 GEN 8273,4,1,8049,-6,8121,-6,1.  
 CGS 8277,8097,8098,A4,R5,  
 CGS 8279,8099,8100,A4,R5,  
 CGS 8281,8101,8102,A4,R5,  
 CGS 8283,8104,8105,A4,R5,  
 CGS 8285,8106,8107,A4,R5,  
 CGS 8287,8109,8110,A4,R5,  
 CGS 8289,8111,8112,A4,R5,  
 CGS 8291,8113,8114,A4,R5,  
 CGS 8293,8116,8117,A4,R5,  
 CGS 8295,8118,8119,A4,R5,  
 CGS 8297,8121,8122,A4,R5,  
 CGS 8299,8123,8124,A4,R5,  
 CGS 8301,8125,8126,A4,R5,  
 CGS 8303,8128,8129,A4,R5,  
 CGS 8305,8130,8131,A4,R5,  
 CGS 8307,8097,8103,A4,R5,  
 CGS 8309,8109,8115,A4,R5,  
 CGS 8311,8121,8127,A4,R5,  
 CGS 8313,8104,8110,A4,R5,  
 CGS 8315,8116,8122,A4,R5,  
 CGS 8317,8099,8105,A4,R5,  
 CGS 8319,8111,8117,A4,R5,  
 CGS 8321,8123,8129,A4,R5,  
 CGS 8323,8106,8112,A4,R5,  
 CGS 8325,8118,8124,A4,R5,  
 CGS 8327,8101,8107,A4,R5,  
 CGS 8329,8113,8119,A4,R5,  
 8192,8067,8073,A3,P3  
 8194,8079,8085,A3,R3  
 8196,8062,8068,A3,R3  
 8198,8074,8080,A3,R3  
 8200,8086,8092,A3,R3  
 8202,8069,8075,A3,R3  
 8204,8081,8087,A3,R3  
 8206,8064,8070,A3,P3  
 8208,8076,8082,A3,P3  
 8210,8088,8094,A3,P3  
 8212,8071,8077,A3,R3  
 8214,8083,8089,A3,R3  
 8216,8066,8072,A3,R3  
 8218,8078,8084,A3,R3  
 8220,8090,8096,A3,R3  
 8222,8026,8062,A3,R4  
 8224,8028,8064,A3,R4  
 8226,8030,8066,A3,P4  
 8228,8032,8068,A3,P4  
 8230,8034,8070,A3,R4  
 8232,8036,8072,A3,P4  
 8234,8038,8074,A3,P4  
 8236,8040,8076,A3,R4  
 8238,8042,8078,A3,R4  
 8240,8044,8080,A3,R4  
 8242,8046,8082,A3,P4  
 8244,8048,8084,A3,P4  
 8246,8050,8086,A3,P4  
 8248,8052,8088,A3,R4  
 8250,8054,8090,A3,P4  
 8252,8056,8092,A3,R4  
 8254,8058,8094,A3,P4  
 8256,8060,8096,A3,P4  
 8278,8098,8099,A4,R5  
 8280,8100,8101,A4,R5  
 8282,8103,8104,A4,P5  
 8284,8105,8106,A4,R5  
 8286,8107,8108,A4,P5  
 8288,8110,8111,A4,R5  
 8290,8112,8113,A4,R5  
 8292,8115,8116,A4,P5  
 8294,8117,8118,A4,P5  
 8296,8119,8120,A4,P5  
 8298,8122,8123,A4,R5  
 8300,8124,8125,A4,R5  
 8302,8127,8128,A4,R5  
 8304,8129,8130,A4,R5  
 8306,8131,8132,A4,P5  
 8308,8103,8109,A4,P5  
 8310,8115,8121,A4,R5  
 8312,8098,8104,A4,P5  
 8314,8110,8116,A4,P5  
 8316,8122,8128,A4,R5  
 8318,8105,8111,A4,R5  
 8320,8117,8123,A4,R5  
 8322,8100,8106,A4,R5  
 8324,8112,8118,A4,R5  
 8326,8124,8130,A4,R5  
 8328,8107,8113,A4,P5  
 8330,8119,8125,A4,R5

## APPENDIX A, CONTINUED

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CGS 8331,8125,8131,A4,R5,      8332,8102,8108,A4,P5
CGS 8333,8108,8114,A4,R5,      8334,8114,8120,A4,P5
CGS 8335,8120,8126,A4,R5,      8336,8126,8132,A4,P5
END
BCD 3CONSTANTS DATA
NDSTOR=6500,ITERMX=600 ,DRLXCA=1.E-9,ARLYCA=1.E-9
TIME0=0.,TIMEND=32.,TSTEP0=4.
EXTLIM=.5
100=1.41      $TILE THICKNESS (IN)
101=6.0      $TILE SIDE LENGTH (IN)
102=0.16*10.  $SIP THICKNESS (IN)
103=.06      $TERMINATOR GAP (IN)
106=.05      $GAP WIDTH (IN)
107=00.0000  $VISCOSITY (LBM/FT-SEC)
108=0.0000   $DENSITY OF GAS (LB/FT**3)
109=1.0/26.7*.16  $SIP/GAP DP FACTOR (IN/PSI)
110=1.21/26.7*.16  $SIP/SURFACE DP FACTOR (IN/PSI)
111=0.1      $INITIAL EDGE CLEARANCE (IN)
112=0.1      $EDGE CLEARANCE (IN)
113=.5      $SIP/TILE DISCHARGE COEFFICIENT
114=.1      $SIP/FILLER BAR CLEARANCE (IN)
115=115.    $TEMPERATURE (F)
116=0.0     $AVERAGE PRESSURE
117=5.5     $LRF TO MOVE .05 IN LATEPALLY
118=0.0     $CLOSURE OF GAP 1
119=0.0     $CLOSURE OF GAP 2
120=.001    $MINIMUM GAP CLEARANCE (IN)
121=1.E-3   $MINIMUM EDGE CLEARANCE (IN)
123=1.0     $PERMEABILITY FACTOR
1,,2,,3,,4,,5,,6,,7,,8,,9,,10,,11,,12,,13,,14,,15=0.
ITEST=0,JTEST=0,KTEST=0,LTEST=0,MTEST=0
NTEST=1    $ 0= 3 TILE MOVE; 1= 1 TILE MOVES
END
BCD 3ARRAY DATA      $VALUES SPECIFIED AT T=560P, I1900
1,0.,2.652E-6,1.E8,2.652E-6,END      $LBM-IN-LRF,TILE
2,2.5,1.274E-4,10.,5.097E-4,15.,7.646E-4,END  $LBM-IN/LRF-SEC,TILE
3,2.5,1.274E-4,10.,5.097E-4,15.,7.646E-4,END  $LBM-IN/LRF-SEC,TILE
4,2.5,8.011E-4,10.,3.204E-3,15.,4.807E-3,END  $LBM-IN/LRF-SEC,SIP
5,2.5,8.011E-4,10.,3.204E-3,15.,4.807E-3,END  $LBM-IN/LRF-SEC,FILL BAR
6,-200.0,6.6E-6,100.,12.75E-6,END      $VISCOSITY (LBM/SEC-FT)
7,SPACE,216,END      $EDGE CLEARANCE STORAGE
10,SPACE,24,END
11,SPACE,24,END
12,SPACE,24,END
13,SPACE,20,END
14,SPACE,20,END
20,SPACE,24,END
21,SPACE,24,END
22,SPACE,24,END
23,SPACE,20,END
24,SPACE,20,END
30,SPACE,24,END
31,SPACE,24,END
32,SPACE,24,END
33,SPACE,20,END
34,SPACE,20,END
40,SPACE,24,END
41,SPACE,24,END
42,SPACE,24,END
43,SPACE,20,END
44,SPACE,20,END
50,SPACE,24,END
51,SPACE,24,END
52,SPACE,24,END

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## APPENDIX A, CONTINUED

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53,SPACE,20,END
54,SPACE,20,FND
60,SPACE,24,END
61,SPACE,24,END
62,SPACE,24,END
63,SPACE,20,FND
64,SPACE,20,FND
70,SPACE,24,END
71,SPACE,24,END
72,SPACE,24,FND
73,SPACE,20,FND
74,SPACE,20,FND
80,SPACE,24,END
81,SPACE,24,END
82,SPACE,24,END
83,SPACE,20,FND
84,SPACE,20,END
90,SPACE,24,FND      $SURFACE NODES
91,SPACE,24,END      $GAP NODES
92,SPACE,24,END      $SIP NODES
93,SPACE,20,END      $TILE BOND NODES
94,SPACE,20,END      $SIP NODES
15,SPACE,24,END      $TILE NODES
25,SPACE,24,FND
35,SPACE,24,END
45,SPACE,24,FND
55,SPACE,24,END
65,SPACE,24,FND
75,SPACE,24,END
85,SPACE,24,FND
95,SPACE,24,END
96,SPACE,10,FND
END
RCD 3FECTION
F DIMENSION PLOCIN(81,2), XT(81), YT(2)
F DIMENSION XNODES(150), YNODES(150)
F DIMENSION XLINC(16), YLINC(16)
F NAMELIST /XYCOORDP /XC, YC, ISTA, IFIN
F READ(7, XYCOORDP)
F WRITE(4, XYCOORDP)
F CALL PNTERP(PLOCIN, XT, YT, ISTA, IFIN)
F XC = XC - .0325 * SOPT(2.)
F CALL GENPT(XC, YC, 6.065, XLINC, YLINC, 16)
F NHOLD = 0
F DS = 1.0
F DO = .5325
F XLENGTH = 6.065
F ANGLE = -45.0
F DO R6 J = 1, 4
F NNODES = 18
F IF(J .EQ. 2 .OR. J .EQ. 3) NNODES = 21
F CALL LONG(XLINC(J), YLINC(J), ANGLE, XLENGTH, DS, DO, XNODES, YNODES
F 1 , NNODES, 6)
F DO R5 I=1, NNODES
F XN = XNODES(I)
F YN = YNODES(I)
F CALL PRESND(R1, XT, 2, YT, R1, PLOCIN, XN, YN, PRES)
F T(NHOLD+I+1122) = PRES
F R5 CONTINUE
F NHOLD = NHOLD + NNODES
F R6 CONTINUE
F NNODES = 6
F DO R8 J = 1, 12
F CALL SHOPT(XLINC(J+4), YLINC(J+4), ANGLE, XLENGTH, DS, DO,

```

## APPENDIX A, CONTINUED

