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PINSIM-MOD1: A Nuclear Fuel Pin/Electric Fuel Pin Simulator Transient Analysis Code

R. C. Hagar R. A. Hedrick

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PINSIM-MOD1 A NUCLEAR FUEL PIN/ELECTRIC FUEL PIN SIMULATOR TRANSIENT ANALYSIS CODE

R C Hagar R A Hedrick

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NOTICE This document contains information of a preliminary nature It is subject to revision or correction and therefore does not represent a final report

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LIST OF SYMBOLS

Symbol	Definition
A_i	Area of surface of volume V_i
A_j	Flow area, area of integration (ft^2)
$\overline{A}$	Tridiagonal coefficient matrix in the conduction equation system (forward-calculation)
$\overline{A}_B$	Coefficient matrix in the conduction equation system (back-calculation)
$A_{i\ j}$	The i,jth coefficient in $\overline{A}$
B_H	High-pass filter breakpoint
B_L	Low-pass filter breakpoint
$\overline{B}$	Column vector of knowns in conduction equation system (forward-calculation)
$\overline{B}_B$	Column vector of knowns in conduction equation system (back-calculation)
b_-	Elements of $\overline{B}$
C_p	Specific heat capacity (Btu/lb_m-°F)
C_{p_i}	Specific heat capacity of radial node i (Btu/lb_m-°F)
C_E	Fractional expansion of nuclear pin cladding region
C_i	Concentration of delayed neutron group i
c_p	Specific heat capacity at constant pressure (Btu/lb_m- R)
c_v	Specific heat capacity at constant volume (Btu/lb_m-°R)
C_1, C_2, C_3	Coefficients used in linear expansion gap model
D_H	Hydraulic diameter (in)
$D_{H,j}$	Hydraulic diameter (in) of coolant node j
E_A	Voltage across a representative pin in the actual power system (V)
E_I	Voltage across a representative pin in the ideal power system (V)

E_o	E_I during previous time step (V)
F_E	Fractional expansion of nuclear pin fuel region
F_i	Radial power fraction of node i
f_{form}	Form friction factor
f_{RE}	Flow friction factor
f_{Re}	Friction factor
g	Acceleration of gravity (32 2 ft/sec^2)
g_C	Conversion constant (32 2 lb_m-ft/sec^2-lb_f)
H	Enthalpy (Btu)
H_j	Specific enthalpy of water node j (Btu/lb_m)
h_c	Contact gap conductance
h_f	Surface convective heat transfer coefficient (Btu/sec-ft^2- F)
h_{fg}	Fluid heat of vaporization (Btu/lb_m)
h_{gap}	Effective gap conductance
h_o	Nominal open gap conductance
k_i	Thermal conductivity of the material of node i (Btu/sec-ft- F)
$k_{i\ i+1}$	Equivalent intranodal thermal conductivity (Btu/sec-ft- F)
k	Thermal conductivity (Btu/sec-ft- F)
L_j	Flow length of water node j (ft)
l	Axial length (ft)
M_j	Mass of water node j (lb_m)
NL	Number of axial levels on the specified 'feedback" nuclear pin
Nu	Nusselt number
n	Number of equations in the conduction equation system number of nodes (subvolumes) in a substrate
P	Pressure (psia)
P_{sat}	Saturation pressure (psia)

Pr	Prandtl number
Q_i	Total rate of energy transfer from a pin to coolant node i
Q	Heat generation rate (Btu/sec)
q''	Surface heat flux (Btu/sec-ft^2)
q'''	Volumetric heat generation rate (Btu/sec-ft^3)
q_{ij}	Heat flow between nodes (Btu/sec)
R	Total reactivity ($)
Re	Reynolds number
R_C	Radius to cladding center of mass (ft)
R_{CON}	Control reactivity
R_F	Outer radius of nuclear pin fuel region (ft)
R_F^i	Feedback reactivity from axial level i
R_{FT}	Reactivity as a function of average fuel temperature in the entire reactor core
R_{IN}	Input reactivity
R_ρ	Reactivity as a function of normalized water density for entire reactor ($)
r	Radial distance (ft)
r_i	Radius of node i [(Eq) A 10]
r_{in_i}	Inner radius of node i (ft)
r_I	Radius of inner surface of gap (ft)
r_O	Radius of outer surface of gap (ft)
r_{out_i}	Outer radius of node i (ft)
r_s	Radius of the surface of the pin (ft)
$\bar{r}_i$	Radius of center of mass of node i [(Eq) A 11]
s	Neutron source
T	Temperature (F)

T_b	Bulk coolant temperature (F)
T_i	Temperature of radial node i (F)
T_i^j	Temperature of radial node i (F) during iteration j
T_I	Temperature of node on inner surface of gap (F)
$T_{I,B}$	Bias temperature of node on inner surface of gap (F)
T_O	Temperature of node on outer surface of gap (F)
$T_{O\ B}$	Bias temperature of node on outer surface of gap (F)
T_{sat}	Saturation temperature (F)
T_W^i	Temperature of coolant node adjacent to axial level i
T_W	Temperature of adjacent coolant node
$\overline{T}$	Column vector of unknowns in the conduction equation system (forward-calculation)
$\overline{T}_B$	Column vector of unknowns in the conduction equation system (back-calculation)
$\overline{T}_C$	Mean temperature of nuclear pin cladding region
$\overline{T}_{C,S}$	Mean temperature of nuclear pin cladding region at steady state
$\overline{T}_F^i$	Mean nuclear pin fuel region temperature at axial level i
$\overline{T}_F$	Mean temperature of nuclear pin fuel region
$\overline{T}_{F,S}$	Mean temperature of nuclear pin fuel region at steady state
$\overline{T}_i$	Iteration-averaged temperature of node i
t	Time (sec)
Δt	Time period of interest (sec)
U	Internal energy (Btu)
U_J	Internal energy of water node j (Btu)
u	Specific internal energy (Btu/lb_m)
V_o	Rate of change of E_I during previous time step (V)
v	Specific volume (ft^3/lb_m)

W_{FT}^{i}	Weighting factor for fuel temperature (Doppler) feedback from axial level i
W_{j}	Mass flow rate of water node j (lb_m/sec)
W_{ρ}^{i}	Weighting factor for water density feedback from axial level i
Z	Axial distance (ft)
$z_{in\ j}$	Axial height of nodal inlet j (ft)
$z_{out\ j}$	Axial height of nodal outlet j (ft)
α_{FT}^{i}	Fuel temperature reactivity coefficient ($/ F)
α_{WT}^{i}	Coolant temperature reactivity coefficient ($/ F)
β	Effective delayed neutron fraction
β_{i}	Effective delayed neutron fraction for delayed neutron group i
ε	Pin surface roughness (in)
θ	Azimuthal angle (radians)
Λ	Neutron generation time (sec)
λ_{i}	Decay constant of delayed neutron group i
ξ	Damping ratio of the actual voltage control system
μ_{f}	Specific internal energy of fluid in two-phase mixture (Btu/lb_m)
μ_{g}	Specific internal energy of vapor in two-phase mixture (Btu/lb_m)
ρ	Density (lb_m/ft^3)
ρ_{f}	Density of fluid in two-phase mixture (lb_m/ft^3)
ρ_{g}	Density of vapor in two-phase mixture (lb_m/ft^3)
ρ_{i}	Density of pin radial node i (lb_m/ft^3), density of fluid in coolant node i (lb_m/ft^3)
ρ^{i}	Water density of coolant node adjacent to axial level i
τ_{C}	Thickness of nuclear pin cladding region (ft)
τ_{gap}	Gap thickness (ft)

$\tau_{gap\ B}$	Bias gap thickness (ft)
θ	Azimuthal distance (ft)
Φ	Neutron flux $(cm^2\text{-}sec)^{-1}$
ω_n	Natural angular frequency of the actual voltage control system

PINSIM-MOD1 A NUCLEAR FUEL PIN/ELECTRIC FUEL PIN SIMULATOR TRANSIENT ANALYSIS CODE

R C Hagar R A Hedrick

ABSTRACT

The PINSIM-MOD1 digital computer code has been developed for (1) simulating the thermal response of both nuclear fuel pins and electrically heated fuel pin simulators to reactor accident environments, (2) determining transient simulator power input and (3) analyzing the results of simulator experiments The code is capable of simulating the thermal response of up to four pins and their associated coolant channels

Three interrelated power systems are modeled in the code which is capable of determining the power for these systems by interpolating user-supplied tables, by solving the point reactor kiretics equations with or without reactivity feedback by back-calculation from desired pin surface conditions, or by determining the second-order transfer function response to a calculated demand

The one-dimensional time-dependent conservation of energy mass, and momentum equations are solved for the coolant channels by either an explicit or an implicit technique Transient pin temperature distributions are determined by a one-dimensional iterative implicit technique The code contains an equation-of-state formulation for water, heat transfer and friction factor correlations, and temperature-dependent thermophysical property data for several materials

PINSIM-MOD1 was developed and is operational on an IBM 360/195 computer system

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1 INTRODUCTION

An understanding of the severity of the thermal-hydraulic phenomena associated with hypothetical pressurized-water-reactor (PWR) accidents such as the loss-of-coolant accident (LOCA) is essential for an assessment of reactor safety Experimental investigations of these phenomena often require the use of electrically heated pins to simulate nuclear fuel pins during the accident sequence The PINSIM-MOD1 computer code has been developed for use in (1) designing such electrical simulators, (2) determining transient simulator power input, (3) predicting and

analyzing the transient thermal responses of different simulator designs and (4) evaluating the results of simulator experiments

In analyzing simulator experiments, it is often necessary to determine

1 the thermal response of a nuclear fuel pin to a specified LOCA environment
2 the electric power that must be supplied to a specified electric pin simulator to force its surface to respond as a nuclear fuel pin,
3 the thermal response of the electric pin to a specified LOCA environment when used with an actual electric power system to simulate the response of the nuclear pin

In addition, evaluating whether a specified simulator experiment has simulated or will simulate a conceivable nuclear pin transient is often desirable

PINSIM-MOD1 addresses these problems by modeling three interrelated power systems and up to four nuclear and/or electric pins and their associated coolant channels The power systems are referred to as nuclear ideal and actual The code allows the power for any or all of these systems to be entered as a table(s) in the input data The nuclear system power may also be determined from the solution of the point reactor kinetics equations or be back-calculated from the desired thermal response of a specified nuclear pin The ideal system power may also be back-calculated from the desired response of a specified electric pin The pin surface conditions (surface heat flux surface temperature etc) for the power back-calculation in either the nuclear or the ideal system may each be either tabulated in the input data or set equal to the calculated surface conditions of another pin in the problem being solved The actual system power may be set equal to either the nuclear or the ideal system powers, or it may be determined as the response of a second-order transfer function to the changes in the ideal system power

The code uses either an explicit or a fully implicit method to solve the coolant channel conservation equations Transient temperature distributions in the pins are determined by an implicit one-dimensional

iterative scheme which applies the resulting surface heat flux to the fluid energy equations

PINSIM-MOD1 is intended for use as a core-analysis code as such it requires coolant boundary conditions (at the inlet and outlet of the core) to be supplied in the input data deck

This document will present, in turn discussions of pin modeling techniques and pin heat conduction mathematical models system power calculations, and mathematical models and correlations used in coolant channel calculations These sections are followed by a summary of structure and solution logic of PINSIM-MOD1 and a discussion of several sample problems The appendices include a description of PINSIM's input data deck, a listing of several major subroutines, partial output listings of the sample problems, and other supplemental information

2 MATHEMATICAL MODELS

2 1 Pin Heat Conduction

2 1 1 Pin model

PINSIM-MOD1 allows up to four pins to be modeled simultaneously Each pin may be either nuclear or electric and each may or may not be associated with a coolant channel Each pin is modeled as a set of axial levels, each of which is modeled as a series of concentric regions Up to 20 axial levels are allowed per pin, and each level may consist of as many as ten regions The user defines the axial length and axial power fractions for each level and the region dimensions radial power fractions and materials for each region The code assumes a gap when the user supplies adjacent region boundaries that are not coincidental

Radial nodes are distributed by the code in each radial region The user specifies the number of nodes to be distributed in each region up to 20 radial nodes are allowed on each level The nodes are then distributed so that all nodes within a region have the same mass

2 1 2 Conduction equation

PINSIM-MOD1 solves the conduction equation in cylindrical coordinates azimuthal and axial heat conduction are assumed to be negligible

The general form of the conduction equation is

$$\overline{\nabla} \times k\overline{\nabla}T + q''' = \rho C_p \frac{\partial T}{\partial t} \qquad (2\ 1)$$

Ignoring azimuthal and axial conduction, this may be written in cylindrical coordinates as

$$\frac{1}{r}\frac{\partial}{\partial r}\left(k_r r \frac{\partial T_r}{\partial r}\right) + q'''(r) = \rho(r)\ C_p(r)\ \frac{\partial T_r}{\partial t} \qquad (2\ 2)$$

The difference form of this equation, derived in Appendix A, is

$$\left[\frac{2K_{i-1,i}}{\ln(\bar{r}_i/\bar{r}_{i-1})}\right] T_{i-1}(t) + \left[-\frac{2K_{i-1,i}}{\ln(\bar{r}_i/\bar{r}_{i-1})} - \frac{\rho_i C_{p_i}(r_i^2 - r_{i-1}^2)}{\Delta t}\right.$$

$$\left. - \frac{2K_{i,i+1}}{\ln(r_{i+1}/r_i)}\right] T_i(t) + \left[\frac{2K_{i,i+1}}{\ln(\bar{r}_{i+1}/\bar{r}_i)}\right] T_{i+1}(t) = -F_i Q(r_i^2 - r_{i-1}^2)$$

$$- \left[\frac{\rho_i C_{p_i}(r_i^2 - r_{i-1}^2)}{\Delta t}\right] T_i(t - \Delta t) \qquad (2\ 3)$$

Equation (2 3) may be conveniently written in matrix form as

$$\bar{A}\,\bar{T} = \bar{B}\ , \qquad (2\ 4)$$

where $\bar{A}$ is the tridiagonal coefficient matrix of the system

$$\bar{A} = \begin{bmatrix} a_{1\,1} & a_{1\,2} & 0 & 0 & 0 & & & & \\ a_{2\,1} & a_{2\,2} & a_{2\,3} & 0 & 0 & & & & \\ 0 & a_{3\,2} & a_{3\,3} & a_{3\,4} & 0 & & & & \\ 0 & 0 & a_{4\,3} & a_{4\,4} & a_{4\,5} & & & & \\ & & & & & & & & \\ & & & & & & & & \\ 0 & 0 & 0 & & & a_{n-2\,n-3} & a_{n-2\,n-2} & a_{n-2\,n-1} & 0 \\ 0 & 0 & 0 & & & & a_{n-1\,n-2} & a_{n-1\,n-1} & a_{n-1\,n} \\ 0 & 0 & 0 & & & & 0 & a_{n\,n-1} & a_{n\,n} \end{bmatrix}$$

$$a_{i,i+1} = \frac{2K_{i,i+1}}{\ln(\bar{r}_{i+1}/\bar{r}_i)}\ ,$$

$$a_{i,i} = \frac{2K_{i,i+1}}{\ln(\bar{r}_{i+1}/\bar{r}_i)} - \frac{\rho_i C_{p_i}(r_i^2 - r_{i-1}^2)}{\Delta t} - \frac{2K_{i-1,i}}{\ln(\bar{r}_i/\bar{r}_{i-1})}$$

$$a_{i\ i-1} = \frac{2K_{i-1,i}}{\ln(\bar{r}_i/\bar{r}_{i-1})}$$

$$a_{n,n} = \frac{-2K_{n-1,n}}{\ln(\bar{r}_n/\bar{r}_{n-1})} - \frac{\rho_n C p_n (r_n^2 - r_{n-1}^2)}{\Delta t}$$

$$- \{2/[1/r_n h_f(t)] + [\ln(r_n/\bar{r}_n)/n]\}$$

$\bar{T}$ is a column vector of unknowns (nodal temperatures at time t)

$$\bar{T} = \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ \\ \\ T_{n-2} \\ T_{n-1} \\ T_n \end{bmatrix}$$

$\bar{B}$ represents a column vector of knowns

$$\bar{B} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ \\ \\ b_{n-2} \\ b_{n-1} \\ b_n \end{bmatrix},$$

where, for $i < n$

$$b_i = -F_i Q(r_i^2 - r_{i-1}^2) - \left[\frac{\rho_i C_{p_i}(r_i^2 - r_{i-1}^2)}{\Delta t} \right] T_i(t - \Delta t)$$

and

$$b_n = -F_n Q(r_n^2 - r_{n-1}^2) - \{2/[1/r_n h_f(t)] + [\ln(r_n/\bar{r}_n)/K_n]\}\ T_b(t - \Delta t)$$
$$- [\rho_n C_{p_n}(r_n^2 - r_{n-1}^2)/\Delta t]\ T_n(t - \Delta t)$$

2 1 3 Pin material properties

PINSIM-MOD1 allows up to ten materials to be modeled in each pin The materials used in a PINSIM problem may be either materials known to the code or those defined by the user Materials known to PINSIM-MOD1 include uranium dioxide, Zircaloy, boron nitride, magnesium oxide, cupro-nickel, Inconel, and SS 316 Thermal properties of uranium dioxide and Zircaloy are determined in PINSIM-MOD1 by the appropriate subroutines in the MATPRO-09 (Ref 1) material properties package Many of the MATPRO-09 subroutines have been incorporated into PINSIM-MOD1 Subroutines were developed for PINSIM-MOD1 which determine the thermal properties of the other materials listed previously These subroutines incorporate polynomial expressions for thermal conductivity, density, and specific heat capacities The coefficients of the polynomials are based on data gathered and processed by the Oak Ridge National Laboratory (ORNL) Blowdown Heat Transfer (BDHT) Program[2] and are those determined by the ORTCAL[3] thermocouple calibration code to be representative of a typical electric pin used in bundle 1 of the BDHT experimental facility

PINSIM-MOD1 also allows the user to supply data from which the thermal properties of each material may be determined These data may be in the form of temperature-dependent property tables, coefficients of polynomials in temperature, or constants

2 1 4 Gas heat transfer

PINSIM-MOD1 allows the user four options for determining the equivalent conductivity of gaps or material interfaces in the pin model For

all four options the assumption is made that unless the gap is explicitly modeled the temperature of the gap gas is the average of the temperature of the adjacent nodes The user may (1) supply a table of gap conductivity vs temperature, (2) use the gap model developed by MacDonald and Broughton for the MATPRO subcode GAPHTR (Ref 4) (3) use a modification of the Ross-Stoute gap model (Ref 5) or (4) supply the appropriate coefficients to use a linear expansion gap model The latter three options will be discussed following a discussion of gap-modeling techniques

Gas gaps in a PINSIM-MOD1 problem may be modeled either explicitly or by omission That is, the user can define a gas gap region by identifying the region, assigning radial boundaries for the region and assigning appropriate material properties, or he can define implicitly a gap by assigning noncoincidental region boundaries to adjacent nongas regions

The MacDonald-Broughton gap model calculates the thermal gap conductance between nuclear fuel and the nuclear fuel pin cladding as a function of nuclear fuel burnup The model encompasses fuel-clad geometries ranging from an open gap with partial fuel-to-cladding contact to a closed gap with hard contact Fuel pellet cracking is considered implicitly in the model This model calculates the effective fuel-to-cladding gap conductance as

$$h_{gap} = (1 - F)h_o + Fh_c \qquad (2\ 5)$$

Relationships for h_o, h_c, and F are discussed in Ref 4

The modified Ross-Stoute gap model used in PINSIM-MOD1 was developed at the Idaho National Engineering Laboratory (INEL) for use in the FRAP-T4 (Ref 6) nuclear fuel pin analysis code The subroutine in PINSIM-MOD1 which incorporates this model is essentially identical to the FRAP-T4 subroutine GAPHTC, the only changes made to this subroutine were those necessary to make it compatible with IBM computing machinery This gap model accounts for heat transferred across the gap by conduction through the gas, by radiation from the fuel to the cladding, and when the gap is closed, by contact conductance The various material properties used by this model (i e fuel and cladding emissivities gas

thermal conductivity, etc) are determined in PINSIM-MOD1 by the appropriate MATPRO-09 (Ref 1) subroutines

The linear expansion gap model used in PINSIM-MOD1 is the gap model used in the ORTCAL[3] calibration codes and ORINC[7] inverse code These codes developed for use in the analysis of data gathered by the BDHT program simulator experiments, model the gap as

$$\tau_{gap}(T) = \tau_{gap,B} + \Delta\tau_{gap}(T) \tag{2 6}$$

where

$$\Delta\tau_{gap}(T) = r_I \{\exp [C_1(T_I - T_{I,B}) + C_2(T_I^2 - T_{I,B}^2) + C_3(T_I^3 - T_{I,B}^3)] - 1\} + r_O \{\exp [C_1(T_O - T_{O,B}) + C_2(T_O^2 - T_{O,B}^2) + C_3(T_O^3 - T_{O,B}^3)] - 1\}$$

PINSIM-MOD1 requires the user to supply the expansion coefficients C_1 C_2, and C_3 the bias temperatures $T_{I,B}$ and $T_{O,B}$ and the bias gap thickness $\tau_{gap,B}$

2 1 5 Fuel pin deformation

The nuclear fuel pin model in PINSIM-MOD1 is allowed to deform radially by the action of thermal expansion and contraction Axial expansion is not considered Radial displacements of the fuel and the clad are computed with simple one-control volume models, and the thermal expansion of both regions is based on the average temperatures of the regions The user-supplied dimensions of the fuel and the clad regions are assumed to be the dimensions of the pin at steady-state temperatures The outer radius of the fuel region is computed as

$$R_F(\overline{T}_F) = R_F(\overline{T}_{F,S}) \{1 + [F_E(\overline{T}_F) - F_E(\overline{T}_{F,S})]\} \tag{2 7}$$

PINSIM-MOD1 uses the MATPRO routine FTHEXP[8] to evaluate F_E The radius to the clad center of mass is computed as

$$R_C(\overline{T}_C) = R_C(\overline{T}_{C,S}) \{1 + [C_E(\overline{T}) - C_E(\overline{T}_{C,S})]\} \tag{2 8}$$

PINSIM-MOD1 uses the MATPRO routine CDTHEX[9] to evalute C_E The clad is thinned by assuming a constant clad volume The clad thickness is given by

$$\tau_C(T) = \{\tau_C(\overline{T}_{C\ S})/[R_C(T)/R_C(\overline{T}_{C\ S})]\} \qquad (2\ 9)$$

The inner and outer radii of the clad are determined by subtracting and adding respectively, half the clad thickness to the average clad radius

2 2 Power Systems

Power supplied to the individual pin models in PINSIM-MOD1 may be taken from one of three power systems these are referred to as the nuclear, ideal electric, and actual electric systems Transient power for each of these systems may be supplied to the code as tabular input data In addition, the nuclear system power may be determined by solving the point reactor kinetics equations The nuclear and ideal electric system powers may each be back-calculated from desired surface conditions and the actual electric system power may be either set equal to one of the other system powers or determined as the response of a second-order transfer function to changes in ideal power Each of these options will be discussed in turn

2 2 1 Point reactor kinetics

The normalized nuclear system power may be calculated from the reactor kinetics equations the magnitude of the steady-state nuclear power is supplied by the user The kinetics equations are solved by a code which uses a method identical to that employed in the RELAP4/MOD5 (Ref 10) code, several subroutines from RELAP have been integrated with only minor changes into PINSIM-MOD1 The equations thus solved are

$$\frac{d\phi}{dt} = \frac{\beta}{\Lambda}(R-1)\,\phi + \sum_{i=1}^{6} \lambda_i C_i + s\ , \qquad (2\ 10)$$

$$\frac{dC_i}{dt} + \lambda_i C_i = \frac{\beta_i}{\Lambda}\,\phi \text{ for } i=1,\ 2\quad 6 \qquad (2\ 11)$$

$$\beta = \sum_{i=1}^{6} \beta_i \qquad (2\ 12)$$

The delayed neutron constants used by this code are given in Table 1

Table 1 Delayed neutron constants

Group	β_i/β	λ_i (sec^{-1})
1	0 038	0 0127
2	0 213	0 0317
3	0 198	0 115
4	0 407	0 311
5	0 128	1 40
6	0 026	3 87

The driving function for the reactor kinetics equations is reactivity PINSIM-MOD1 allows reactivity to be tabulated (vs time) in the input deck or determined by adding the contributions of feedback from a specified pin-channel model and tabulated control reactivity Contributions to the feedback reactivity include effects, i e , fuel temperature, water density, and water temperature from each axial level of the specified nuclear pin When the feedback option is selected, the total reactivity is calculated by

$$R(t) = R_{IN} + [R_{CON}(t) - R_{CON}(0)] + \left[\sum_{i=1}^{NL} R_F^i(t) - \sum_{i=1}^{NL} R_F^i(0) \right]$$

The feedback reactivity from pin level i is calculated by

$$R_F^i(t) = W_\rho^i R_\rho \left[\frac{\rho^i(t)}{\rho_i(0)} \right] + W_{FT}^i R_{FT} \left[\overline{T}_F^i(t) \right] + \alpha_{FT}^i \overline{T}_F^i(t) + \alpha_{WT}^i\ T_W^i(t)$$

2 2 2 <u>Back-calculation</u>

A unique feature of PINSIM-MOD1 is its ability to determine the nuclear system power from boundary conditions applied to the surface of

a specified nuclear pin model, and the ideal system power from boundary conditions applied to the surface of a specified electric pin model The back-calculation is performed on only one level of the specified pin model Boundary conditions may be applied either as surface heat flux and surface temperature or as surface heat flux heat transfer coefficient, and bulk coolant temperature

The back-calculational method is iterative and is based on the assumptions that (1) both the radial and axial power distributions are fixed and known and (2) the system power is a known multiple of the pin power The method is described briefly in the following discussion and is illustrated in Fig 1

The matrix form of the conduction equation is given in Eq (2 3) this equation may be written for a single node as

$$a_{i,i-1}T_{i-1} + a_{i\ i}T_i + a_{i\ i+1}T_{i+1} + F_iQ = b_i \qquad (2\ 13)$$

Assuming that node k is the outermost heat-generating node, F_i for all nodes $i > k$ will be zero If the outermost node is node m Eq (2 13) for node m reduces to

$$a_{m,m-1}T_{m-1} + a_{m\ m}T_m = b_m \qquad (2\ 14)$$

Heat transferred between the outermost node and the fluid may be expressed as

$$T_m = T_W + q''' \left[\frac{1}{r_s h_f} + \frac{\ln(r_s/r_m)}{k_m} \right] \qquad (2\ 15)$$

The temperature of the outermost node on the specified level of the pin is determined by Eq (2 15), and the temperature of the next inner node is determined by solving Eq (2 14) for T_{m-1} Equation (2 13) is then solved for each successive inner node (T_{i-1} beginning with $i = m - 1$) until a heat-generating node ($F_i \neq 0$) is reached A matrix system is then constructed which has the form

$$\overline{A}_B\ \overline{T}_B = \overline{B}_B$$

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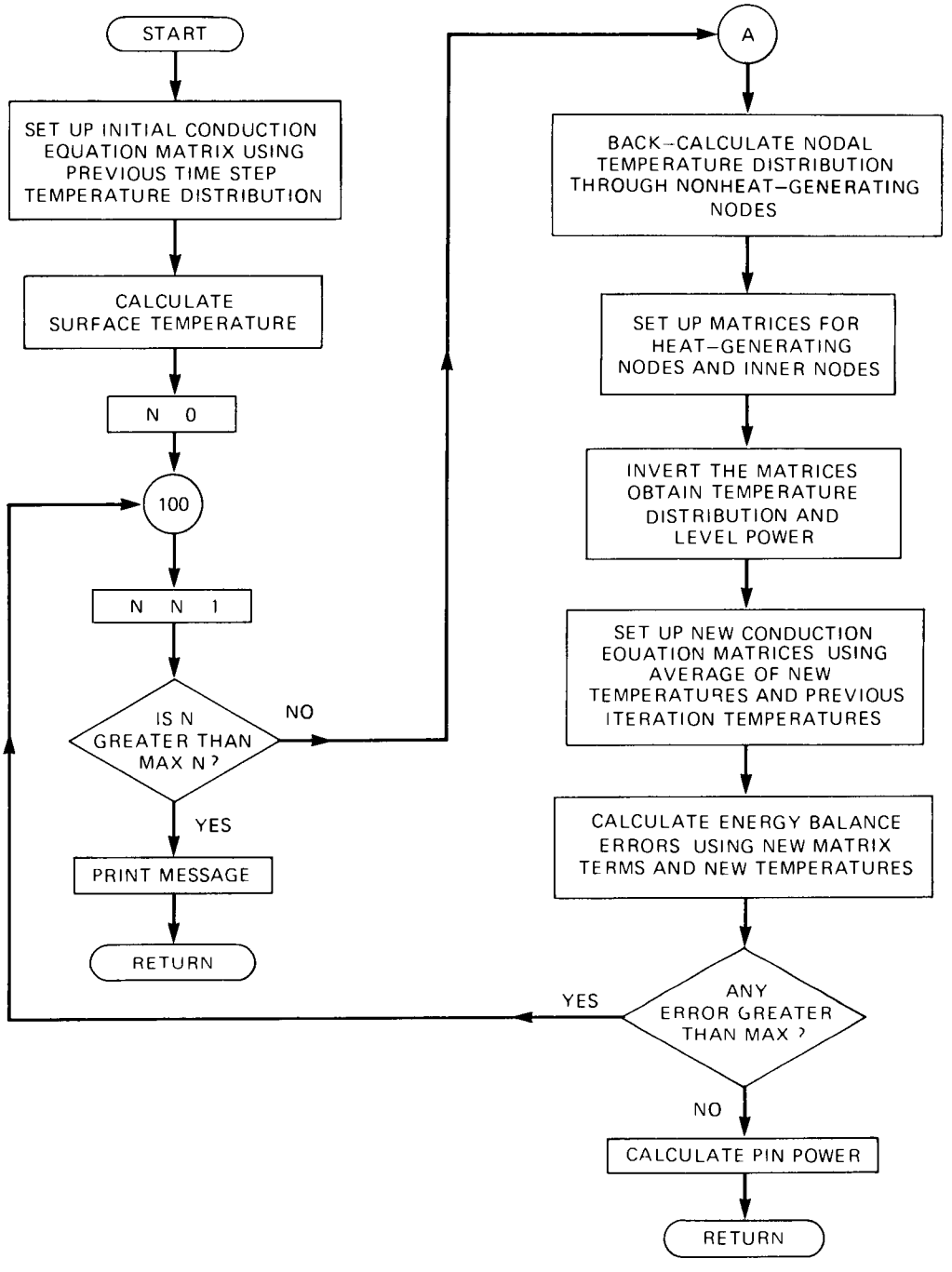

Fig 1 Simplified back-calculational method

where

$$\overline{A}_B = \begin{bmatrix} a_{1\ 1} & a_{1,2} & 0 & 0 & & F_1 \\ a_{2\ 1} & a_{2,2} & a_{2,3} & 0 & & F_2 \\ 0 & a_{3,2} & a_{3,3} & a_{3,4} & & F_3 \\ & & & & & \\ & & & & & \\ 0 & 0 & & a_{k-1,k-2} & a_{k-1\ k-1} & F_{k-1} \\ & & & 0 & a_{k,k-1} & F_k \end{bmatrix},$$

$$\overline{T}_B = \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ \\ T_{k-2} \\ T_{k-1} \\ Q \end{bmatrix}, \qquad (2\ 16)$$

and

$$\overline{B}_B = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ \\ \\ b_{k-1} - a_{k-1,k}\ T_k \\ b_k - a_{k,k}T_k - a_{k,k+1}T_{k+1} \end{bmatrix}$$

The solution is determined by inverting the matrix The conduction equation matrix is then reformulated, using iteration-averaged nodal temperatures, defined as

$$\overline{T}_i = \frac{T_i^j + T_i^{j-1}}{2} \qquad (2\ 17)$$

where j is the iteration counter

An energy-balance error is calculated for each node as

$$\text{Error}_i = a_{i,i-1}\overline{T}_{i-1} + a_{i\ i}\overline{T}_i + a_{i,i+1}\overline{T}_{i+1} + F_i Q - b_i \qquad (2\ 18)$$

If any Error_i is greater than a user-supplied value, the iteration is repeated, beginning with a recalculation of the temperature of the outer node If all errors are smaller than the user-supplied limit the pin power is determined by dividing Q (determined by inverting the matrix) by the level's axial power fraction, system power is then simply the pin power multiplied by a user-supplied factor

2 2 3 Transfer-function system response

This option is included as a means of determining the actual system power so that an estimate may be made of how closely a specified electrical heater power control system can follow the back-calculated ideal power demand The code converts the power of a specified pin in the ideal system to voltage using the ideal pin heater element resistance and determines the actual voltage response to the ideal voltage demand The mean actual voltage during the time step is converted to the power of a specified pin in the actual system using actual pin heater element resistances The actual system power is then determined by multiplying the power of the specified actual pin by a user-supplied factor

PINSIM-MOD1 models the power control system as a linear second-order differential equation Thus the system response equation is

$$\frac{1}{\omega_n^2}\frac{d^2E_A}{dt^2} + \frac{2\xi}{\omega_n}\frac{dE_A}{dt} + E_A = E_I \qquad (2\ 19)$$

PINSIM-MOD1 uses one of the three analytical solutions to this equation to determine E_A For $\xi < 1$, the solution is

$$E_A = E_I + \exp(-\xi\omega_n t) \left[(E_o - E_I) \cos(\omega t) + \frac{\xi\omega_n (E_o - E_I) + V_o}{\omega} \sin(\omega t) \right] \quad (2\ 20)$$

where

$$V_o = \exp(-\xi\omega_n t) \left\{ [\xi\omega_n (E_o - E_I) + V_o] \cos(\omega t) - \omega(E_o - E_I) \sin(\omega t) - \xi\omega_n \left[(E_o - E_I) \cos(\omega t) + \frac{\xi\omega_n (E_o - E_I) + V_o}{\omega} \sin(\omega t) \right] \right\} \quad (2\ 21)$$

For $\xi = 1$, the solution is

$$E_A = E_I + \exp(-\xi\omega_n t) \{ (E_o - E_I) + [\omega_n (E_o - E_I) + V_o]\ t \} , \quad (2\ 22)$$

where

$$V_o = \exp(-\xi\omega_n t) \left(\omega_n (E_o - E_I) + V_o - \xi\omega_n \{ (E_o - E_I) + t\ [\omega_n (E_o - E_I) + V_o] \} \right) \quad (2\ 23)$$

For $\xi > 1$, the solution is

$$E_A = E_I + \exp(-\xi\omega_n t) \left[(E_o - E_I) \cos h(\omega t) + \frac{\xi\omega_n (E_o - E_I) + V_o}{\omega} \sin h(\omega t) \right] \quad (2\ 24)$$

where

$$V_o = \exp(-\xi\omega_n t)\left\{\left[\xi\omega_n(E_o - E_I) + V_o\right]\cos h(\omega t) + \omega(E_o - E_I)\sin h\,(\omega t) - \xi\omega_n\left[(E_o - E_I)\cos h(\omega t) + \frac{\xi\omega_n(E_o - E_I) + V_o}{\omega}\sin h(\omega t)\right]\right\} \quad (2\ 25)$$

In the equations above,

$$\omega = \omega_n(|1 - \xi^2|)^2 \quad (2\ 26)$$

2 2 4 <u>Signal filtering</u>

PINSIM-MOD1 includes a digital signal filter which may be used, at the user's option to "smooth" any or all of the following parameters

1 surface heat flux boundary condition for power back-calculation for the nuclear and/or the ideal system
2 surface temperature boundary condition for power back-calculation for either the nuclear and/or the ideal system,
3 back-calculated power in the nuclear and/or the ideal system
4 power in the actual system when the actual power is equated to either the nuclear or the ideal system power

In all cases, the code stores both the filtered and the unfiltered parameters

The user is allowed the option of processing the parameters using either a low-pass high-pass, notch or maximum-minimum filter (The notch filter is a combination of the low- and high-pass filters) The equation used by PINSIM-MOD1 for low-pass filtering of any parameter Z is

$$Z_{FILT}(t) = \frac{Z_{FILT}(t - \Delta t) + B_L \Delta t Z_{UNFILT}(t)}{1 + B_L \Delta t}$$

The equation used for high-pass filtering is

$$Z_{FILT}(t) = \frac{Z_{FILT}(t - \Delta t) - [Z_{UNFILT}(t - \Delta t) - Z_{UNFILT}(t)]}{1 + B_H \Delta t},$$

where the subscripts FILT and UNFILT are filtered and unfiltered respectively The user supplies the low- and high-pass breakpoints (B_L and B_H respectively) The maximum-minimum filter allows the user to limit the allowed range of the selected parameters

2 3 Channel Conservation Equations

PINSIM-MOD1 solves the conservation-of-energy -mass and -momentum equations for water-filled coolant channels The method of solution is similar to that used in the BLAST code [11] As many as 50 water nodes may be used to represent up to 4 coolant channels

The conservation equations for water node j are as follows

Conservation of energy

$$\frac{dU_j}{dt} = H_j W_{j-1} - H_{j+1} W_j + Q_j \tag{2 27}$$

Conservation of mass

$$\frac{dM_j}{dt} = W_{j-1} - W_j \tag{2 28}$$

Conservation of momentum

$$L_j \frac{dW_j}{dt} = 144 g_c A_j \ (P_j - P_{j+1}) - \rho_j g A_j \ (z_{out,j} - z_{in\ j})$$

$$+ \left[\frac{(W_{j-1})^2}{\rho_{j-1} A_{j-1}} - \frac{(W_j)^2}{\rho_j A_j} \right] - (f_{Re} + f_{form}) \left(\frac{12 L_j}{D_{H,j}} \frac{|W_j| W_j}{2 \rho_j A_j} \right) \tag{2 29}$$

Note that changes of kinetic and potential energy have been neglected in the conservation-of-energy equation

The water node pressure is considered to be a function of specific internal energy and density, that is,

$$P_j = P(u_j, \rho_j)$$

2 4 Heat Transfer Correlations, Friction Factor Correlations, and Tube Properties

In order to solve the conservation equations, values for convective heat transfer coefficients must be obtained The various correlations used to determine the surface heat transfer coefficient are listed in Table 2 The correlations for departure from nucleate boiling (DNB) flux (also given in Table 2) are used as trips to determine when two-phase correlations beyond DNB rather than the nucleate boiling correlation, should be applied Trips from other regimes are based on quality (e g , from film boiling to superheat forced convection) or on a comparison of pin surface to bulk fluid temperature drop as calculated by correlations for adjacent regimes For example, if a Dittus-Boelter correlation in the subcooled forced convection regime results in a tube wall-to-bulk temperature drop greater than the Thom nucleate boiling correlation, but the DNB flux has not been exceeded, the nucleate boiling heat transfer correlation is used

Table 2 Heat transfer and DNB flux correlations[a]

Regime	Correlation
Subcooled forced convection	Dittus-Boelter
Two-phase	
Nucleate boiling (subcooled and saturated)	Thom[12]
Transition boiling	McDonough Milich and King[13]
Film boiling	Dougall Rohsenow [14] Groeneveld [15] or Morgan[16] (for low flow)
Superheat forced convection	Dittus-Boelter
DNB flux	W-3,[17] Jansen, Levy,[18] B and W [19] or Barnett[20]

[a]These correlations were chosen on the basis that they are acceptable for emergency core cooling system evaluations for light-water-cooled reactors (10 CFR 50, Appendix K)

Friction factors are obtained from fits to the Fanning friction factor curves In the two-phase regions, Martinelli-Nelson two-phase multipliers or Thom modified Martinelli-Nelson two-phase multipliers are applied, depending on the pressure