```

F      1          XNODES,YNODES,NNODES,6)
F      DO 87 I=1,NNODES
F      XN = XNODES(I)
F      YN = YNODES(I)
F      CALL PRESND(81,XT,2,YT,81,PLOCIN,XN,YN,PRES)
F      T(NHOLD+I+1122) = PRES
F  87 CONTINUE
F      NHOLD = NHOLD + NNODES
F  88 CONTINUE
C
F      NNC=NNA+NND
F      DO 15 J=1,NNC
F  15 T(J)=2.135
      SPLIT(3,A2+1,A96+1,A96+4)
      APYMPY(3,A96+4,R123,A96+4)
      JOIN(3,A96+1,A96+4,A2+1)
      SPLIT(3,A3+1,A96+1,A96+4)
      APYMPY(3,A96+4,P123,A96+4)
      JOIN(3,A96+1,A96+4,A3+1)
      SPLIT(3,A4+1,A96+1,A96+4)
      APYMPY(3,A96+4,P123,A96+4)
      JOIN(3,A96+1,A96+4,A4+1)
      SPLIT(3,A5+1,A96+1,A96+4)
      APYMPY(3,A96+4,P123,A96+4)
      JOIN(3,A96+1,A96+4,A5+1)
      P109 = -P109
      P110 = -P110
      R116 = 0.0
      DO 5 ITEST=1,150
      R116 = P116 + T1224 + ITEST - 1
5 CONTINUE
      R116 = R116/150.
      R108=P116*144.0/(53.3*(R115+460.))
      D1DFG1(R115,A6,P107)
      R9=12.8E-6/R107/.071*R108
      R1=((P101/6.)*R100/2.)*560.0/(R115+460.0)
      R2=P103*P9
      R3=(P101/6.*R100/2.)/(P101/6.)*R9
      R4=((P101/6.)*R100/2.)*R9
      R5=(P101/6.*R102/(R101/6.))*R9
      R6=(P102)*R9
      STDSTL
F      CALL CNTRL(PLOCIN,XT,YT,XC,YC,ISTA,IFIN)
      WRITE(NUSER1,100)
F 100 FORMAT("UNDENSIFIED LI900 TPS TILE 6X6X1.3253"
F      1      /"
F      2      /"MACH NO.=0.950"
F      3      /"
F      4      /"
F      5      /"TILE APPAY MODEL"
F      6      /"LAPC MAR. 23, 1981 MF6TPP5" )
      DO 1 ITEST=1,6
      WRITE(NUSER1,*) T1+ITEST-1
1 CONTINUE
      DO 2 ITEST=1,6
      WRITE(NUSER1,*) T7+ITEST-1
2 CONTINUE
      DO 3 ITEST=1,6
      WRITE(NUSER1,*) T13-ITEST+1
3 CONTINUE
      DO 4 ITEST=1,6
      WRITE(NUSER1,*) T19-ITEST+1
4 CONTINUE
      DO 11 ITEST=1,72

```

## APPENDIX A, CONTINUED

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WRITE(NUSER1,*) T25+ITEST-1
11 CONTINUE
DO 12 ITEST=1,36
WRITE(NUSER1,*) T97+ITEST-1
12 CONTINUE
DO 21 ITEST=1,6
WRITE(NUSER1,*) T201+ITEST-1
21 CONTINUE
DO 22 ITEST=1,6
WRITE(NUSER1,*) T207+ITEST-1
22 CONTINUE
DO 23 ITEST=1,6
WRITE(NUSER1,*) T213-ITEST+1
23 CONTINUE
DO 24 ITEST=1,6
WRITE(NUSER1,*) T219-ITEST+1
24 CONTINUE
WRITE(NUSER1,*) T1115, T1122, T1129, T8100, T8107, T8114
WRITE(NUSER1,*) T97, T104, T111, T118, T125, T132
WRITE(NUSER1,*) T4115, T4122, T4129, T5100, T5107, T5114
WRITE(NUSER1,*) T7130, T7125, T7120, T127, T122, T117
WRITE(NUSER1,*) T112, T107, T102, T3109, T3104, T3099
END
BCD 3VARIABLES 1
IF(ITERCT.GT.400)ITERXT=1000
IF(ITERCT.LE.10) ITERXT=4
VARGS
VAPCS
BLDARY(A12+1, T1097, T1098, T1099, T1100, T1101, T1102, T1102, T1108, $SIP NODES
AT1114, T1120, T1126, T1132, T1132, T1131, T1130, T1129, T1128, T1127,
BT1127, T1121, T1115, T1109, T1103, T1097)
RLDARY(A13+1, T1025, T1026, T1027, T1028, T1029, T1030, T1036, T1042, $STILE B NODES
AT1048, T1054, T1060, T1059, T1058, T1057, T1056, T1055, T1049, T1043,
RT1037, T1031)
RLDARY(A14+1, T1097, T1098, T1099, T1100, T1101, T1102, T1108, T1114, $SIP NODES
AT1120, T1126, T1132, T1131, T1130, T1129, T1128, T1127, T1121, T1115,
RT1109, T1103)
BLDARY(A22+1, T2097, T2098, T2099, T2100, T2101, T2102, T2102, T2108, $SIP NODES
AT2114, T2120, T2126, T2132, T2132, T2131, T2130, T2129, T2128, T2127,
BT2127, T2121, T2115, T2109, T2103, T2097)
RLDARY(A23+1, T2025, T2026, T2027, T2028, T2029, T2030, T2036, T2042, $STILE B NODES
AT2048, T2054, T2060, T2059, T2058, T2057, T2056, T2055, T2049, T2043,
RT2037, T2031)
BLDARY(A24+1, T2097, T2098, T2099, T2100, T2101, T2102, T2108, T2114, $SIP NODES
AT2120, T2126, T2132, T2131, T2130, T2129, T2128, T2127, T2121, T2115,
RT2109, T2103)
RLDARY(A32+1, T3097, T3098, T3099, T3100, T3101, T3102, T3102, T3108, $SIP NODES
AT3114, T3120, T3126, T3132, T3132, T3131, T3130, T3129, T3128, T3127,
BT3127, T3121, T3115, T3109, T3103, T3097)
RLDARY(A33+1, T3025, T3026, T3027, T3028, T3029, T3030, T3036, T3042, $STILE B NODES
AT3048, T3054, T3060, T3059, T3058, T3057, T3056, T3055, T3049, T3043,
BT3037, T3031)
RLDARY(A34+1, T3097, T3098, T3099, T3100, T3101, T3102, T3108, T3114, $SIP NODES
AT3120, T3126, T3132, T3131, T3130, T3129, T3128, T3127, T3121, T3115,
RT3109, T3103)
RLDARY(A42+1, T4097, T4098, T4099, T4100, T4101, T4102, T4102, T4108, $SIP NODES
AT4114, T4120, T4126, T4132, T4132, T4131, T4130, T4129, T4128, T4127,
RT4127, T4121, T4115, T4109, T4103, T4097)
RLDARY(A43+1, T4025, T4026, T4027, T4028, T4029, T4030, T4036, T4042, $STILE B NODES
AT4048, T4054, T4060, T4059, T4058, T4057, T4056, T4055, T4049, T4043,
BT4037, T4031)
RLDARY(A44+1, T4097, T4098, T4099, T4100, T4101, T4102, T4108, T4114, $SIP NODES
AT4120, T4126, T4132, T4131, T4130, T4129, T4128, T4127, T4121, T4115,
RT4109, T4103)

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## APPENDIX A, CONTINUED

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BLDARY(A52+1,T5097,T5098,T5099,T5100,T5101,T5102,T5102,T5108,$SIP NODES
AT5114,T5120,T5126,T5132,T5132,T5131,T5130,T5129,T5128,T5127,
BT5127,T5121,T5115,T5109,T5103,T5097)
BLDARY(A53+1,T5025,T5026,T5027,T5028,T5029,T5030,T5036,T5042,$STILE B NODES
AT5048,T5054,T5060,T5059,T5058,T5057,T5056,T5055,T5049,T5043,
BT5037,T5031)
BLDARY(A54+1,T5097,T5098,T5099,T5100,T5101,T5102,T5108,T5114,$SIP NODES
AT5120,T5126,T5132,T5131,T5130,T5129,T5128,T5127,T5121,T5115,
BT5109,T5103)
BLDARY(A62+1,T6097,T6098,T6099,T6100,T6101,T6102,T6102,T6108,$SIP NODES
AT6114,T6120,T6126,T6132,T6132,T6131,T6130,T6129,T6128,T6127,
BT6127,T6121,T6115,T6109,T6103,T6097)
BLDARY(A63+1,T6025,T6026,T6027,T6028,T6029,T6030,T6036,T6042,$STILE B NODES
AT6048,T6054,T6060,T6059,T6058,T6057,T6056,T6055,T6049,T6043,
BT6037,T6031)
BLDARY(A64+1,T6097,T6098,T6099,T6100,T6101,T6102,T6108,T6114,$SIP NODES
AT6120,T6126,T6132,T6131,T6130,T6129,T6128,T6127,T6121,T6115,
BT6109,T6103)
BLDARY(A72+1,T7097,T7098,T7099,T7100,T7101,T7102,T7102,T7108,$SIP NODES
AT7114,T7120,T7126,T7132,T7132,T7131,T7130,T7129,T7128,T7127,
BT7127,T7121,T7115,T7109,T7103,T7097)
BLDARY(A73+1,T7025,T7026,T7027,T7028,T7029,T7030,T7036,T7042,$STILE B NODES
AT7048,T7054,T7060,T7059,T7058,T7057,T7056,T7055,T7049,T7043,
BT7037,T7031)
BLDARY(A74+1,T7097,T7098,T7099,T7100,T7101,T7102,T7108,T7114,$SIP NODES
AT7120,T7126,T7132,T7131,T7130,T7129,T7128,T7127,T7121,T7115,
BT7109,T7103)
BLDARY(A82+1,T8097,T8098,T8099,T8100,T8101,T8102,T8102,T8108,$SIP NODES
AT8114,T8120,T8126,T8132,T8132,T8131,T8130,T8129,T8128,T8127,
BT8127,T8121,T8115,T8109,T8103,T8097)
BLDARY(A83+1,T8025,T8026,T8027,T8028,T8029,T8030,T8036,T8042,$STILE B NODES
AT8048,T8054,T8060,T8059,T8058,T8057,T8056,T8055,T8049,T8043,
BT8037,T8031)
BLDARY(A84+1,T8097,T8098,T8099,T8100,T8101,T8102,T8108,T8114,$SIP NODES
AT8120,T8126,T8132,T8131,T8130,T8129,T8128,T8127,T8121,T8115,
BT8109,T8103)
BLDARY(A92+1,T 97,T 98,T 99,T 100,T 101,T 102,T 102,T 108,$SIP NODES
AT 114,T 120,T 126,T 132,T 132,T 131,T 130,T 129,T 128,T 127,
BT 127,T 121,T 115,T 109,T 103,T 97)
BLDARY(A93+1,T 25,T 26,T 27,T 28,T 29,T 30,T 36,T 42,$STILE B NODES
AT 48,T 54,T 60,T 59,T 58,T 57,T 56,T 55,T 49,T 43,
BT 37,T 31)
BLDARY(A94+1,T 97,T 98,T 99,T 100,T 101,T 102,T 108,T 114,$SIP NODES
AT 120,T 126,T 132,T 131,T 130,T 129,T 128,T 127,T 121,T 115,
BT 109,T 103)
C
CALCULATION OF GAP DEFLECTIONS
IF(ITERCT .NE. 1) GO TO 35
BLDARY(A10+1,T1201,T1202,T1203,T1204,T1205,T1206,T1207,T1208,$SURFACE NODE
AT1209,T1210,T1211,T1212,T1213,T1214,T1215,T1216,T1217,T1218,
BT1219,T1220,T1221,T1222,T1223,T1224)
BLDARY(A11+1,T1001,T1002,T1003,T1004,T1005,T1006,T1007,T1008,$GAP NODES
AT1009,T1010,T1011,T1012,T1013,T1014,T1015,T1016,T1017,T1018,
BT1019,T1020,T1021,T1022,T1023,T1024)
BLDARY(A20+1,T2201,T2202,T2203,T2204,T2205,T2206,T2207,T2208,$SURFACE NODE
AT2209,T2210,T2211,T2212,T 206,T 205,T 204,T 203,T 202,T 201,
BT2219,T2220,T2221,T1212,T1211,T1210)
BLDARY(A21+1,T2001,T2002,T2003,T2004,T2005,T2006,T2007,T2008,$GAP NODES
AT2009,T2010,T2011,T2012,T 6,T 5,T 4,T 3,T 2,T 1,
BT2019,T2020,T2021,T1012,T1011,T1010)
BLDARY(A30+1,T3201,T3202,T3203,T3204,T3205,T3206,T3207,T3208,$SURFACE NODE
AT3209,T3210,T3211,T3212,T3213,T3214,T3215,T3216,T3217,T3218,
BT 209,T 208,T 207,T2212,T2211,T2210)
BLDARY(A31+1,T3001,T3002,T3003,T3004,T3005,T3006,T3007,T3008,$GAP NODES
AT3009,T 3010,T 3011,T 3012,T 3013,T 3014,T 3015,T 3016,T 3017,T 3018,

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## APPENDIX A, CONTINUED

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BT 9,T 8,T 7,T2012,T2011,T2010)
BLDARY(A40+1,T3218,T3217,T3216,T3215,T3214,T3213,T4207,T4208,$SURFACE NODE
AT4209,T4210,T4211,T4212,T4213,T4214,T4215,T4216,T4217,T4218,
BT4219,T4220,T4221,T 212,T 211,T 210)
BLDAPY(A41+1,T3018,T3017,T3016,T3015,T3014,T3013,T4007,T4008,$GAP NODES
AT4009,T4010,T4011,T4012,T4013,T4014,T4015,T4016,T4017,T4018,
BT4019,T4020,T4021,T 12,T 11,T 10)
BLDARY(A50+1,T4218,T4217,T4216,T4215,T4214,T4213,T5207,T5208,$SURFACE NODE
AT5209,T5210,T5211,T5212,T5213,T5214,T5215,T5216,T5217,T5218,
BT5219,T5220,T5221,T5222,T5223,T5224)
BLDAPY(A51+1,T4018,T4017,T4016,T4015,T4014,T4013,T5007,T5008,$GAP NODES
AT5009,T5010,T5011,T5012,T5013,T5014,T5015,T5016,T5017,T5018,
BT5019,T5020,T5021,T5022,T5023,T5024)
BLDARY(A60+1,T 218,T 217,T 216,T 215,T 214,T 213,T4221,T4220,$SURFACE NODE
AT4219,T5224,T5223,T5222,T6213,T6214,T6215,T6216,T6217,T6218,
BT6219,T6220,T6221,T6222,T6223,T6224)
BLDAPY(A61+1,T 18,T 17,T 16,T 15,T 14,T 13,T4021,T4020,$GAP NODES
AT4019,T5024,T5023,T5022,T6013,T6014,T6015,T6016,T6017,T6018,
BT6019,T6020,T6021,T6022,T6023,T6024)
BLDARY(A70+1,T7201,T7202,T7203,T7204,T7205,T7206,T 221,T 220,$SURFACE NODE
AT 219,T6224,T6223,T6222,T7213,T7214,T7215,T7216,T7217,T7218,
BT7219,T7220,T7221,T7222,T7223,T7224)
BLDAPY(A71+1,T7001,T7002,T7003,T7004,T7005,T7006,T 21,T 20,$GAP NODES
AT 19,T6024,T6023,T6022,T7013,T7014,T7015,T7016,T7017,T7018,
BT7019,T7020,T7021,T7022,T7023,T7024)
BLDAPY(A80+1,T1218,T1217,T1216,T1215,T1214,T1213,T2221,T2220,$SURFACE NODE
AT2219,T 224,T 223,T 222,T7206,T7205,T7204,T7203,T7202,T7201,
BT8219,T8220,T8221,T8222,T8223,T8224)
BLDARY(A81+1,T1018,T1017,T1016,T1015,T1014,T1013,T2021,T2020,$GAP NODES
AT2019,T 24,T 23,T 22,T7006,T7005,T7004,T7003,T7002,T7001,
BT8019,T8020,T8021,T8022,T8023,T8024)
BLDAPY(A90+1,T 201,T 202,T 203,T 204,T 205,T 206,T 207,T 208,$SURFACE NODE
AT 209,T 210,T 211,T 212,T 213,T 214,T 215,T 216,T 217,T 218,
BT 219,T 220,T 221,T 222,T 223,T 224)
BLDARY(A91+1,T 1,T 2,T 3,T 4,T 5,T 6,T 7,T 8,$GAP NODES
AT 9,T 10,T 11,T 12,T 13,T 14,T 15,T 16,T 17,T 18,
BT 19,T 20,T 21,T 22,T 23,T 24)
C GAP CONDUCTORS (NORMAL)
LTEST = 0
DO 5 ITEST=1,24
IF(ITEST.EQ. 7 .OR. ITEST.EQ. 13) LTEST = LTEST+1
IF(ITEST.EQ. 19) LTEST = LTEST + 1
IF(ITEST.EQ. 24) LTEST= 23
A95+ITEST = A93 +ITEST - LTEST
A85+ITEST = A83 +ITEST - LTEST
A75+ITEST = A73 +ITEST - LTEST
A65+ITEST = A63 +ITEST - LTEST
A55+ITEST = A53 +ITEST - LTEST
A45+ITEST = A43 +ITEST - LTEST
A35+ITEST = A33 +ITEST - LTEST
A25+ITEST = A23 +ITEST - LTEST
A15+ITEST = A13 +ITEST - LTEST
5 CONTINUE
G1=(P108*P106+*3*P101/6.*32.2/(144.*P107+R100))
P13=G1/P106**3
DO 10 ITEST=1,24
G1+ITEST-1=G1
G1001+ITEST-1=G1
IF(ITEST.LE.12)G2001+ITEST-1=G1
IF(ITEST.GT. 18 .AND. ITEST.LT. 22) G2019+ITEST-19=G1
IF(ITEST.LT. 19) G3001+ITEST-1=G1
IF(ITEST.GE. 7 .AND. ITEST.LT.22) G4007+ITEST-7=G1
IF(ITEST.GT.6) G5007+ITEST-7=G1
IF(ITEST.GT.12) G6013+ITEST-13=G1

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## APPENDIX A, CONTINUED

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IF(ITEST .LT. 7 ) G7001+ITEST-1=G1
IF(ITEST .GT. 12) G7013+ITEST-13=G1
IF(ITEST .GT. 18) G8019+ITEST-19=G1
10 CONTINUE
C GAP CONDUCTORS (TANGENTIAL)
G25=(R108*R106**3*R100*32.2/(144.*P1C7*R101/6.))
R14=G25/R106**3
DN 20 ITEST=1,24
G24+ITEST=G25
G1024+ITEST=G25
IF(ITEST.LT.13)G2025+ITEST-1=G25
IF(ITEST .GT. 17 .AND. ITEST .LT. 22) G2042+ITEST-18=G25
IF(ITEST .EQ. 24) G2048=G25
IF(ITEST .LT. 19) G3025+ITEST-1=G25
IF(ITEST .EQ. 21) G3045=G25
IF(ITEST .EQ. 24) G3048 = G25
IF(ITEST .GT. 5 .AND. ITEST .LT. 22) G4030+ITEST-6=G25
IF(ITEST .GT. 5) G5030+ITEST-6=G25
IF(ITEST .EQ. 9) G6033=G25
IF(ITEST .GT. 11) G6036+ITEST-12=G25
IF(ITEST .LT. 7) G7024+ITEST=G25
IF(ITEST .EQ.9) G7033=G25
IF(ITEST .GT. 11) G7036+ITEST-12=G25
IF(ITEST .EQ. 9) G8033=G25
IF(ITEST .GT. 17) G8042+ITEST-18=G25
20 CONTINUE
G30 = G25/2.0
G36 = G30
G42 = G30
G48 = G30
G1030 = G30
G1036 = G30
G1042 = G30
G1048 = G30
G2030 = G30
G2036 = G30
G2042 = G30
G2048 = G30
G3030 = G30
G3036 = G30
G3042 = G30
G3048 = G30
G4030 = G30
G4036 = G30
G4042 = G30
G4048=G30
G5030 = G30
G5036 = G30
G5042 = G30
G5048 = G30
G6030=G30
G6036 = G30
G6042 = G30
G6048 = G30
G7030 = G30
G7036 = G30
G7042 = G30
G7048 = G30
G8030=G30
G8036=G30
G8042 = G30
G8048 = G30
R118=0.0
R119=0.0

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## APPENDIX A, CONTINUED

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DO 22 ITEST=1,6
R118=P118+T18+ITEST-1+T218+ITEST-1-T1+ITEST-1-T201+ITEST-1
R119=P119+T24+ITEST-1+T224+ITEST-1-T7+ITEST-1-T207+ITEST-1
22 CONTINUE
R118 = R118/2.*R100/R117*.05
R119 = R119/2.*R100/R117*.05
IF(TIMEN .LT. 2.0) R118=P106-.005
IF(TIMEN .LT. 2.0) R119=.005-R106
IF(P118 .GE. (P106-R120)) R118=R106-R120
IF(R119 .GE. (R106-R120)) R119=R106-R120
R106 = -1.*P106
IF(P118 .LE. (P106+R120)) P118 = (R106+R120)
IF(R119 .LE. (R106+R120)) R119 = (R106+R120)
R106 = -1.0*P106
DO 23 ITEST=1,6
G1+ITEST-1=G1+ITEST-1*(R106-R118)**3/R106**3
G7+ITEST-1=G7+ITEST-1*(R106-R119)**3/R106**3
G13+ITEST-1=G13+ITEST-1*(P106+R118)**3/R106**3
G19+ITEST-1=G19+ITEST-1*(R106+R119)**3/R106**3
23 CONTINUE
DO 24 ITEST=1,5
G24+ITEST = G24+ITEST*(R106-R118)**3/R106**3
G30+ITEST = G30+ITEST*(R106-R119)**3/R106**3
G36+ITEST = G36+ITEST*(R106+R118)**3/R106**3
G42+ITEST = G42+ITEST*(R106+R119)**3/R106**3
24 CONTINUE
G30=G30*(P106-R118/2.-P119/2.-ABS(P119-R118)/2.)
1 **3/(2.*R106**3)
G36=G36*(P106+P118/2.-R119/2.-ABS(P119+P118)/2.)
1 **3/(2.*P106**3)
G42=G42*(P106+R118/2.+P119/2.-ABS(P119-R118)/2.)
1 **3/(2.*P106**3)
G48=G48*(P106-P118/2.+R119/2.-ABS(P119+P118)/2.)
1 **3/(2.*P106**3)
C EDGE CONDUCTORS
R7=(P108/(R107*.5*144.)*32.2)
DO 30 ITEST=1,24
JTEST = (ITEST-1)*9
IF(TIMEN .GE. 2.0)
1R112=(R109*(A92+ITEST-A91+ITEST)-P110*(A92+ITEST-A90+ITEST)
1 +P111+P10*A7+JTEST+1)/(R10+1.)
IF(A91+ITEST .LT. A95+ITEST) R112=P121*.9999
IF(P112 .LE. P121) R112 = R121
IF(ABS(A7+JTEST+1 - R121) .LE. 1.E-10) P112=R121
A7 + JTEST + 1 = P112
G53+ITEST-1=P7*R112**3
IF(TIMEN .GE. 2.0)
1R112=(R109*(A12+ITEST-A11+ITEST)-R110*(A12+ITEST-A10+ITEST)
1 +R111+R10*A7+JTEST+2)/(P10+1.)
IF(A11+ITEST .LT. A15+ITEST) R112=P121*.9999
IF(P112 .LE. P121) R112 = R121
IF(ABS(A7+JTEST+2 - R121) .LE. 1.E-10) P112=P121
A7 + JTEST + 2 = P112
G1053+ITEST-1=P7*P112**3
IF(TIMEN .GE. 2.0)
1R112=(P109*(A22+ITEST-A21+ITEST)-R110*(A22+ITEST-A20+ITEST)
1 +P111+P10*A7+JTEST+3)/(R10+1.)
IF(A21+ITEST .LT. A25+ITEST) R112=P121*.9999
IF(P112 .LE. P121) R112 = R121
IF(ABS(A7+JTEST+3 - R121) .LE. 1.E-10) P112=P121
A7+JTEST+3 = P112
G2053+ITEST-1=P7*P112**3
IF(TIMEN .GE. 2.0)
1R112=(P109*(A32+ITEST-A31+ITEST)-R110*(A32+ITEST-A30+ITEST)

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## APPENDIX A, CONTINUED

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1      +P111+R10*A7+JTEST+4)/(R10+1.)
IF(A31+ITEST .LT. A35+ITEST) R112=P121*.9999
IF(P112 .LE. R121) R112 = R121
IF(ABS(A7+JTEST+4 - R121) .LE. 1.E-10) P112=R121
A7+JTEST+4 = R112
G3053+ITEST-1=R7*R112**3
IF(TIMEN .GE. 2.0)
1R112=(R109*(A42+ITEST-A41+ITEST)-R110*(A42+ITEST-A40+ITEST)
1      +P111+R10*A7+JTEST+5)/(R10+1.)
IF(A41+ITEST .LT. A45+ITEST) R112=R121*.9999
IF(P112 .LE. R121) R112 = R121
IF(ABS(A7+JTEST+5 - R121) .LE. 1.E-10) R112=P121
A7+JTEST+5 = P112
G4053+ITEST-1=R7*P112**3
IF(TIMEN .GE. 2.0)
1P112=(R109*(A52+ITEST-A51+ITEST)-R110*(A52+ITEST-A50+ITEST)
1      +P111+R10*A7+JTEST+6)/(R10+1.)
IF(A51+ITEST .LT. A55+ITEST) R112=P121*.9999
IF(P112 .LE. R121) R112 = R121
IF(ABS(A7+JTEST+6 - R121) .LE. 1.E-10) R112=R121
A7+JTEST+6 = P112
G5053+ITEST-1=R7*R112**3
IF(TIMEN .GE. 2.0)
1P112=(R109*(A62+ITEST-A61+ITEST)-R110*(A62+ITEST-A60+ITEST)
1      +P111+P10*A7+JTEST+7)/(R10+1.)
IF(A61+ITEST .LT. A65+ITEST) R112=P121*.9999
IF(P112 .LE. R121) P112 = R121
IF(ABS(A7+JTEST+7 - R121) .LE. 1.E-10) P112=R121
A7+JTEST+7 = R112
G6053+ITEST-1=R7*R112**3
IF(TIMEN .GE. 2.0)
1R112=(R109*(A72+ITEST-A71+ITEST)-R110*(A72+ITEST-A70+ITEST)
1      +P111+P10*A7+JTEST+8)/(R10+1.)
IF(A71+ITEST .LT. A75+ITEST) R112=P121*.9999
IF(P112 .LE. P121) P112 = P121
IF(ABS(A7+JTEST+8 - R121) .LE. 1.E-10) R112=R121
A7 + JTEST + 8 = R112
G7053+ITEST-1=P7*P112**3
IF(TIMEN .GE. 2.0)
1R112=(R109*(A82+ITEST-A81+ITEST)-R110*(A82+ITEST-A80+ITEST)
1      +P111+P10*A7+JTEST+9)/(R10+1.)
IF(A81+ITEST .LT. A85+ITEST) P112=P121*.9999
IF(P112 .LE. R121) P112 = P121
IF(ABS(A7+JTEST+9 - R121) .LE. 1.E-10) P112=P121
A7+JTEST+9 = P112
G8053+ITEST-1=P7*P112**3
30 CONTINUE
C GLORAL GAP DEFLECTIONS
C GAP CONDUCTORS(NORMAL)
IF(ITEST.FO.0) 31,165
31 CONTINUE
G7 = R13*P106**3
G8 = G7
G9 = G7
DD 161 ITEST = 1,3
G2010+ITEST-1 = G24
161 CONTINUE
DD 162 ITFST = 1,6
G3001+ITEST-1 = G1
G3007+ITEST-1 = G7+ITEST-1
G3013+ITEST-1 = G13
G7013+ITEST-1 = G1
162 CONTINUE
C GAP CONDUCTORS(TANGENTIAL)

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## APPENDIX A, CONTINUED

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G31 = R14*P106**3
G32 = G31
G33 = (G31+G34-ABS(G31-G34))/2.
165 CONTINUE
G8033=(G47+G2043-ABS(G47-G2043))/2.
G2042=(G25+G1034-ABS(G25-G1034))/4.
G2036=(G47+G25-ABS(G47-G25))/4.
G3045=(G31+G2035-ABS(G31-G2035))/2.
G3042=(G37+G31-ABS(G37-G31))/4.
G4048=(G37+G34-ABS(G37-G34))/4.
G4045=(G4044+G35-ABS(G4044-G35))/2.
G6030=(G29+G4044-ABS(G29-G4044))/4.
G6048=(G6047+G41-ABS(G6047-G41))/4.
G7033=(G43+G6047-ABS(G43-G6047))/2.
G7030=(G1034+G46-ABS(G1034-G46))/4.
G8036=(G46+G7029-ABS(G46-G7029))/4.
IF(NTEST.EQ.0) 34,35
34 CONTINUE
G2033 = (G1034+G47-ABS(G1034-G47))/2.
G3025 = G25
G3026 = G25
G3027 = G25
G3028 = G25
G3029 = G25
G3030 = G30
G3031 = G35
G3032 = G35
G3033 = G35
G3034 = G35
G3035 = G35
G3036 = G36
DD 163 ITFST = 1,5
G3037+ITEST-1 = G37
G7037+ITEST-1 = G25
163 CONTINUE
G3048 = G48
G7036 = (G31+G25-ABS(G31-G25))/4.
G7042 = (G25+G1034-ABS(G25-G1034))/4.
G6033=(G4043+G5047-ABS(G4043-G5047))/2.
35 CONTINUE
C SIP TO TILE CONDUCTORS
R8=(R113*P114*(.4472*P108)**.5)
DD 40 ITFST=1,20
R15=0.0
IF(ITFST .LE. 5) R15=(-P118)
IF(ITEST .GE. 6 .AND. ITEST .IF. 10) R15=(-R119)
IF(ITEST .GE. 11 .AND. ITEST .LE. 15) R15=P118
IF(ITEST .GE. 16) R15 = R119
G256+ITEST=R8*(ABS(A94+ITEST-A93+ITEST)+1.E-8)**(-.5)/
1 R114*(R114+R15)
G1256+ITEST=RP*(ABS(A14+ITEST-A13+ITEST)+1.E-8)**(-.5)
G2256+ITEST=PR*(ABS(A24+ITEST-A23+ITEST)+1.E-8)**(-.5)
G3256+ITEST=PR*(ABS(A34+ITEST-A33+ITEST)+1.E-8)**(-.5)/
1 R114*(R114+R15)
G4256+ITEST=R8*(ABS(A44+ITEST-A43+ITEST)+1.E-8)**(-.5)
G5256+ITEST=R8*(ABS(A54+ITEST-A53+ITEST)+1.E-8)**(-.5)
G6256+ITEST=RR*(ABS(A64+ITEST-A63+ITEST)+1.E-8)**(-.5)
G7256+ITEST=R8*(ABS(A74+ITEST-A73+ITEST)+1.E-8)**(-.5)
G8256+ITEST=R8*(ABS(A84+ITEST-A83+ITEST)+1.E-8)**(-.5)
40 CONTINUE
ENN
BCD 3OUTPUT CALLS
IF(TIMEN .LT. TIMEND-.01) GO TO 30
TPRINT

```

## APPENDIX A, CONTINUED

```

      IF(MTEST.EQ.0) GO TO 40
      QMAP(1HA)
40  MTEST=MTEST+1
      PRINT (R118, R119)
      PRINTA(KTFST,A7+1,216,1)
      DO 1 ITEST=1,6
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T1+ITEST-1)
      1 CONTINUE
      DO 2 ITEST=1,6
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T7+ITEST-1)
      2 CONTINUE
      DO 3 ITEST=1,6
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T13+ITEST-1)
      3 CONTINUE
      DO 4 ITEST=1,6
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T19+ITEST-1)
      4 CONTINUE
      DO 11 ITEST=1,72
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T25+ITEST-1)
      11 CONTINUE
      DO 12 ITEST=1,36
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T97+ITEST-1)
      12 CONTINUE
      DO 21 ITEST=1,6
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T201+ITEST-1)
      21 CONTINUE
      DO 22 ITEST=1,6
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T207+ITEST-1)
      22 CONTINUE
      DO 23 ITEST=1,6
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T213+ITEST+1)
      23 CONTINUE
      DO 24 ITEST=1,6
C     IF(TIMEN .GT. 7.0 .AND. TIMEN .LT. 9.0)
C     1QMAP(3HDAR,T219+ITEST+1)
      24 CONTINUE
      30 CONTINUE
      END
      RCD 3SUBROUTINES
      F     SURROUTINE PMITAS(THOLD,GAPS,ROUNDS)
      C
      FCALL COMMON
      C
      F     DIMENSION THOLD(108), GAPS(24), ROUNDS(24)
      C
      F     DO 10 I=1,6
      F     GAPS(I)=T(792+I)
      F     GAPS(6+I)=T(729+I)
      F     GAPS(12+I) = T(805-I)
      F     GAPS(18+I) = T(718-I)
      F     ROUNDS(I) =T(1230+I)
      F     ROUNDS(6+I)=T(1167+I)
      F     ROUNDS(12+I) = T(1243-I)
      F     ROUNDS(18+I) = T(1156-I)
      F 10 CONTINUE

```

## APPENDIX A, CONTINUED

```

C
F      DO 20 I=1,72
F      THOLD(I) = T(I)
F 20  CONTINUE
C
F      DO 30 I=73,108
F      THOLD(I) = T(649+I-73)
F 30  CONTINUE
F      RETURN
F      END
FSTART
      SUBROUTINE OMAP (A1 ,A2 ,A3 ,A4 ,A5 ,A6 ,A7 ,A8 ,A9 ,A10,
1         A11,A12,A13,A14,A15,A16,A17,A18,A19,A20,
2         A21,A22,A23,A24,A25,A26,A27,A28,A29,A30,
3         A31,A32,A33,A34,A35,A36,A37,A38,A39,A40,
4         A41,A42,A43,A44,A45,A46,A47,A48,A49,A50,
5         A51,A52,A53,A54,A55,A56,A57,A58,A59,A60)
C
C*****
C
C      THIS SUBROUTINE COMPUTES A TOTAL NODAL/SYSTEM HEAT BALANCE.
C
C      THE CALLING SEQUENCE IS...
C      CALL OMAP(APG)      -OR-
C      CALL OMAP(APG,T1,T2,...)  -OR-
C      CALL OMAP(T1,T2,...)
C
C      ARG - ANY COMBINATION OF THE HOLLORITH LETTERS
C            ( O, D, A, H, P )
C      O... REQUEST A ONET
C      D... MAP ALL DIFFUSION NODES
C      A... MAP ALL ARITHMETIC NODES
C      H... MAP ALL HEATER NODES
C      P... MAP ALL BOUNDARY NODES
C      T1,T2,... ANY NODE TEMPERATURE THAT A MAP IS DESIRED.
C      THE TOTAL NUMBER OF ARGUMENTS CANNOT EXCEED 60.
C      THIS SUBROUTINE USES THE FOLLOWING FILES...
C      PCS   - CONTAINS THE PSEUDO COMPUTE SEQUENCE.
C      GDRCT - CONTAINS THE CONDUCTOR DIRECTORY.
C      ONETF - CONTAINS THE NODE TOTALS FOR ONET IF A ONET IS
C              REQUESTED.
C*****
C
      COMMON / CNTRL /      TIMEN   , TIMEO   , TIMEH   , TIMEEND ,
1      TSTFPU , TSTFPI , TSTEPL , TSTEPH ,
2      TSTFPO , DMXTCA , DMXTCC , NDMXTC ,
3      AMXTCA , AMXTCC , NAMXTC , DRLXCA ,
4      DRLXCC , NDRLXC , ARLXCA , ARLXCC ,
5      NARLXC , FBALSA , EBALSC , EBALNA ,
6      EBALNC , NEBALN , ITERMX , ITERCT ,
7      ITEPXT , EXTLIM , RLYFAC , DQRLCA ,
8      DQPLCC , NDQRLC , AORLCA , AQFLCC ,
9      NAOPLC , PERIOD , NPRDMX , NPRDCT ,
10     CSGFAC , CSGMIN , NCSGMN , CSGMAX ,
11     NCSGMX , ARSZRD , SBCNST , ITEROT ,
12     PACKUP , DATE , TIMDY , NLINE ,
13     NPAGE , NOSTOP , CDUMMY(46)
      COMMON / COMREC /    NAKREC , NDIR1 , NDIR2 , NDIR3 ,
1      NDATT , NDATC , GDIR1 , GDIP2 ,
2      GDATA , PCS , PCSB , UKDIP ,
3      CKDATA , UKDATA , ADIR1 , ADIP2 ,
4      ADATA , VCCD , VGCD , ODX3 ,
      COMMON / DIMENS /    NND , NNA , NNH , NNT ,

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## APPENDIX A, CONTINUED

```

C          ABS. ADDRESS OF A1,A2,..,AN - ABS. ADDRESS OF T(1) + 1
C
C          THIS SECTION ALSO NUMERICALLY ORDERS THE NODES BY RELATIVE
C          NODE NUMBERS
C
          OPTIONS      = 0
          IPKWRD       = 1
          LGLT         = 15
          ICHAR        = 0
          IF( ( A1 .AND. 777777777R ) .EQ. 555555555B ) ICHAR = 77R
C
C*****
C          CHECK TO SEE IF THE FIRST ARGUMENT IS -CHARACTER DATA-
C
          IF( ICHAR .EQ. 0 )                GO TO 1200
C
C*****
C          INTERROGATE THE FIRST ARGUMENT FOR OPTIONS
C
          DO 1000 I = 6,30,6
          NA      = SHIFT(A1, I).AND. 77R
          IF( NA .FO. 1R )      GO TO 1100
          IF( NA .FO. 1RD )     OPTIONS = OPTIONS .OR. 1R
          IF( NA .FO. 1RA )     OPTIONS = OPTIONS .OR. 2B
          IF( NA .FO. 1RH )     OPTIONS = OPTIONS .OR. 4R
          IF( NA .FO. 1PR )     OPTIONS = OPTIONS .OR. 10R
          IF( NA .FO. 1RO )     OPTIONS = OPTIONS .OR. 20B
1000    CONTINUE
1100    CONTINUE
          IF( KOUNT .GT. 1 )     GO TO 1200
          KOUNT      = KOUNT - 1
                                GO TO 2000
1200    LOCT1      = LDCF( T(1) ) - 1
C
          GO TO (1360,1359,1358,1357,1356,1355,1354,1353,1352,1351,
1          1350,1349,1348,1347,1346,1345,1344,1343,1342,1341,
2          1340,1339,1338,1337,1336,1335,1334,1333,1332,1331,
3          1330,1329,1328,1327,1326,1325,1324,1323,1322,1321,
4          1320,1319,1318,1317,1316,1315,1314,1313,1312,1311,
5          1310,1309,1308,1307,1306,1305,1304,1303,1302,1301), KOUNT
C
1301    IX(ITH+60) = LDCF(A60)-LOCT1
1302    IX(ITH+59) = LDCF(A59)-LOCT1
1303    IX(ITH+58) = LDCF(A58)-LOCT1
1304    IX(ITH+57) = LDCF(A57)-LOCT1
1305    IX(ITH+56) = LDCF(A56)-LOCT1
1306    IX(ITH+55) = LDCF(A55)-LOCT1
1307    IX(ITH+54) = LDCF(A54)-LOCT1
1308    IX(ITH+53) = LDCF(A53)-LOCT1
1309    IX(ITH+52) = LDCF(A52)-LOCT1
1310    IX(ITH+51) = LDCF(A51)-LOCT1
1311    IX(ITH+50) = LDCF(A50)-LOCT1
1312    IX(ITH+49) = LDCF(A49)-LOCT1
1313    IX(ITH+48) = LDCF(A48)-LOCT1
1314    IX(ITH+47) = LDCF(A47)-LOCT1
1315    IX(ITH+46) = LDCF(A46)-LOCT1
1316    IX(ITH+45) = LDCF(A45)-LOCT1
1317    IX(ITH+44) = LDCF(A44)-LOCT1
1318    IX(ITH+43) = LDCF(A43)-LOCT1
1319    IX(ITH+42) = LDCF(A42)-LOCT1
1320    IX(ITH+41) = LDCF(A41)-LOCT1
1321    IX(ITH+40) = LDCF(A40)-LOCT1
1322    IX(ITH+39) = LDCF(A39)-LOCT1
1323    IX(ITH+38) = LDCF(A38)-LOCT1