2 5 Equation-of-State and Thermodynamic Transport Properties

The water equation-of-state is determined by data from the 1967 American Society of Mechanical Engineers (ASME) Steam Tables [21] which are stored in PINSIM-MOD1 in tabular form For a series of values of saturation pressure the tables contain the corresponding values of ρ_f ρ_g, u_f u_g, and T_{SAT} In the subcooled region, the code also stores

$$\left.\frac{\partial u}{\partial P}\right|_\rho , \left.\frac{\partial H}{\partial P}\right|_\rho \quad \left.\frac{\partial T}{\partial P}\right|_\rho$$

and, in the superheat region, the code stores

$$\left.\frac{\partial P}{\partial u}\right|_\rho , \left.\frac{\partial H}{\partial P}\right|_\rho \quad \left.\frac{\partial T}{\partial P}\right|_\rho$$

This information was obtained from Refs 22 and 23 The thermodynamic transport properties of viscosity, conductivity, specific heat and Prandtl number are determined from fits to the 1967 ASME steam tables

The code applies interpolation and iteration techniques to calculate pressure, temperature and the required derivatives using the above information from values of specific internal energy u and density ρ known at time t In the single-phase regions, the techniques are basically those presented in Ref 23

The first step in the pressure search is to compare the density ρ to the critical density and the specific internal energy u to the saturated specific internal energy u_{SAT} at the known density ρ The value of u_{SAT} is calculated by interpolation on density From this the state of the water (liquid, two-phase, or vapor) can be determined

If the water is in the liquid phase, the saturation pressure P_{SAT} and the derivative $\partial P/\partial U|_\rho$ at the known density are determined by linear interpolation on density from data stored in the tables Then the pressure is found from

$$P = P_{SAT} + \left.\frac{\partial P}{\partial u}\right|_\rho (u - u_{SAT})$$

The enthalpy follows because $h = u + P/\rho$ Nodal temperatures are next determined using interpolated values from the tables of T_{SAT} and $\partial T/\partial P|_\rho$ at the known density

$$T = T_{SAT} + \left.\frac{\partial T}{\partial P}\right|_\rho (P - P_{SAT})$$

In the two-phase region, a different search technique is used to find temperature, pressure, and the required derivatives from known internal energy and density Iterating on nodal pressure, two values of pressure, P_α and P_β are found such that the corresponding specific volumes, v_α and v_β, bracket the known specific volume ($v = 1/\rho$) that is,

$$v_\alpha < v < v_\beta ,$$

and are as close to v as desired, that is,

$$|v_\alpha - v| < \varepsilon \text{ and } |v_\beta - v| < \varepsilon , \qquad (2\ 30)$$

where ε is a preset convergence The values of v_α and v_β are determined from P_α and P_β by, for example,

$$v_\alpha = v_f(P_\alpha) + \frac{u + P_\alpha v - h_f(P_\alpha)}{h_{fg}(P_\alpha)} \times v_{fg}(P_\alpha)$$

where u and v are known, and the saturation properties at P_α and P_β are determined by interpolation on pressure using the tables Having found v_α and v_β, which bracket v and satisfy the restrictions in Eq (2 30),

the pressure corresponding to the known u and v is found by interpolation

$$P = P_\alpha + \frac{(v - v_\alpha)}{(v_\beta - v_\alpha)} (P_\beta - P_\alpha) \qquad (2\ 31)$$

Now the saturation properties at P can be determined

2 6 Channel Boundary Conditions

PINSIM-MOD1 requires the user to supply tables defining the coolant channel inlet and outlet flow rate, pressure, and enthalpy for each channel simulated The calculations are driven by inlet and outlet flow rates if the pressure values in the tables are set equal to zero otherwise the calculations are driven by inlet and outlet pressures Steady-state calculations require that both pressure and flow rate be specified at time equal to 0 0 sec

PINSIM-MOD1 has the capability, at the option of the user, to time-average the coolant channel boundary conditions over a user-supplied interval Δt The calculation performed by PINSIM-MOD1 on each property P (mass flow rate, enthalpy, and pressure) is an approximation of the equation

$$\overline{P}(t) = \frac{1}{\Delta t} \int_{t-\Delta t}^{t} P(t)\, dt$$

3 PROGRAM DESCRIPTION

3 1 Code Structure

During the development of PINSIM-MOD1, an effort was made to keep the code highly modular The code presently is composed of over 150 subroutines written in FORTRAN IV and several subroutines in ASSEMBLY language The code was developed for IBM computing systems

A structure used with PINSIM-MOD1 overlays the data input and initialization routines with the calculational routines which are used in the steady-state and transient phases of problem execution A less extensive scheme overlays several steady-state routines with transient routines After overlaying, PINSIM-MOD1 occupies roughly 960 K bytes of core when compiled with the IBM FORTRAN-H (OPT = 2) compiler

3 2 Code Input and Output

PINSIM-MOD1 uses the NRTS INP[24] free-format input package to process the input data The INP package allows the use of easily formatted and easily modified data decks and supplies the user with easily understood data deck error diagnostics

Extensive input data examination has been included in the input subroutines The code terminates execution of the problem at the end of data deck input and initialization if any one of several data deck errors are found Errors that will terminate execution include missing data cards, problem option logic errors, variables out of proper ranges and unused data cards

The output of PINSIM-MOD1 is structured in four areas major edits, minor edits, plot records, and debug output All are controlled by user-supplied data Major edits provide detailed summaries of the transient problem at user-defined intervals, while minor edits provide single-line summaries of user-selected parameters at user-defined intervals Debug output can be used to examine certain intermediate terms used in several phases of the problem solution The user can also have all the minor edit variable parameters and arrays written to a tape A postprocessing

plot package has been developed that will plot selected minor edit variables

3 3 Solution Logic

Primary program control in PINSIM-MOD1 is retained in the main program and three major subroutines These major subroutines each direct execution of each of the three phases of a problem input steady-state calculations, and transient calculations The main program does little more than call these major subroutines A simplified flowchart of the main program is presented as Fig 2 simplified flowcharts of the steady-state and transient driver subroutines are included as Figs 3 and 4 Listings of these subroutines are provided in Appendix G

3 3 1 Steady-state solution logic

The PINSIM-MOD1 problem proceeds from data input and initialization through the steady-state calculations in three steps First the proper system powers are scaled down and loaded into the pin nodal power distribution, second, steady-state coolant properties pressure and enthalpy distributions, and pin temperature distribution are determined and finally, the power system calculations are initialized A simplified flowchart of the steady-state solution scheme is presented in Fig 3

Coolant properties and pin temperatures The user supplies initial pressure and enthalpy estimates for each of the coolant nodes Using these input estimates the code performs a state search at the beginning of the steady-state calculations The mass flow rate for each node is set equal to the appropriate channel inlet flow rate so that the conservation of mass equation [Eq (2 28)] is automatically satisfied The code then determines dW/dt for each coolant node by evaluating the right side of Eq (2 29) Beginning with the inlet node of each channel the code adjusts the nodal pressures so that this time derivative is zero for each node This process is repeated, using adjusted pressures and original enthalpies until nodal pressures converge

Heat transfer coefficients for each water node are calculated after the nodal pressure calculations converge Steady-state heat fluxes are

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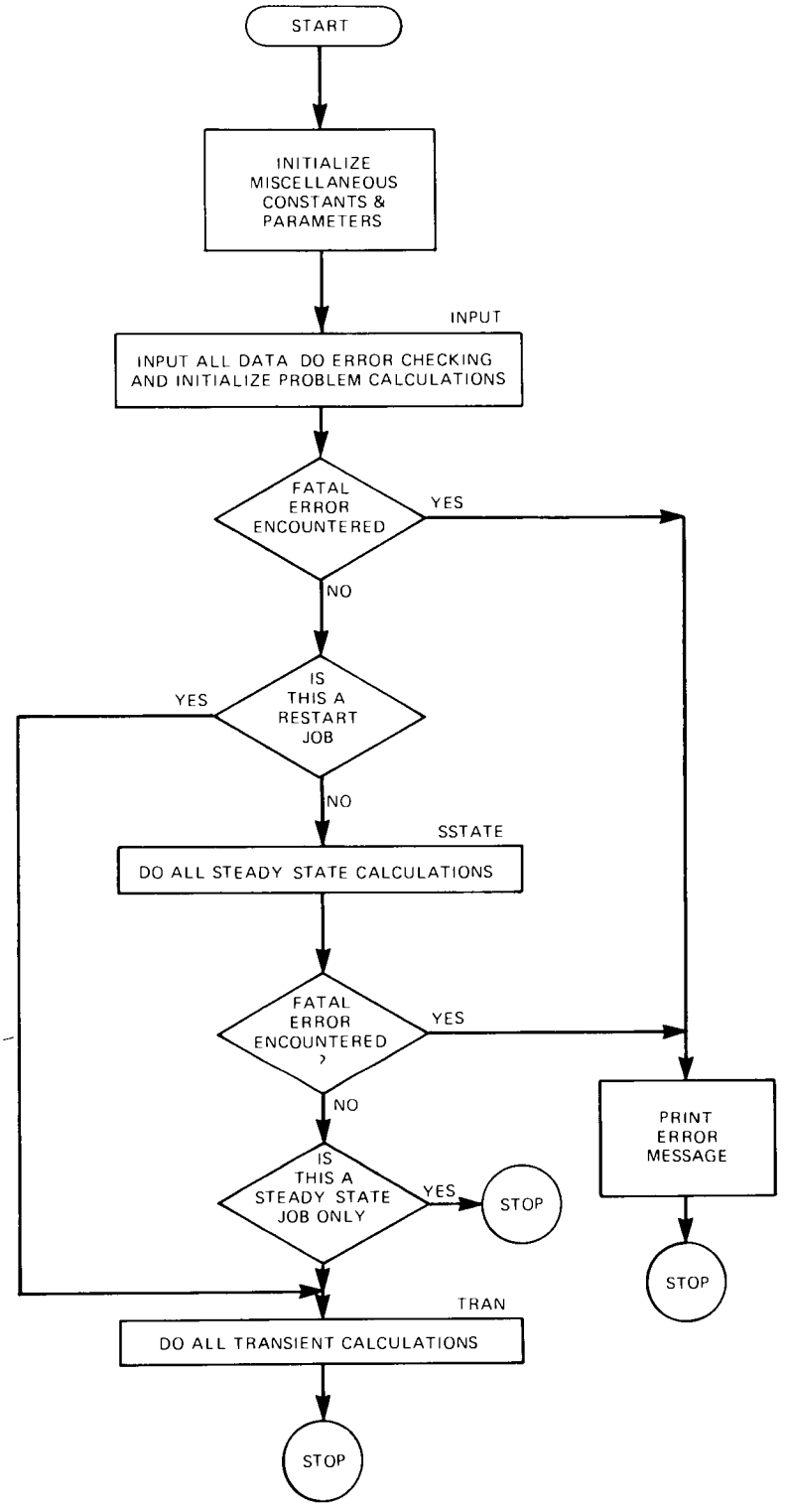

Fig 2 Simplified PINSIM-MOD1 main program flowchart

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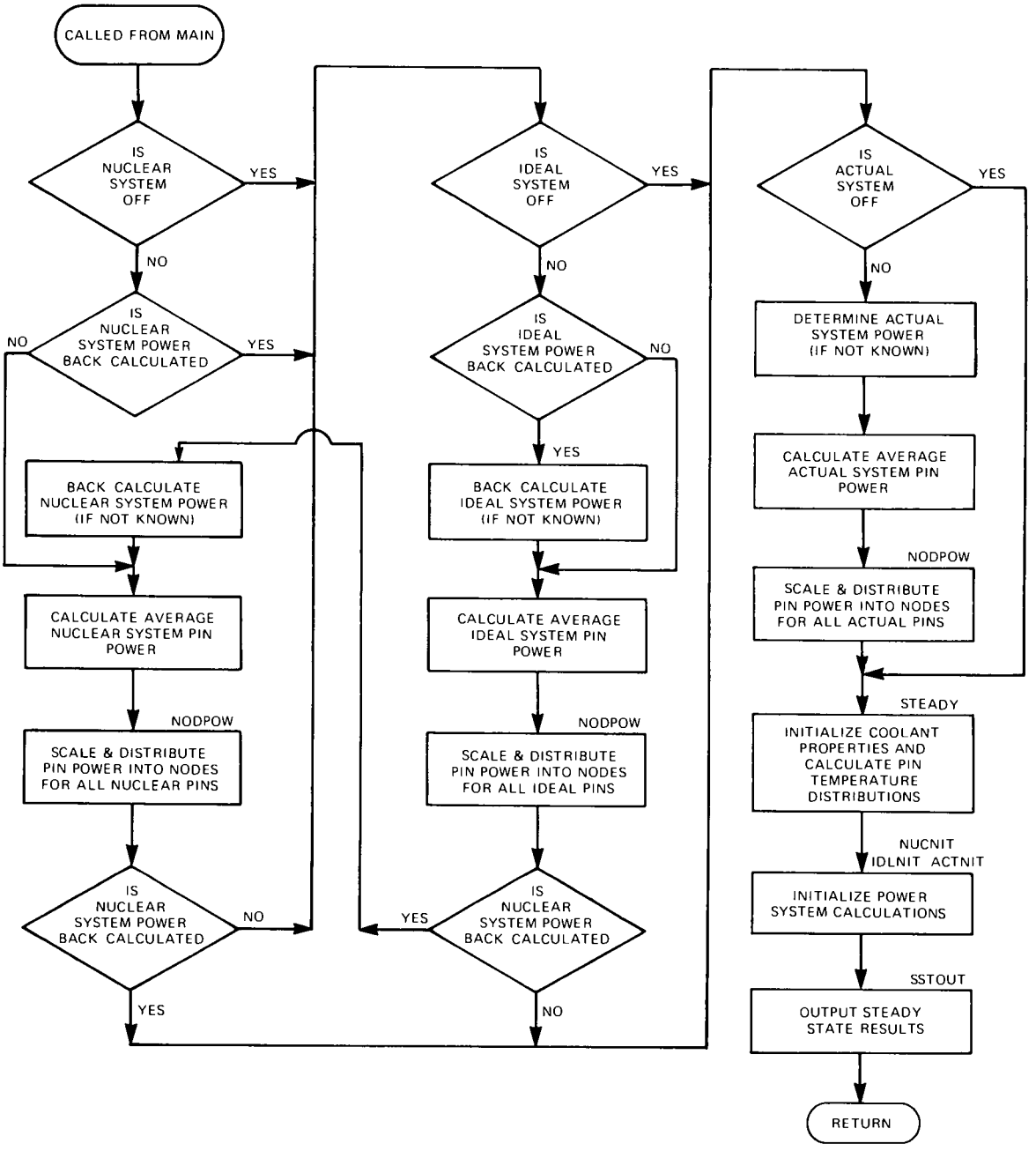

Fig 3 Simplified PINSIM-MOD1 subroutine SSTATE flowchart

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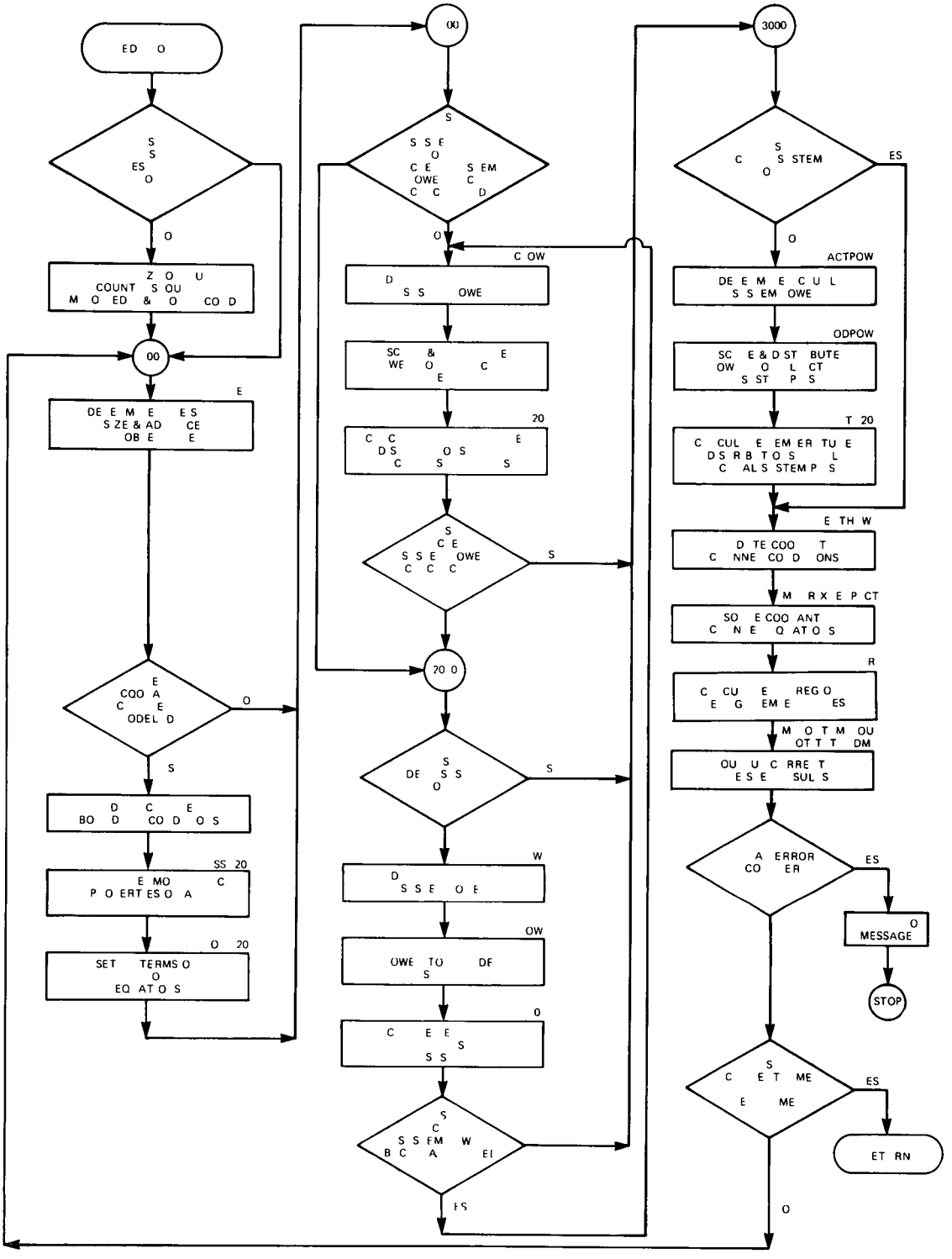

Fig 4 Simplified PINSIM-MOD1 subroutine TRAN flowchart

set equal to the ratio of the amount of heat generated in the associated rod level of each coolant node divided by the heat transfer area of that level and rod surface temperatures are determined An initial temperature distribution estimate based on calculated rod surface temperatures is made on each level of each pin so that the temperature-dependent thermal properties may be determined The conduction equation matrix is solved for rod nodal temperatures using the initial estimate matrix terms The thermal properties are reevaluated using these temperatures and an energy balance is performed on each rod node using the updated matrix terms and the temperatures used to update the matrix If the energy balance error for any node is greater than a user-supplied limit the updated conduction equation matrix on the level is solved for nodal temperatures, the matrix is reevaluated, and the energy balance is recomputed This process is repeated on each level of each pin until the energy balance error converges to within user-supplied limits

The steady-state heat fluxes, along with the inlet flow rates and enthalpies to each coolant channel are used to determine outlet enthalpies for each coolant node The average nodal enthalpies are then determined and compared with the previous estimates of nodal enthalpies If these differ by more than a preset convergence criterion the code repeats the iteration on nodal pressures (which was discussed in the first paragraph of this section) using the new values of nodal enthalpy Rod temperatures are recalculated by the method previously discussed, and coolant channel nodal enthalpies are reevaluated This iterative technique is continued until convergence is achieved on both channel nodal pressures and enthalpies

Power system initialization If the reactor kinetics initialization option is selected for the nuclear power system a steady-state reactivity inventory is performed after coolant channel and pin properties are determined This inventory consists in determining the steadv-state reactivity inserted by each node in the channel associated with the designated nuclear pin and by each level of that pin

Back-calculation initialization of system power for either the nuclear or the ideal electric system is performed on a single level of a designated

pin The temperature distribution on this level is determined after the coolant properties and temperature distributions on the other pins

The first step in the back-calculation initialization is the determination of the steady-state system power If the surface heat flux is tabulated, the user-supplied system power is used to determine the steady-state heat flux and the heat flux table is normalized to this value If the surface heat flux used in the back-calculation is taken from another pin model, the user-supplied system power is reset to a value that will cause the surface heat flux on the back-calculation level to be equal to the specified boundary conditions

The surface temperature on the back-calculation level is determined from desired surface conditions Determination of the temperature distribution on this level then proceeds as described in the section titled "Coolant Properties and Pin Temperatures "

3 3 2 Transient solution logic

The sequence of calculations performed in each cycle of transient calculations is briefly described below, a simplified flowchart is given in Fig 4

1 The size of the time step is determined The user may either specify the step size or allow the code to calculate the required step size within user-defined limits

2 The average temperature is determined for all regions and levels of all pins

3 The deformation of each nuclear fuel pin is determined, and the nodes in the deformed pins are redistributed

4 Inlet and outlet boundary conditions are determined for each coolant channel Thermal properties of the nodes in the coolant channels are determined, and the terms of the momentum equation for each channel are calculated

5 Current system power is determined for each system, that power is distributed to each pin model associated with that system, and transient rod temperature distributions are determined for each system in turn Unless the nuclear system power is back-calculated, the nuclear

system and its pins are updated first, followed by the ideal electric and the actual electric systems and their pins If the nuclear system power is back-calculated, the ideal electric system is updated first, followed by the nuclear and actual electric systems

6 Nodal enthalpies are determined for each coolant node, the terms of the mass and energy conservation equations for each channel are calculated, and the equations are solved

7 Desired results are output

This sequence is repeated until the elapsed problem time is equal to the user-supplied problem end time If a fatal error occurs, the code finishes the current sequence before terminating the job

3 4 Time-Step Size Selection

PINSIM-MOD1 allows the user to define up to ten time-step size intervals within a problem For each of these intervals, a user may either specify the calculational time-step size to be used during the interval or allow the code to calculate the required time-step size The algorithms used in PINSIM-MOD1 to determine the calculational time-step size are essentially the same as the corresponding algorithms in RELAP4/MOD5 (Ref 10)

4 SAMPLE PROBLEMS

The results of several sample calculations are included as an illustration of the capabilities of PINSIM-MOD1 However these results are preliminary they do not constitute detailed analyses of any of the problems discussed The sensitivity of the results to variations in nodal distributions time-step sizes and time-averaging periods has not been established Therefore these results should be examined in a qualitative rather than quantitative sense

4 1 Simulation of an Electric Pin Transient

Sample problem 1 is a simulation of the thermal response of a single unpowered electric pin to a hydraulic environment similar to that of a typical LOCE The coolant channel inlet and outlet conditions were supplied by a RELAP4/MOD5 calculation of the response of a model of the THTF to test 100 These boundary conditions are presented as Figs 5 and 6

The PINSIM model of the electric pin and coolant channel is illustrated schematically in Fig 7 The pin was modeled as a stack of 11 axial levels, each of which was adjacent to a coolant node, relevant dimensions and initial distributions are given in the problem output (Appendix D)

In addition to samples of the major edit and minor edit output from sample problem 1, several plots of some data associated with pin level 6 (near the axial center of the pin) and with the coolant channel are presented Figure 8 presents PINSIM-MOD1 calculated temperatures for several internal nodes and the surface of level 6 The equivalent intersheath gap conductivity calculated for this problem is given in Fig 9 The pin surface heat flux and surface heat transfer coefficient calculated at level 6 are presented in Figs 10 and 11, respectively Figures 12 and 13 present internal energy and mass flow rates for several of the coolant channel nodes, including coolant node 6, which was adjacent to pin level 6

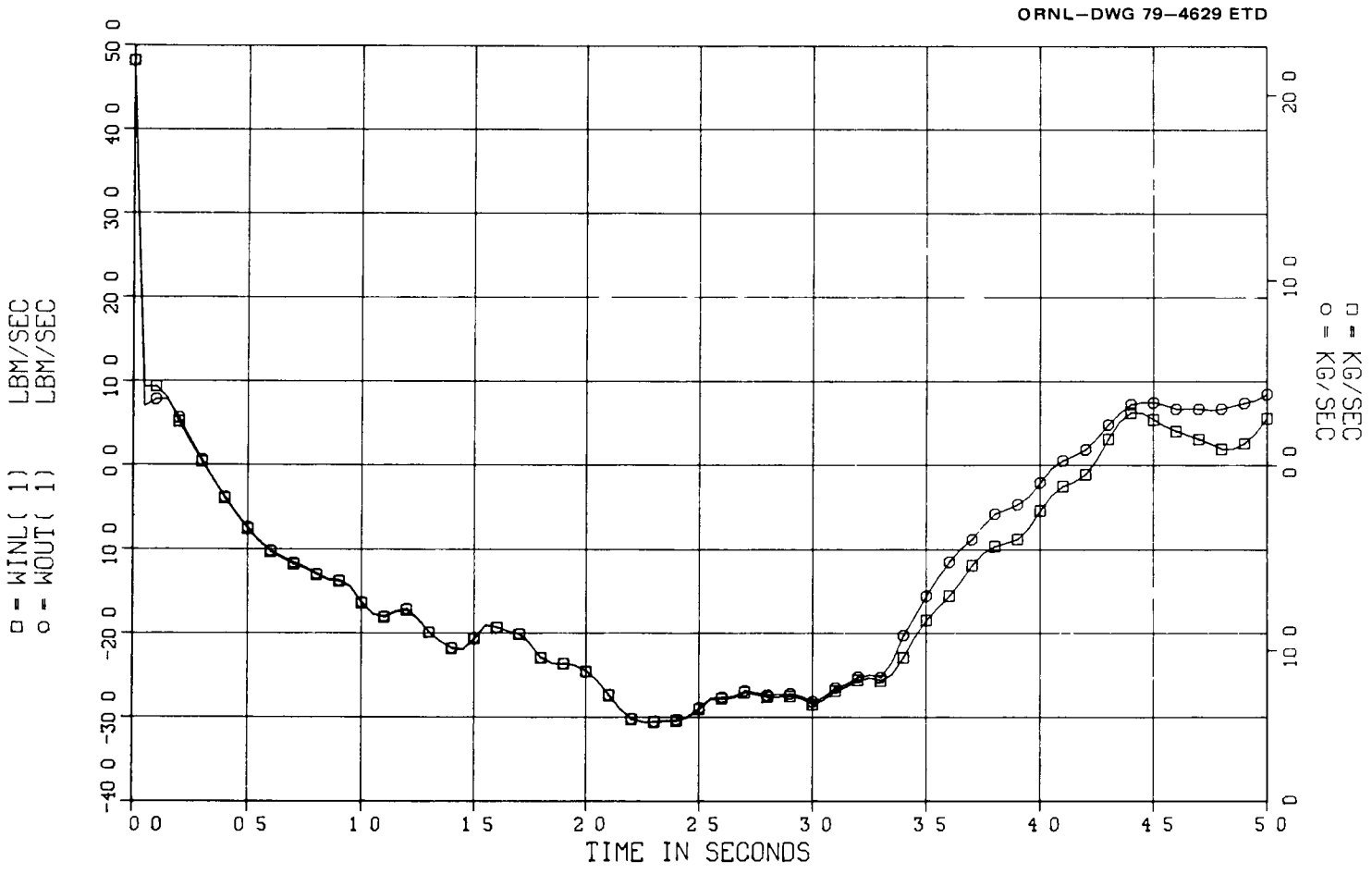

Fig 5 Sample problem 1 coolant channel inlet and outlet flow rate

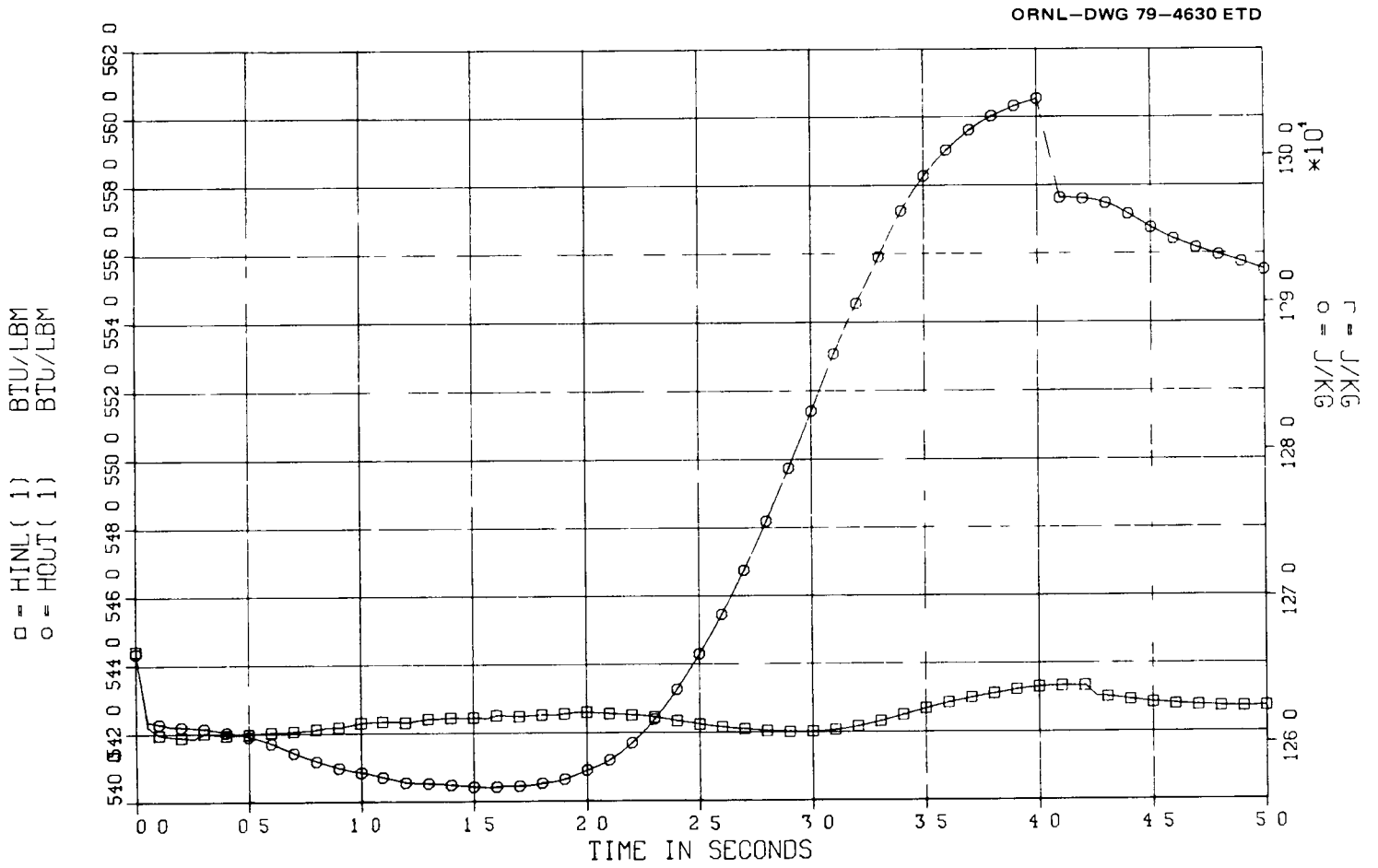

Fig 6 Sample problem 1 coolant channel inlet and outlet enthalpy

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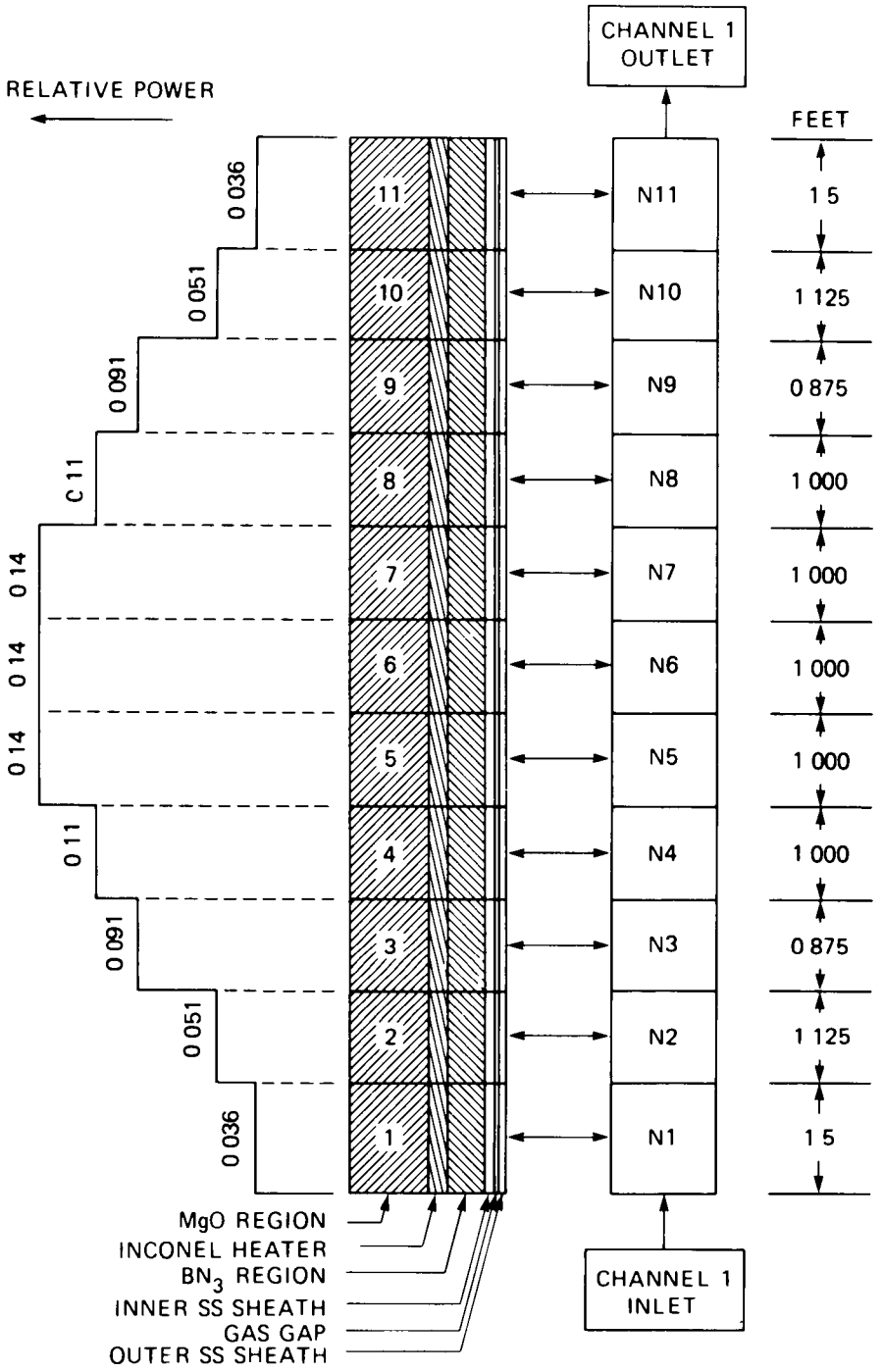