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## APPENDIX A, CONTINUED

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1324 IX(ITH+37) = LOCF(A37)-LOCT1
1325 IX(ITH+36) = LOCF(A36)-LOCT1
1326 IX(ITH+35) = LOCF(A35)-LOCT1
1327 IX(ITH+34) = LOCF(A34)-LOCT1
1328 IX(ITH+33) = LOCF(A33)-LOCT1
1329 IX(ITH+32) = LOCF(A32)-LOCT1
1330 IX(ITH+31) = LOCF(A31)-LOCT1
1331 IX(ITH+30) = LOCF(A30)-LOCT1
1332 IX(ITH+29) = LOCF(A29)-LOCT1
1333 IX(ITH+28) = LOCF(A28)-LOCT1
1334 IX(ITH+27) = LOCF(A27)-LOCT1
1335 IX(ITH+26) = LOCF(A26)-LOCT1
1336 IX(ITH+25) = LOCF(A25)-LOCT1
1337 IX(ITH+24) = LOCF(A24)-LOCT1
1338 IX(ITH+23) = LOCF(A23)-LOCT1
1339 IX(ITH+22) = LOCF(A22)-LOCT1
1340 IX(ITH+21) = LOCF(A21)-LOCT1
1341 IX(ITH+20) = LOCF(A20)-LOCT1
1342 IX(ITH+19) = LOCF(A19)-LOCT1
1343 IX(ITH+18) = LOCF(A18)-LOCT1
1344 IX(ITH+17) = LOCF(A17)-LOCT1
1345 IX(ITH+16) = LOCF(A16)-LOCT1
1346 IX(ITH+15) = LOCF(A15)-LOCT1
1347 IX(ITH+14) = LOCF(A14)-LOCT1
1348 IX(ITH+13) = LOCF(A13)-LOCT1
1349 IX(ITH+12) = LOCF(A12)-LOCT1
1350 IX(ITH+11) = LOCF(A11)-LOCT1
1351 IX(ITH+10) = LOCF(A10)-LOCT1
1352 IX(ITH+9) = LOCF(A9) -LOCT1
1353 IX(ITH+8) = LOCF(A8) -LOCT1
1354 IX(ITH+7) = LOCF(A7) -LOCT1
1355 IX(ITH+6) = LOCF(A6) -LOCT1
1356 IX(ITH+5) = LOCF(A5) -LOCT1
1357 IX(ITH+4) = LOCF(A4) -LOCT1
1358 IX(ITH+3) = LOCF(A3) -LOCT1
1359 IX(ITH+2) = LOCF(A2) -LOCT1
1360 IX(ITH+1) = LOCF(A1) -LOCT1

C
LTH = ITH
IF(ICHAP.EQ.0) GO TO 1400
LTH = ITH+1
KOUNT = KOUNT-1
1400 APGEND = LTH+KOUNT

C
C*****
C CHECKING USERS INPUT TO OMAP.
C
IERPRD = 0
LTH = LTH+1
DO 1600 I = LTH,APGEND
NA = IX(I)
IF((NA.GE.1).AND.(NA.LE.NNT)) GO TO 1600
NLINE = NLINE + 1
C IF (NLINE.GE.47) CALL TOPLIN CSC
IERPRD = 1
K = I-LTH+1
IF(ICHAP.NE.0) K = K+1
WRITE (OUTPUT,1501) K
1501 FORMAT(*O++CAUTION++ ERROR IN ARGUMENT *,I2,* OF OMAP CALL.* )
1600 CONTINUE
IF(IERPRD.EQ.0) GO TO 1740
WRITE (OUTPUT,1701)
1701 FORMAT(*O++CAUTION++ DUE TO ERRORS IN THE ARGUMENTS TO OMAP, *
* * OMAP WILL NOT BE GIVEN.*)

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## APPENDIX A, CONTINUED

```

2030 CONTINUE
      CALL RWIND (ONET(1))
      NPREO      = 0
      NODE1      = 7777777777B
      IEND       = 0
      IF( KOUNT .GT. 0 )
      IF( NND .EQ. 0 )
      NODE1 = IX( LTH )
      GO TO 2100
C
C*****
C      SET UP FOR THE DIFFUSION NODE PASS
C
      MASKO      = 21R
      MASK1      = 1R
      ISTART     = 1
      IEND       = NND
      TYPE       = DIFF
      ASSIGN 2100 TO NRET
      GO TO 4000
2100 CONTINUE
      IF( NNA .EQ. 0 )
      GO TO 2200
C
C*****
C      SET UP FOR THE ARITHMETIC NODE PASS
C
      MASKO      = 22R
      MASK1      = 2R
      ISTART     = IEND + 1
      IEND       = NDPA
      TYPE       = APTH
      ASSIGN 2200 TO NRET
      GO TO 4000
2200 CONTINUE
      IF( NNH .EQ. 0 )
      GO TO 2300
C
C*****
C      SET UP FOR THE HEATER NODE PASS
C
      MASKO      = 24R
      MASK1      = 4R
      ISTART     = IEND + 1
      IEND       = NDAH
      TYPE       = HEAT
      ASSIGN 2300 TO NRET
      GO TO 4000
2300 CONTINUE
      IF( NSEOR .EQ. 0 )
      GO TO 2900
      IF( (OPTIONS .AND. 10R) .GT. 0 )
      GO TO 2400
      IF( LTH .GT. ARGEND )
      GO TO 2900
      IF( NODE1 .LE. NDAH )
      GO TO 2900
2400 CONTINUE
C
C*****
C      BRING IN THE BOUNDARY NODE -PCS-
C
      IF( NSEOR.EQ.NSEOR )
      GO TO 2420
C      IF (NLINE.GE.43) CALL TOPLIN
      NLINE      = NLINE+4
      WRITE( OUTPUT,2411 )
2411 FORMAT( *O++CAUTION++ -OMAP- INSUFFICIENT AREA IN -ISEC-(PCS)*
1          * APRAY TO ALLOW A BOUNDARY NODE MAP.* / 14X
2          * A -ONET- PERFORMED ON THIS NETWORK WILL THUS BE IN*
3          * FPROP.* )
      GO TO 2900
2420 CONTINUE

```

CSC



## APPENDIX A, CONTINUED

```

      CALL READAK (NRIO(1),ISEQ(1),NSEQB,PCSB)
      IPKWD      = 1
      LGLT      = 15
C
C*****
C      SET UP FOR THE BOUNDARY NODE PASS
C
      MASKO      = 30B
      MASK1      = 10B
      ISTART     = IEND + 1
      IEND       = NNT
      TYPE       = BOUN
      ASSIGN 2810 TO NPET
                                                    GO TO 4000
2810 CONTINUE
C
C*****
C      RESTORE THE NORMAL -PCS-
C
      CALL READAK (NRIO(1),ISEQ(1),NSEQ,PCS)
2900 CONTINUE
C
C*****
C      ALL CALCULATIONS FOR QMAP HAVE BEEN PERFORMED.  CHECK FOR A
C      -QNET- PRINT REQUEST.
C
      IF((OPTIONS .AND. ZCP) .EQ. 0 ) GO TO 9090
C
      CALL TOPLIN
      WRITE( OUTPUT,3001 ) NNT, TIMEN
3001 FORMAT(*-,32X,*A QNET ON A *,I6,* NODE PROBLEM AT *,G13.6,
*      * (TIME UNITS).*,//,18X,
*      *THE TOTALS OF THE VARIOUS HEAT TRANSFER MODES (ENERGY *,
*      *UNITS/TIME UNIT) ON EACH NODE ARE...*)
      WRITE( OUTPUT,3002 )
3002 FORMAT(*OINPUT (INTERNAL)*,12X,*LINEAR*,8X,*LIN 1-WAY*,6X,
*      *RADIATION*,8X,*HEAT*,7X,*NEGATIVE INTERNAL*,3X,
*      *BALANCE ON*,/,7X,*NODE*,8X,*TYPE*,4X,3(* TRANSFER*,6X),
*      *SOURCE/SINK*,5X,*ENERGY CHANGE*,8X,*NODE*,/,
*      1X16(*-),1X6(*-),2X4(*----- *),
*      17(*-),2X,13(*-))
      NLINE      = NLINE + 9
      SODSL      = 0.0
      SODSL1     = 0.0
      SODSP      = 0.0
      SONS       = 0.0
      SCIENP     = 0.0
      QNETDTL    = 0.0
      THAR       = 0
      CALL WDEF (QNETF(1),1)
      CALL RWIND (QNETF(1))
C
C*****
C      PRINT THE QNET FOR DIFFUSION AND ARITHMETIC NODES.
C
2300 CONTINUE
      CALL READSQ (QNETF(1),QNETD(1),9,LNG,JDEF)
      IF(JDEF.GT.0) GO TO 3400
      IF( NODEO .GT. NDPA ) GO TO 3500
      IF (NLINE.LT.47) GO TO 3300
C
      CALL TOPLIN
      WRITE( OUTPUT,3002 )
      NLINE      = NLINE + 4
3300 CONTINUE
      CIENP      = -CIENP

```

## APPENDIX A, CONTINUED

```

      NLINE      = NLINE + 1
      WRITE( OUTPUT,3301 ) ONETD
3301  FORMAT(1X16,* (*I6,*) *AR,4(G13.6,2X),2XG13.6,4XG13.6)
      SODSL      = SODSL + QDSL
      SODSL1     = SODSL1 + QDSL1
      SODSP      = SODSR + QDSR
      SODS       = SODS + ODS
      SCIENR     = SCIENR + CIENR
      QNETOTL    = QNETOTL + QNETT

```

GO TO 3100

3400 CONTINUE

```

C
C*****
C      END OF FILE ON ONETF
C
C      IHAB      = 1
C
C

```

3500 CONTINUE

```

C      IF (NLINE.GE.41) CALL TOPLIN
      WRITE( OUTPUT,3501 ) SONETD
3501  FORMAT(//,10X,*TOTALS OF DIFF *,4(*-----*),
*      17(*-*),2X,13(*-*),/,10X,*AND ARITH NODES *,
*      4(G13.6,2X),2X,G13.6,4X,G13.6,// )
      NLINE      = NLINE + 4
      IF( IHAB .EQ. 1 )      GO TO 9999
      SODSI      = 0.0
      SODSF      = 0.0
      SODSL1     = 0.0
      SCIENR     = 0.0
      SODS       = 0.0
      QNETOTL    = 0.0

```

CSC

GO TO 3700

3600 CONTINUE

```

C
C*****
C      PRINT THE ONET FOR THE HEATER AND BOUNDARY NODES
C
C      CALL READSO (ONETF(1),ONETD(1),9,1NG,JEOF)
      IF(JEOF.GT.C)      GO TO 3900

```

3700 CONTINUE

```

C      IF (NLINE.LT.47) GO TO 3300
      CALL TOPLIN
      WRITE( OUTPUT,3002 )
      NLINE      = NLINE + 4

```

CSC

3800 CONTINUE

```

      NLINE      = NLINE + 1
      WRITE( OUTPUT,3301 ) ONETD
      SODSL      = SODSL + QDSL
      SODSL1     = SODSL1 + QDSL1
      SODSP      = SODSR + QDSR
      SODS       = SODS + ODS
      SCIENR     = SCIENR + CIENR
      QNETOTL    = QNETOTL + QNETT

```

GO TO 3600

3900 CONTINUE

```

C
C*****
C      END OF FILE ON -ONETF-
C
C      IF (NLINE.GE.45) CALL TOPLIN
      WRITE( OUTPUT,3901 ) SONETD
3901  FORMAT(//,9X,*TOTALS OF HEATER *,4(*-----*),
*      17(*-*),2X,13(*-*),/,9X,*AND BOUND NODES *,

```

CSC

## APPENDIX A, CONTINUED

```

*          4(G13.6,2X),2X,G13.6,4X,G13.6 )
          GO TO 9999
4000 CONTINUE
C
C *****
C *
C *          LOGIC FOR THE QMAP CALCULATIONS AND QNET DATA TAPE
C *
C *****
C
      OPT          = OPTIONS .AND. MASK0
      IQPSN        = 0
      IF((OPT .EQ. 20R) .AND. (KOUNT .GT. 0)) IQPSN = 1
      DO 7000 LOP = ISTART,IEND
      NODE0        = NODE0 + 1
      PRINT        = OPT .AND. MASK1
4100 CONTINUE
      IF( OPT .GT. 0 )          GO TO 4600
4200 CONTINUE
      IF( NODE0 .LT. NODE1 )   GO TO 4400
      IF( NODE0 .GT. NODE1 )   GO TO 4300
      PRINT          = 1
          GO TO 4600
4300 CONTINUE
      LTH           = LTH + 1
      IF( LTH .GT. ARGEND )    GO TO 7100
      NODE1         = IX(LTH)
          GO TO 4200
4400 CONTINUE
      IF( LGLT .LT. 15 )      GO TO 4500
      CALL UNPACK
      LGLT           = 0
4500 CONTINUE
      LGLT          = LGLT + 1
      INFO          = INFOGT( LGLT )
      IF((INFO .AND. 1B) .EQ. 1 ) GO TO 7000
          GO TO 4400
4600 CONTINUE
C
C *****
C          SAVE THE INITIAL IPKWRD AND LGLT FOR THIS NODE
C
      IPKWRDS       = IPKWRD-7
      LGLTS         = LGLT
      NODE         = ND( NODE0 )
      IF( IQPSN .EQ. 0 )      GO TO 4900
4700 CONTINUE
      IF( NODE0 .LT. NODE1 )   GO TO 4900
      IF( NODE0 .GT. NODE1 )   GO TO 4800
      PRINT         = 1
          GO TO 4900
4800 CONTINUE
      LTH           = LTH + 1
      IF( LTH .GE. ARGEND )    IQPSN = 0
      IF( LTH .GT. ARGEND )    GOTO 4900
      NODE1         = IX( LTH )
          GO TO 4700
4900 CONTINUE
      IF( PRINT .EQ. 0 )      GO TO 6000
C
C *****
C          PRINTING THE FIRST PART OF -QMAP- PRINT OUT
C
C          CALL TOPLIN

```

## APPENDIX A, CONTINUED

```

C      WRITE( OUTPUT,5001 ) NODE,TYPE,NODE,NODEO,TIMEN,TSTEPU          CSC
C5001  FORMAT(*0*,5RX,*NODE*,I6,/,
C      *      * A OMAP OF INPUT *,A6,* NODE *,I6,* (INTERNAL*,I6,
C      *      *) AT *,G13.6,* (TIME UNITS) OVER A TIME STEP OF *,G13.6,
C      *      *(TIME UNITS).*,/ )
C      TEMPN      = T( NODEO )
C      IF((ITRAN .GT. 0) .AND. (NODEO .LE. NODEA)) GO TO 5100
C      WRITE( OUTPUT,5002 ) NODE,TEMPN
C5002  FORMAT(* THE TEMPERATURE OF NODE *,I6,* IS *,G13.6,* (DEG.)* )  CSC
C      GO TO 5300
5100  CONTINUE
C      TEMPD      = EXTRA( ITNTH+NODEO-1 ) + ABSZRO
C      WRITE( OUTPUT,5101 ) NODE,TEMPD,TEMPN
5101  FORMAT(* THE TEMPERATURE OF NODE *,I6,
C      *      * AT THE START OF THE TIME STEP WAS *,G13.6,
C      *      * (DEG), AND *,G13.6,* (DEG) AT THE END.* )
5300  CONTINUE
C      NLINE      = NLINE + 5
C      IF( TYPE .NE. DIFF )          GO TO 5900
C
C*****
C      SUM CONDUCTANCE FOR NODEO
C
C      SUMGL      = 0.0
C      SUMGRL     = 0.0
5400  CONTINUE
C      IF( LGLT .NE. 15 )          GO TO 5500
C      CALL UNPACK
C      LGLT       = 0
5500  CONTINUE
C      LGLT       = LGLT + 1
C      NG        = LG(LGLT)
C      NT        = LT(LGLT)
C      INFO      = INFOGT(LGLT)
C      GNG       = G( NG )
C
C*****
C      CHECK FOR CONDUCTOR TYPE
C
C      IF((INFO.AND.4B).NE.0)      GO TO 5600
C
C*****
C      LINEAP
C
C      SUMGL      = SUMGL + GNG
C      GO TO 5700
5600  CONTINUE
C
C*****
C      RADIATION
C
C      TIA        = T( NODEO ) - ABSZRO
C      TNTA       = T( NT ) - ABSZRO
C      SUMGRL     = SUMGRL + GNG*(TNTA**2 + TIA**2)*(TNTA + TIA)
5700  CONTINUE
C
C*****
C      CHECK FOR MORE ADJOINING NODES
C
C      IF((INFO .AND. 1R) .EQ. 0 ) GO TO 5400
C
C*****
C      CHECK FOR ZERO SUM OF CONDUCTORS
C

```

## APPENDIX A, CONTINUED

```

SUMG          = SUMGL + SBCNST*SUMGR1
IF( SUMG .GT. 0.0 )          GO TO 5800
NLINE         = NLINE + 2
WRITE( OUTPUT,5701 ) NODE
5701 FORMAT(*O++CAUTION++ THE SUM OF CONDUCTORS ATTACHED TO INPUT *,
*          *NODE *,I5,* IS NOT GREATER THAN ZERO.* )
SUMG          = 1.E300
5800 CONTINUE
CSG           = C( NODE0 )/SUMG
C WRITE( OUTPUT,5801 ) NODE, C( NODE0 ), CSG          CSC
C5801 FORMAT(*OTHE CAPACITANCE OF NODE*,I6,* IS *,G13.6,          CSC
C *          * (ENERGY UNITS/DEG), AND THE CAP./SUM OF CONDUCT IS *,          CSC
C *          G13.6,* (TIME UNITS).* )          CSC
NLINE         = NLINE + 2
C
C*****
C PRINT THE NODE CONNECTIONS
C
5900 CONTINUE
C WRITE( OUTPUT,5901 ) NODE          CSC
C5901 FORMAT(*-,42X,*THE ADJOINING NODES TO NODE *,I5,* ARE...*,/,          CSC
C *          1X2(*INPUT (INTERNAL)*7X),6X*CONDUCTOR*6X          CSC
C *          *HEAT TRANSFER RATE*,5X,*TEMPERATURE OF*,/,7X,*NODE*,7X,          CSC
C *          *TYPE*,5X,*CONDUCTOR*,7X,*TYPE*,8X,*VALUE*,5X,          CSC
C *          *(ENERGY UNITS/TIME UNITS) ADJOINING NODE*/1X15(*-*),          CSC
C *          1X6(*-*),1X16(*-*),1X9(*-*),1X13(*-*),1X25(*-*),1X14(*-*) CSC
NLINE         = NLINE + 6
6000 CONTINUE
C
C*****
C RESTORE THE NODE POINTERS TO THE -PCS- .
C
LGLT          = LGLTS
IPKWRD        = IPKWRDS
CALL UNPACK
C
C*****
C COMPUTING INSTANTANEOUS HEAT RATES FOR EACH CONDUCTIVE PATH
C
QDSL          = 0.0
QDSP          = 0.0
QDSL1         = 0.0
QDS           = 0.0
TETA         = 0.0
IF( TYPE .NE. ROUN )          QDS = Q( NODE0 )
TIA           = T( NODE0 ) - ABSZPD
6100 CONTINUE
IF( LGLT .NE. 15 )          GO TO 6200
CALL UNPACK
LGLT          = 0
6200 CONTINUE
LGLT          = LGLT + 1
NG            = LG( LGLT )
NT            = LT( LGLT )
GNG           = G( NG )
TNTA         = T( NT ) - ABSZPD
NCAC          = IX( IGDRC+NG )
INFO         = INFOGT( LGLT )
TYPEN        = ROUN
IF( NT .LE. NDAH )          TYPEN = HEAT
IF( NT .LE. NDPA )          TYPEN = ARTH
IF( NT .LE. NND )          TYPEN = DIFF
L1W          = INFO .AND. 6P
IF( L1W .EQ. 0 )          TYPEC = REG

```

## APPENDIX A, CONTINUED

```

      IF( L1W .EQ. 4 )          TYPEC = RAD
      IF( L1W .FO. 2 )          TYPEC = REG1W
      IF( L1W .EQ. 6 )          TYPEC = RAD1W
      IF((INFO.AND.4B).NE.0)    GO TO 6300
C
C*****
C      LINEAR CONDUCTOR
C
      HT          = GNG*(TNTA - TIA)
C
C      6300 CONTINUE
C
C*****
C      RADIATION CONDUCTOR
C
      HT          = GNG*SBCNST*(TNTA**4-TIA**4)
C      6400 CONTINUE
C
C*****
C      KEEPING TRACK OF SUMATIONS OF...
C      TOTAL HEAT TRANSFER.....QDSL
C      TOTAL RADIATION HEAT TRANSFER.....QDSP
C      TOTAL LINEAR 1-WAY TRANSFER.....QDSL1
C
      IF( L1W .EQ. 0 )          QDSL = QDSL + HT
      IF( L1W .EQ. 2 )          QDSL1 = QDSL1 + HT
      IF( L1W .GT. 2 )          QDSP = QDSP + HT
      IF( PRINT .EQ. 0 )        GO TO 660C
C
C*****
C      PRINT SECOND PART OF QMAP PRINT OUT
C
      IF (NLINE.LT.47) GO TO 650C
C      CALL TOPLIN
C      WRITE( OUTPUT,5901 ) NODEF
C      NLINE          = NLINE + 6
C      6500 CONTINUE
C      NLINE          = NLINE + 1
C      WRITE( OUTPUT,6501 ) ND(NT), NT, TYPEN, NCAC, NG, TYPEC, GNG, HT,
C      1              T(NT)
C      6501 FORMAT(1Y,I6,* (*I6,*) *AR,I6,* (*I6,*) *A10,G13.6,
C      *              2(7X,G13.6) )
C      WRITE( OUTPUT,6501 ) NODEF, ND(NT), HT
C      WRITE( NUSER2,6501 ) NODEF, ND(NT), HT
C      6501 FORMAT(1X,I4,6X,I4,6X,G13.6)
C      6600 CONTINUE
C      IF((INFO .AND. 1B) .EQ. 0 )    GO TO 6100
C
C*****
C      CALCULATION OF NEGATIVE RATE OF CHANGE OF THE INTERNAL ENERGY
C
      CIENP          = 0.0
      NPCIE          = 0
      IF( ITRAN .EQ. 0 )          GO TO 6700
      IF( NODE0 .GT. NND )        GO TO 6700
      NPCIF          = 1
      CIENP          = C(NODEC) * (TIA - EXTRA(ITNTH+NODE0-1)) / TSTEPU
      IF( TSTEPU .FO. 0.0 )        CIFNP = 0.0
C      6700 CONTINUE
C      IF((OPT .AND. 20B) .EQ. 0 )    GO TO 6800
C
C*****
C      WRITE OUT THE FILE FOR -ONET-
C

```

## APPENDIX A, CONTINUED

```

      QNETT      = QDSL + QDSL1 + QDSR + QDS - CIENR
      CALL WRITSO (QNETF(1),QNETD(1),9)
6800  CONTINUE
      IF( PRINT .EQ. 0 )          GO TO 7000
C
C*****
C      PRINT THE THIRD PART OF -QMAP- PRINT OUT
C
C      IF (NLINE.GE.36) CALL TOPLIN
C      WRITE( OUTPUT,6900 ) NNODE,QDSL,QDSL1,QDSR          CSC
C6900  FORMAT(*0*,47X,*THE TOTALS ON NODE *,I6,* ARE...*/,    CSC
C      *          21X,*LINEAR HEAT TRANSFER (CONDUCTION/CONVECTION)... *,    CSC
C      *          G13.6,/,    CSC
C      *          21X,*LINEAR 1-WAY TRANSFER (ENTHALPY TRANSFER)..... *,    CSC
C      *          G13.6,/,    CSC
C      *          21X*RADIATION HEAT TRANSFER*24(*.*),1XG13.6)    CSC
C      IF( NNODE.LE.NDAH )      WRITE( OUTPUT,6901 ) QDS          CSC
C6901  FORMAT(21X*HEAT SOURCE/SINKS APPLIED*22(*.*),1XG13.6)    CSC
C      TETR      = QDSL + QDSL1 + QDSR + QDS
C      WRITE( OUTPUT,6902 ) TETR          CSC
C6902  FORMAT(69X,15(*-*),/,69X,G13.6,* ENERGY UNITS/TIME UNIT* )    CSC
C      IF( NRCIE .EQ. 0 )          GO TO 7000
      6903  FORMAT(21X*LESS THE INTERNAL ENERGY CHANGE* 16(*.*),1XG13.6)
C      TETR      = TETR - CIENR
C      WRITE( OUTPUT,6902 ) TETR          CSC
7000  CONTINUE
7100  CONTINUE
      GO TO NPFT, ( 2100, 2200, 2300, 2810 )
9999  CONTINUE
      NLINE      = 60
      CALL NAJFLD (LOCF(EXTRA(NTH)),4)
      CALL CLOSEY (QNETF(1),1,0)
      RETURN
      END
SUBROUTINE CNTRL(PLOCIN,XT,YT,XC,YC,ISTA,IFIN)
DIMENSION XNODES(8,8), YNODES(8,8), PSURF(8,8)
DIMENSION TCAL(36),PSUR(6,6),G(24),R(24),THOLD(108)
DIMENSION PLOCIN(81,2), XT(81),YT(2)
C
C
      TRANSX(THETA,X,Y,XC) = COS(THETA)*X - SIN(THETA)*Y + XC
      TRANSY(THETA,X,Y,YC) = SIN(THETA)*X + COS(THETA)*Y + YC
C
      DO = .5325
      DS = 1.0
      XLENGTH = 6.065
      ANGLE = 45.0
      PI = 3.1416954
      THETA = ANGLE*PI/180.
C
C      CALCULATE NODE POSITIONS
C
      DO 30 J=1,8
      DO 20 I=1,6
      XNODES(I+1,J) = DO+(I-1)*DS
20  CONTINUE
      XNODES(1,J) = 0.0
      XNODES(8,J) = XLENGTH
      30  CONTINUE
      DO 40 I=1,8
      DO 50 J=1,6
      YNODES(I,J+1) = DO+(J-1)*DS
50  CONTINUE