Fig 7 Sample problem 1 problem model

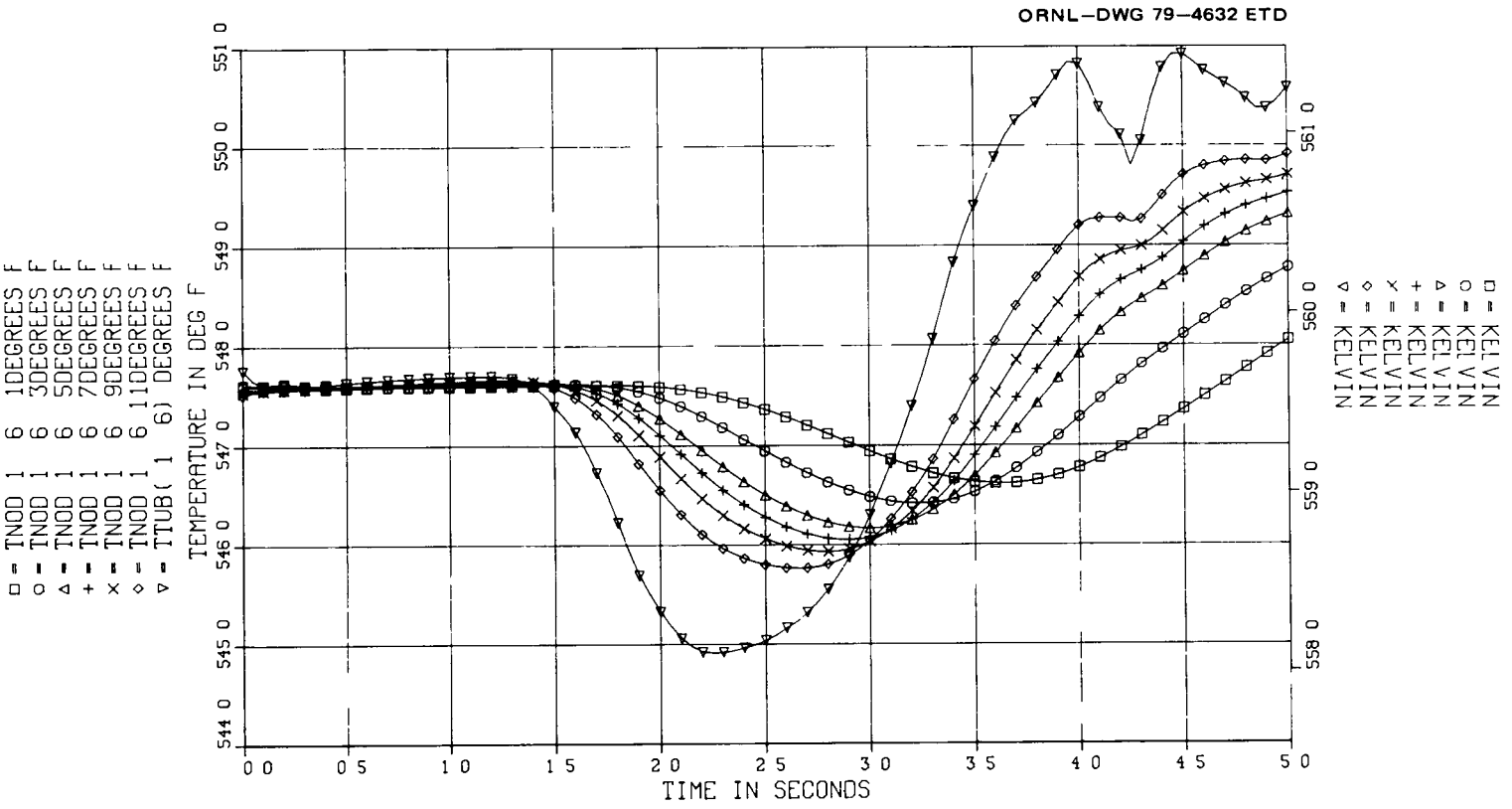

Fig 8 Sample problem 1 internal pin temperatures, level 6

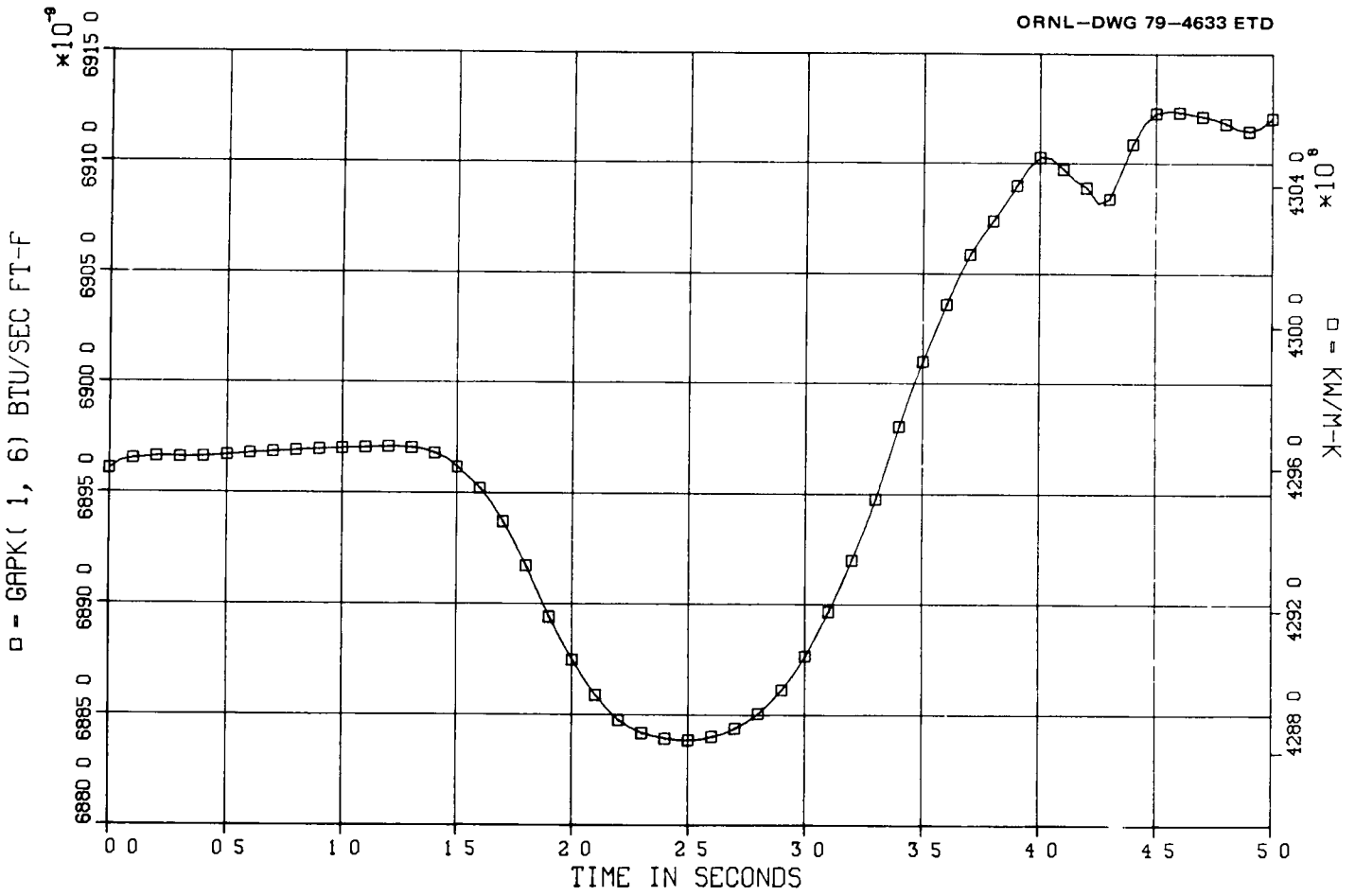

Fig 9 Sample problem 1 equivalent gap conductivity, level 6

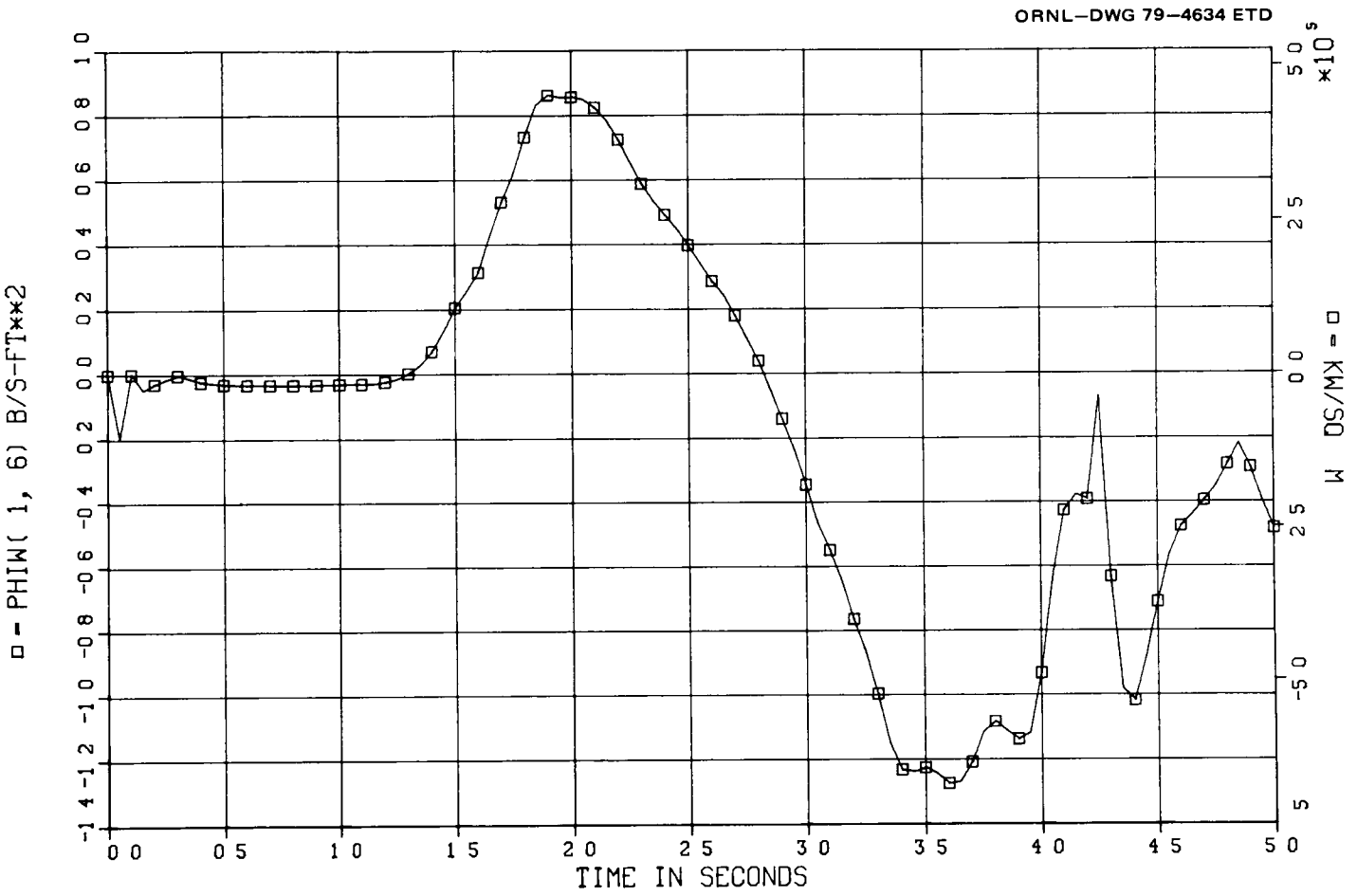

Fig 10 Sample problem 1 calculated surface heat flux, level 6

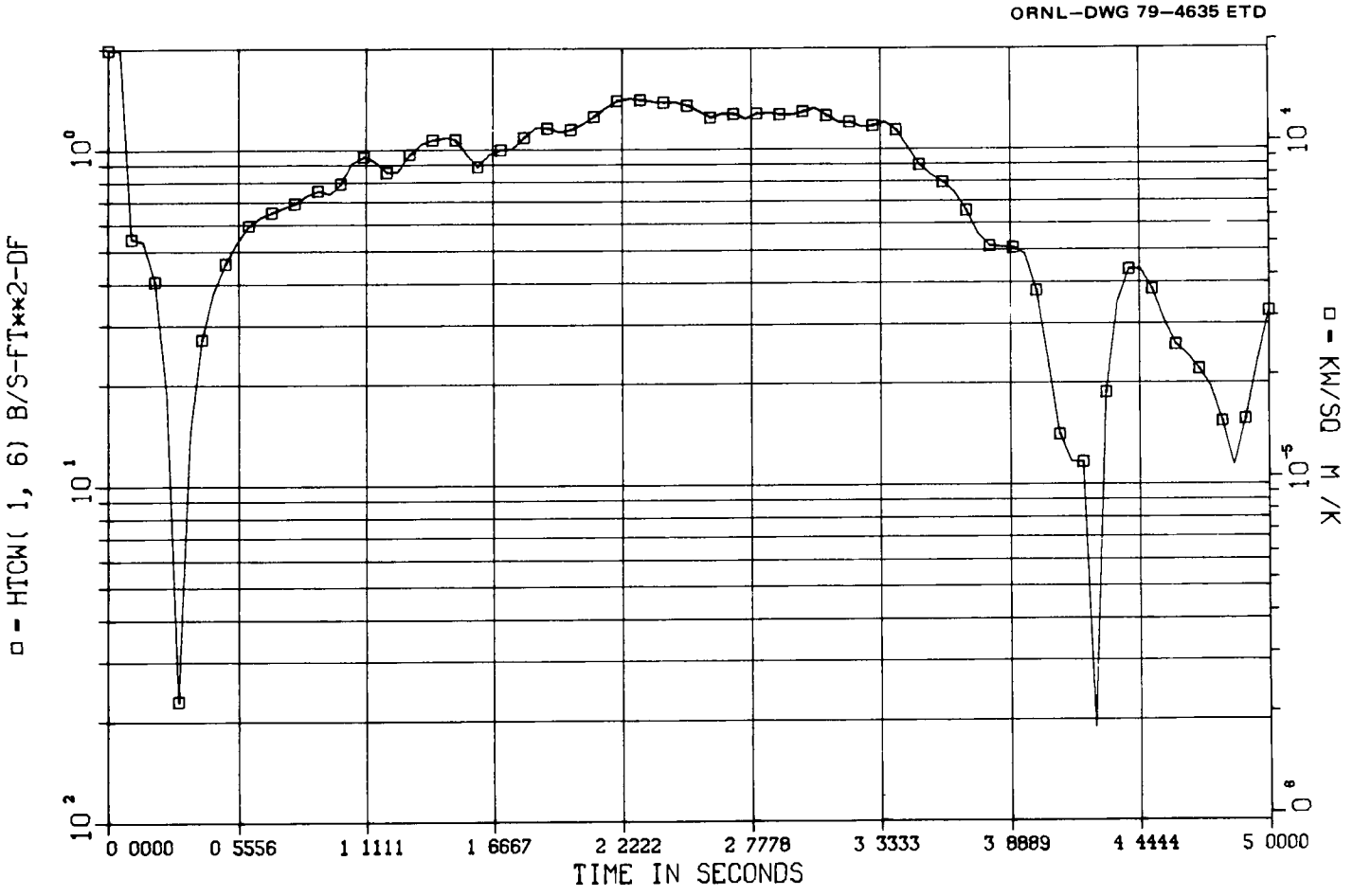

Fig 11 Sample problem 1 calculated surface heat transfer coefficient, level 6

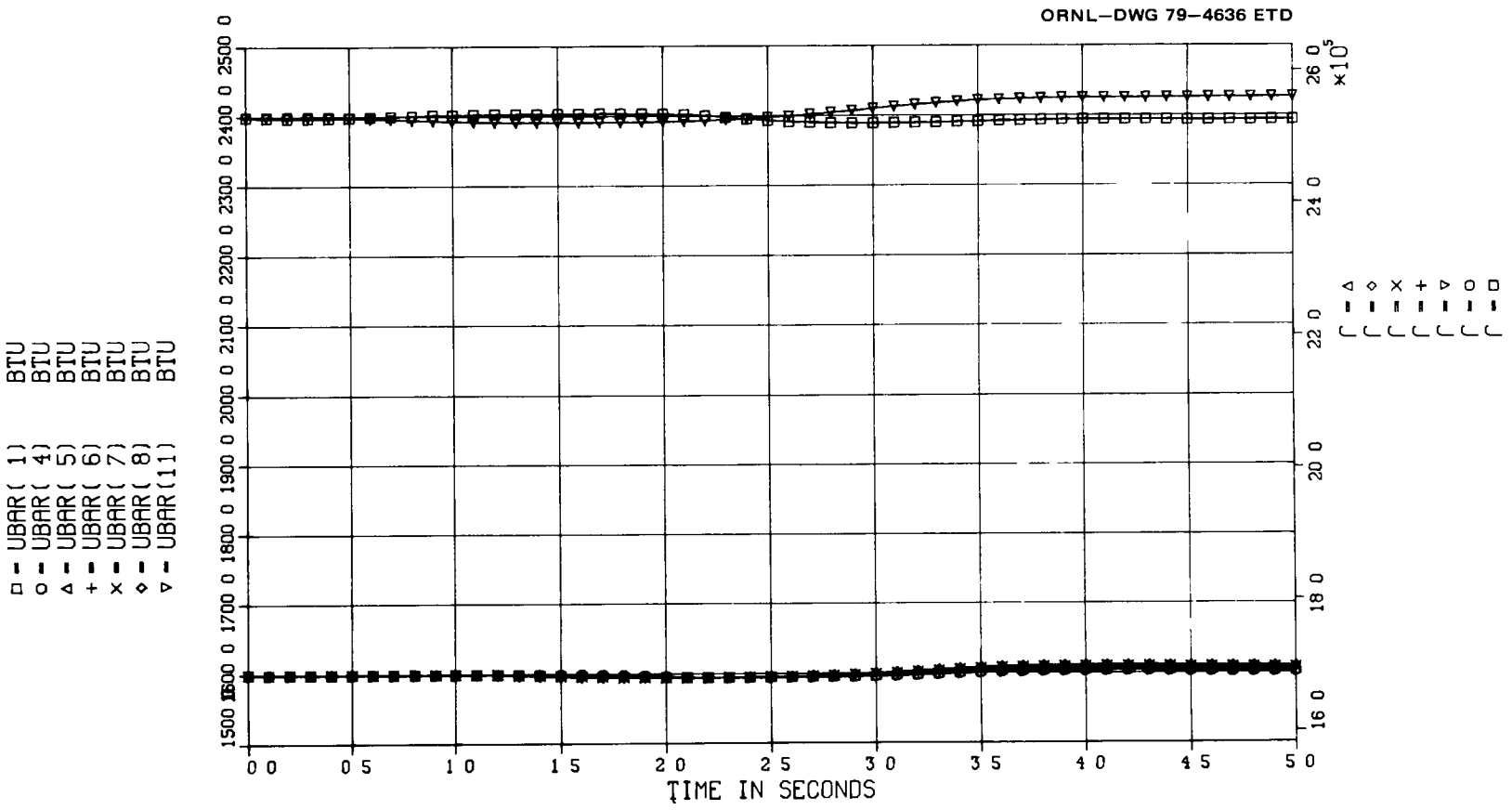

Fig 12 Sample problem 1 calculated coolant node internal energy

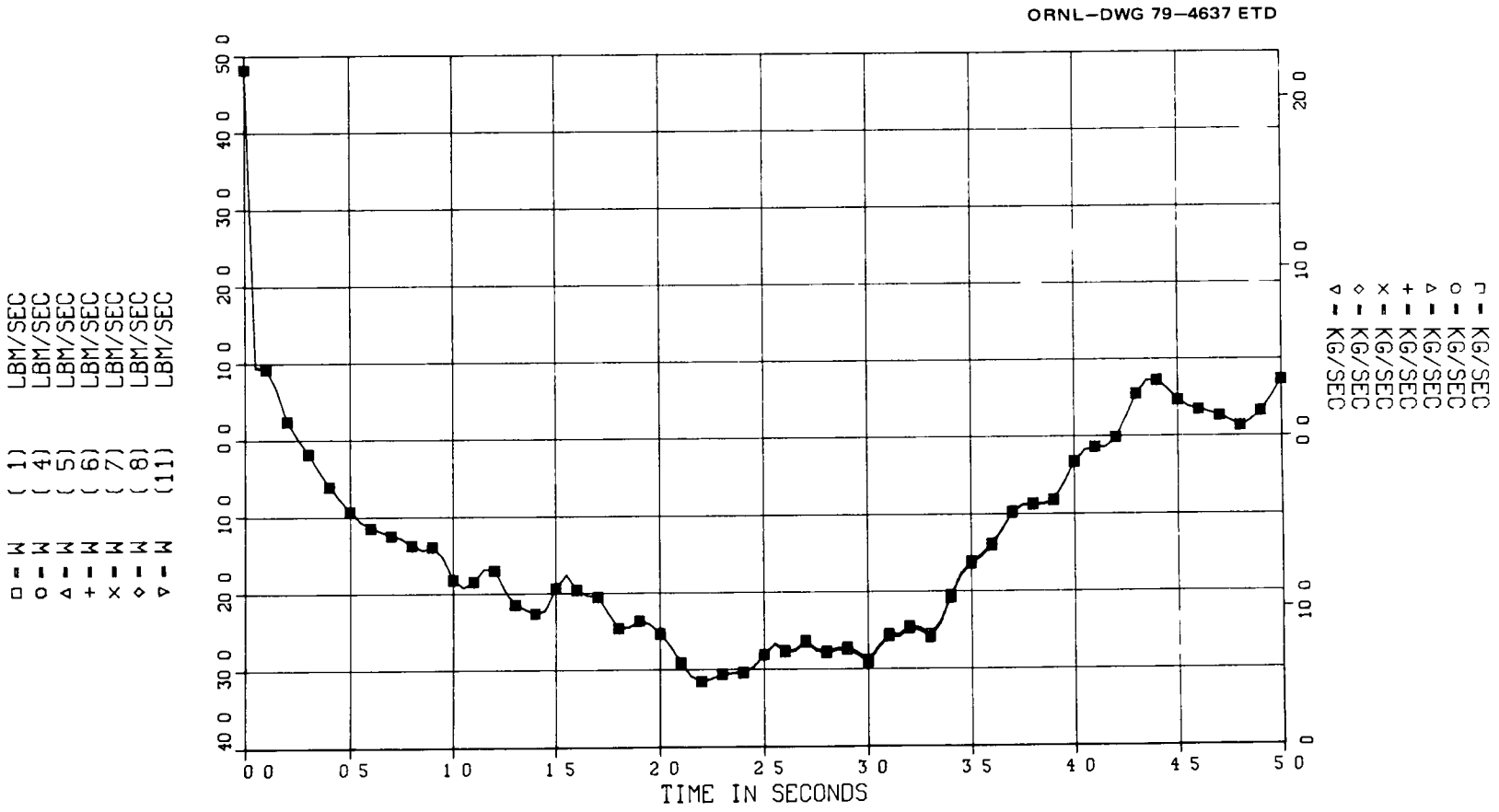

Fig 13 Sample problem 1 calculated nodal flow rates

4 2 Analysis of an Electric Pin Transient

Sample problem 2 illustrates a nuclear pin simulation analysis of Thermal-Hydraulic Test Facility (THTF) test 105 [25] The objective of the analysis was to generate data that would assist in evaluating the extent to which the test simulated a concernable nuclear pin transient The PINSIM-MOD1 model used test 105 electric pin surface heat flux and surface temperature (calculated by the ORINC[7] computer code) to back-calculate equivalent nuclear pin temperatures and equivalent nuclear pin power

The results presented were calculated using boundary conditions from axial level E of the electric pin This level corresponds to a position roughly one-third the distance from the lower end of the heated region of the pin (the inlet side) to the upper end of the heated region The heated region in the THTF electric pins is 3 7 m (12 ft) long The nuclear pin modeled in the problem was essentially the same as the pin modeled in sample problem 1 a complete description of the pin model may be found in the partial listing of the problem output (Appendix E)

Figure 14 presents the surface heat flux transient (calculated by ORINC) used as a boundary condition in this problem, Fig 15 indicates the surface temperature boundary condition, along with the equivalent nuclear pin temperature distribution transient calculated by PINSIM-MOD1 Figure 16 presents the PINSIM-MOD1—calculated equivalent nuclear pin power Figure 17 shows the time history of the integrated equivalent nuclear power, this plot provides a measure of the energy that an equivalent nuclear system would have to supply to the nuclear pin model for the nuclear pin to produce the heat flux transient illustrated in Fig 14 if exposed to the surface temperature transient of Fig 15 (The integrated power data were not calculated by PINSIM-MOD1, a post-processer code was used)