```

## APPENDIX A, CONTINUED

```

      YNODES(I,1) = 0.0
      YNODES(I,8) = XLENGTH
40  CONTINUE
      CALCULATE SURFACE PRESSURES OVER THE SUBJECT TILE
C
C
C      CALL PNTEPP(PLOCIN,XT,YT,ISTA,IFIN)
      DO 60 I=1,8
      DO 70 J=1,8
      XN = TRANSX(-THETA,XNODES(I,J),YNODES(I,J),XC)
      YN = TRANSY(-THETA,XNODES(I,J),YNODES(I,J),YC)
      CALL PRESND(B1,XT,2,YT,B1,PLOCIN,XN,YN,PPES)
      PSURF(I,J) = PRES
70  CONTINUE
60  CONTINUE
      DO 61 I=1,6
      DO 62 J=1,6
      PSUR(I,J) = PSURF(I+1,J+1)
62  CONTINUE
61  CONTINUE
C
      CALL PMITAS(THOLD,G,R)
      DO 100 I=1,36
      TCAL(J) = THOLD(I)
100 CONTINUE
C
      CALL CALFM(TCAL,G,PSUR,R)
      RETURN
      END
      SUBROUTINE PNTEPP(PLOCIN,XT,YT,ISTA,IFIN)
C
C
C      DIMENSION Y1(50), Y1(50), PLOC1(50)
      DIMENSION X2(50), Y2(50), PLOC2(50)
      DIMENSION TITLE(8), YP(50), TEMP(50)
      DIMENSION PLOCIN(81,2), XNODES(150), YNODES(150)
      DIMENSION XT(P1), YT(2)
      DIMENSION XLINC(16),YLINC(16)
C
C
C      READ INPUT DATA
C
C
C      READ(5,100) (TITLE(I), I=1,P)
      READ(5,200) NPUN,XMACH,PHI,OPSF,PPSIA
      WRITE(6,250) (TITLE(I), I=1,8)
      WRITE(6,260) NPUN,XMACH,PHI,OPSF,PPSIA
      WRITE(6,270)
      READ(5,290) N1
      DO 10 I=1,N1
      READ(5,300) X1(I), Y1(I), PLOC1(I)
      WRITE(6,280) NRUN,X1(I),Y1(I),PLOC1(I)
10  CONTINUE
      READ(5,290) N2
      DO 20 I=1,N2
      READ(5,300) X2(I), Y2(I), PLOC2(I)
      WRITE(6,280) NRUN,X2(I),Y2(I),PLOC2(I)
20  CONTINUE
C
100 FORMAT(8A10)
200 FORMAT(A4,F10.4,F10.2,F10.1,F10.3)
250 FORMAT(1H ,8A10)
260 FORMAT(1H ,// " RUN          MACH          PHI          0          P"/" NUMBER
1  DEG.    PSF    PSIA"/1H ,I4,F9.4,FR.2,F7.1,F9.0)
270 FORMAT(1H ,// " RUN          X          Y          P-LDC"/" NUMBER
1          PSIA")

```



## APPENDIX A, CONTINUED

```

290 FORMAT(I5)
300 FORMAT(F12.5,F12.5,F12.3)
280 FORMAT(1H ,A4,3F12.5)
C
C   DETERMINE THE RANGE OVER WHICH THE DATA SETS ARE TO
C   BE INTERPOLATED. OUTSIDE THE RANGE THE DATA IS
C   EXTRAPOLATED WITH STRAIGHT, FLAT LINES.
C
XSTAR1 =IFIX(X1(1) + .5)
XSTAR2 = IFIX(X2(1) + .5)
IF(XSTAR1 .LT. X1(1)) XSTAR1 = XSTAR1 + .5
IF(XSTAR2 .LT. X2(1)) XSTAR2 = XSTAR2 + .5
WRITE(6,24) XSTAR1,XSTAR2
24 FORMAT(1H , "XSTAR1=",F12.5," XSTAR2=",F12.5)
XSTOP1 = IFIX(X1(N1) + .5)
XSTOP2 = IFIX(X2(N2) + .5)
IF(XSTOP1 .GT. X1(N1)) XSTOP1 = XSTOP1 - .5
IF(XSTOP2 .GT. X2(N2)) XSTOP2 = XSTOP2 - .5
WRITE(6,31) XSTOP1,XSTOP2
31 FORMAT(1H , "XSTOP1=",F12.5," XSTOP2=",F12.5)
C
C   YT(1) = Y1(1)
C   YT(2) = Y2(1)
C
C
C   INTERPOLATE THE TWO DATA SETS TO A REGULAR GRID
C   USING CUBIC SPLINES. (AKCLIR)
C
C
SIGMA = 2.5
ISLPSW = 3
C
C   FIRST DATA SET
C
CALL CURV1(N1,X1,PLOC1,SPL1,SPLN,ISLPSW,YP,TEMP,SIGMA,IERR)
IF(IERR-1) 50,60,60
C
50 DO 40 K=ISTA,IFIN
I=K-ISTA+1
XT(I) = .5*(K-1)
IF(XT(I) .LT. XSTAR1) PLOCIN(I,1)=CURV2(X1(1),N1,X1,PLOC1,YP,
1 SIGMA)
IF(XT(I) .GE. XSTAR1 .OR. XT(I) .LE. XSTOP1)
1 PLOCIN(I,1)=CURV2(XT(I),N1,X1,PLOC1,YP,SIGMA)
IF(XT(I) .GT. XSTOP1) PLOCIN(I,1)=CURV2(X1(N1),N1,X1,PLOC1,YP,
1 SIGMA)
40 CONTINUE
C
C   SECOND DATA SET
C
CALL CURV1(N2,X2,PLOC2,SPL1,SPLN,ISLPSW,YP,TEMP,SIGMA,IERR)
IF(IERR-1) 90,60,60
C
90 DO 110 K=ISTA,IFIN
I=K-ISTA+1
XT(I) = .5*(K-1)
IF(XT(I) .LT. XSTAR2) PLOCIN(I,2)=CURV2(X2(1),N2,X2,PLOC2,YP,
1 SIGMA)
IF(XT(I) .GE. XSTAR2 .OR. XT(I) .LE. XSTOP2)
1 PLOCIN(I,2) = CURV2(XT(I),N2,X2,PLOC2,YP,SIGMA)
IF(XT(I) .GT. XSTOP2) PLOCIN(I,2)=CURV2(X2(N2),N2,X2,PLOC2,YP,
1 SIGMA)

```

## APPENDIX A, CONTINUED

```

110 CONTINUE
60 CONTINUE
  IF(IEPR -1 .EQ. 0) PRINT IEPR
  IF(IEPR -1 .EQ. 1) PRINT IERR
  RETURN
  END
  SUBROUTINE PRESND(NX,X,NY,Y,MAXF,F,XD,YD,PPES)
  DIMENSION IPT(2),IORDER(2),X(NX),Y(NY),F(MAXF,NY)
  IPT(1) = -1
  IPT(2) = -1
  IORDER(1) = 1
  IORDER(2) = 1
  CALL IRI(NX,X,NY,Y,MAXF,F,IORDER,IPT,XD,YD,PRES,IEPR,
C  GO TO(100,200,300,400),
C 100 WRITE(6,600)
C  GO TO 500
C 200 WRITE(6,700)
C  GO TO 500
C 300 WRITE(6,800)
C  GO TO 500
C 400 WRITE(6,900)
C 600 FORMAT(1H ,
C 700 FORMAT(1H ,
C 800 FORMAT(1H ,
C 900 FORMAT(1H ,
1000 FORMAT(1H ,I11,1H,,F12.3,1H,,F10.1,2F12.5)
500 RETURN
  END
  SUBROUTINE LONG(XC,YC,ANGLE,XLENGTH,DS,DO,XNODES,YNODES,NNODES,N)
C
  DIMENSION XNODES(NNODES), YNODES(NNODES)
C
  TRANSX(THETA,X,Y,XC) = COS(THETA)*X - SIN(THETA)*Y + XC
  TRANSY(THETA,X,Y,YC) = SIN(THETA)*X + COS(THETA)*Y + YC
C
  XNTL = FLOAT(NNODES)/FLOAT(N)
  NTL = XNTL + .5
  TOTAL = XNTL*XLENGTH
  PI = 3.14159623
  THETA = ANGLE*PI/180.0
  Y = 0.0
  XPEF = 0.0
  DO 20 J = 1,NTL
  DO 10 I=1,N
  X = DO + (I-1)*DS + XPEF
  IF(X .GT. TOTAL) GO TO 50
  XNODES((J-1)*N+I) = TRANSX(THETA,X,Y,XC)
  YNODES((J-1)*N+I) = TRANSY(THETA,X,Y,YC)
30 FORMAT(1H ,F12.5)
10 CONTINUE
  XPEF = X + DO
20 CONTINUE
50 CONTINUE
  RETURN
  END
  SUBROUTINE SHOPT(XC,YC,ANGLE,XLENGTH,DS,DO,XNODES,YNODES,NNODES)
C
  DIMENSION XNODES(NNODES), YNODES(NNODES)
C
  TRANSX(THETA,X,Y,XC) = COS(THETA)*X - SIN(THETA)*Y + XC
  TRANSY(THETA,X,Y,YC) = SIN(THETA)*X + COS(THETA)*Y + YC
C
  PI = 3.14159623
  THETA = ANGLE*PI/180.0

```

## APPENDIX A, CONTINUED

```

X = 0.0
DO 10 I = 1, NNODES
Y = DO + (I-1)*DS
XNODES(I) = TRANSX(THETA, X, Y, XC)
YNODES(I) = TRANSY(THETA, X, Y, YC)
10 CONTINUE
RETURN
END
SUBROUTINE GENPT(XREF, YREF, XLENGTH, XLINC, YLINC, N)
C
C   DIMENSION XLINC(N), YLINC(N)
C
C   DLENGTH = XLENGTH*SOPT(.5)
C
XLINC(2) = XREF - 1.5*DLENGTH
YLINC(2) = YREF + 1.5*DLENGTH
XLINC(1) = XREF - 2.5*DLENGTH
YLINC(1) = YREF + .5*DLENGTH
XLINC(3) = XREF
YLINC(3) = YREF + 2. *DLENGTH
XLINC(4) = XREF + 1.5*DLENGTH
YLINC(4) = YREF + 2.5*DLENGTH
XLINC(5) = XLINC(1)
YLINC(5) = YLINC(1)
XLINC(6) = XLINC(1) + DLENGTH
YLINC(6) = YLINC(1) - DLENGTH
XLINC(7) = XLINC(1) + 2.0*DLENGTH
YLINC(7) = YLINC(1) - 2.0*DLENGTH
XLINC(8) = XLINC(1) + 3.0*DLENGTH
YLINC(8) = YLINC(1) - 3.0*DLENGTH
XLINC(9) = XLINC(2) + .5*DLENGTH
YLINC(9) = YLINC(2) - .5*DLENGTH
XLINC(10) = XREF
YLINC(10) = YREF
XLINC(11) = XLINC(2) + 2.5*DLENGTH
YLINC(11) = YLINC(2) - 2.5*DLENGTH
XLINC(12) = XLINC(2) + 3.5*DLENGTH
YLINC(12) = YLINC(2) - 3.5*DLENGTH
XLINC(13) = XLINC(3) + .5*DLENGTH
YLINC(13) = YLINC(3) - .5*DLENGTH
XLINC(14) = XLINC(3) + 1.5*DLENGTH
YLINC(14) = YLINC(3) - 1.5*DLENGTH
XLINC(15) = XLINC(3) + 2.5*DLENGTH
YLINC(15) = YLINC(3) - 2.5*DLENGTH
XLINC(16) = XLINC(3) + 3.5*DLENGTH
YLINC(16) = YLINC(3) - 3.5*DLENGTH
DO 10 I=1,16
10 CONTINUE
100 FORMAT(1H ,2F12.5)
RETURN
END
SUBROUTINE FINDND(XC, YC, ANGLE, XLENGTH, DS, DO, XNODES, YNODES, NNODES)
C
C   DIMENSION XNODES(NNODES), YNODES(NNODES)
C
TRANSX(THETA, X, Y, XC) = COS(THETA)*X-SIN(THETA)*Y+XC
TRANSY(THETA, X, Y, YC) = SIN(THETA)*X+COS(THETA)*Y+YC
C
N = NNODES/4.0
PI = 3.14159654
THETA = ANGLE*PI/180.0
C
C   SIDE 1
C

```

## APPENDIX A, CONTINUED

```

N1 = 1
N2 = N
DO 10 I=N1,N2
X = 0.0
Y = DO+(I-1)*DS
23 FORMAT(1H,4F12.5)
XNODES(I) = TRANSX(THETA,X,Y,XC)
YNODES(I) = TRANSY(THETA,X,Y,YC)
10 CONTINUE
C
C   SIDE 2
C
N1 = N2 + 1
N2 = N1 + N - 1
I1 = 1
DO 20 I=N1,N2
X = DO + (I1-1)*DS
Y = XLENGTH
XNODES(I) = TRANSX(THETA,X,Y,XC)
YNODES(I) = TRANSY(THETA,X,Y,YC)
I1 = I1 + 1
20 CONTINUE
C
C   SIDE 3
C
N1 = N2 + 1
N2 = N1 + N - 1
I1 = 1
DO 30 I = N1,N2
X = XLENGTH
Y = XLENGTH - (DO+(I1-1)*DS)
XNODES(I) = TRANSX(THETA,X,Y,XC)
YNODES(I) = TRANSY(THETA,X,Y,YC)
I1 = I1 + 1
30 CONTINUE
C
C   SIDE 4
C
N1 = N2 + 1
N2 = N1 + N - 1
I1 = 1
DO 40 I = N1,N2
X = XLENGTH - (DO+(I1-1)*DS)
Y = 0.0
XNODES(I) = TRANSX(THETA,X,Y,XC)
YNODES(I) = TRANSY(THETA,X,Y,YC)
I1 = I1 + 1
40 CONTINUE
C
RETURN
END
SURROUTINE CALFM(T,G,PSUR,R)
REAL T(36), PSUR(6,6), PTBL(6,6), A(6,6), F(24), GM(24),
A    H(24), FX(24), FY(24), MX(24), MY(24), R(24),
P    G(24), MXX, MYY, MZZ, MXTOT, MYTOT, MZTOT,KS
C
C   SURROUTINE TO COMPUTE THE FORCES AND MOMENTS
C   UPON THE THERMAL PROTECTION SYSTEM (TPS) TILES.
C
NAMFLIST/SHOCK/U,RHD,XMU,XSHOCK,XZEPD,KS,DELTA,X,DTILE,FLDSIGN
READ AND PRINT INPUT CONSTANTS FROM SHOCK NAMELIST
FLDSIGN=1.0
READ(7,SHOCK)
WRITE(6,SHOCK)

```

## APPENDIX A, CONTINUED

```

C      I=0.
C      EPS = ERROR CRITERIA FOR SKIN FRICTION COMPUTATION.
C      EPS=1.F-04
C      XLTILE = DISTANCE ALONG DIAGONAL OF THE TILE
C              WHICH IS THE X-AXIS LENGTH.
C      XLTILE=6.*SQRT(2.)
C      THE TILE IS DIVIDED INTO 36 SMALLER DIVISIONS.
C      A DIVISION OF A 6 X 6 TILE HAS AN AREA OF 1.
C      ARRAY 'A' CONTAINS THE AREA OF EACH DIVISION.
C      DO 100 M=1,6
C      DO 100 N=1,6
C 100  A(M,N)=1.
C      GRAV = ACCELERATION DUE TO GRAVITY (FT/SEC**2).
C      GRAV=32.2
C      'PTBL' CONTAINS THE TILE BOND LINE PRESSURES
C      THAT WERE CONTAINED IN 'T'.
C      DO 200 M=1,6
C      DO 200 N=1,6
C      I=I+1
C      PSUP(M,N)=T(36+I)
C 200  PTBL(M,N)=T(I)
C      CALL PRTOUT(R,G,PSUP,PTBL)
C
C      CALCULATION OF THE NORMAL FORCE.
C
C      FM=0.
C      DO 300 M=1,6
C      DO 300 N=1,6
C 300  FM=FM+(PTBL(M,N)-PSUP(M,N))*A(M,N)
C
C      CALCULATION OF THE MOMENT ABOUT THE X-AXIS.
C
C      MXX=0.
C      DO 400 M=1,6
C      DO 400 N=1,6
C      Y=(M-N+6.)*SQRT(2.)/2.
C 400  MXX=MXX+(PTBL(M,N)-PSUP(M,N))*A(M,N)*(XLTILE/2.-Y)
C
C      CALCULATION OF THE MOMENT ABOUT THE Y-AXIS.
C
C      MYY=0.
C      DO 500 M=1,6
C      DO 500 N=1,6
C      X=(M+N-1.)*SQRT(2.)/2.
C 500  MYY=MYY+(PTBL(M,N)-PSUP(M,N))*A(M,N)*(XLTILE/2.-X)
C      MZZ=0.
C
C      CALCULATION OF THE GAP MOMENTS ABOUT THE X AND Y
C      AXIS AND CALCULATION OF THE GAP FORCES IN
C      THE X AND Y DIRECTION.
C
C      GMX=0.
C      GMY=0.
C      GFX=0.
C      GFY=0.
C      DO 600 I=1,24
C      RAW GAP FORCE.
C      F(I)=(R(I)-G(I))/2.*DTILE+G(I)*DTILE
C      RAW GAP MOMENT.
C      GM(I)=(R(I)-G(I))/3.*(DTILE**2.)+G(I)/2.*(DTILE**2.)
C      H(I)=GM(I)/F(I)
C      CALCULATE THE SIGN OF X AND Y.
C      SIGNX=1.
C      IF (I.GE.7.AND.I.LE.18) SIGNX=-1.

```

## APPENDIX A, CONTINUED

```

SIGNY=1.
IF (I.LT.13) SIGNY=-1.
C   GAP FORCE IN THE X DIRECTION.
FX(I)=SIGNX*F(I)/SQRT(2.)
C   GAP FORCE IN THE Y DIRECTION.
FY(I)=SIGNY*F(I)/SQRT(2.)
C   GAP MOMENT ABOUT THE X-AXIS.
MX(I)=-FY(I)*H(I)
C   GAP MOMENT ABOUT THE Y-AXIS.
MY(I)=FX(I)*H(I)
C
C   SUM OF THE GAP FORCES AND MOMENTS.
C
GFX=GFX+FX(I)
GFY=GFY+FY(I)
GMX=GMX+MX(I)
600 GMY=GMY+MY(I)
C   CALCULATE THE GAP MOMENT ABOUT THE Z-AXIS.
GMZ=0.
J=0.
DO 700 I=1,4
DO 700 II=1,6
J=J+1
XL=3.5-II
700 GMZ=GMZ+F(J)*XL
C
C   CALCULATION OF THE SKIN FRICTIONAL FORCE IN THE
C   X DIRECTION AND THE MOMENT ABOUT THE Y-AXIS.
C
SFXSV=0.
SMYSV=0.
750 CONTINUE
SFX=0.
SMY=0.
X=XZERO-DELTAX
800 X=X+DELTAX
XP=X-XSHOCK
IF (X.GT.(XZERO+6.*SQRT(2.))) GO TO 850
DELTA=0.37*X*(RHO*U*X/(12.*X*MU))**(-.2)
XPAT=XP/DELTA
CALL NTUPP(XPAT,ANS)
CFP=(2.87+1.58*ALOG10(X/KS))**(-2.5)
TW=CFP*RHO*(U**2.)/(2.*GRAV)
TWB=TW*ANS
DELTA=-2*(X-XZERO)*DELTAX+12*SQRT(2.)*DELTAX
IF (X.LE.(XZERO+6*SQRT(2.)/2.)) DELTAA=2*(X-XZERO)*DELTAX
DFX=FLOSIGN*TWB*DELTA/144.
DMY=DFX*DTILE
SFX=SFX+DFX
SMY=SMY+DMY
GO TO 800
850 CONTINUE
ERR1=ABS(SFX-SFXSV)/ARS(SFX)
ERR2=ARS(SMY-SMYSV)/ARS(SMY)
SFXSV=SFX
SMYSV=SMY
DELTAX=C.5*DELTAX
IF (ERR1.GT.EPS.OP.ERR2.GT.EPS) GO TO 750
C
C   END OF COMPUTATION OF SKIN FRICTION FORCE AND MOMENT.
C
C   COMBINING ALL FORCES AND MOMENTS INTO TOTAL
C   FORCES AND MOMENTS UPON THE TILE.
C

```

## APPENDIX A, CONTINUED

```

FXTOT=GFX+SFX
FYTOT=GFY
FZTOT=FM
MXTOT=MXX+GMX
MYTOT=MYY+GMY+SMY
MZTOT=GMZ
C
C   END OF FORCES AND MOMENTS COMPUTATION.
C
      WRITE(6,1000)
1000  FORMAT(33X,30HTOTAL FORCES AND TOTAL MOMENTS,///,
        A6X,5HFXTOT,11X,5HFYTOT,11X,5HFZTOT,11X,5HMXTOT,11X,
        B5HMYTOT,11X,5HMZTOT,///)
      WRITE(6,2000) FXTOT, FYTOT, FZTOT, MXTOT, MYTOT, MZTOT
2000  FORMAT(1X,6(E16.8),////)
      WRITE(6,3000)
3000  FORMAT(11X,10HGAP FORCES,30X,11HGAP MOMENTS,///,
        A7X,3HGFY,13X,3HGFY,13X,3HGMX,13X,
        B3HGMY,13X,3HGMZ,///)
      WRITE(6,4000) GFX, GFY, GMX, GMY, GMZ
4000  FORMAT(1X,5(E16.8),////)
      WRITE(6,5000) SFX, SMY
5000  FORMAT(1X,32HSKIN FRICTION FORCES AND MOMENTS,
        A///,7X,3HSFX,13X,3HSMY,///,1X,2(E16.8),////)
      WRITE(6,6000) FM
6000  FORMAT(1X,15HNDPMAL FORCE FM,E16.8,////)
      WRITE(6,7000) MXX, MY, MZ
7000  FORMAT(14X,20HNDPMAL FORCE MOMENTS,///,
        A7X,2HMXX,13X,2HMY,13X,2HMZ,///,3(E16.8),////)
      RETURN
      END
      SUBROUTINE NTUPP(X,Y)
      DIMENSION XDD(31), TOT(31)
      DATA XDD/-8.0,-7.0,-6.5,-6.0,-5.5,-5.0,-4.0,-3.0,-2.0,
        A      -1.0,-0.5, 0.0, 0.5, 1.0, 2.0, 3.0, 4.0, 5.0,
        B      6.0, 7.0, 8.0, 9.0,10.0,10.5,11.0,11.5,12.0,
        C      12.5,13.0,13.5,14.0/
      DATA TOT/1.000,0.993,0.986,0.981,0.979,0.871,0.750,0.643,
        A      0.550,0.479,0.450,0.436,0.429,0.429,0.436,0.454,
        B      0.479,0.518,0.554,0.586,0.618,0.700,0.782,0.825,
        C      0.882,0.914,0.946,0.964,0.979,0.989,1.000/
      DO 900 I=1,20
      IF (XDD(I).LE.X.AND.X.LE.XDD(I+1)) GO TO 950
900  CONTINUE
      IF (X.LT.(-8).OR.X.GT.14) Y=1.
      RETURN
950  Y=TOT(I)+(TOT(I+1)-TOT(I))*(X-XDD(I))/(XDD(I+1)-XDD(I))
      RETURN
      END
      SUBROUTINE PPTOUT(B,G,PSUR,PTRL)
      DIMENSION T(72),R(24),G(24),PSUR(6,6),PTRL(6,6)
      WRITE(6,3)
3     FORMAT(1X,19HR(1-24), TOP OF GAP,/)
      K=1
      DO 30 I=1,4
      N=K
      M=K+5
      WRITE(6,8000) (B(J),J=N,M)
      K=K+6
30    CONTINUE
      WRITE(6,4)
4     FORMAT(1X,22HG(1-24), BOTTOM OF GAP,/)
      K=1
      DO 40 I=1,4

```

## APPENDIX A, CONTINUED

```
N=K
M=K+5
WRITE(6,8000) (G(J),J=N,M)
K=K+6
40 CONTINUE
WRITE(6,5)
5 FORMAT(1X,10HAPPAY PSUR,/)
DO 50 I=1,6
50 WRITE(6,9000) (PSUR(I,J),J=1,6)
WRITE(6,6)
6 FORMAT(1X,10HARRAY PTBL,/)
DO 60 I=1,6
60 WRITE(6,9000) (PTBL(I,J),J=1,6)
8000 FORMAT(6(1X,F16.8),/)
9000 FORMAT(6(1X,F16.8),/)
RETURN
END
FSTOP
END
BCD 3FND OF DATA
```



## APPENDIX A, CONTINUED

## Pressure Profile

MF-6 REGION (REPRESENTATION A)  
 MF6 1.812 40.51 656 285.