4 3 Electric Pin Power Program

Sample problem 3 illustrates the use of PINSIM-MOD1 in determining an electric power program The results were calculated by one of a series

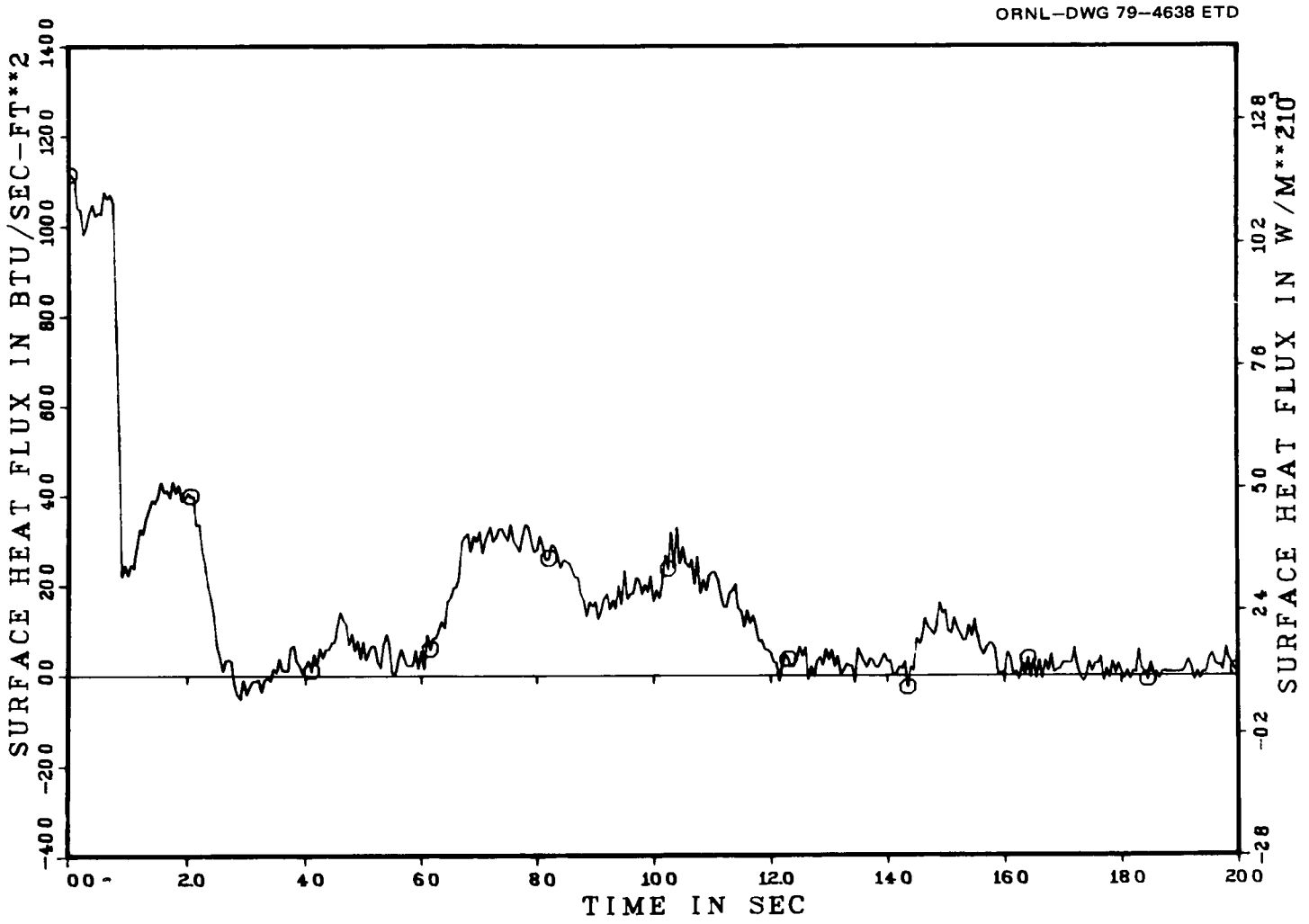

Fig 14 Test 105 electric pin surface heat flux, level E

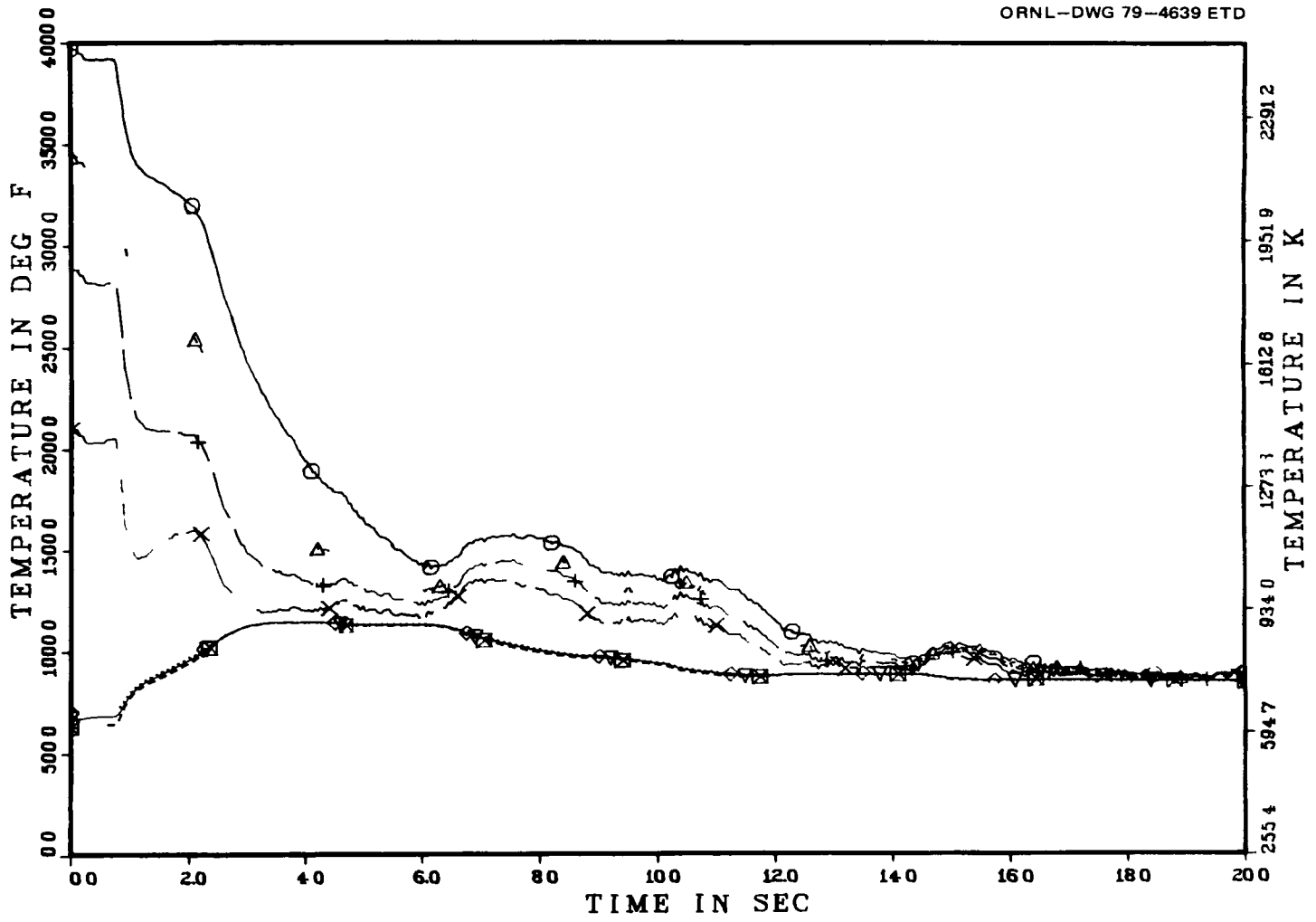

Fig 15 Test 105 equivalent nuclear pin temperatures, level E

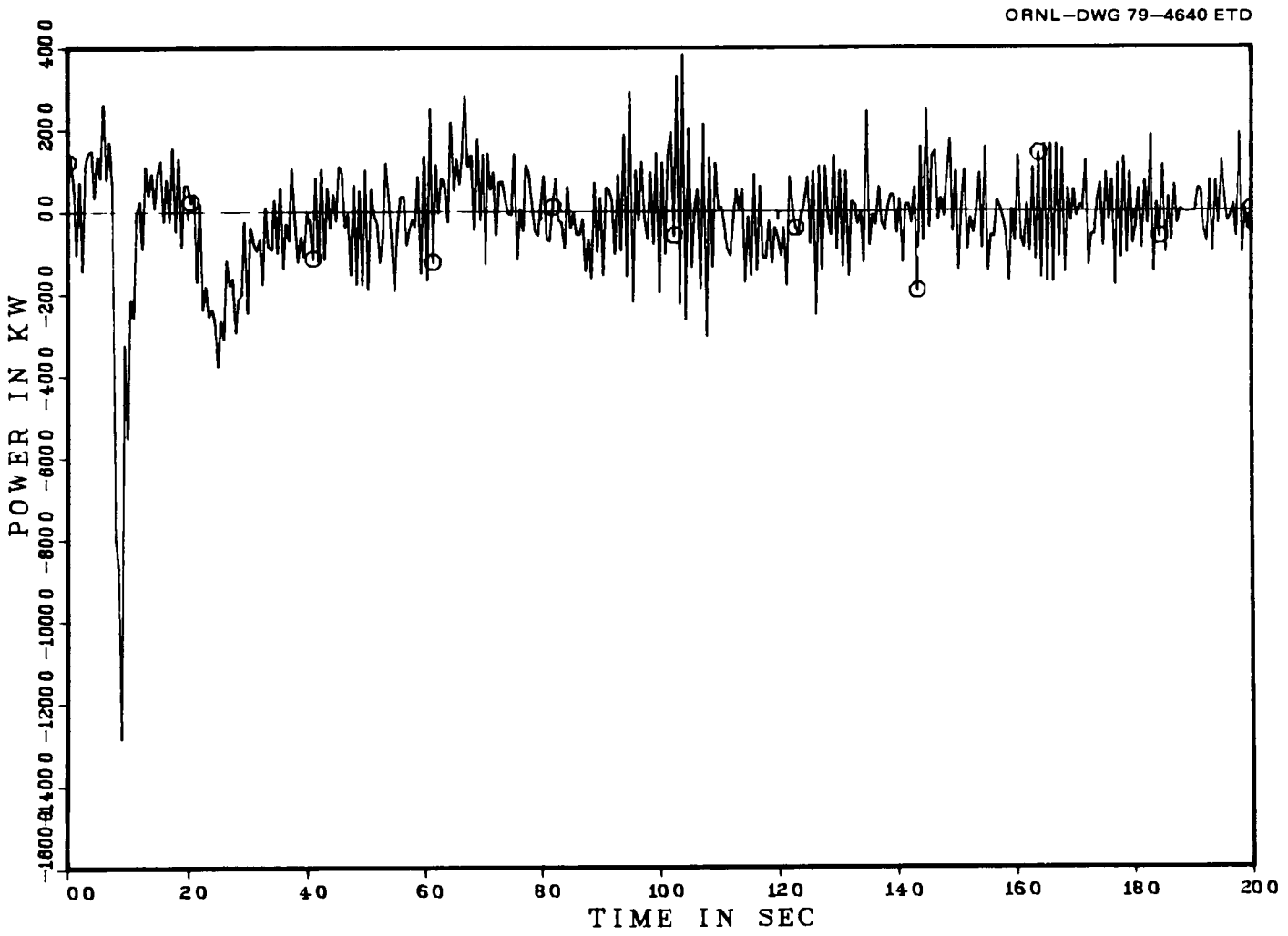

Fig 16 Test 105 unfiltered nuclear power, level E

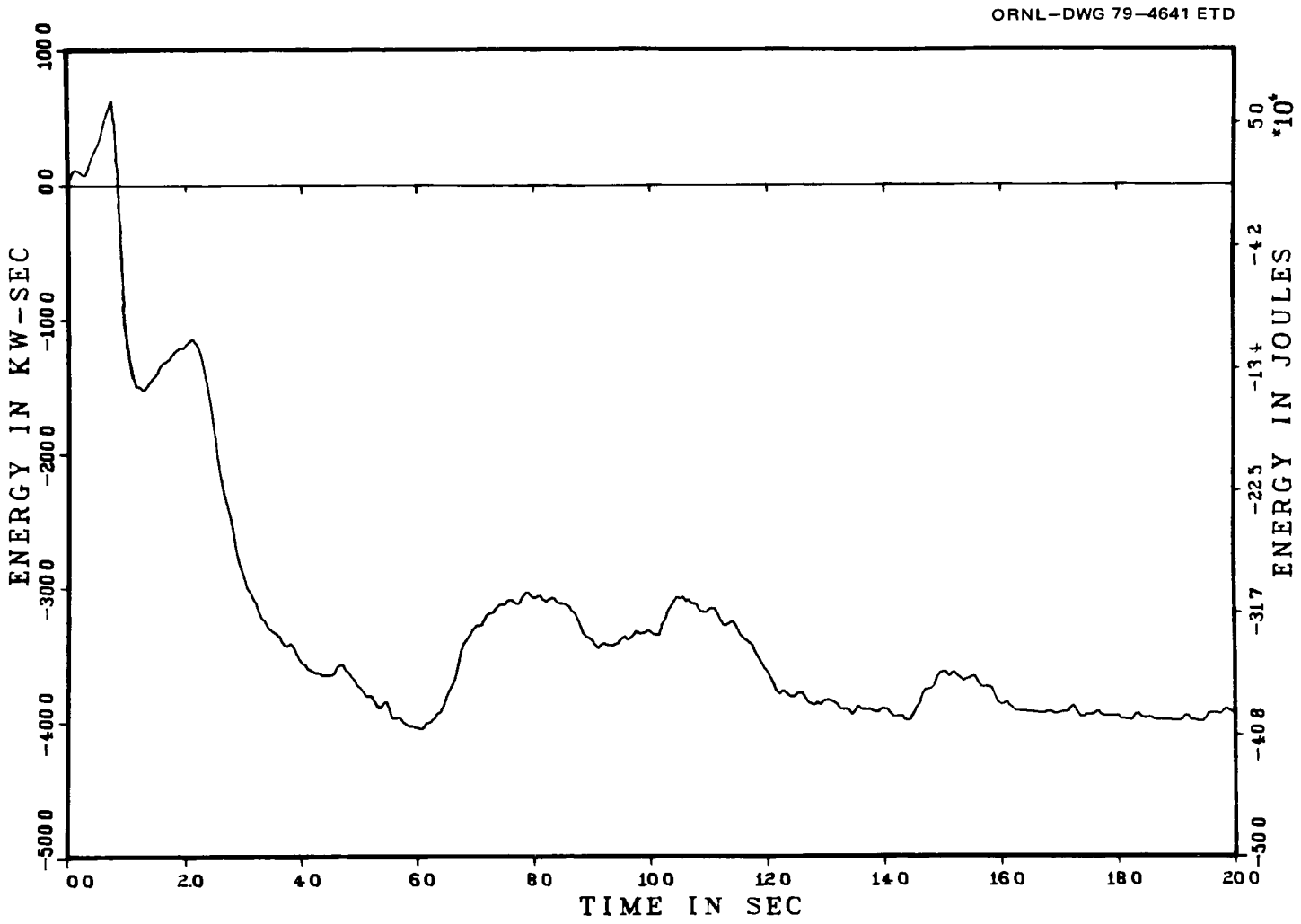

Fig 17 Test 105 integrated equivalent nuclear power, level E

of PINSIM-MOD1 jobs executed during the development and analysis of the electric power program for a test that was to approximate as nearly as possible a nuclear reactor system LOCA environment as calculated by RELAP4/MOD5 [10]

The PINSIM-MOD1 job was intended to calculate an "ideal" electric power transient required to force an electric pin to produce a desired surface heat flux with a specified surface temperature transient The electric pin model is fully described in the partial listing of the PINSIM-MOD1 output, provided as Appendix F

The desired surface heat flux transient is presented in Fig 18, the specified surface temperature transient is presented in Fig 19, along with some internal node temperature histories calculated by PINSIM-MOD1 The back-calculated electric power was not allowed to oscillate to extremes that could not be realized, but was truncated at a maximum of 125 kW and a minimum of 0 0 kW The resulting ideal power transient is presented in Fig 20 The best realizable surface heat flux curve on Fig 18 is the result of PINSIM-MOD1's forward calculation of the heat flux, using the truncated power and the specified surface temperature as boundary conditions The ideal power transient is translated to a more meaningful curve by integrating the power transient, smoothing the integral curve slightly, and differentiating the resulting curve The results of such a translation of the ideal power demand are presented in Figs 21 to 23