22

0.0	-17.0	3.74
10.0	-17.0	3.74
12.0	-17.0	3.74
14.0	-17.0	3.74
16.0	-17.0	3.83
18.0	-17.0	3.92
19.0	-17.0	3.98
19.5	-17.0	4.025
20.0	-17.0	4.10
20.5	-17.0	4.22
22.0	-17.0	4.88
23.0	-17.0	5.30
24.0	-17.0	5.54
25.0	-17.0	5.65
26.0	-17.0	5.72
28.0	-17.0	5.80
30.0	-17.0	5.96
32.0	-17.0	6.07
34.0	-17.0	6.19
36.0	-17.0	6.30
38.0	-17.0	6.42
40.0	-17.0	6.52

22

0.0	17.0	3.74
10.0	17.0	3.74
12.0	17.0	3.74
14.0	17.0	3.74
16.0	17.0	3.83
18.0	17.0	3.92
19.0	17.0	3.98
19.5	17.0	4.025
20.0	17.0	4.10
20.5	17.0	4.22
22.0	17.0	4.88
23.0	17.0	5.30
24.0	17.0	5.54
25.0	17.0	5.65
26.0	17.0	5.72
28.0	17.0	5.80
30.0	17.0	5.96
32.0	17.0	6.07
34.0	17.0	6.19
36.0	17.0	6.30
38.0	17.0	6.42
40.0	17.0	6.52

APPENDIX A, CONTINUED  
 Output Listing Results of the Model  
 for a Shuttle TPS Tile in Region MF6

```

A
EDIT 2.1.7
A
EDIT 2.1.7
A
EDIT 2.1.7
  RCD 3CONSTANTS DATA
  NDSTOR=6500,ITERMX=600 ,DRLXCA=1.E-9,ARLXCA=1.E-9
  TIME0=0.,TINEND=32.,TSTEP0=4.
  EXTLIM=.5
  100=1.47      $TILE THICKNESS (IN)
  101=6.0      $TILE SIDE LENGTH (IN)
  102=0.16*10. $SSIP THICKNESS (IN)
  103=.06      $TERMINATOR GAP (IN)
  106=.05      $GAP WIDTH (IN)
  107=00.0000  $VISCOSITY (LBM/FT-SEC)
  108=0.0000  $DENSITY OF GAS (LB/FT**3)
  109=1.0/26.7*.16  $SSIP/GAP DP FACTOR (IN/PSI)
  110=1.21/26.7*.16  $SSIP/SURFACE DP FACTOR (IN/PSI)
  111=0.1      $INITIAL EDGE CLEARANCE (IN)
  112=0.1      $EDGE CLEARANCE (IN)
  113=.5      $SSIP/TILE DISCHARGE COEFFICIENT
  114=.1      $SSIP/FILLER BAR CLEARANCE (IN)
  115=115.    $TEMPERATURE (F)
  116=0.0      $AVERAGE PRESSURE
  117=5.5      $LBF TO MOVE .05 IN Laterally
  118=0.0      $CLOSURE OF GAP 1
  119=0.0      $CLOSURE OF GAP 2
  120=.001     $MINIMUM GAP CLEARANCE (IN)
  121=1.E-3    $MINIMUM EDGE CLEARANCE (IN)
  123=1.0      $PERMEABILITY FACTOR
  1,,2,,3,,4,,5,,6,,7,,8,,9,,10,,11,,12,,13,,14,,15=0.
  ITEST=0,JTEST=0,KTEST= EDGAP,LTEST=0,MTEST=0
  NTEST=0      $ 0= 3 TILE MOVE; 1= 1 TILE MOVES
  END
  BCD 3ARRAY DATA      $VALUES SPECIFIED AT T=560R, LI900
A
EDIT 2.1.7
A
  
```

\*XYCOORD

XC = .1364E+02,

YC = 0.0,

ISTA = 1,

IFIN = 81,

SEND  
MF-6 REGION (REPRESENTATION A)

RUN NUMBER	MACH	PHI DEG.	Q PSF	P PSIA
****	1.8120	49.51	6560.0	285.

RUN NUMBER	X	Y	P-LOC PSIA
MF6	0.00000	-17.00000	3.74000
MF6	10.00000	-17.00000	3.74000
MF6	12.00000	-17.00000	3.74000
MF6	14.00000	-17.00000	3.74000
MF6	16.00000	-17.00000	3.83000
MF6	18.00000	-17.00000	3.92000
MF6	19.00000	-17.00000	3.98000
MF6	19.50000	-17.00000	4.02500
MF6	20.00000	-17.00000	4.10000
MF6	20.50000	-17.00000	4.22000
MF6	22.00000	-17.00000	4.88000
MF6	23.00000	-17.00000	5.30000
MF6	24.00000	-17.00000	5.54000
MF6	25.00000	-17.00000	5.65000
MF6	26.00000	-17.00000	5.72000
MF6	28.00000	-17.00000	5.80000
MF6	30.00000	-17.00000	5.96000
MF6	32.00000	-17.00000	6.07000
MF6	34.00000	-17.00000	6.19000
MF6	36.00000	-17.00000	6.30000
MF6	38.00000	-17.00000	6.42000
MF6	40.00000	-17.00000	6.52000
MF6	0.00000	17.00000	3.74000
MF6	10.00000	17.00000	3.74000
MF6	12.00000	17.00000	3.74000
MF6	14.00000	17.00000	3.74000
MF6	16.00000	17.00000	3.83000
MF6	18.00000	17.00000	3.92000
MF6	19.00000	17.00000	3.98000
MF6	19.50000	17.00000	4.02500
MF6	20.00000	17.00000	4.10000
MF6	20.50000	17.00000	4.22000
MF6	22.00000	17.00000	4.88000
MF6	23.00000	17.00000	5.30000
MF6	24.00000	17.00000	5.54000
MF6	25.00000	17.00000	5.65000
MF6	26.00000	17.00000	5.72000
MF6	28.00000	17.00000	5.80000
MF6	30.00000	17.00000	5.96000
MF6	32.00000	17.00000	6.07000
MF6	34.00000	17.00000	6.19000
MF6	36.00000	17.00000	6.30000
MF6	38.00000	17.00000	6.42000
MF6	40.00000	17.00000	6.52000
XSTAR1=	0.00000	XSTAR2=	0.00000
XSTOP1=	40.00000	XSTOP2=	40.00000

APPENDIX A, CONTINUED

++NOTE++ -STOSTL- REQUIRES 2244 WORDS OF DYNAMIC STORAGE

++CAUTION++ ITERMX( 600) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
DRLXCC( 3028)= .382975E-04 VS. DRLXCA= .100000E-08  
ARLXCC( 3004)= .382931E-04 VS. ARLXCA= .100000E-08  
EBALSC = 0. VS. EBALSA= 0.  
EBALNC( 0)= 0. VS. EBALNA= 0.

++CAUTION++ ITERMX( 600) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
DRLXCC( 7030)= -.267802E-04 VS. DRLXCA= .100000E-08  
ARLXCC( 7102)= -.267032E-04 VS. ARLXCA= .100000E-08  
EBALSC = 0. VS. EBALSA= 0.  
EBALNC( 0)= 0. VS. EBALNA= 0.

++CAUTION++ ITERMX( 600) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
DRLXCC( 57)= .187135E-04 VS. DRLXCA= .100000E-08  
ARLXCC( 129)= .186953E-04 VS. ARLXCA= .100000E-08  
EBALSC = 0. VS. EBALSA= 0.  
EBALNC( 0)= 0. VS. EBALNA= 0.

++CAUTION++ ITERMX( 600) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
DRLXCC( 30)= .561489E-04 VS. DRLXCA= .100000E-08  
APLXCC( 102)= .560494E-04 VS. ARLXCA= .100000E-08  
EBALSC = 0. VS. EBALSA= 0.  
EBALNC( 0)= 0. VS. EBALNA= 0.

++CAUTION++ ITERMX( 600) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
DRLXCC( 8055)= -.487474E-04 VS. DRLXCA= .100000E-08  
ARLXCC( 8127)= -.484792E-04 VS. ARLXCA= .100000E-08  
EBALSC = 0. VS. EBALSA= 0.  
EBALNC( 0)= 0. VS. EBALNA= 0.

++CAUTION++ ITERMX( 600) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
DRLXCC( 2056)= .231362E-04 VS. DRLXCA= .100000E-08  
ARLXCC( 2128)= .231159E-04 VS. ARLXCA= .100000E-08  
EBALSC = 0. VS. EBALSA= 0.  
EBALNC( 0)= 0. VS. EBALNA= 0.

APPENDIX A, CONTINUED

++CAUTION++ ITERMX( 600) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
 DRLXCC( 1025) = -.111780E-03 VS. DRLXCA = .100000E-08  
 ARLXCC( 1097) = -.111041E-03 VS. ARLXCA = .100000E-08  
 EBALSC = 0. VS. EBALSA = 0.  
 EBALNC( 0) = 0. VS. EBALNA = 0.

++CAUTION++ ITERMX( 600) EXCEEDED BEFORE RELAXATION CRITERIA MET...  
 DRLXCC( 7055) = -.145189E-03 VS. DRLXCA = .100000E-08  
 ARLXCC( 7127) = -.144175E-03 VS. ARLXCA = .100000E-08  
 EBALSC = 0. VS. EBALSA = 0.  
 EBALNC( 0) = 0. VS. EBALNA = 0.

TIMEN = 32.0000      EBALSC( 0) = 0.      CSGMIN( 0) = 0.      DRLXCC( 7055) = -.145189E-03  
 TSTEPU = 4.00000      ERALNC( 0) = 0.      CSGMAX( 0) = 0.      ARLXCC( 7127) = -.144175E-03  
                          ITERCT = 1      DMXTCC( 0) = 0.      AMXTCC( 0) = 0.

DIFFUSION NODES

T 25=	4.42267	T 26=	4.48743	T 27=	4.55947	T 28=	4.63563	T 29=	4.71312	T 30=	4.78548
T 31=	4.48889	T 32=	4.57068	T 33=	4.64131	T 34=	4.71058	T 35=	4.77867	T 36=	4.84564
T 37=	4.55712	T 38=	4.63675	T 39=	4.70691	T 40=	4.77537	T 41=	4.84345	T 42=	4.91477
T 43=	4.61586	T 44=	4.69538	T 45=	4.76713	T 46=	4.83862	T 47=	4.91160	T 48=	4.99256
T 49=	4.67161	T 50=	4.74951	T 51=	4.82514	T 52=	4.90341	T 53=	4.98456	T 54=	5.07590
T 55=	4.73053	T 56=	4.79966	T 57=	4.88492	T 58=	4.97720	T 59=	5.07172	T 60=	5.16449
T 61=	4.51289	T 62=	4.55477	T 63=	4.61395	T 64=	4.67829	T 65=	4.73861	T 66=	4.78158
T 67=	4.55335	T 68=	4.59856	T 69=	4.65791	T 70=	4.72061	T 71=	4.77875	T 72=	4.82060
T 73=	4.60715	T 74=	4.65281	T 75=	4.71257	T 76=	4.77551	T 77=	4.83423	T 78=	4.87756
T 79=	4.66050	T 80=	4.70658	T 81=	4.76787	T 82=	4.83331	T 83=	4.89535	T 84=	4.94232
T 85=	4.70812	T 86=	4.75435	T 87=	4.81827	T 88=	4.88811	T 89=	4.95513	T 90=	5.00625
T 91=	4.74260	T 92=	4.78790	T 93=	4.85507	T 94=	4.93014	T 95=	5.00219	T 96=	5.05547
T 1025=	3.92848	T 1026=	3.93441	T 1027=	3.94100	T 1028=	3.94706	T 1029=	3.95058	T 1030=	3.94892
T 1031=	3.94305	T 1032=	3.96012	T 1033=	3.97147	T 1034=	3.98033	T 1035=	3.98518	T 1036=	3.97882
T 1037=	3.96458	T 1038=	3.98425	T 1039=	3.99892	T 1040=	4.01221	T 1041=	4.02426	T 1042=	4.03088
T 1043=	3.99017	T 1044=	4.00905	T 1045=	4.02580	T 1046=	4.04422	T 1047=	4.06826	T 1048=	4.11053
T 1049=	4.01614	T 1050=	4.03349	T 1051=	4.05092	T 1052=	4.07236	T 1053=	4.10090	T 1054=	4.14348
T 1055=	4.04978	T 1056=	4.05826	T 1057=	4.07456	T 1058=	4.09809	T 1059=	4.13018	T 1060=	4.17320
T 1061=	3.94739	T 1062=	3.95266	T 1063=	3.95962	T 1064=	3.96616	T 1065=	3.97054	T 1066=	3.97175
T 1067=	3.95958	T 1068=	3.96779	T 1069=	3.97722	T 1070=	3.98590	T 1071=	3.99212	T 1072=	3.99396
T 1073=	3.97877	T 1074=	3.98872	T 1075=	4.00078	T 1076=	4.01310	T 1077=	4.02433	T 1078=	4.03177
T 1079=	4.00102	T 1080=	4.01152	T 1081=	4.02565	T 1082=	4.04202	T 1083=	4.06010	T 1084=	4.07739

APPENDIX A, CONTINUED

SHUTTLE TILE INTEPNAL FLOW

T 1085	4.02267	T 1086	4.03285	T 1087	4.04797	T 1088	4.06695	T 1089	4.08880	T 1090	4.10911
T 1091	4.04010	T 1092	4.04852	T 1093	4.06354	T 1094	4.08381	T 1095	4.10757	T 1096	4.12897
T 2025	4.18864	T 2026	4.26007	T 2027	4.31715	T 2028	4.35656	T 2029	4.39252	T 2030	4.43928
T 2031	4.20815	T 2032	4.28689	T 2033	4.34449	T 2034	4.38875	T 2035	4.42001	T 2036	4.43085
T 2037	4.23647	T 2038	4.31725	T 2039	4.37809	T 2040	4.42954	T 2041	4.47350	T 2042	4.50585
T 2043	4.27397	T 2044	4.35256	T 2045	4.41658	T 2046	4.47707	T 2047	4.54123	T 2048	4.63073
T 2049	4.31762	T 2050	4.39000	T 2051	4.45639	T 2052	4.52407	T 2053	4.59733	T 2054	4.68845
T 2055	4.36297	T 2056	4.42600	T 2057	4.49735	T 2058	4.57467	T 2059	4.65759	T 2060	4.73432
T 2061	4.24803	T 2062	4.28667	T 2063	4.33162	T 2064	4.36987	T 2065	4.39713	T 2066	4.41070
T 2067	4.26376	T 2068	4.30448	T 2069	4.35128	T 2070	4.39284	T 2071	4.42415	T 2072	4.44063
T 2073	4.28963	T 2074	4.33188	T 2075	4.38186	T 2076	4.42222	T 2077	4.46042	T 2078	4.43559
T 2079	4.32175	T 2080	4.36441	T 2081	4.41767	T 2082	4.45222	T 2083	4.52401	T 2084	4.56627
T 2085	4.35474	T 2086	4.39654	T 2087	4.45229	T 2088	4.51238	T 2089	4.57110	T 2090	4.61808
T 2091	4.37977	T 2092	4.42008	T 2093	4.47781	T 2094	4.54203	T 2095	4.60461	T 2096	4.65061
T 3025	4.77686	T 3026	4.90016	T 3027	4.94738	T 3028	4.99022	T 3029	5.01420	T 3030	5.02292
T 3031	4.80100	T 3032	4.90392	T 3033	4.96621	T 3034	5.01084	T 3035	5.03901	T 3036	5.05043
T 3037	4.83404	T 3038	4.93124	T 3039	4.99710	T 3040	5.04546	T 3041	5.07820	T 3042	5.09263
T 3043	4.87926	T 3044	4.97272	T 3045	5.04093	T 3046	5.09475	T 3047	5.13555	T 3048	5.16119
T 3049	4.93621	T 3050	5.02513	T 3051	5.09729	T 3052	5.15955	T 3053	5.21319	T 3054	5.26319
T 3055	5.00320	T 3056	5.08839	T 3057	5.17059	T 3058	5.24639	T 3059	5.31495	T 3060	5.37397
T 3061	4.85381	T 3062	4.90787	T 3063	4.95575	T 3064	4.99519	T 3065	5.02113	T 3066	5.03327
T 3067	4.87007	T 3068	4.92065	T 3069	4.97151	T 3070	5.01301	T 3071	5.04124	T 3072	5.05491
T 3073	4.89987	T 3074	4.94800	T 3075	5.00099	T 3076	5.04574	T 3077	5.07772	T 3078	5.09415
T 3079	4.93768	T 3080	4.98625	T 3081	5.04157	T 3082	5.09090	T 3083	5.12879	T 3084	5.15074
T 3085	4.98109	T 3086	5.02937	T 3087	5.08784	T 3088	5.14308	T 3089	5.18873	T 3090	5.21880
T 3091	5.01701	T 3092	5.06535	T 3093	5.12757	T 3094	5.18864	T 3095	5.24069	T 3096	5.27484
T 4025	5.08489	T 4026	5.17530	T 4027	5.26035	T 4028	5.34661	T 4029	5.43474	T 4030	5.51123
T 4031	5.17389	T 4032	5.27625	T 4033	5.35917	T 4034	5.43898	T 4035	5.52352	T 4036	5.61011
T 4037	5.26180	T 4038	5.36158	T 4039	5.43985	T 4040	5.51309	T 4041	5.59023	T 4042	5.63729
T 4043	5.35640	T 4044	5.44676	T 4045	5.51722	T 4046	5.58158	T 4047	5.64759	T 4048	5.72878
T 4049	5.46089	T 4050	5.53854	T 4051	5.59914	T 4052	5.65233	T 4053	5.70356	T 4054	5.76065
T 4055	5.58564	T 4056	5.64935	T 4057	5.69965	T 4058	5.73936	T 4059	5.77366	T 4060	5.80649
T 4061	5.20215	T 4062	5.25522	T 4063	5.32539	T 4064	5.40043	T 4065	5.47337	T 4066	5.53374
T 4067	5.25584	T 4068	5.31048	T 4069	5.37911	T 4070	5.45086	T 4071	5.52054	T 4072	5.57739
T 4073	5.32909	T 4074	5.38183	T 4075	5.44651	T 4076	5.51282	T 4077	5.57658	T 4078	5.62816
T 4079	5.41013	T 4080	5.45828	T 4081	5.51677	T 4082	5.57561	T 4083	5.63099	T 4084	5.67483
T 4085	5.49106	T 4086	5.53346	T 4087	5.58476	T 4088	5.63509	T 4089	5.68060	T 4090	5.71469
T 4091	5.55629	T 4092	5.59378	T 4093	5.63928	T 4094	5.68249	T 4095	5.71972	T 4096	5.74560
T 5025	5.63696	T 5026	5.69384	T 5027	5.74364	T 5028	5.78918	T 5029	5.83287	T 5030	5.83454
T 5031	5.69363	T 5032	5.75113	T 5033	5.79647	T 5034	5.83838	T 5035	5.88050	T 5036	5.92891
T 5037	5.75206	T 5038	5.80211	T 5039	5.84220	T 5040	5.88079	T 5041	5.92138	T 5042	5.97102

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

T 5043	5.82536	T 5044	5.85301	T 5045	5.88572	T 5046	5.92080	T 5047	5.95897	T 5048	6.00745
T 5049	5.87409	T 5050	5.89568	T 5051	5.92705	T 5052	5.96055	T 5053	5.99503	T 5054	6.03769
T 5055	5.90167	T 5056	5.93095	T 5057	5.97207	T 5058	6.00793	T 5059	6.03721	T 5060	6.05666
T 5061	5.93691	T 5062	5.97379	T 5063	5.97704	T 5064	5.91670	T 5065	5.85338	T 5066	5.89188
T 5067	5.74008	T 5068	5.77002	T 5069	5.80701	T 5070	5.84478	T 5071	5.88025	T 5072	5.90780
T 5073	5.78578	T 5074	5.81210	T 5075	5.84553	T 5076	5.88065	T 5077	5.91449	T 5078	5.94146
T 5079	5.83583	T 5080	5.85584	T 5081	5.88497	T 5082	5.91722	T 5083	5.94887	T 5084	5.97443
T 5085	5.87516	T 5086	5.89270	T 5087	5.92021	T 5088	5.95070	T 5089	5.97968	T 5090	6.00210
T 5091	5.89773	T 5092	5.91658	T 5093	5.94585	T 5094	5.97624	T 5095	6.00259	T 5096	6.01958
T 6025	4.79623	T 6026	4.85004	T 6027	4.96724	T 6028	5.06864	T 6029	5.16641	T 6030	5.26096
T 6031	4.89575	T 6032	4.99395	T 6033	5.08783	T 6034	5.17808	T 6035	5.26761	T 6036	5.35150
T 6037	4.99095	T 6038	5.09853	T 6039	5.18576	T 6040	5.27126	T 6041	5.36054	T 6042	5.44631
T 6043	5.13346	T 6044	5.19887	T 6045	5.27527	T 6046	5.35789	T 6047	5.44734	T 6048	5.53619
T 6049	5.22578	T 6050	5.27808	T 6051	5.35667	T 6052	5.44231	T 6053	5.52746	T 6054	5.61390
T 6055	5.27651	T 6056	5.32997	T 6057	5.43942	T 6058	5.54411	T 6059	5.61567	T 6060	5.69583
T 6061	4.91767	T 6062	4.96503	T 6063	5.04571	T 6064	5.13055	T 6065	5.20866	T 6066	5.26498
T 6067	4.98070	T 6068	5.03552	T 6069	5.11182	T 6070	5.19257	T 6071	5.26816	T 6072	5.32440
T 6073	5.06546	T 6074	5.12078	T 6075	5.19336	T 6076	5.27103	T 6077	5.34577	T 6078	5.40436
T 6079	5.16143	T 6080	5.20708	T 6081	5.27450	T 6082	5.34992	T 6083	5.42386	T 6084	5.49375
T 6085	5.23594	T 6086	5.27739	T 6087	5.34487	T 6088	5.42083	T 6089	5.49241	T 6090	5.54886
T 6091	5.27755	T 6092	5.31980	T 6093	5.39417	T 6094	5.47444	T 6095	5.54216	T 6096	5.59026
T 7025	4.33896	T 7026	4.35620	T 7027	4.38710	T 7028	4.43214	T 7029	4.49037	T 7030	4.54692
T 7031	4.38662	T 7032	4.41751	T 7033	4.45232	T 7034	4.49530	T 7035	4.54572	T 7036	4.60029
T 7037	4.42281	T 7038	4.45904	T 7039	4.49660	T 7040	4.54158	T 7041	4.59545	T 7042	4.66288
T 7043	4.45297	T 7044	4.49088	T 7045	4.52911	T 7046	4.57786	T 7047	4.63866	T 7048	4.71224
T 7049	4.49552	T 7050	4.51587	T 7051	4.54862	T 7052	4.60338	T 7053	4.67987	T 7054	4.73638
T 7055	4.54780	T 7056	4.52337	T 7057	4.54199	T 7058	4.60849	T 7059	4.70770	T 7060	4.83423
T 7061	4.38661	T 7062	4.40332	T 7063	4.43280	T 7064	4.47176	T 7065	4.51429	T 7066	4.54676
T 7067	4.41368	T 7068	4.43372	T 7069	4.46503	T 7070	4.50425	T 7071	4.54604	T 7072	4.57985
T 7073	4.44544	T 7074	4.46745	T 7075	4.50059	T 7076	4.54183	T 7077	4.58647	T 7078	4.62344
T 7079	4.47585	T 7080	4.49747	T 7081	4.53120	T 7082	4.57556	T 7083	4.62557	T 7084	4.66776
T 7085	4.50551	T 7086	4.52115	T 7087	4.55265	T 7088	4.60089	T 7089	4.65958	T 7090	4.71241
T 7091	4.52854	T 7092	4.53365	T 7093	4.56071	T 7094	4.61275	T 7095	4.67980	T 7096	4.74026
T 8025	4.10021	T 8026	4.10354	T 8027	4.11908	T 8028	4.14254	T 8029	4.17442	T 8030	4.21578
T 8031	4.13645	T 8032	4.15978	T 8033	4.18139	T 8034	4.20609	T 8035	4.23454	T 8036	4.26684
T 8037	4.17561	T 8038	4.20377	T 8039	4.22889	T 8040	4.25584	T 8041	4.28500	T 8042	4.31596
T 8043	4.21709	T 8044	4.24384	T 8045	4.27079	T 8046	4.30143	T 8047	4.33539	T 8048	4.37159
T 8049	4.25736	T 8050	4.28002	T 8051	4.30839	T 8052	4.34538	T 8053	4.38988	T 8054	4.43614
T 8055	4.29469	T 8056	4.31077	T 8057	4.34033	T 8058	4.38870	T 8059	4.45801	T 8060	4.50876
T 8061	4.13617	T 8062	4.14444	T 8063	4.16060	T 8064	4.18228	T 8065	4.20668	T 8066	4.22745
T 8067	4.16096	T 8068	4.17407	T 8069	4.19311	T 8070	4.21593	T 8071	4.23982	T 8072	4.25384

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

T 8073=	4.19504	T 8074=	4.21067	T 8075=	4.23229	T 8076=	4.25717	T 8077=	4.28227	T 8078=	4.30147
T 8079=	4.23111	T 8080=	4.24732	T 8081=	4.27087	T 8082=	4.29888	T 8083=	4.32752	T 8084=	4.34935
T 8085=	4.26367	T 8086=	4.27932	T 8087=	4.30464	T 8088=	4.33704	T 8089=	4.37170	T 8090=	4.39783
T 8091=	4.28620	T 8092=	4.30079	T 8093=	4.32746	T 8094=	4.36472	T 8095=	4.40692	T 8096=	4.43631
ARITHMETIC NODES											
T 97=	4.42269	T 98=	4.48745	T 99=	4.55948	T 100=	4.63564	T 101=	4.71313	T 102=	4.78549
T 103=	4.48891	T 104=	4.55941	T 105=	4.63188	T 106=	4.70583	T 107=	4.77858	T 108=	4.84566
T 109=	4.55713	T 110=	4.62722	T 111=	4.70060	T 112=	4.77505	T 113=	4.84774	T 114=	4.91576
T 115=	4.61586	T 116=	4.68974	T 117=	4.76614	T 118=	4.84393	T 119=	4.92052	T 120=	4.99257
T 121=	4.67161	T 122=	4.74778	T 123=	4.82819	T 124=	4.91182	T 125=	4.99561	T 126=	5.07591
T 127=	4.73054	T 128=	4.79966	T 129=	4.88494	T 130=	4.97721	T 131=	5.07173	T 132=	5.16449
T 1024=	3.73973	T 1023=	3.73970	T 1022=	3.73966	T 1021=	3.73962	T 1020=	3.73958	T 1019=	3.73956
T 8024=	3.73958	T 8023=	3.73964	T 8022=	3.73979	T 8021=	3.74006	T 8020=	3.74046	T 8019=	3.74081
T 7024=	3.74113	T 7023=	3.74144	T 7022=	3.74385	T 7021=	3.75083	T 7020=	3.76307	T 7019=	3.77502
T 1007=	3.73953	T 1008=	3.73958	T 1009=	3.73971	T 1010=	3.73993	T 1011=	3.74006	T 1012=	3.73995
T 2021=	3.73949	T 2020=	3.73844	T 2019=	3.73769	T 2018=	3.75647	T 2017=	3.77759	T 2016=	3.80088
T 21=	3.83406	T 20=	3.89161	T 19=	3.95582	T 6024=	4.02567	T 6023=	4.07218	T 6022=	4.16296
T 6021=	4.30936	T 6020=	4.50777	T 6019=	4.72815	T 2007=	3.75437	T 2008=	3.76700	T 2009=	3.78068
T 2010=	4.02547	T 2011=	4.03305	T 2012=	4.04217	T 7=	4.05376	T 8=	4.12188	T 9=	4.25657
T 10=	4.39505	T 11=	4.49692	T 12=	4.62068	T 4021=	4.96276	T 4020=	5.23842	T 4019=	5.45220
T 5024=	5.56200	T 5023=	5.63398	T 5022=	5.68592	T 5021=	5.73473	T 5020=	5.77505	T 5019=	5.81391
T 3007=	4.83106	T 3008=	4.91152	T 3009=	5.01275	T 3010=	5.13389	T 3011=	5.26323	T 3012=	5.34531
T 4007=	5.55148	T 4008=	5.63028	T 4009=	5.66743	T 4010=	5.72889	T 4011=	5.76069	T 4012=	5.78542
T 5007=	5.88464	T 5008=	5.92897	T 5009=	5.97109	T 5010=	6.00752	T 5011=	6.03716	T 5012=	6.05691
T 1001=	3.73973	T 1002=	3.73970	T 1003=	3.73965	T 1004=	3.73981	T 1005=	3.73956	T 1006=	3.73954
T 1018=	3.73958	T 1017=	3.73963	T 1016=	3.73975	T 1015=	3.73996	T 1014=	3.74022	T 1013=	3.74031
T 7001=	3.74109	T 7002=	3.74143	T 7003=	3.74385	T 7004=	3.75078	T 7005=	3.76291	T 7006=	3.77464
T 7018=	3.84010	T 7017=	3.87374	T 7016=	3.90951	T 7015=	3.94969	T 7014=	3.99657	T 7013=	4.05166
T 2001=	3.74019	T 2002=	3.74048	T 2003=	3.74074	T 2004=	3.74074	T 2005=	3.74083	T 2006=	3.74267
T 1=	3.76281	T 2=	3.78491	T 3=	3.81425	T 4=	3.84835	T 5=	3.88652	T 6=	3.93164
T 18=	4.02126	T 17=	4.06116	T 16=	4.13961	T 15=	4.25904	T 14=	4.40978	T 13=	4.54206
T 6018=	5.10942	T 6017=	5.29281	T 6016=	5.43952	T 6015=	5.54427	T 6014=	5.61577	T 6013=	5.65907
T 3001=	3.89872	T 3002=	3.91056	T 3003=	3.94098	T 3004=	3.98968	T 3005=	4.06295	T 3006=	4.17469
T 3018=	4.43905	T 3017=	4.59329	T 3016=	4.80912	T 3015=	5.03271	T 3014=	5.21767	T 3013=	5.33417
T 4018=	5.58579	T 4017=	5.64946	T 4016=	5.69973	T 4015=	5.73941	T 4014=	5.77368	T 4013=	5.80651
T 5018=	5.88812	T 5017=	5.93098	T 5016=	5.97213	T 5015=	6.00799	T 5014=	6.03727	T 5013=	6.05671
T 1097=	3.92849	T 1098=	3.93442	T 1099=	3.94101	T 1100=	3.94707	T 1101=	3.95059	T 1102=	3.94894
T 1103=	3.94306	T 1104=	3.95681	T 1105=	3.96804	T 1106=	3.97737	T 1107=	3.98287	T 1108=	3.97883
T 1109=	3.96458	T 1110=	3.98157	T 1111=	3.99677	T 1112=	4.01126	T 1113=	4.02433	T 1114=	4.03108
T 1115=	3.99018	T 1116=	4.00792	T 1117=	4.02594	T 1118=	4.04626	T 1119=	4.07180	T 1120=	4.11053
T 1121=	4.01615	T 1122=	4.03378	T 1123=	4.05255	T 1124=	4.07566	T 1125=	4.10540	T 1126=	4.14349

APPENDIX A, CONTINUED



SHUTTLE TILE INTERNAL FLOW

T 1127=	4.04979	T 1128=	4.05828	T 1129=	4.07457	T 1130=	4.09810	T 1131=	4.13020	T 1132=	4.17322
T 2097=	4.16865	T 2098=	4.26007	T 2099=	4.31715	T 2100=	4.35657	T 2101=	4.38253	T 2102=	4.39288
T 2103=	4.20815	T 2104=	4.27964	T 2105=	4.33955	T 2106=	4.38652	T 2107=	4.41927	T 2108=	4.43086
T 2109=	4.23647	T 2110=	4.30965	T 2111=	4.37402	T 2112=	4.43003	T 2113=	4.47652	T 2114=	4.50586
T 2115=	4.27398	T 2116=	4.34711	T 2117=	4.41570	T 2118=	4.48197	T 2119=	4.54964	T 2120=	4.63073
T 2121=	4.31763	T 2122=	4.38763	T 2123=	4.45829	T 2124=	4.53095	T 2125=	4.60715	T 2126=	4.68846
T 2127=	4.36299	T 2128=	4.42603	T 2129=	4.49737	T 2130=	4.57468	T 2131=	4.65759	T 2132=	4.73434
T 3097=	4.77686	T 3098=	4.90017	T 3099=	4.94739	T 3100=	4.99022	T 3101=	5.01420	T 3102=	5.02292
T 3103=	4.80100	T 3104=	4.89683	T 3105=	4.96168	T 3106=	5.00896	T 3107=	5.03831	T 3108=	5.05043
T 3109=	4.83404	T 3110=	4.92306	T 3111=	4.99279	T 3112=	5.04514	T 3113=	5.07934	T 3114=	5.09264
T 3115=	4.87926	T 3116=	4.96701	T 3117=	5.04022	T 3118=	5.09867	T 3119=	5.14061	T 3120=	5.16120
T 3121=	4.93622	T 3122=	5.02366	T 3123=	5.10094	T 3124=	5.16745	T 3125=	5.22203	T 3126=	5.26317
T 3127=	5.00321	T 3128=	5.08800	T 3129=	5.17059	T 3130=	5.24639	T 3131=	5.31496	T 3132=	5.37097
T 4097=	5.08490	T 4098=	5.17530	T 4099=	5.26035	T 4100=	5.34661	T 4101=	5.43474	T 4102=	5.54990
T 4103=	5.17389	T 4104=	5.26268	T 4105=	5.34811	T 4106=	5.43369	T 4107=	5.52419	T 4108=	5.62962
T 4109=	5.26180	T 4110=	5.35054	T 4111=	5.43297	T 4112=	5.51313	T 4113=	5.59580	T 4114=	5.68694
T 4115=	5.35640	T 4116=	5.44184	T 4117=	5.51754	T 4118=	5.58779	T 4119=	5.65678	T 4120=	5.72857
T 4121=	5.46089	T 4122=	5.54002	T 4123=	5.60954	T 4124=	5.66185	T 4125=	5.71348	T 4126=	5.76061
T 4127=	5.58517	T 4128=	5.64917	T 4129=	5.69954	T 4130=	5.73933	T 4131=	5.77366	T 4132=	5.80649
T 5097=	5.63696	T 5098=	5.69384	T 5099=	5.74364	T 5100=	5.78918	T 5101=	5.83287	T 5102=	5.88430
T 5103=	5.69363	T 5104=	5.74400	T 5105=	5.79076	T 5106=	5.83561	T 5107=	5.88063	T 5108=	5.92882
T 5109=	5.75206	T 5110=	5.79688	T 5111=	5.83904	T 5112=	5.88116	T 5113=	5.92450	T 5114=	5.97093
T 5115=	5.82536	T 5116=	5.85160	T 5117=	5.88666	T 5118=	5.92483	T 5119=	5.96465	T 5120=	6.00736
T 5121=	5.87409	T 5122=	5.89691	T 5123=	5.93059	T 5124=	5.96629	T 5125=	6.00138	T 5126=	6.03702
T 5127=	5.90167	T 5128=	5.93093	T 5129=	5.97199	T 5130=	6.00785	T 5131=	6.03713	T 5132=	6.05660
T 6097=	4.79623	T 6098=	4.85005	T 6099=	4.96725	T 6100=	5.06864	T 6101=	5.16641	T 6102=	5.26099
T 6103=	4.89575	T 6104=	4.99257	T 6105=	5.07963	T 6106=	5.17342	T 6107=	5.26823	T 6108=	5.36151
T 6109=	4.99095	T 6110=	5.09122	T 6111=	5.18140	T 6112=	5.27342	T 6113=	5.36800	T 6114=	5.46632
T 6115=	5.13346	T 6116=	5.19615	T 6117=	5.27785	T 6118=	5.36743	T 6119=	5.46055	T 6120=	5.55186
T 6121=	5.22578	T 6122=	5.27930	T 6123=	5.36347	T 6124=	5.45482	T 6125=	5.54181	T 6126=	5.63382
T 6127=	5.27651	T 6128=	5.32997	T 6129=	5.43925	T 6130=	5.54368	T 6131=	5.61550	T 6132=	5.69574
T 7097=	4.33897	T 7098=	4.35621	T 7099=	4.38711	T 7100=	4.43215	T 7101=	4.49038	T 7102=	4.54694
T 7103=	4.38663	T 7104=	4.41042	T 7105=	4.44524	T 7106=	4.49111	T 7107=	4.54543	T 7108=	4.60030
T 7109=	4.42282	T 7110=	4.45289	T 7111=	4.49137	T 7112=	4.54040	T 7113=	4.59866	T 7114=	4.66288
T 7115=	4.49301	T 7116=	4.48641	T 7117=	4.52617	T 7118=	4.57944	T 7119=	4.64457	T 7120=	4.71228
T 7121=	4.49554	T 7122=	4.51310	T 7123=	4.54685	T 7124=	4.60563	T 7125=	4.68657	T 7126=	4.78638
T 7127=	4.54768	T 7128=	4.52339	T 7129=	4.54204	T 7130=	4.60851	T 7131=	4.70770	T 7132=	4.83423
T 8097=	4.10021	T 8098=	4.10355	T 8099=	4.11909	T 8100=	4.14255	T 8101=	4.17443	T 8102=	4.21579
T 8103=	4.13645	T 8104=	4.15364	T 8105=	4.17485	T 8106=	4.20115	T 8107=	4.23227	T 8108=	4.26684
T 8109=	4.17562	T 8110=	4.19910	T 8111=	4.22473	T 8112=	4.25400	T 8113=	4.28566	T 8114=	4.31597
T 8115=	4.21710	T 8116=	4.24180	T 8117=	4.27028	T 8118=	4.30364	T 8119=	4.33952	T 8120=	4.37160

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

T 8121= 4.25737	T 8122= 4.28017	T 8123= 4.31033	T 8124= 4.34993	T 8125= 4.39621	T 8126= 4.43615
T 8127= 4.29470	T 8128= 4.31078	T 8129= 4.34036	T 8130= 4.38871	T 8131= 4.45797	T 8132= 4.50873
HEATER NODES ++NONE++					
BOUNDARY NODES					
T 1224= 3.73977	T 1223= 3.73970	T 1222= 3.73963	T 1221= 3.73957	T 1220= 3.73951	T 1219= 3.73945
T 8224= 3.73940	T 8223= 3.73939	T 8222= 3.73945	T 8221= 3.73975	T 8220= 3.74046	T 8219= 3.74121
T 7224= 3.74043	T 7223= 3.73679	T 7222= 3.73391	T 7221= 3.73935	T 7220= 3.76358	T 7219= 3.73782
T 1207= 3.73940	T 1208= 3.73939	T 1209= 3.73945	T 1210= 3.73975	T 1211= 3.74046	T 1212= 3.74121
T 2221= 3.74043	T 2220= 3.73679	T 2219= 3.73391	T 224= 3.73935	T 223= 3.76358	T 222= 3.79782
T 221= 3.83526	T 220= 3.86684	T 219= 3.89778	T 6224= 3.93286	T 6223= 3.97628	T 6222= 4.04756
T 6221= 4.19683	T 6220= 4.46016	T 6219= 4.79234	T 2207= 3.73963	T 2208= 3.76464	T 2209= 3.79899
T 2210= 3.83421	T 2211= 3.86584	T 2212= 3.89669	T 207= 3.93412	T 208= 3.97779	T 209= 4.05101
T 210= 4.19132	T 211= 4.44958	T 212= 4.78128	T 4221= 5.12506	T 4220= 5.37207	T 4219= 5.53250
T 5224= 5.61971	T 5223= 5.67905	T 5222= 5.72362	T 5221= 5.75306	T 5220= 5.77816	T 5219= 5.81771
T 3207= 4.19683	T 3208= 4.46017	T 3209= 4.79234	T 3210= 5.11617	T 3211= 5.36557	T 3212= 5.52797
T 4207= 5.62181	T 4208= 5.68083	T 4209= 5.72462	T 4210= 5.75228	T 4211= 5.77706	T 4212= 5.81604
T 5207= 5.87570	T 5208= 5.93534	T 5209= 5.98508	T 5210= 6.02379	T 5211= 6.06003	T 5212= 6.09982
T 1201= 3.73977	T 1202= 3.73970	T 1203= 3.73963	T 1204= 3.73957	T 1205= 3.73951	T 1206= 3.73945
T 1218= 3.73940	T 1217= 3.73939	T 1216= 3.73945	T 1215= 3.73975	T 1214= 3.74046	T 1213= 3.74121
T 7201= 3.74043	T 7202= 3.73679	T 7203= 3.73391	T 7204= 3.73935	T 7205= 3.76359	T 7206= 3.79783
T 7218= 3.83526	T 7217= 3.86684	T 7216= 3.89778	T 7215= 3.93286	T 7214= 3.97628	T 7213= 4.04756
T 2201= 3.73976	T 2202= 3.74049	T 2203= 3.74121	T 2204= 3.74049	T 2205= 3.73693	T 2206= 3.73392
T 201= 3.73963	T 202= 3.76464	T 203= 3.79809	T 204= 3.83421	T 205= 3.86584	T 206= 3.89669
T 218= 3.93412	T 217= 3.97779	T 216= 4.05101	T 215= 4.19132	T 214= 4.44958	T 213= 4.78129
T 6218= 5.12506	T 6217= 5.37207	T 6216= 5.53250	T 6215= 5.61971	T 6214= 5.67905	T 6213= 5.72362
T 3201= 3.83526	T 3202= 3.86684	T 3203= 3.89778	T 3204= 3.93286	T 3205= 3.97628	T 3206= 4.04756
T 3218= 4.19683	T 3217= 4.46017	T 3216= 4.79234	T 3215= 5.11617	T 3214= 5.36557	T 3213= 5.52797
T 4218= 5.62181	T 4217= 5.68083	T 4216= 5.72462	T 4215= 5.75228	T 4214= 5.77706	T 4213= 5.81609
T 5218= 5.87570	T 5217= 5.93534	T 5216= 5.98508	T 5215= 6.02379	T 5214= 6.06003	T 5213= 6.09982

3.26711E-02

-3.61680E-02

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

FDGAP ( 1)	1.00000E-03	FDGAP ( 2)	1.00000E-03	FDGAP ( 3)	1.00000E-03	FDGAP ( 4)	1.00000E-03	FDGAP ( 5)	1.00000E-03
EDGAP ( 6)	1.00000E-03	EDGAP ( 7)	1.00000E-03	EDGAP ( 8)	1.00000E-03	EDGAP ( 9)	1.00000E-03	EDGAP (10)	1.00000E-03
FDGAP (11)	1.00000E-03	FDGAP (12)	1.00000E-03	FDGAP (13)	1.00000E-03	FDGAP (14)	1.00000E-03	FDGAP (15)	1.00000E-03
EDGAP (16)	1.00000E-03	EDGAP (17)	1.00000E-03	EDGAP (18)	1.00000E-03	EDGAP (19)	1.00000E-03	EDGAP (20)	1.00000E-03
FDGAP (21)	1.00000E-03	FDGAP (22)	1.00000E-03	FDGAP (23)	1.00000E-03	FDGAP (24)	1.00000E-03	FDGAP (25)	1.00000E-03
EDGAP (26)	1.00000E-03	EDGAP (27)	1.00000E-03	EDGAP (28)	1.00000E-03	EDGAP (29)	1.00000E-03	EDGAP (30)	1.00000E-03
FDGAP (31)	1.00000E-03	FDGAP (32)	1.00000E-03	FDGAP (33)	1.00000E-03	FDGAP (34)	1.00000E-03	FDGAP (35)	1.00000E-03
EDGAP (36)	1.00000E-03	EDGAP (37)	1.00000E-03	EDGAP (38)	1.00000E-03	EDGAP (39)	1.00000E-03	EDGAP (40)	1.00000E-03
FDGAP (41)	1.00000E-03	FDGAP (42)	1.00000E-03	FDGAP (43)	1.00000E-03	FDGAP (44)	1.00000E-03	FDGAP (45)	1.00000E-03
EDGAP (46)	1.00000E-03	EDGAP (47)	1.00000E-03	EDGAP (48)	1.00000E-03	EDGAP (49)	1.00000E-03	EDGAP (50)	1.00000E-03
FDGAP (51)	1.00000E-03	FDGAP (52)	1.00000E-03	FDGAP (53)	1.00000E-03	FDGAP (54)	1.00000E-03	FDGAP (55)	1.00000E-03
EDGAP (56)	1.00000E-03	EDGAP (57)	1.00000E-03	EDGAP (58)	1.00000E-03	EDGAP (59)	9.94881E-02	EDGAP (60)	1.00000E-03
FDGAP (61)	1.00000E-03	FDGAP (62)	1.00000E-03	FDGAP (63)	1.00000E-03	FDGAP (64)	1.00000E-03	FDGAP (65)	1.00000E-03
EDGAP (66)	1.00000E-03	EDGAP (67)	1.00000E-03	EDGAP (68)	9.96326E-02	EDGAP (69)	9.99536E-02	EDGAP (70)	1.00000E-03
FDGAP (71)	1.00000E-03	FDGAP (72)	1.00000E-03	FDGAP (73)	1.00000E-03	FDGAP (74)	1.00000E-03	FDGAP (75)	1.00000E-03
EDGAP (76)	1.00000E-03	EDGAP (77)	9.97298E-02	EDGAP (78)	9.98984E-02	EDGAP (79)	1.00000E-03	EDGAP (80)	1.00000E-03
FDGAP (81)	1.00000E-03	FDGAP (82)	1.00000E-03	FDGAP (83)	1.00000E-03	FDGAP (84)	1.00000E-03	FDGAP (85)	1.00000E-03
EDGAP (86)	9.98300E-02	EDGAP (87)	9.98818E-02	EDGAP (88)	9.95814E-02	EDGAP (89)	1.00000E-03	EDGAP (90)	1.00000E-03
FDGAP (91)	1.00000E-03	FDGAP (92)	1.00000E-03	FDGAP (93)	1.00000E-03	FDGAP (94)	9.92579E-02	FDGAP (95)	9.98812E-02
EDGAP (96)	9.98340E-02	EDGAP (97)	9.96730E-02	EDGAP (98)	1.00000E-03	EDGAP (99)	1.00000E-03	EDGAP (100)	1.00000E-03
FDGAP (101)	1.00000E-03	FDGAP (102)	1.00000E-03	FDGAP (103)	1.00000E-03	FDGAP (104)	1.00000E-03	FDGAP (105)	1.00000E-03
EDGAP (106)	9.97264E-02	EDGAP (107)	1.00000E-03	EDGAP (108)	1.00000E-03	EDGAP (109)	1.00000E-03	EDGAP (110)	1.00000E-03
FDGAP (111)	1.00000E-03	FDGAP (112)	1.00000E-03	FDGAP (113)	9.99305E-02	FDGAP (114)	9.96873E-02	FDGAP (115)	1.00000E-03
EDGAP (116)	1.00000E-03	EDGAP (117)	1.00000E-03	EDGAP (118)	1.00000E-03	EDGAP (119)	1.00000E-03	EDGAP (120)	1.00000E-03
FDGAP (121)	1.00000E-03	FDGAP (122)	9.99754E-02	FDGAP (123)	1.00000E-03	FDGAP (124)	9.95408E-02	FDGAP (125)	1.00000E-03
EDGAP (126)	1.00000E-03	EDGAP (127)	1.00000E-03	EDGAP (128)	1.00000E-03	EDGAP (129)	1.00000E-03	EDGAP (130)	1.00000E-03
FDGAP (131)	9.99065E-02	FDGAP (132)	9.98853E-02	FDGAP (133)	9.94523E-02	FDGAP (134)	1.00000E-03	FDGAP (135)	1.00000E-03
EDGAP (136)	1.00000E-03	EDGAP (137)	1.00000E-03	EDGAP (138)	1.00000E-03	EDGAP (139)	1.00000E-03	EDGAP (140)	9.98193E-02
FDGAP (141)	9.99060E-02	FDGAP (142)	9.93255E-02	FDGAP (143)	1.00000E-03	FDGAP (144)	1.00000E-03	FDGAP (145)	1.00000E-03
EDGAP (146)	1.00000E-03	EDGAP (147)	1.00000E-03	EDGAP (148)	1.00000E-03	EDGAP (149)	9.97722E-02	EDGAP (150)	9.99883E-02
FDGAP (151)	1.00000E-03	FDGAP (152)	1.00000E-03	FDGAP (153)	1.00000E-03	FDGAP (154)	1.00000E-03	FDGAP (155)	1.00000E-03
EDGAP (156)	1.00000E-03	EDGAP (157)	1.00000E-03	EDGAP (158)	9.97380E-02	EDGAP (159)	1.00000E-03	EDGAP (160)	1.00000E-03
FDGAP (161)	1.00000E-03	FDGAP (162)	1.00000E-03	FDGAP (163)	1.00000E-03	FDGAP (164)	1.00000E-03	FDGAP (165)	1.00000E-03
EDGAP (166)	1.00000E-03	EDGAP (167)	1.00000E-03	EDGAP (168)	1.00000E-03	EDGAP (169)	1.00000E-03	EDGAP (170)	1.00000E-03
FDGAP (171)	1.00000E-03	FDGAP (172)	1.00000E-03	FDGAP (173)	1.00000E-03	FDGAP (174)	1.00000E-03	FDGAP (175)	1.00000E-03
EDGAP (176)	1.00000E-03	EDGAP (177)	1.00000E-03	EDGAP (178)	1.00000E-03	EDGAP (179)	1.00000E-03	EDGAP (180)	1.00000E-03
FDGAP (181)	1.00000E-03	FDGAP (182)	1.00000E-03	FDGAP (183)	1.00000E-03	FDGAP (184)	1.00000E-03	FDGAP (185)	1.00000E-03
EDGAP (186)	1.00000E-03	EDGAP (187)	1.00000E-03	EDGAP (188)	1.00000E-03	EDGAP (189)	1.00000E-03	EDGAP (190)	1.00000E-03
FDGAP (191)	1.00000E-03	FDGAP (192)	1.00000E-03	FDGAP (193)	1.00000E-03	FDGAP (194)	1.00000E-03	FDGAP (195)	1.00000E-03
EDGAP (196)	1.00000E-03	EDGAP (197)	1.00000E-03	EDGAP (198)	1.00000E-03	EDGAP (199)	1.00000E-03	EDGAP (200)	1.00000E-03
FDGAP (201)	1.00000E-03	FDGAP (202)	1.00000E-03	FDGAP (203)	1.00000E-03	FDGAP (204)	1.00000E-03	FDGAP (205)	1.00000E-03
EDGAP (206)	1.00000E-03	EDGAP (207)	1.00000E-03	EDGAP (208)	1.00000E-03	EDGAP (209)	1.00000E-03	EDGAP (210)	1.00000E-03
FDGAP (211)	1.00000E-03	FDGAP (212)	1.00000E-03	FDGAP (213)	1.00000E-03	FDGAP (214)	1.00000E-03	FDGAP (215)	1.00000E-03
EDGAP (216)	1.00000E-03	EDGAP (217)	1.00000E-03	EDGAP (218)	1.00000E-03	EDGAP (219)	1.00000E-03	EDGAP (220)	1.00000E-03

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

++CAUTION++ ITERMX( 600) EXCEEDED REFDOPE RELAXATION CRITERIA MET...  
 ORLXCC( 8025) = -.494811E-04 VS. ORLXCA = .100000E-08  
 ARLXCC( 8097) = -.491024E-04 VS. ARLXCA = .100000E-08  
 FBALSC( ) = 0. VS. EBALSA = 0.  
 EBALNC( 0) = 0. VS. EBALNA = 0.

TIMEN = 32.0000 EPALSC( ) = 0. CSGMIN( 0) = 0. ORLXCC( 8025) = -.494811E-04  
 TSTEPU = 4.00000 EBALNC( 0) = 0. CSGMAX( 0) = 0. ARLXCC( 8097) = -.491024E-04  
 ITERMCT 601 DMXTCC( 0) = 0. AMXTCC( 0) = 0.