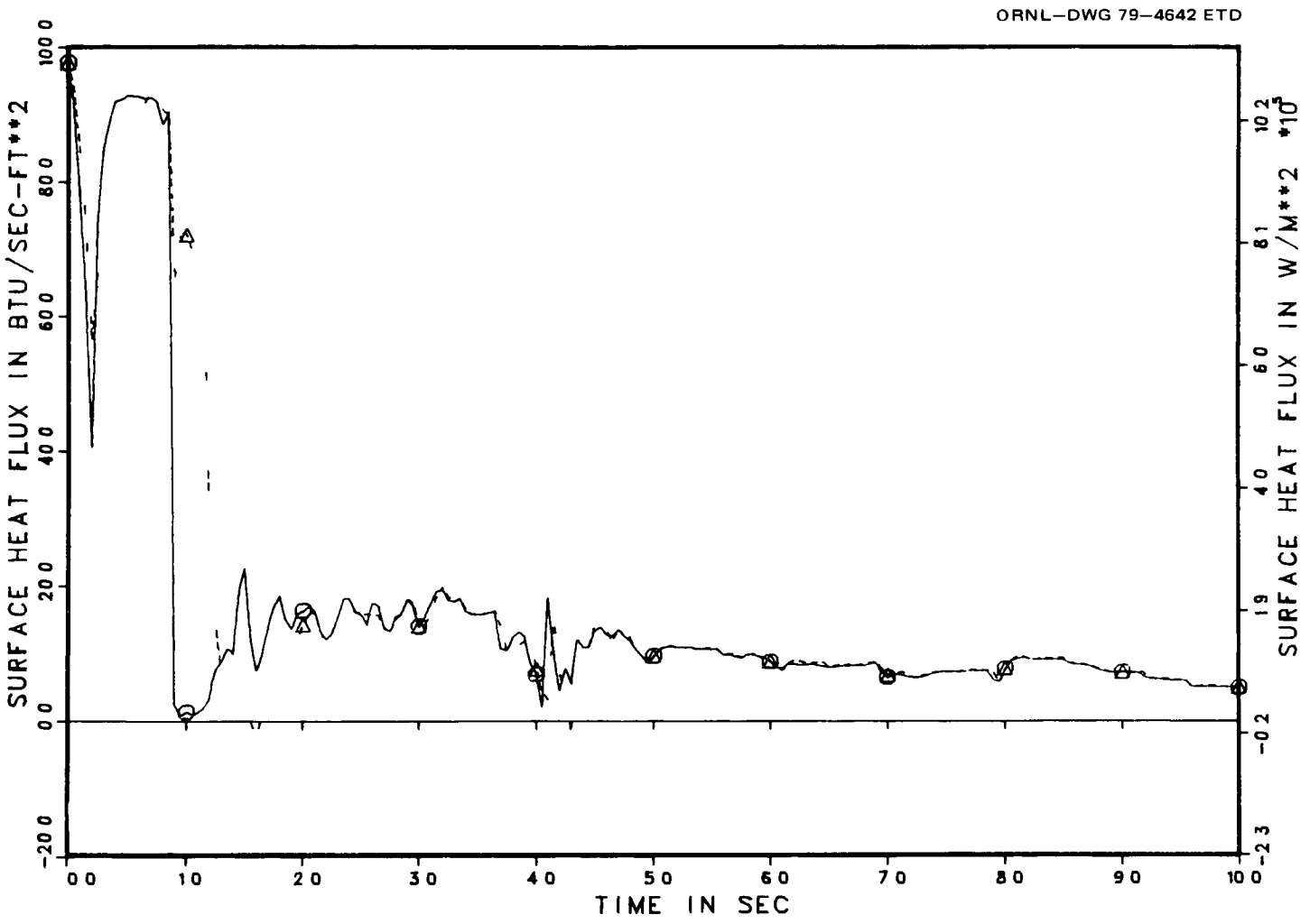

Fig 18 Sample problem 3 flux comparison for limited power transient

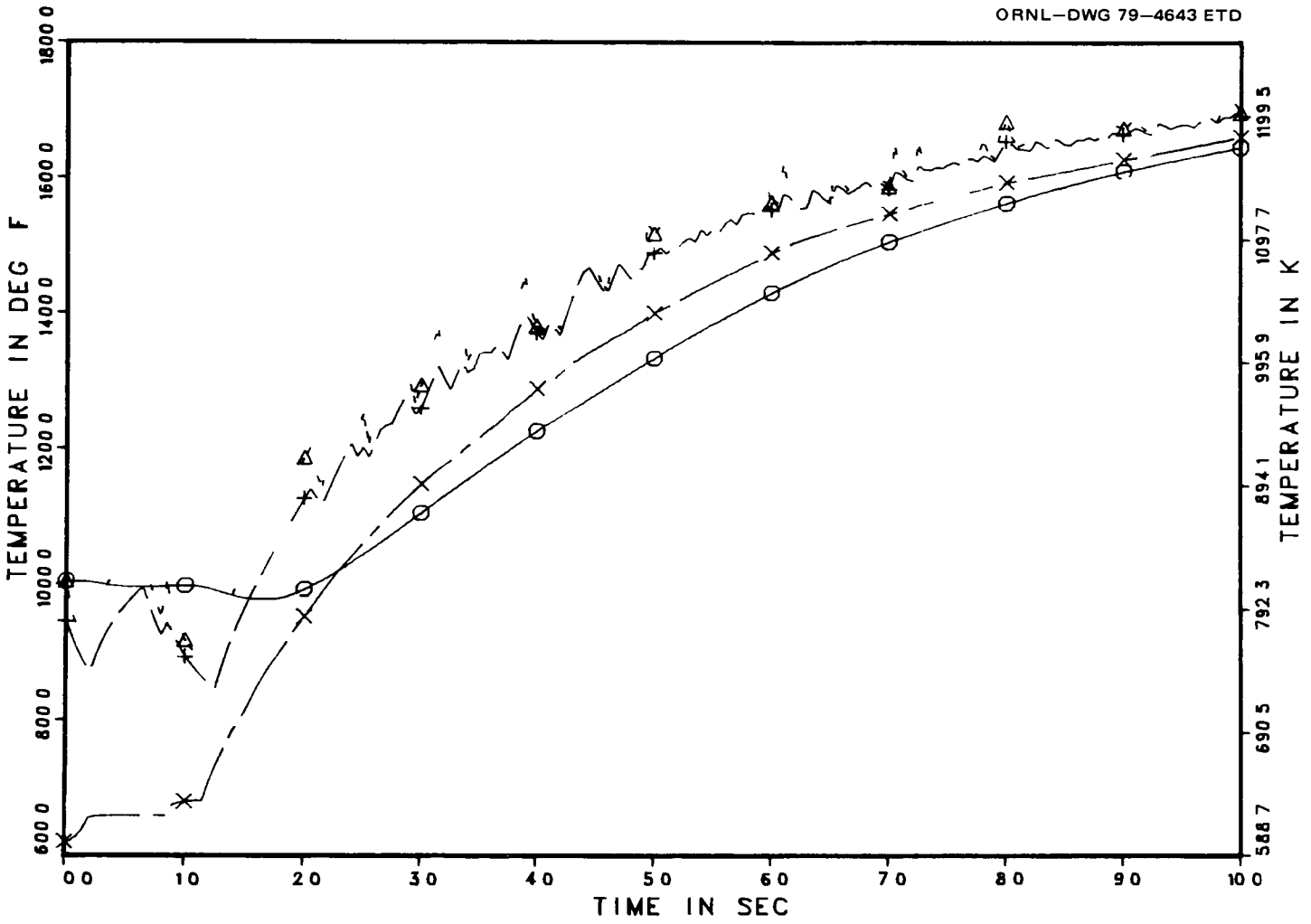

Fig 19 Sample problem 3 pin temperatures for limited power transient

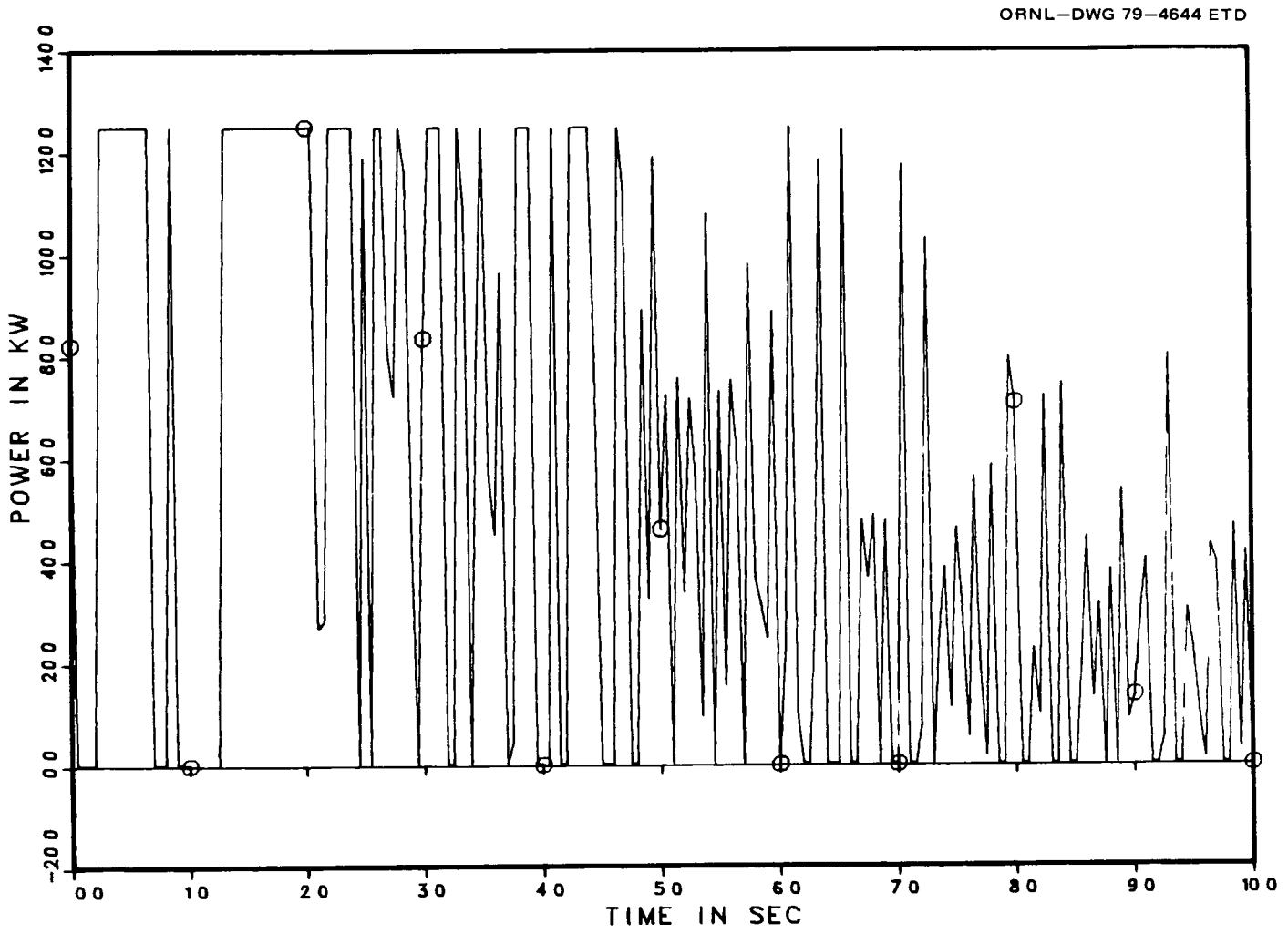

Fig 20 Sample problem 3 limited ideal power transient

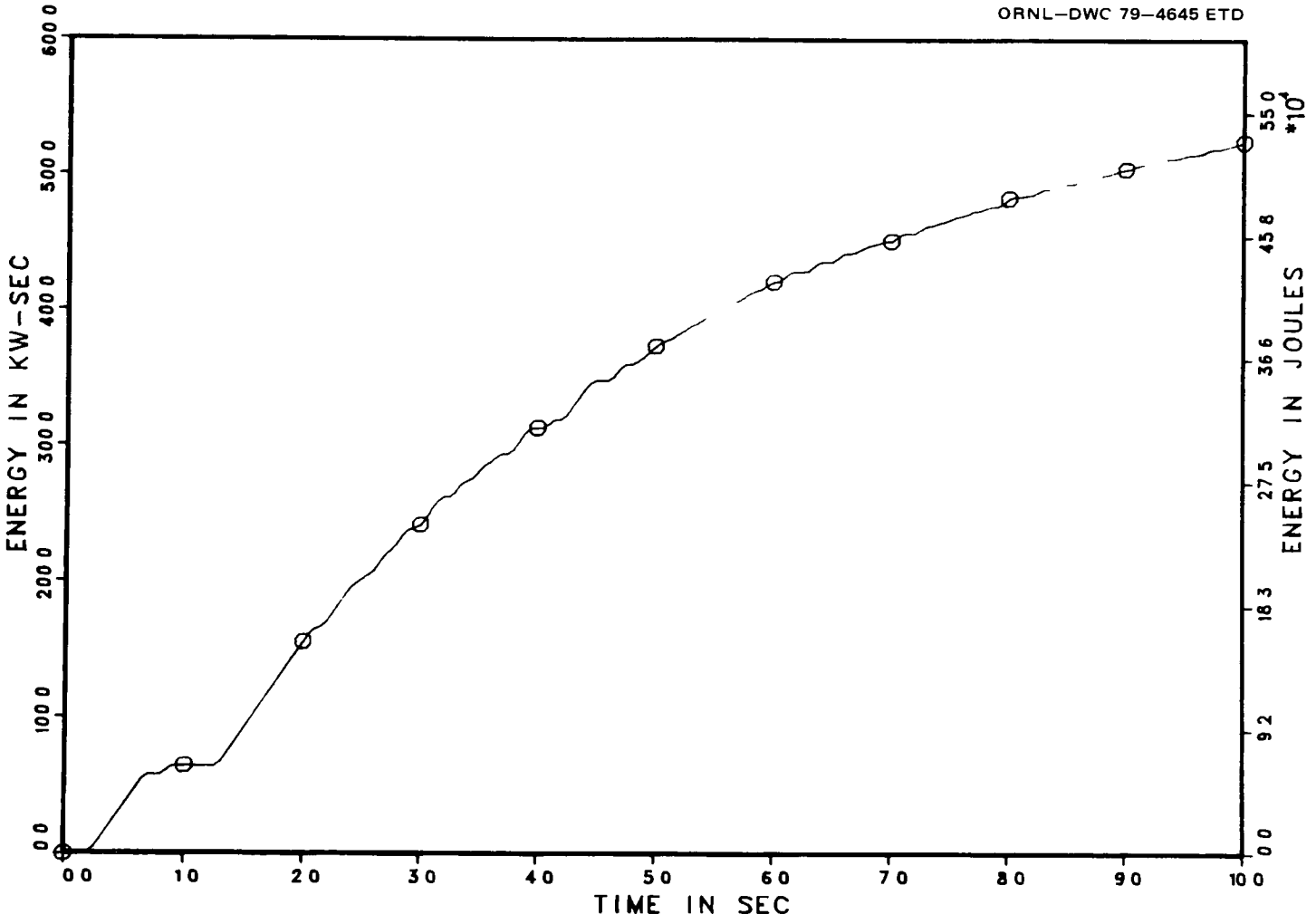

Fig 21 Sample problem 3 integrated limited ideal power

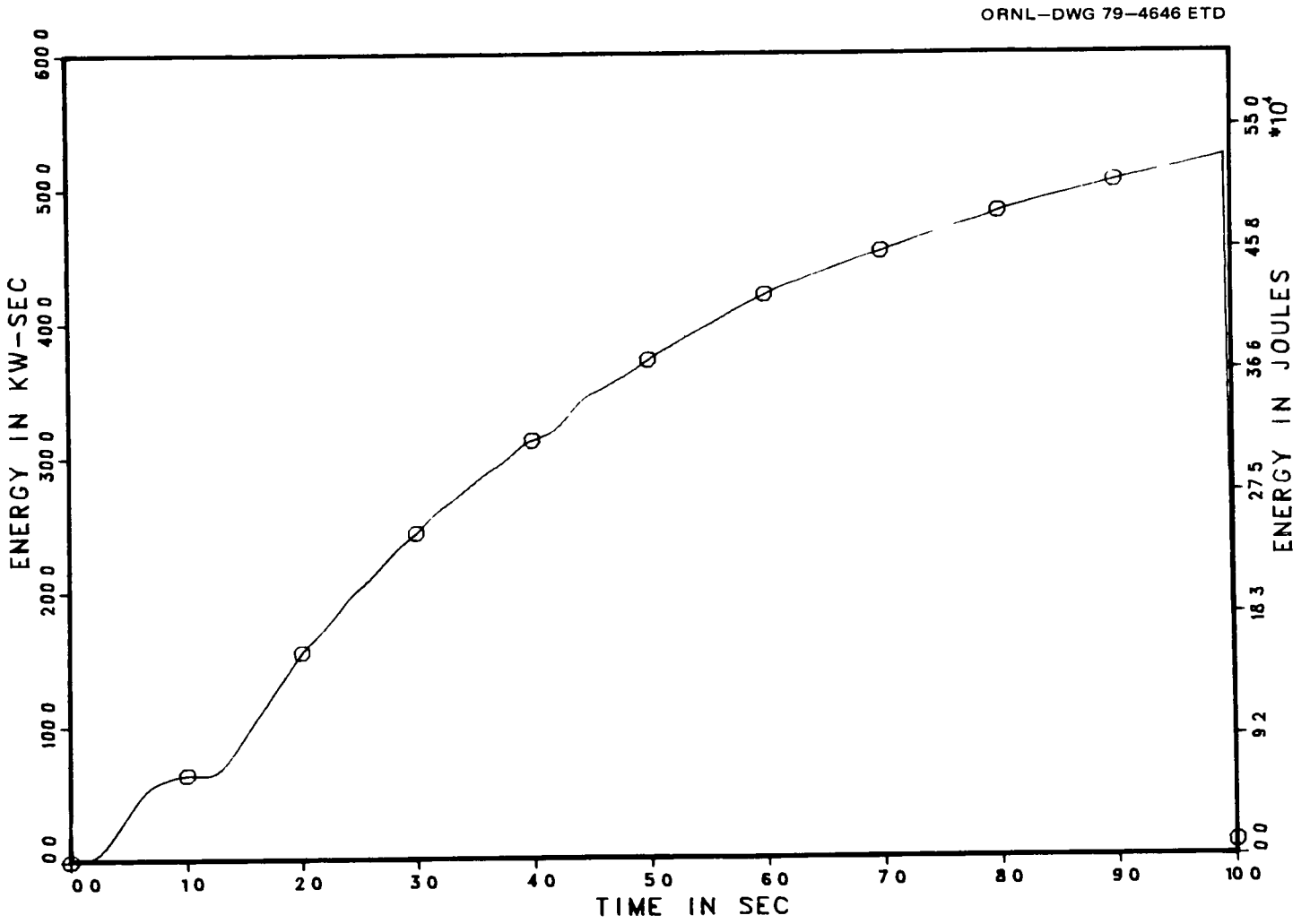

Fig 22 Sample problem 3 smoothed integrated limited ideal power

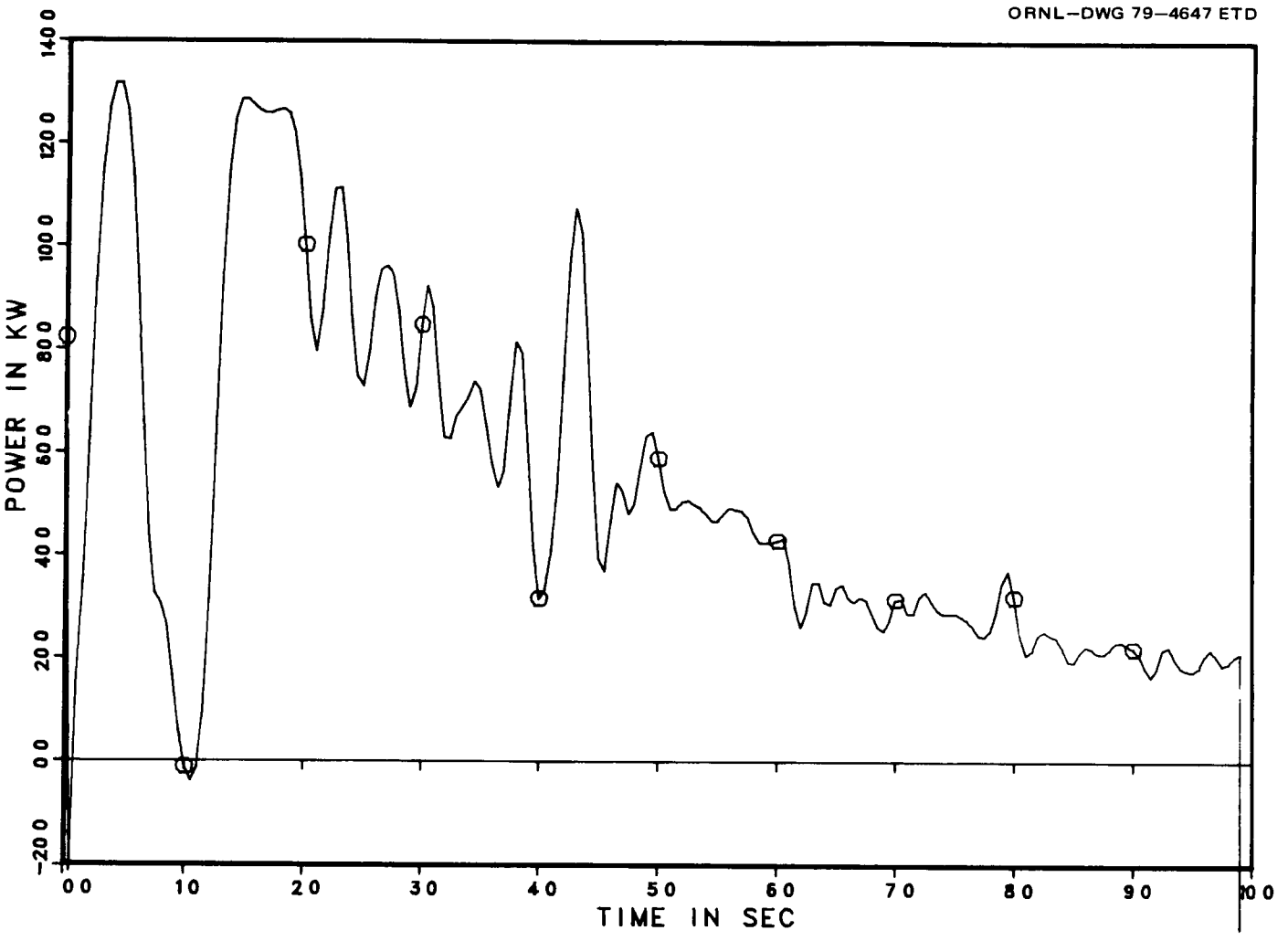

Fig 23 Sample problem 3 translated ideal power transient

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APPENDICES

Appendix A

FORMULATION OF THE CONDUCTION EQUATION MATRIX

The parabolic differential equation used to model the transfer of heat in a solid with an internal heat source is

$$2\pi \left(rkl \frac{\partial T}{\partial r} \right)_{r_{out_1}} - 2\pi \left(rkl \frac{\partial T}{\partial r} \right)_{r_{in_1}} + q''' = \rho_1 C_{p_1} V_1 \frac{\partial T_1}{\partial t} \qquad \text{(A 1)}$$