DIFFUSION NODES

T 25=	4.49376	T 26=	4.57054	T 27=	4.63778	T 28=	4.69736	T 29=	4.75394	T 30=	4.81931
T 31=	4.54650	T 32=	4.63247	T 33=	4.70063	T 34=	4.76208	T 35=	4.82102	T 36=	4.88326
T 37=	4.60153	T 38=	4.68721	T 39=	4.75625	T 40=	4.82001	T 41=	4.88262	T 42=	4.95086
T 43=	4.66070	T 44=	4.74138	T 45=	4.81084	T 46=	4.87771	T 47=	4.94516	T 48=	5.02102
T 49=	4.72037	T 50=	4.79422	T 51=	4.86574	T 52=	4.93785	T 53=	5.01151	T 54=	5.09450
T 55=	4.78157	T 56=	4.84357	T 57=	4.92473	T 58=	5.00788	T 59=	5.09109	T 60=	5.17567
T 61=	4.57815	T 62=	4.62210	T 63=	4.67768	T 64=	4.73302	T 65=	4.78307	T 66=	4.82082
T 67=	4.61126	T 68=	4.65725	T 69=	4.71389	T 70=	4.77045	T 71=	4.82177	T 72=	4.85968
T 73=	4.65731	T 74=	4.70369	T 75=	4.76138	T 76=	4.81988	T 77=	4.87371	T 78=	4.91397
T 79=	4.70757	T 80=	4.75298	T 81=	4.81160	T 82=	4.87268	T 83=	4.92993	T 84=	4.97344
T 85=	4.75488	T 86=	4.79873	T 87=	4.85885	T 88=	4.92338	T 89=	4.98461	T 90=	5.03130
T 91=	4.78961	T 92=	4.83147	T 93=	4.89416	T 94=	4.96278	T 95=	5.02780	T 96=	5.07623
T 1025=	3.96713	T 1026=	3.98106	T 1027=	4.00067	T 1028=	4.02451	T 1029=	4.05174	T 1030=	4.07656
T 1031=	3.98635	T 1032=	4.01315	T 1033=	4.03461	T 1034=	4.05499	T 1035=	4.07260	T 1036=	4.07986
T 1037=	4.01755	T 1038=	4.04054	T 1039=	4.06293	T 1040=	4.08331	T 1041=	4.10044	T 1042=	4.110752
T 1043=	4.04050	T 1044=	4.06757	T 1045=	4.09076	T 1046=	4.11374	T 1047=	4.13787	T 1048=	4.15859
T 1049=	4.07070	T 1050=	4.09463	T 1051=	4.11839	T 1052=	4.14451	T 1053=	4.17387	T 1054=	4.21017
T 1055=	4.11029	T 1056=	4.12134	T 1057=	4.14653	T 1058=	4.17763	T 1059=	4.21387	T 1060=	4.25051
T 1061=	3.99508	T 1062=	4.00625	T 1063=	4.02323	T 1064=	4.04266	T 1065=	4.06141	T 1066=	4.07438
T 1067=	4.00967	T 1068=	4.02363	T 1069=	4.04150	T 1070=	4.06000	T 1071=	4.07606	T 1072=	4.09528
T 1073=	4.03175	T 1074=	4.04666	T 1075=	4.06533	T 1076=	4.08426	T 1077=	4.10062	T 1078=	4.11033
T 1079=	4.05650	T 1080=	4.07140	T 1081=	4.09089	T 1082=	4.11176	T 1083=	4.13178	T 1084=	4.14742
T 1085=	4.08100	T 1086=	4.09490	T 1087=	4.11496	T 1088=	4.13801	T 1089=	4.16138	T 1090=	4.18021
T 1091=	4.10100	T 1092=	4.11233	T 1093=	4.13266	T 1094=	4.15769	T 1095=	4.18368	T 1096=	4.20376
T 2025=	4.23864	T 2026=	4.30072	T 2027=	4.35089	T 2028=	4.39072	T 2029=	4.41884	T 2030=	4.43149
T 2031=	4.26503	T 2032=	4.33568	T 2033=	4.38743	T 2034=	4.42832	T 2035=	4.45742	T 2036=	4.46753
T 2037=	4.30051	T 2038=	4.37197	T 2039=	4.42651	T 2040=	4.47229	T 2041=	4.51005	T 2042=	4.53566
T 2043=	4.33857	T 2044=	4.41158	T 2045=	4.46997	T 2046=	4.52320	T 2047=	4.57636	T 2048=	4.64904

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

T 2049	4.38143	T 2050	4.45483	T 2051	4.51713	T 2052	4.57744	T 2053	4.63475	T 2054	4.71116
T 2055	4.43087	T 2056	4.50413	T 2057	4.57124	T 2058	4.64628	T 2059	4.69421	T 2060	4.76161
T 2061	4.49732	T 2062	4.53315	T 2063	4.57203	T 2064	4.40814	T 2065	4.43468	T 2066	4.44821
T 2067	4.31686	T 2068	4.35336	T 2069	4.39554	T 2070	4.43350	T 2071	4.46216	T 2072	4.47769
T 2073	4.34730	T 2074	4.38530	T 2075	4.43024	T 2076	4.47248	T 2077	4.50730	T 2078	4.52934
T 2079	4.38241	T 2080	4.42196	T 2081	4.47033	T 2082	4.51833	T 2083	4.56197	T 2084	4.59601
T 2085	4.41791	T 2086	4.45867	T 2087	4.51024	T 2088	4.56313	T 2089	4.61106	T 2090	4.64997
T 2091	4.44587	T 2092	4.48741	T 2093	4.54156	T 2094	4.59869	T 2095	4.64638	T 2096	4.68436
T 3025	4.79221	T 3026	4.91643	T 3027	4.95950	T 3028	4.99771	T 3029	5.02353	T 3030	5.03274
T 3031	4.81697	T 3032	4.92022	T 3033	4.98008	T 3034	5.02182	T 3035	5.04827	T 3036	5.05530
T 3037	4.85617	T 3038	4.95033	T 3039	5.01291	T 3040	5.05811	T 3041	5.09838	T 3042	5.10135
T 3043	4.90789	T 3044	4.99533	T 3045	5.05866	T 3046	5.10821	T 3047	5.14541	T 3048	5.16876
T 3049	4.96920	T 3050	5.05137	T 3051	5.11668	T 3052	5.17311	T 3053	5.22107	T 3054	5.26321
T 3055	5.03636	T 3056	5.12060	T 3057	5.19119	T 3058	5.25976	T 3059	5.32180	T 3060	5.37369
T 3061	4.86983	T 3062	4.92328	T 3063	4.96882	T 3064	5.00577	T 3065	5.03097	T 3066	5.04268
T 3067	4.88734	T 3068	4.93700	T 3069	4.98566	T 3070	5.02473	T 3071	5.05123	T 3072	5.06353
T 3073	4.91946	T 3074	4.96663	T 3075	5.01676	T 3076	5.05857	T 3077	5.08818	T 3078	5.10115
T 3079	4.96210	T 3080	5.00764	T 3081	5.05903	T 3082	5.10447	T 3083	5.13908	T 3084	5.15844
T 3085	5.00851	T 3086	5.05333	T 3087	5.10672	T 3088	5.15696	T 3089	5.19814	T 3090	5.22473
T 3091	5.04578	T 3092	5.09142	T 3093	5.14741	T 3094	5.20264	T 3095	5.24971	T 3096	5.29059
T 4025	5.11042	T 4026	5.19593	T 4027	5.27602	T 4028	5.35391	T 4029	5.43953	T 4030	5.51333
T 4031	5.18627	T 4032	5.28800	T 4033	5.36937	T 4034	5.44542	T 4035	5.52707	T 4036	5.61020
T 4037	5.27019	T 4038	5.37015	T 4039	5.44692	T 4040	5.51796	T 4041	5.59289	T 4042	5.63736
T 4043	5.36324	T 4044	5.45318	T 4045	5.52209	T 4046	5.58496	T 4047	5.64943	T 4048	5.72083
T 4049	5.46654	T 4050	5.54288	T 4051	5.60184	T 4052	5.65419	T 4053	5.70459	T 4054	5.76068
T 4055	5.58587	T 4056	5.64951	T 4057	5.69976	T 4058	5.73943	T 4059	5.77371	T 4060	5.80052
T 4061	5.21969	T 4062	5.27048	T 4063	5.33724	T 4064	5.40795	T 4065	5.47797	T 4066	5.53661
T 4067	5.26850	T 4068	5.32212	T 4069	5.38847	T 4070	5.45727	T 4071	5.52446	T 4072	5.57938
T 4073	5.33826	T 4074	5.39030	T 4075	5.45343	T 4076	5.51776	T 4077	5.57963	T 4078	5.62975
T 4079	5.41730	T 4080	5.46444	T 4081	5.52166	T 4082	5.57913	T 4083	5.63318	T 4084	5.67801
T 4085	5.49581	T 4086	5.53740	T 4087	5.58783	T 4088	5.63730	T 4089	5.68202	T 4090	5.71550
T 4091	5.53868	T 4092	5.59584	T 4093	5.64090	T 4094	5.68945	T 4095	5.72054	T 4096	5.74616
T 5025	5.63744	T 5026	5.69466	T 5027	5.74397	T 5028	5.78945	T 5029	5.83331	T 5030	5.88455
T 5031	5.69410	T 5032	5.75165	T 5033	5.79683	T 5034	5.83865	T 5035	5.88071	T 5036	5.92192
T 5037	5.75278	T 5038	5.80259	T 5039	5.84252	T 5040	5.88102	T 5041	5.92152	T 5042	5.97103
T 5043	5.82608	T 5044	5.85341	T 5045	5.88597	T 5046	5.92097	T 5047	5.95906	T 5048	5.99546
T 5049	5.87433	T 5050	5.89588	T 5051	5.92719	T 5052	5.96065	T 5053	5.99509	T 5054	6.03721
T 5055	5.90171	T 5056	5.93095	T 5057	5.97207	T 5058	6.00793	T 5059	6.04372	T 5060	6.08201
T 5061	5.70741	T 5062	5.73842	T 5063	5.77742	T 5064	5.81700	T 5065	5.85364	T 5066	5.88201
T 5067	5.74057	T 5068	5.77048	T 5069	5.80737	T 5070	5.84504	T 5071	5.88045	T 5072	5.90790
T 5073	5.78630	T 5074	5.81253	T 5075	5.84584	T 5076	5.88087	T 5077	5.91464	T 5078	5.94155

APPENDIX A, CONTINUED

SHUTTLE TILF INTERNAL FLOW

T 5079=	5.83629	T 5080=	5.85619	T 5081=	5.88522	T 5082=	5.91740	T 5083=	5.94898	T 5084=	5.97449
T 5085=	5.87542	T 5086=	5.89292	T 5087=	5.92038	T 5088=	5.95081	T 5089=	5.97975	T 5090=	5.00214
T 5091=	5.89787	T 5092=	5.91670	T 5093=	5.94594	T 5094=	5.97631	T 5095=	6.00263	T 5096=	6.01961
T 6025=	4.83930	T 6026=	4.89248	T 6027=	5.00178	T 6028=	5.09520	T 6029=	5.18559	T 6030=	5.27752
T 6031=	4.92529	T 6032=	5.02211	T 6033=	5.11231	T 6034=	5.19816	T 6035=	5.28352	T 6036=	5.37419
T 6037=	5.00988	T 6038=	5.11768	T 6039=	5.20304	T 6040=	5.28586	T 6041=	5.37256	T 6042=	5.47762
T 6043=	5.14602	T 6044=	5.21173	T 6045=	5.28674	T 6046=	5.36727	T 6047=	5.45373	T 6048=	5.56214
T 6049=	5.23450	T 6050=	5.28625	T 6051=	5.36304	T 6052=	5.44724	T 6053=	5.53059	T 6054=	5.63402
T 6055=	5.28086	T 6056=	5.33422	T 6057=	5.43955	T 6058=	5.54422	T 6059=	5.61575	T 6060=	5.68590
T 6061=	4.95142	T 6062=	4.99718	T 6063=	5.07360	T 6064=	5.15346	T 6065=	5.22718	T 6066=	5.28128
T 6067=	5.00774	T 6068=	5.06123	T 6069=	5.13459	T 6070=	5.21174	T 6071=	5.28404	T 6072=	5.33826
T 6073=	5.08504	T 6074=	5.13964	T 6075=	5.21034	T 6076=	5.28551	T 6077=	5.35786	T 6078=	5.41498
T 6079=	5.17510	T 6080=	5.22064	T 6081=	5.28623	T 6082=	5.35972	T 6083=	5.43147	T 6084=	5.48915
T 6085=	5.24541	T 6086=	5.28623	T 6087=	5.35228	T 6088=	5.42677	T 6089=	5.49683	T 6090=	5.55184
T 6091=	5.28421	T 6092=	5.32581	T 6093=	5.39841	T 6094=	5.47766	T 6095=	5.54458	T 6096=	5.59214
T 7025=	4.42798	T 7026=	4.44870	T 7027=	4.47372	T 7028=	4.50066	T 7029=	4.54079	T 7030=	4.59252
T 7031=	4.46596	T 7032=	4.49492	T 7033=	4.52478	T 7034=	4.55935	T 7035=	4.60214	T 7036=	4.65492
T 7037=	4.49690	T 7038=	4.52780	T 7039=	4.56129	T 7040=	4.60140	T 7041=	4.65137	T 7042=	4.71940
T 7043=	4.51955	T 7044=	4.55166	T 7045=	4.58789	T 7046=	4.63302	T 7047=	4.69001	T 7048=	4.75450
T 7049=	4.53555	T 7050=	4.56649	T 7051=	4.60401	T 7052=	4.65447	T 7053=	4.72221	T 7054=	4.81514
T 7055=	4.54371	T 7056=	4.56965	T 7057=	4.60493	T 7058=	4.66654	T 7059=	4.74378	T 7060=	4.86074
T 7061=	4.46826	T 7062=	4.48397	T 7063=	4.50823	T 7064=	4.53760	T 7065=	4.57085	T 7066=	4.59916
T 7067=	4.48961	T 7068=	4.50775	T 7069=	4.53472	T 7070=	4.56745	T 7071=	4.60328	T 7072=	4.63340
T 7073=	4.51449	T 7074=	4.53433	T 7075=	4.56426	T 7076=	4.60120	T 7077=	4.64197	T 7078=	4.67734
T 7079=	4.53561	T 7080=	4.55660	T 7081=	4.58913	T 7082=	4.63041	T 7083=	4.67677	T 7084=	4.71704
T 7085=	4.55048	T 7086=	4.57168	T 7087=	4.60598	T 7088=	4.65156	T 7089=	4.70476	T 7090=	4.75239
T 7091=	4.55785	T 7092=	4.57825	T 7093=	4.61300	T 7094=	4.66183	T 7095=	4.72149	T 7096=	4.77647
T 8025=	4.17849	T 8026=	4.16985	T 8027=	4.18848	T 8028=	4.21825	T 8029=	4.25094	T 8030=	4.28684
T 8031=	4.20262	T 8032=	4.22675	T 8033=	4.24896	T 8034=	4.27430	T 8035=	4.30133	T 8036=	4.32890
T 8037=	4.24376	T 8038=	4.27089	T 8039=	4.29481	T 8040=	4.31982	T 8041=	4.34651	T 8042=	4.37555
T 8043=	4.28374	T 8044=	4.31127	T 8045=	4.33597	T 8046=	4.36206	T 8047=	4.39134	T 8048=	4.42748
T 8049=	4.32652	T 8050=	4.35092	T 8051=	4.37551	T 8052=	4.40293	T 8053=	4.43559	T 8054=	4.47823
T 8055=	4.37298	T 8056=	4.39209	T 8057=	4.41695	T 8058=	4.44554	T 8059=	4.48248	T 8060=	4.53039
T 8061=	4.20776	T 8062=	4.21313	T 8063=	4.22955	T 8064=	4.25263	T 8065=	4.27680	T 8066=	4.29576
T 8067=	4.22935	T 8068=	4.24181	T 8069=	4.26053	T 8070=	4.28302	T 8071=	4.30567	T 8072=	4.32266
T 8073=	4.26296	T 8074=	4.27785	T 8075=	4.29809	T 8076=	4.32093	T 8077=	4.34359	T 8078=	4.36129
T 8079=	4.29911	T 8080=	4.31461	T 8081=	4.33567	T 8082=	4.35950	T 8083=	4.38385	T 8084=	4.40370
T 8085=	4.33367	T 8086=	4.34853	T 8087=	4.36984	T 8088=	4.39475	T 8089=	4.42114	T 8090=	4.44347
T 8091=	4.35976	T 8092=	4.37351	T 8093=	4.39487	T 8094=	4.42059	T 8095=	4.44875	T 8096=	4.47295
T 97=	4.49376	T 98=	4.57052	T 99=	4.63777	T 100=	4.69736	T 101=	4.75386	T 102=	4.81933

ARITHMETIC NODES

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

T 103=	4.56650	T 104=	4.62237	T 105=	4.69264	T 106=	4.75815	T 107=	4.82095	T 108=	4.89327
T 109=	4.60154	T 110=	4.67804	T 111=	4.75060	T 112=	4.82002	T 113=	4.88679	T 114=	4.95087
T 115=	4.66071	T 116=	4.73577	T 117=	4.80992	T 118=	4.88278	T 119=	4.95355	T 120=	5.02103
T 121=	4.72038	T 122=	4.79255	T 123=	4.86871	T 124=	4.94577	T 125=	5.02174	T 126=	5.09451
T 127=	4.78157	T 128=	4.84357	T 129=	4.92474	T 130=	5.00789	T 131=	5.09110	T 132=	5.17569
T 1024=	3.73973	T 1023=	3.73971	T 1022=	3.73967	T 1021=	3.73962	T 1J20=	3.73959	T 1019=	3.73957
T 8024=	3.73959	T 8023=	3.73965	T 8022=	3.73980	T 8021=	3.74008	T 8020=	3.74047	T 8019=	3.74083
T 7024=	3.74115	T 7023=	3.74145	T 7022=	3.74387	T 7021=	3.75084	T 7020=	3.76309	T 7019=	3.77503
T 1007=	3.73955	T 1008=	3.73960	T 1009=	3.73972	T 1010=	3.73995	T 1011=	3.74008	T 1012=	3.73998
T 2021=	3.73991	T 2020=	3.73847	T 2019=	3.73772	T 2018=	3.75680	T 2017=	3.77797	T 2016=	3.80619
T 21=	3.83439	T 20=	3.89199	T 19=	3.95609	T 18=	4.02567	T 17=	4.07219	T 16=	4.16297
T 6021=	4.30936	T 6020=	4.50777	T 6019=	4.72816	T 6018=	4.96238	T 6017=	5.21186	T 6016=	5.46557
T 2010=	4.02530	T 2011=	4.03292	T 2012=	4.04208	T 2013=	4.05372	T 2014=	4.06780	T 2015=	4.08448
T 10=	4.39505	T 11=	4.49694	T 12=	4.62073	T 13=	4.76859	T 14=	4.93884	T 15=	5.13384
T 5024=	5.56219	T 5023=	5.63410	T 5022=	5.68598	T 5021=	5.73476	T 5020=	5.77506	T 5019=	5.81393
T 3007=	4.85084	T 3008=	4.91134	T 3009=	5.01263	T 3010=	5.13384	T 3011=	5.26323	T 3012=	5.40531
T 4007=	5.55157	T 4008=	5.63036	T 4009=	5.68750	T 4010=	5.72894	T 4011=	5.76073	T 4012=	5.79442
T 5007=	5.88466	T 5008=	5.92898	T 5009=	5.97110	T 5010=	6.00752	T 5011=	6.03716	T 5012=	6.05891
T 1001=	3.73973	T 1002=	3.73971	T 1003=	3.73966	T 1004=	3.73962	T 1005=	3.73958	T 1006=	3.73955
T 1018=	3.73959	T 1017=	3.73965	T 1016=	3.73977	T 1015=	3.73998	T 1014=	3.74024	T 1013=	3.74033
T 7001=	3.74111	T 7002=	3.74145	T 7003=	3.74387	T 7004=	3.75080	T 7005=	3.76293	T 7006=	3.77467
T 7019=	3.84016	T 7017=	3.87385	T 7016=	3.90966	T 7015=	3.94984	T 7014=	3.99669	T 7013=	4.05174
T 2001=	3.74020	T 2002=	3.74049	T 2003=	3.74075	T 2004=	3.74075	T 2005=	3.74083	T 2006=	3.74268
T 1=	3.76315	T 2=	3.78534	T 3=	3.81469	T 4=	3.84875	T 5=	3.88684	T 6=	3.93189
T 18=	4.02127	T 17=	4.06116	T 16=	4.13961	T 15=	4.25904	T 14=	4.40979	T 13=	4.58210
T 6018=	5.10946	T 6017=	5.29288	T 6016=	5.43964	T 6015=	5.54437	T 6014=	5.61585	T 6013=	5.65913
T 3001=	3.89879	T 3002=	3.91062	T 3003=	3.94102	T 3004=	3.98970	T 3005=	4.06296	T 3006=	4.17467
T 3011=	4.43904	T 3017=	4.59329	T 3016=	4.80913	T 3015=	5.03272	T 3014=	5.21768	T 3013=	5.33419
T 4011=	5.58600	T 4017=	5.64961	T 4016=	5.69984	T 4015=	5.73948	T 4014=	5.77372	T 4013=	5.80653
T 5011=	5.88813	T 5017=	5.93098	T 5016=	5.97214	T 5015=	6.00800	T 5014=	6.03727	T 5013=	6.05672
T 1097=	3.96715	T 1098=	3.98108	T 1099=	4.00069	T 1100=	4.02452	T 1101=	4.05175	T 1102=	4.07986
T 1103=	3.98636	T 1104=	4.00875	T 1105=	4.03046	T 1106=	4.05211	T 1107=	4.07109	T 1108=	4.07986
T 1109=	4.01256	T 1110=	4.03681	T 1111=	4.05999	T 1112=	4.08207	T 1113=	4.10046	T 1114=	4.10753
T 1115=	4.04051	T 1116=	4.06561	T 1117=	4.09031	T 1118=	4.11538	T 1119=	4.14082	T 1120=	4.16460
T 1121=	4.07071	T 1122=	4.09447	T 1123=	4.11990	T 1124=	4.14792	T 1125=	4.17833	T 1126=	4.21018
T 1127=	4.11032	T 1128=	4.12136	T 1129=	4.14654	T 1130=	4.17763	T 1131=	4.21387	T 1132=	4.25051
T 2097=	4.23865	T 2098=	4.30073	T 2099=	4.35090	T 2100=	4.39073	T 2101=	4.41885	T 2102=	4.43150
T 2103=	4.26504	T 2104=	4.32847	T 2105=	4.38209	T 2106=	4.42553	T 2107=	4.45621	T 2108=	4.46754
T 2109=	4.30051	T 2110=	4.36498	T 2111=	4.42262	T 2112=	4.47241	T 2113=	4.51231	T 2114=	4.53567
T 2115=	4.33858	T 2116=	4.40714	T 2117=	4.46991	T 2118=	4.52816	T 2119=	4.58381	T 2120=	4.64906
T 2121=	4.38145	T 2122=	4.45367	T 2123=	4.52036	T 2124=	4.58509	T 2125=	4.64395	T 2126=	4.71118

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

T 2127=	4.43090	T 2128=	4.50413	T 2129=	4.57125	T 2130=	4.64625	T 2131=	4.69422	T 2132=	4.76164
T 3097=	4.79221	T 3098=	4.91645	T 3099=	4.95951	T 3100=	4.99771	T 3101=	5.02353	T 3102=	5.03275
T 3103=	4.81697	T 3104=	4.91317	T 3105=	4.97542	T 3106=	5.01960	T 3107=	5.04725	T 3108=	5.05630
T 3109=	4.85617	T 3110=	4.94244	T 3111=	5.00868	T 3112=	5.05757	T 3113=	5.08924	T 3114=	5.10135
T 3115=	4.90789	T 3116=	4.99025	T 3117=	5.05824	T 3118=	5.11201	T 3119=	5.15015	T 3120=	5.16976
T 3121=	4.96920	T 3122=	5.05068	T 3123=	5.12067	T 3124=	5.18088	T 3125=	5.22945	T 3126=	5.26320
T 3127=	5.03636	T 3128=	5.12060	T 3129=	5.19119	T 3130=	5.25976	T 3131=	5.32181	T 3132=	5.37310
T 4097=	5.11042	T 4098=	5.19593	T 4099=	5.27602	T 4100=	5.35391	T 4101=	5.43953	T 4102=	5.55008
T 4103=	5.18627	T 4104=	5.27570	T 4105=	5.35864	T 4106=	5.44016	T 4107=	5.52762	T 4108=	5.62973
T 4109=	5.27019	T 4110=	5.35927	T 4111=	5.44015	T 4112=	5.51793	T 4113=	5.59826	T 4114=	5.63763
T 4115=	5.36524	T 4116=	5.44832	T 4117=	5.52237	T 4118=	5.59100	T 4119=	5.65841	T 4120=	5.72843
T 4121=	5.46654	T 4122=	5.54369	T 4123=	5.60781	T 4124=	5.66350	T 4125=	5.71432	T 4126=	5.75065
T 4127=	5.58551	T 4128=	5.64935	T 4129=	5.69966	T 4130=	5.73940	T 4131=	5.77371	T 4132=	5.80652
T 5097=	5.63743	T 5098=	5.69466	T 5099=	5.74397	T 5100=	5.78945	T 5101=	5.83331	T 5102=	5.83432
T 5103=	5.69410	T 5104=	5.74454	T 5105=	5.79113	T 5106=	5.83588	T 5107=	5.88084	T 5108=	5.92863
T 5109=	5.75278	T 5110=	5.79738	T 5111=	5.83938	T 5112=	5.88138	T 5113=	5.92463	T 5114=	5.97094
T 5115=	5.82608	T 5116=	5.85202	T 5117=	5.88693	T 5118=	5.92500	T 5119=	5.96474	T 5120=	6.00737
T 5121=	5.87433	T 5122=	5.89711	T 5123=	5.93073	T 5124=	5.96637	T 5125=	6.00142	T 5126=	6.03702
T 5127=	5.90171	T 5128=	5.93093	T 5129=	5.97200	T 5130=	6.00785	T 5131=	6.03714	T 5132=	6.05660
T 6097=	4.83930	T 6098=	4.89248	T 6099=	5.00178	T 6100=	5.09520	T 6101=	5.18559	T 6102=	5.27752
T 6103=	4.92529	T 6104=	5.01390	T 6105=	5.10234	T 6106=	5.19299	T 6107=	5.28391	T 6108=	5.37419
T 6109=	5.00989	T 6110=	5.10813	T 6111=	5.19725	T 6112=	5.28717	T 6113=	5.37952	T 6114=	5.47762
T 6115=	5.14603	T 6116=	5.20792	T 6117=	5.28815	T 6118=	5.37579	T 6119=	5.46612	T 6120=	5.56211
T 6121=	5.23450	T 6122=	5.28681	T 6123=	5.36892	T 6124=	5.45887	T 6125=	5.54423	T 6126=	5.63395
T 6127=	5.28086	T 6128=	5.33422	T 6129=	5.43941	T 6130=	5.54382	T 6131=	5.61560	T 6132=	5.69581
T 7097=	4.42798	T 7098=	4.44870	T 7099=	4.47372	T 7100=	4.50066	T 7101=	4.54070	T 7102=	4.59253
T 7103=	4.46597	T 7104=	4.48944	T 7105=	4.51939	T 7106=	4.55606	T 7107=	4.60199	T 7108=	4.65493
T 7109=	4.49690	T 7110=	4.52322	T 7111=	4.55771	T 7112=	4.60127	T 7113=	4.65501	T 7114=	4.71939
T 7115=	4.51956	T 7116=	4.54845	T 7117=	4.58636	T 7118=	4.63544	T 7119=	4.69614	T 7120=	4.76450
T 7121=	4.53556	T 7122=	4.56432	T 7123=	4.60332	T 7124=	4.65716	T 7125=	4.72842	T 7126=	4.81515
T 7127=	4.54372	T 7128=	4.56965	T 7129=	4.60494	T 7130=	4.66055	T 7131=	4.74379	T 7132=	4.86074
T 8097=	4.17845	T 8098=	4.16986	T 8099=	4.18849	T 8100=	4.21825	T 8101=	4.25095	T 8102=	4.28684
T 8103=	4.20264	T 8104=	4.22053	T 8105=	4.24264	T 8106=	4.26984	T 8107=	4.29943	T 8108=	4.32891
T 8109=	4.24377	T 8110=	4.26635	T 8111=	4.29095	T 8112=	4.31828	T 8113=	4.34730	T 8114=	4.37557
T 8115=	4.28375	T 8116=	4.30957	T 8117=	4.33590	T 8118=	4.36436	T 8119=	4.39522	T 8120=	4.42750
T 8121=	4.32653	T 8122=	4.35172	T 8123=	4.37813	T 8124=	4.40741	T 8125=	4.44102	T 8126=	4.47825
T 8127=	4.37300	T 8128=	4.39210	T 8129=	4.41696	T 8130=	4.44555	T 8131=	4.48250	T 8132=	4.53042
HEATER NODES											
++NONE++											
BOUNDARY NODES											
T 1224=	3.73977	T 1223=	3.73970	T 1222=	3.73963	T 1221=	3.73957	T 1220=	3.73951	T 1219=	3.73945

APPENDIX A, CONTINUED



SHUTTLE TILF INTERNAL FLOW

T 8224=	3.73940	T 8223=	3.73939	T 8222=	3.73945	T 8221=	3.73975	T 8220=	3.74066	T 8219=	3.74121
T 7224=	3.74043	T 7223=	3.73679	T 7222=	3.73391	T 7221=	3.73975	T 7220=	3.76358	T 7219=	3.77782
T 1207=	3.73940	T 1208=	3.73939	T 1209=	3.73945	T 1210=	3.73975	T 1211=	3.74046	T 1212=	3.74121
T 2221=	3.74043	T 2220=	3.73679	T 2219=	3.73391	T 2218=	3.73975	T 2217=	3.74358	T 2216=	3.74782
T 221=	3.83526	T 220=	3.86684	T 219=	3.89774	T 218=	3.93286	T 217=	3.97628	T 216=	4.04756
T 6221=	4.19683	T 6220=	4.46016	T 6219=	4.79233	T 6218=	5.12506	T 6217=	5.46454	T 6216=	5.81101
T 2210=	3.83421	T 2211=	3.86584	T 2212=	3.89669	T 2213=	3.93412	T 2214=	3.97654	T 2215=	4.05101
T 210=	4.19132	T 211=	4.44958	T 212=	4.77124	T 213=	5.12506	T 214=	5.47707	T 215=	5.81771
T 9224=	5.61971	T 9223=	5.67905	T 9222=	5.72362	T 9221=	5.75306	T 9220=	5.77816	T 9219=	5.81101
T 3207=	4.19683	T 3208=	4.46017	T 3209=	4.79234	T 3210=	5.11617	T 3211=	5.43657	T 3212=	5.75290
T 4207=	5.62181	T 4208=	5.68083	T 4209=	5.72462	T 4210=	5.75228	T 4211=	5.77706	T 4212=	5.81101
T 9207=	5.87570	T 9208=	5.93534	T 9209=	5.98508	T 9210=	6.02379	T 9211=	6.06003	T 9212=	6.09982
T 1201=	3.73940	T 1202=	3.73939	T 1203=	3.73963	T 1204=	3.73957	T 1205=	3.73951	T 1206=	3.73945
T 1218=	3.73940	T 1217=	3.73939	T 1216=	3.73945	T 1215=	3.73975	T 1214=	3.74046	T 1213=	3.74121
T 7201=	3.74043	T 7202=	3.73679	T 7203=	3.73391	T 7204=	3.73935	T 7205=	3.76358	T 7206=	3.79783
T 7218=	3.83526	T 7217=	3.86684	T 7216=	3.89778	T 7215=	3.93286	T 7214=	3.97628	T 7213=	4.04756
T 2201=	3.93412	T 2202=	3.97464	T 2203=	3.97412	T 2204=	3.97404	T 2205=	3.97393	T 2206=	3.97392
T 201=	3.73963	T 202=	3.74464	T 203=	3.79899	T 204=	3.83421	T 205=	3.86584	T 206=	3.89669
T 218=	3.93412	T 217=	3.97779	T 216=	4.05101	T 215=	4.19132	T 214=	4.44958	T 213=	4.79129
T 6218=	5.12506	T 6217=	5.37207	T 6216=	5.53250	T 6215=	5.61971	T 6214=	5.67905	T 6213=	5.72362
T 3201=	3.83526	T 3202=	3.86684	T 3203=	3.89778	T 3204=	3.93286	T 3205=	3.97628	T 3206=	4.04756
T 3218=	4.19683	T 3217=	4.46017	T 3216=	4.79234	T 3215=	5.11617	T 3214=	5.43657	T 3213=	5.75290
T 4218=	5.62181	T 4217=	5.68083	T 4216=	5.72462	T 4215=	5.75228	T 4214=	5.77706	T 4213=	5.81101
T 9218=	5.87570	T 9217=	5.93534	T 9216=	5.98508	T 9215=	6.02379	T 9214=	6.06003	T 9213=	6.09982

A.	ALL	ARITHMETIC	MODES	WILL	BE
07	23	152089E	-05		MAPPED
07	98	326037E	-04		
07	103	350519E	-04		
07	8120	446904E	-04		
07	2127	424158E	-04		
08	26	153293E	-04		
08	97	326037E	-04		
08	99	448188E	-04		
08	104	360379E	-04		
09	2128	455474E	-04		
09	97	213994E	-04		
09	98	381888E	-04		
09	100	420622E	-04		
09	103	337052E	-04		
09	2129	463113E	-04		
100	28	369833E	-05		
100	99	420622E	-04		
100	101	403686E	-04		
100	106	434560E	-04		
100	2130	361077E	-04		
101	29	129480E	-04		
101	100	403686E	-04		
101	102	473828E	-04		
101	107	455644E	-04		
101	2131	425988E	-04		
102	30	228511E	-04		
102	101	473828E	-04		
102	108	469099E	-04		
102	2132	651310E	-04		
102	103	417875E	-04		
103	103	302684E	-05		
103	104	325897E	-04		
103	107	350519E	-04		
103	109	380644E	-04		
103	8126	465371E	-04		
104	103	325897E	-04		
104	108	448861E	-04		
104	98	360379E	-04		
104	110	371425E	-04		
105	104	448861E	-04		

APPENDIX A, CONTINUED

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-3.61680F-02

APPENDIX A, CONTINUED

SHUTTLE TILE INTERNAL FLOW

EDGAP ( 1)	1.00000E-03	EDGAP ( 2)	1.00000E-03	EDGAP ( 3)	1.00000E-03	EDGAP ( 4)	1.00000E-03	EDGAP ( 5)	1.00000E-03
EDGAP ( 6)	1.00000E-03	EDGAP ( 7)	1.00000E-03	EDGAP ( 8)	1.00000E-03	EDGAP ( 9)	1.00000E-03	EDGAP (10)	1.00000E-03
EDGAP (11)	1.00000E-03	EDGAP (12)	1.00000E-03	EDGAP (13)	1.00000E-03	EDGAP (14)	1.00000E-03	EDGAP (15)	1.00000E-03
EDGAP (16)	1.00000E-03	EDGAP (17)	1.00000E-03	EDGAP (18)	1.00000E-03	EDGAP (19)	1.00000E-03	EDGAP (20)	1.00000E-03
EDGAP (21)	1.00000E-03	EDGAP (22)	1.00000E-03	EDGAP (23)	1.00000E-03	EDGAP (24)	1.00000E-03	EDGAP (25)	1.00000E-03
EDGAP (26)	1.00000E-03	EDGAP (27)	1.00000E-03	EDGAP (28)	1.00000E-03	EDGAP (29)	1.00000E-03	EDGAP (30)	1.00000E-03
EDGAP (31)	1.00000E-03	EDGAP (32)	1.00000E-03	EDGAP (33)	1.00000E-03	EDGAP (34)	1.00000E-03	EDGAP (35)	1.00000E-03
EDGAP (36)	1.00000E-03	EDGAP (37)	1.00000E-03	EDGAP (38)	1.00000E-03	EDGAP (39)	1.00000E-03	EDGAP (40)	1.00000E-03
EDGAP (41)	1.00000E-03	EDGAP (42)	1.00000E-03	EDGAP (43)	1.00000E-03	EDGAP (44)	1.00000E-03	EDGAP (45)	1.00000E-03
EDGAP (46)	1.00000E-03	EDGAP (47)	1.00000E-03	EDGAP (48)	1.00000E-03	EDGAP (49)	1.00000E-03	EDGAP (50)	1.00000E-03
EDGAP (51)	1.00000E-03	EDGAP (52)	1.00000E-03	EDGAP (53)	1.00000E-03	EDGAP (54)	1.00000E-03	EDGAP (55)	1.00000E-03
EDGAP (56)	1.00000E-03	EDGAP (57)	1.00000E-03	EDGAP (58)	1.00000E-03	EDGAP (59)	9.94881E-02	EDGAP (60)	1.00064E-01
EDGAP (61)	1.00000E-03	EDGAP (62)	1.00000E-03	EDGAP (63)	1.00000E-03	EDGAP (64)	1.00000E-03	EDGAP (65)	1.00000E-03
EDGAP (66)	1.00000E-03	EDGAP (67)	1.00000E-03	EDGAP (68)	9.96326E-02	EDGAP (69)	9.99536E-02	EDGAP (70)	1.00000E-03
EDGAP (71)	1.00000E-03	EDGAP (72)	1.00000E-03	EDGAP (73)	1.00000E-03	EDGAP (74)	1.00000E-03	EDGAP (75)	1.00000E-03
EDGAP (76)	1.00000E-03	EDGAP (77)	9.97298E-02	EDGAP (78)	9.98984E-02	EDGAP (79)	1.00000E-03	EDGAP (80)	1.00000E-03
EDGAP (81)	1.00000E-03	EDGAP (82)	1.00000E-03	EDGAP (83)	1.00000E-03	EDGAP (84)	1.00000E-03	EDGAP (85)	1.00000E-03
EDGAP (86)	9.98300E-02	EDGAP (87)	9.98818E-02	EDGAP (88)	9.95814E-02	EDGAP (89)	1.00000E-03	EDGAP (90)	1.00000E-03
EDGAP (91)	1.00000E-03	EDGAP (92)	1.00000E-03	EDGAP (93)	1.00000E-03	EDGAP (94)	9.92579E-02	EDGAP (95)	9.98812E-02
EDGAP (96)	9.98340E-02	EDGAP (97)	9.96730E-02	EDGAP (98)	1.00000E-03	EDGAP (99)	1.00000E-03	EDGAP (100)	1.00000E-03
EDGAP (101)	1.00000E-03	EDGAP (102)	1.00000E-03	EDGAP (103)	1.00000E-03	EDGAP (104)	1.00000E-03	EDGAP (105)	1.00000E-03
EDGAP (106)	9.97264E-02	EDGAP (107)	1.00000E-03	EDGAP (108)	1.00000E-03	EDGAP (109)	1.00000E-03	EDGAP (110)	1.00000E-03
EDGAP (111)	1.00000E-03	EDGAP (112)	1.00000E-03	EDGAP (113)	9.99305E-02	EDGAP (114)	9.96873E-02	EDGAP (115)	1.00000E-03
EDGAP (116)	1.00000E-03	EDGAP (117)	1.00000E-03	EDGAP (118)	1.00000E-03	EDGAP (119)	1.00000E-03	EDGAP (120)	1.00000E-03
EDGAP (121)	1.00000E-03	EDGAP (122)	9.99754E-02	EDGAP (123)	9.98348E-02	EDGAP (124)	9.95408E-02	EDGAP (125)	1.00000E-03
EDGAP (126)	1.00000E-03	EDGAP (127)	1.00000E-03	EDGAP (128)	1.00000E-03	EDGAP (129)	1.00000E-03	EDGAP (130)	1.00000E-03
EDGAP (131)	9.99065E-02	EDGAP (132)	9.98853E-02	EDGAP (133)	9.94523E-02	EDGAP (134)	1.00000E-03	EDGAP (135)	1.00000E-03
EDGAP (136)	1.00000E-03	EDGAP (137)	1.00000E-03	EDGAP (138)	1.00000E-03	EDGAP (139)	1.00000E-03	EDGAP (140)	9.98193E-02
EDGAP (141)	9.99060E-02	EDGAP (142)	9.93255E-02	EDGAP (143)	1.00000E-03	EDGAP (144)	1.00000E-03	EDGAP (145)	1.00000E-03
EDGAP (146)	1.00000E-03	EDGAP (147)	1.00000E-03	EDGAP (148)	1.00000E-03	EDGAP (149)	9.97722E-02	EDGAP (150)	9.99683E-02
EDGAP (151)	1.00000E-03	EDGAP (152)	1.00000E-03	EDGAP (153)	1.00000E-03	EDGAP (154)	1.00000E-03	EDGAP (155)	1.00000E-03
EDGAP (156)	1.00000E-03	EDGAP (157)	1.00000E-03	EDGAP (158)	9.97380E-02	EDGAP (159)	1.00000E-03	EDGAP (160)	1.00000E-03
EDGAP (161)	1.00000E-03	EDGAP (162)	1.00000E-03	EDGAP (163)	1.00000E-03	EDGAP (164)	1.00000E-03	EDGAP (165)	1.00000E-03
EDGAP (166)	1.00000E-03	EDGAP (167)	1.00000E-03	EDGAP (168)	1.00000E-03	EDGAP (169)	1.00000E-03	EDGAP (170)	1.00000E-03
EDGAP (171)	1.00000E-03	EDGAP (172)	1.00000E-03	EDGAP (173)	1.00000E-03	EDGAP (174)	1.00000E-03	EDGAP (175)	1.00000E-03
EDGAP (176)	1.00000E-03	EDGAP (177)	1.00000E-03	EDGAP (178)	1.00000E-03	EDGAP (179)	1.00000E-03	EDGAP (180)	1.00000E-03
EDGAP (181)	1.00000E-03	EDGAP (182)	1.00000E-03	EDGAP (183)	1.00000E-03	EDGAP (184)	1.00000E-03	EDGAP (185)	1.00000E-03
EDGAP (186)	1.00000E-03	EDGAP (187)	1.00000E-03	EDGAP (188)	1.00000E-03	EDGAP (189)	1.00000E-03	EDGAP (190)	1.00000E-03
EDGAP (191)	1.00000E-03	EDGAP (192)	1.00000E-03	EDGAP (193)	1.00000E-03	EDGAP (194)	1.00000E-03	EDGAP (195)	1.00000E-03
EDGAP (196)	1.00000E-03	EDGAP (197)	1.00000E-03	EDGAP (198)	1.00000E-03	EDGAP (199)	1.00000E-03	EDGAP (200)	1.00000E-03
EDGAP (201)	1.00000E-03	EDGAP (202)	1.00000E-03	EDGAP (203)	1.00000E-03	EDGAP (204)	1.00000E-03	EDGAP (205)	1.00000E-03
EDGAP (206)	1.00000E-03	EDGAP (207)	1.00000E-03	EDGAP (208)	1.00000E-03	EDGAP (209)	1.00000E-03	EDGAP (210)	1.00000E-03
EDGAP (211)	1.00000E-03	EDGAP (212)	1.00000E-03	EDGAP (213)	1.00000E-03	EDGAP (214)	1.00000E-03	EDGAP (215)	1.00000E-03
EDGAP (216)	1.00000E-03								

APPENDIX A, CONTINUED

SSHOCK

U = .2116F+04,  
 RHO = .1E-01,  
 XMU = .128E-04,  
 XSHOCK = .2902E+03,  
 XZERO = .28384E+03,  
 MS = .36E-01,  
 DELTAX = .1E+00,  
 DTILE = .147E+01,  
 FLNSIGN = .1E+01,

SEND  
 B(1-24), TOP OF GAP

3.73963311	3.76463875	3.79899422	3.83420721	3.86584139	3.89669428
3.93411633	3.97779004	4.05100748	4.19131744	4.44957763	4.78128213
4.78128734	4.44958204	4.19131943	4.05100853	3.97779042	3.93411658
3.89777810	3.86683621	3.83525887	3.79782461	3.76358465	3.73934650

G(1-24), BOTTOM OF GAP

3.76315110	3.78533574	3.81466761	3.84874537	3.88684009	3.93189097
4.05372077	4.12186446	4.25656631	4.39504862	4.49693957	4.62072920
4.54209849	4.40979090	4.25904499	4.13961473	4.06116254	4.02126720
3.95608785	3.89199254	3.83439378	3.80119420	3.77797455	3.75679989

ARRAY PSUR

3.75144864	3.78217724	3.81799893	3.85144838	3.88222398	3.91446633
3.78217539	3.81799710	3.85144672	3.88222239	3.91446461	3.95311980
3.81799527	3.85144506	3.88222080	3.91446290	3.95311742	4.00672179
3.85144339	3.88221922	3.91446118	3.95311503	4.00671852	4.10095937
3.88221763	3.91445947	3.95311265	4.00671525	4.10095065	4.29988419
3.91445775	3.95311027	4.00671198	4.10094193	4.29987044	4.60187724

ARRAY PTBL

4.49375718	4.57053951	4.63778196	4.69736158	4.75384345	4.81931356
4.54649757	4.63247456	4.70062859	4.76208033	4.82102465	4.88326212
4.60153316	4.68720678	4.75624859	4.82001131	4.88261904	4.95086033
4.66070120	4.74137614	4.81083980	4.87770792	4.94516205	5.02102113
4.72037471	4.79421891	4.86574390	4.93784914	5.01151309	5.09450125
4.78157233	4.84356956	4.92472869	5.00787704	5.09108966	5.17566815

TOTAL FORCES AND TOTAL MOMENTS

FXTOT	FYTOT	FZTOT	MXTOT	MYTOT	MZTOT
-.50228019E+01	-.27205698E+00	.30952190E+02	.82696153E+00	-.43210101E+01	-.45789313E-01

GAP FORCES

GFX CFY

GAP MOMENTS

GMX GMY GMZ

APPENDIX A, CONTINUED

-.53522744E+01 -.27205698E+00 .13314665E+00 -.38881844E+01 -.45789313E-01

SKIN FRICTION FORCES AND MOMENTS

SFX SMY  
.32947248E+00 .48432454E+00

NORMAL FORCE FM .30952180E+02

NORMAL FORCE MOMENTS

MX MY MZ  
.69381489E+00 -.91715027E+00 0.

++NOTE++ END OF EXECUTIONER PHASE.

APPENDIX A, CONTINUED

## APPENDIX B

Free Stream Velocity U:

$$U_{\infty} = XMACH \sqrt{kgRT} \quad (\text{ft/sec})$$

XMACH = mach number

$$k = \frac{C_p}{C_v} = 1.4$$

g = gravitational constant,  $32.2 \frac{\text{ft}}{\text{sec}^2}$

R = gas constant,  $53.3 \frac{\text{ft-lbf}}{\text{lbm-}^{\circ}\text{R}}$

T = temperature,  $^{\circ}\text{R}$

Free Stream Density RHO:

$$\rho_{\infty} = \frac{P}{RT} \left( \frac{\text{lbm}}{\text{ft}^3} \right)$$

P = free-stream pressure,  $\frac{\text{lbf}}{\text{ft}^2}$

R = gas constant,  $53.3 \frac{\text{ft-lbf}}{\text{lbm-}^{\circ}\text{R}}$

T = temperature,  $^{\circ}\text{R}$

Viscosity Coefficients XMU:

$$\mu_{\infty} = \text{function } (T, ^{\circ}\text{R}) \text{ [Sutherland eq., ref. 6]} \left( \frac{\text{lbm}}{\text{ft-sec}} \right)$$

## APPENDIX B, CONTINUED

Boundary Layer Thickness of Turbulent Flow over a Flat Plate:

$$\delta_0 = .37X_0 \left( \frac{\rho_\infty U_\infty X_0}{12\mu_\infty} \right)^{-1.5} \quad (\text{ft})$$

$X_0$  = distance of subject tile to edge of Shuttle, ft

$\rho_\infty$  = free stream density, lbm/ft<sup>3</sup>

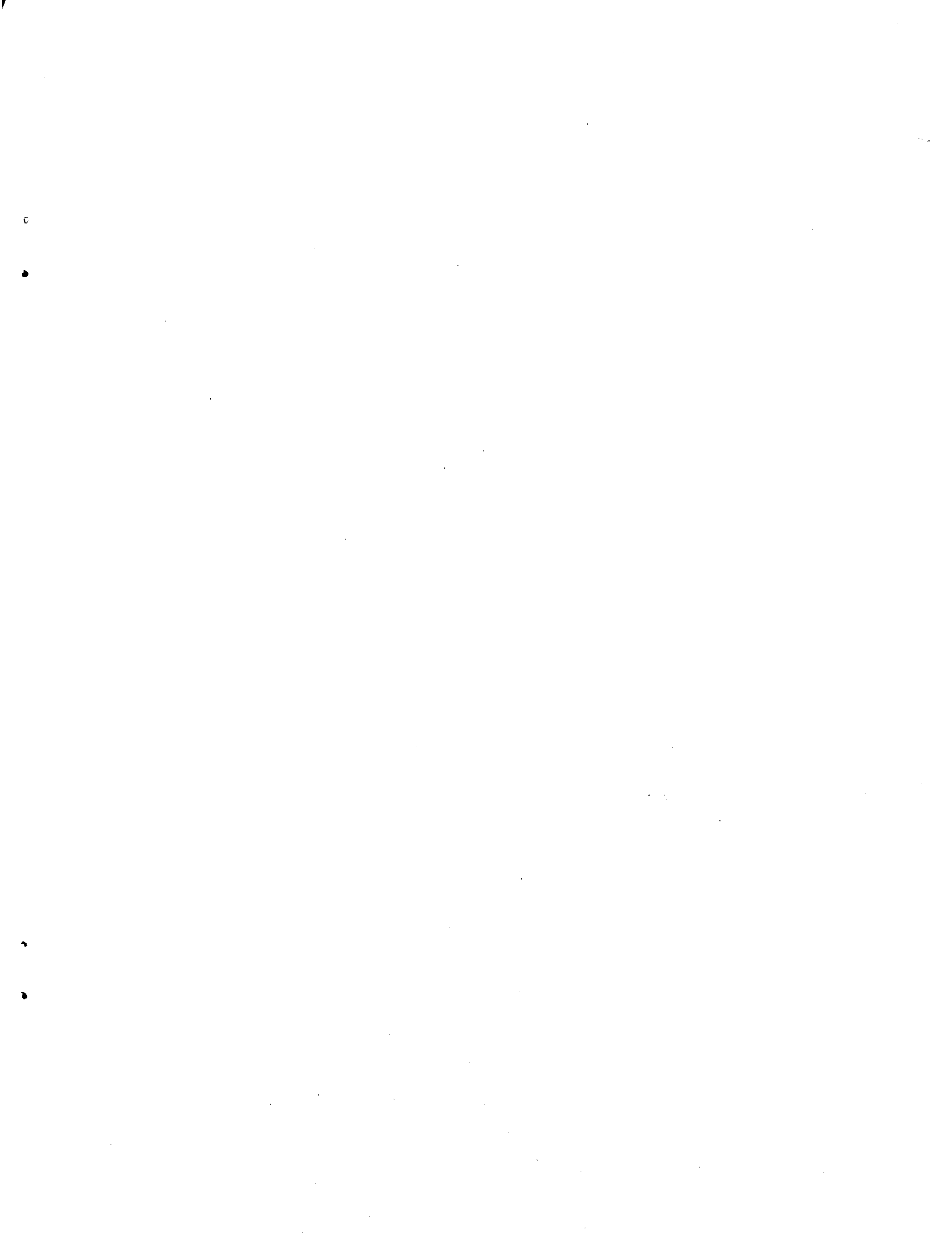
$U_\infty$  = free stream velocity, ft/sec

$\mu_\infty$  = viscosity coefficient, lbm/(ft-sec)

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16. Abstract  <p>This paper is a user's guide for the computer program that calculates the steady-state aerodynamic loads on the Shuttle thermal-protection tiles. The main element in the program is the MITAS-II, Martin Marietta Interactive Thermal Analysis System. MITAS-II is used to calculate the mass flow in a nine-tile model designed to simulate conditions during a Shuttle flight. The procedures used to execute the program using the MITAS-II software are described. A list of the necessary software and data files along with a brief description of their functions is given. The format of the data file containing the surface pressure data is specified. The interpolation techniques used to calculate the pressure profile over the tile matrix are briefly described. In addition, the output from a sample run is explained. The actual output and the procedure file used to execute the program at NASA Langley Research Center on a CDC CYBER-175 are provided in the appendices.</p>					
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