Integration of Eq (A 1) over an incremental volume V_1 yields

$$\int_{V_1} \vec{\nabla} k_1 \vec{\nabla} T_1 \, dV_1 + \int_{V_1} q_1''' \, dV_1 = \int_{V_1} \rho_1 C_{p_1} \frac{\partial T_1}{\partial t} \, dV_1 \qquad \text{(A 2)}$$

Assuming that q''', ρ_1, and C_{p_1} are all constant over V_1 reduces Eq (A 2) to

$$\int_{V_1} \vec{\nabla} k_1 \vec{\nabla} T \, dV_1 + q_1''' V_1 = \rho_1 C_{p_1} V_1 \frac{\partial T_1}{\partial t} \qquad \text{(A 3)}$$

Application of the divergence theorem to the first term allows this result to be written as

$$\int_{A_1} k_1 \vec{\nabla} T \, d\vec{A} + q''' V_1 = \rho_1 C_{p_1} V_1 \frac{\partial T_1}{\partial t} \qquad \text{(A 4)}$$

Restricting the application of these results to cylindrical geometries allows expansion of the gradient of T in cylindrical coordinates This yields

$$\int_{A_1} k_1 \left(\frac{\partial T_i}{\partial r} \vec{r} + \frac{1}{r} \frac{\partial T}{\partial \theta} \vec{\theta} + \frac{\partial T}{\partial Z} \vec{Z} \right) d\vec{A} + q''' V_1 = \rho_1 C_{p_1} V_1 \frac{\partial T_1}{\partial t} \qquad \text{(A 5)}$$

By assuming that axial and azimuthal temperature gradients are insignificant when compared with the radial temperature gradient one can reduce Eq (A 5) to

$$\int_{A_i} k_i \frac{\partial T}{\partial r} \vec{r} \, d\vec{A} + q'''V_i = \rho_i C_{p_i} V_i \frac{\partial T_i}{\partial t} \qquad \text{(A 6)}$$

With the assumption that $k_i(\partial T/\partial r)$ is a function of r and t only Eq (A 6) reduces to

$$2\pi r_o \, k_o \ell_o \left.\frac{\partial T}{\partial r}\right|_{r_o} - 2\pi r_{in} \, k_{in} \ell_{in} \left.\frac{\partial T}{\partial r}\right|_{r_{in}} + q''' \, V_i = \rho_i C_{p_i} V_i \frac{\partial T_i}{\partial t} \qquad \text{(A 7)}$$

Assume now that the volumetric properties of the incremental volume V_i are located in space on a surface of no thickness at a radius r_i This surface is referred to as a "node " This assumption requires that the heat flow between adjacent nodes be constant at any r between the nodal radii Thus,

$$r_{out} \left.\frac{\partial T}{\partial r}\right|_{r_{out}} = \frac{T_i - T_{i+1}}{\ell n \, (r_{i+1}/r_i)} \qquad \text{(A 8)}$$

and

$$r_{in} \left.\frac{\partial T}{\partial r}\right|_{r_{in}} = \frac{T_{i-1} - T_i}{\ell n \, (r_i/r_{i-1})} \qquad \text{(A 9)}$$

This assumption also allows us to write

$$\frac{\partial T_i}{\partial t} = \frac{T_i(t) - T_i(t - \Delta t)}{\Delta t} \qquad \text{(A 10)}$$

Inserting the relationships (A 8) (A 9) and (A 10) into Eq (A 7)

yields

$$-\frac{\bar{k}_{i-1,i}2\pi l}{\ln(\bar{r}_i/\bar{r}_{i-1})}(T_i - T_{i-1}) + \frac{\bar{k}_{i\ i+1}2\pi l}{\ln(\bar{r}_{i+1}/\bar{r}_i)}(T_{i+1} - T_i)$$

$$+ q'''\pi l(r_i^2 - r_{i-1}^2) = \rho C_p \pi l(r_i^2 - r_{i-1}^2)$$

$$\times \frac{T_i(t) - T_i(t - \Delta t)}{\Delta t} \qquad \text{(A 11)}$$

Factoring out πl and using an implicit formulation allows Eq (A 11) to be written as

$$-\frac{2\bar{k}_{i-1\ i}}{\ln(\bar{r}_i/\bar{r}_{i-1})}[T_i(t) - T_{i-1}(t)]$$

$$+ \frac{2\bar{k}_{i,i+1}}{\ln(\bar{r}_{i+1}/\bar{r}_i)}[T_{i+1}(t) - T_i(t)] + q_i'''(r_i^2 - r_{i-1}^2)$$

$$= \rho C_{p_i}(r_i^2 - r_{i-1}^2)\frac{T_i(t) - T_i(t - \Delta t)}{\Delta t} \qquad \text{(A 12)}$$

Collecting terms in Eq (A 12) yields

$$\left[\frac{2\bar{k}_{i-1\ i}}{\ln(\bar{r}_i/\bar{r}_{i-1})}\right] T_{i-1}(t) + \left[-\frac{2\bar{k}_{i-1,i}}{\ln(\bar{r}_i/\bar{r}_{i-1})} - \frac{\rho C_{p_i}(r_i^2 - r_{i-1}^2)}{\Delta t}\right.$$

$$\left. - \frac{2\bar{k}_{i,i+1}}{\ln(\bar{r}_{i+1}/\bar{r}_i)}\right] T_i(t) + \left[\frac{2\bar{k}_{i,i+1}}{\ln(\bar{r}_{i+1}/\bar{r}_i)}\right] T_{i+1}(t)$$

$$= -q_i'''(r_i^2 - r_{i-1}^2) - \left[\frac{\rho C_{p_i}(r_i^2 - r_{i-1}^2)}{\Delta t}\right] T_i(t - \Delta t) \qquad \text{(A 13)}$$

Equation (A 13) may be conveniently written as

$$\bar{A}\,\bar{T} = \bar{B}\ , \qquad \text{(A 14)}$$

where $\bar{A}$ is the tridiagonal coefficient matrix of the system

$$\bar{A} \begin{bmatrix} a_{1\,1} & a_{1\,2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{2\,1} & a_{2\,2} & {}_{2\,3} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & a_{3\,2} & {}_{3\,3} & a_{3\,4} & 0 & 0 & 0 & 0 & 0 \\ & & & & & & & & \\ 0 & 0 & 0 & 0 & a_{n-3\;n-4} & a_{n-3\;n-3} & a_{n-3\;n-2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & a_{n-2\;-3} & {}_{n-2\;n-2} & a_{n-2\;n-1} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & {}_{-1\;n-2} & a_{n-1\;n-1} & a_{n-1\;n} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & a_{n\;n-1} & {}_{n\;n} \end{bmatrix} \tag{A 15}$$

where

$$a_{i,i} = -\frac{2\bar{k}_{i-1,i}}{\ln\,(\bar{r}_i/\bar{r}_{i-1})} - \frac{\rho C_{p_i}(r_i^2 - r_{i-1}^2)}{\Delta t} - \frac{2\bar{k}_{i,i+1}}{\ln\,(\bar{r}_{i+1}/\bar{r}_i)} \tag{A 16}$$

$$a_{i,i+1} = \frac{2\bar{k}_{i,i+1}}{\ln\,(\bar{r}_{i+1}/\bar{r}_i)} \tag{A 17}$$

$$a_{i,i-1} = \frac{2\bar{k}_{i-1,i}}{\ln\,(\bar{r}_i/\bar{r}_{i-1})}\,, \tag{A 18}$$

$$a_{n,n} = -\frac{2\bar{k}_{n-1,n}}{\ln\,(\bar{r}_n/\bar{r}_{n-1})} - \frac{\rho C_{p_n}(r_n^2 - r_{n-1}^2)}{\Delta t}$$

$$- 2/[1/r_n h_f(t + \Delta t)] + [\ln\,(r_n/\bar{r}_n)/k_n] \tag{A 19}$$

$\overline{T}$ is a column vector of unknowns (nodal temperatures at time t)

$$\overline{T} = \begin{bmatrix} T_1 \\ T_2 \\ \\ T_i \\ \\ T_{n-2} \\ T_{n-1} \\ T_n \end{bmatrix} \qquad \text{(A 20)}$$

$\overline{B}$ is a column vector of knowns

$$\overline{B} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ \\ b_{n-2} \\ b_{n-1} \\ b_n \end{bmatrix} \qquad \text{(A 21)}$$

If the nodal heat generation terms q''' are expressed as fractions of

the total heat generation rate Q, such that

$$F_i Q = q_i''' \tag{A 22}$$

the elements of the $\overline{B}$ vector may be written

$$b_i = -F_i Q(r_i^2 - r_{i-1}^2) - \left[\frac{\rho_i C_{p_i}(r_i^2 - r_{i-1}^2)}{\Delta t} \right] T_i(t - \Delta t) \quad i < n \ , \tag{A 23}$$

and

$$b_n = -F_n Q(r_n^2 - r_{n-1}^2) - \left[\frac{2}{\dfrac{1}{r_n h_f(t)} + \dfrac{\ell n(r_n/\overline{r}_n)}{k_n}} \right]$$

$$\times T_b(t - \Delta t) - \left[\frac{\rho_n C_{p_n}(r_n^2 - r_{n-1}^2)}{\Delta t} \right] T_n(t - \Delta t) \tag{A 24}$$

Appendix B

INTEGRATION TECHNIQUE FOR TRANSIENT SOLUTION OF CONSERVATION EQUATIONS

Defining N to be the number of water nodes, the conservation equations can be written in state variable form as

$$\underline{y}(t) = \underline{f}[\underline{y}(t)] \ , \tag{B 1}$$

where $\underline{y}$ is the 3N column vector of state variables

$$\underline{y} = (U_1, \quad , U_n, M_1 \quad M_n, W_1 \quad , W_n) \ ,$$

and $\underline{f}[\underline{y}(t)]$ is the 3N column vector of functions determined by the right-hand sides of Eqs (2 27) to (2 29) The value of the nth state variable at time $t + \Delta t$, where Δt is the computational time step, can be written in terms of state variables at time t by a linearized implicit formulation

$$y_n(t + \Delta t) = y_n(t) + (\Delta t) \frac{dy_n(t + \Delta t)}{dt} \ , \tag{B 2}$$

where

$$\frac{dy_n(t + \Delta t)}{dt} = f_n[\underline{y}(t + \Delta t)] = f_n[\underline{y}(t)] + (\Delta t) \frac{d}{dt} f_n[\underline{y}(t)] \tag{B 3}$$

Applying the chain rule to the d/dt $f_n[\underline{y}(t)]$ term gives

$$\frac{dy_n(t + \Delta t)}{dt} = f_n[\underline{y}(t)] + (\Delta t) \sum_{m=1}^{3N} \frac{\partial f_n[\underline{y}(t)]}{\partial y_m} \frac{dy_m(t)}{dt} \tag{B 4}$$

Approximating $dy_m(t)/dt$ in Eq (B 4) by $[y_m(t + \Delta t) - y_m(t)]/\Delta t$ and substituting Eq (B 4) into Eq (B 2) gives

$$\Delta y_n - (\Delta t) \sum_{m=1}^{3N} \frac{\partial f_n[\underline{y}(t)]}{\partial y_m} \Delta y_m = (\Delta t) f_n[\underline{y}(t)] \ , \tag{B 5}$$

where $\Delta y_n \equiv y_n(t + \Delta t) - y_n(t)$ This equation can be written in terms of the Jacobian matrix, $\underline{\underline{J}}[\underline{y}(t)]$, as

$$[\underline{\underline{I}} - (\Delta t)\ \underline{\underline{J}}\{\underline{y}(t)\}]\ \Delta\underline{y} = (\Delta t)\ \underline{f}[\underline{y}(t)]\ ,$$

where $\underline{\underline{I}}$ is the identity matrix and the ℓmth element of $\underline{\underline{J}}$ is $\partial f_\ell/\partial y_m$

Next, each of the conservation equations (2 27 and 2 29) is cast in the form of Eq (B 5) For example, the conservation of energy equation for coolant node j [Eq (2 27)] becomes

$$\Delta U_j - (\Delta t)\ [H_j \Delta W_{j-1} - H_{j+1} \Delta W_j] = (\Delta t)\ \frac{dU_j(t)}{dt} \qquad \text{(B 6)}$$

Note that H_j and H_{j+1} the nodal inlet and outlet enthalpies, have been assumed constant during Δt so there is no $\partial(\partial U/\partial t)/\partial H$ term in Eq (B 6) Inlet and outlet enthalpies are recomputed at the end of each time step

Writing the momentum Eq (2 29) for water in the form of Eq (B 5) introduces $\partial P/\partial U$ $\partial P/\partial M$, $\partial\rho/\partial U$ and $\partial\rho/\partial M$ terms However terms containing the derivatives of density are orders of magnitude smaller than terms containing the derivatives of pressure and, therefore are neglected Also the friction factors are assumed constant during Δt and are recomputed at the end of each time step

When all the conservation equations have been written in the implicit form of Eq (B 6) terms containing ΔU ΔM, ΔW $\partial P/\partial U$ and $\partial P/\partial M$ for water nodes have been introduced The ΔU and ΔM terms can be eliminated from the 3N equations by algebraic manipulation, leaving a system of equations that may be written

$$\underline{\underline{A}}\ \underline{v} = \underline{b} \qquad \text{(B 7)}$$

where $\underline{v}$ is the N column vector

$$[\Delta W_1, \quad , \Delta W_n]$$

The matrices $\underline{\underline{A}}$ and $\underline{b}$ are determined by the values at time t of heat transfer coefficients, friction factors, enthalpies, the derivatives of pressure with respect to internal energy and mass, and the values of the

right-hand sides of the conservation equations Once the components of $\underline{\underline{A}}$ and $\underline{b}$ have been determined Eq (B 7) is solved by inverting $\underline{\underline{A}}$ From the resulting values of ΔW for the water nodes ΔU ΔM can be determined by back-substitution into the conservation equations which were written in the form of Eq (B 5)

Appendix C

INPUT DATA DESCRIPTION

C 1 Data Deck Organization

A PINSIM-MOD1 problem deck consists of a title card, comment cards (optional), data cards, and a terminator card A listing of the cards is printed at the beginning of each PINSIM-MOD1 problem The order of the title, data, and comment cards is unimportant except that the last title card or the last data card with a duplicate card number will be used Each type of card is discussed in this Appendix

When a card format error is detected, a line containing a dollar sign ($) is located under the character causing the error and a comment giving the card column of the error is printed An error flag is set such that input processing continues, but the problem is aborted at the end of input processing and data initialization

1 Title card A title card must be entered for each PINSIM-MOD1 problem A title card is identified by an equal sign (=) as the first nonblank character The title (the remainder of the title card) is printed as the second line of every page The title card is normally placed first in the problem

2 Comment cards An asterisk (*) or a dollar sign ($) appearing as the first nonblank character identifies the card as a comment card Blank cards are treated as comment cards The only processing of comment cards is printing of contents Comment cards may be placed anywhere in the input deck

3 Data cards Data cards contain a varying number of fields that may be integer, floating point or alphanumeric Blanks preceding and following fields are ignored

The first field on a data card is a card number, which must be an unsigned integer If the first field has an error or is not an integer, an error flag is set Consequently, data on the card are not used, and the card will be identified by the card number in the list of unused data cards After each card number and the accompanying data are read, the card number is compared to previously entered card numbers If a matching

card number is found, the data entered on the previous card are replaced by the data on the current card If the card being processed contains only a card number the card number and the data entered on the previous card are deleted If a card causes replacement or deletion of data a statement is printed indicating that the card is a replacement card

Comment information may follow the data fields on any data card by preceding the comment with an asterisk or dollar sign

A number field is started by either a digit (0 through 9) a sign (+ or −), or a decimal point ( ) A comma or a blank (with one exception subsequently noted) terminates the number field The number field has a number part and, optionally, an exponent part A number field without a decimal point or an exponent is an integer field, a number field with either a decimal point, an exponent, or both is a floating-point field The exponent denotes the power of ten to be applied to the number part of the field The exponent part has an E or D and a plus or minus sign followed by a number giving the power of ten These rules for floating-point numbers are identical to those for entering data in FORTRAN E or F format fields, except that no blanks (one exception) are allowed between characters Floating-point data punched by FORTRAN programs can be read To permit reading of floating-point data, a blank following an E or D denoting an exponent is treated as a plus sign Acceptable ways of entering floating-point numbers, all containing the quantity 12 45, are illustrated by the following six fields 12 45 +12 45 1245+2 1 245+1 1 245E1 and 1 245E+1 A field starting with a letter is an alphanumeric field and is terminated by a comma a blank or the end of the card All characters are allowed except commas and blanks

4 <u>Continuation cards</u> Data on a card may be continued on a continuation card by entering a plus sign as the first nonblank character on the continuation card A field starting on a card must be completed on that card and may not continue to the next card The plus sign indicating the continuation card is not considered part of the first data field on the continuation card and may be placed alone or adjacent to the first data field Continuation cards themselves may be continued In subsequent processing, data on continuation cards are treated as if the data were all entered on one card

5 Terminator cards The input data for a PINSIM-MOD1 problem is terminated by a period card The period card has a period as the first nonblank character Comments may follow the period on the period card

C 2 Data Card Summary

Card 100000 Job Control Card

1 IDJOB JOB TYPE FLAG
- = 0 steady-state problem only
- = 1 transient, generate no plot/restart tape
- = 2 transient, generate a plot/restart tape on unit 1
- = 3 same as 2, but start problem from old plot/restart tape on unit 1

2 RSTRTM RESTART TIME
Time at which job type 3 is to be restarted

3 ENDT Problem end time (sec)

4 NTIM Number of time-step size groups (NTIM $\leq$ 10)

C 2 1 Problem dimensions and options

Card 100100 System Control Flags

1 INUCFL Nuclear System Flag
- = +N Power is tabulated vs time (Card 599000 and others are required)
- = 0 System is off
- = −1 Normalized power by point kinetics (Card 510000 and others are required)
- = −2 Back-calculate power (Card 500100 and others are required

2 IIDLFL Ideal Electric System Flag
- = +N Power is tabulated vs time (Card 699000 and others are required)
- = 0 System is off
- = −1 Back-calculate power (Card 600100 and others are required)

3 IACTFL Actual Electric System Flag

= +N Power is tabulated vs time (Card 799000 and others are required)

= 0 System is off

= −1 Power follows another system (Card 700100 is required)

Card 100200 Steady-State Power

1 PNUC Nuclear System Power (MW)

2 PIDL Ideal Electric System Power (kW)

3 PACT Actual Electric System Power (kW)

Card 100300 Problem Dimensions

1 NPINS Number of pins in the problem

2 NCHAN Number of channels in the problem

Card 10000I Time-Step Group Cards

NTIM (on card 100000) cards are required where I = 1 2, , NTIM

1 TIME Time at which group begins (Must equal 0 0 on card 100301)

2 DTMIN Minimum allowable step size (sec)

3 DTMAX Maximum allowable step size (sec)

4 ITIMFL Time step control flag

= +1 Calculate step size

= +2 Step size = DTMIN

= +3 Step size = DTMAX

Card 100400 Convergence Limits

1 MAXTHT Maximum number of energy-balance iterations to be allowed in determining the transient pin temperature distributions

2 EPSTHT Allowable energy-balance error in determining the transient pin temperature

3 MAXSST Maximum number of energy-balance iterations to be allowed in determining the steady-state distribution

4 EPSSST Allowable energy-balance error in determining the steady-state distribution

5 MAXBKQ Maximum number of energy-balance iterations to be allowed in determining the back-calculation temperature distribution

6 EPSBKQ Allowable energy-balance error in determining the back-calculation temperature distribution

C 2 2 Edit Options

Card 200000 Debug Output Flags

(This card is optional no debug output will be printed if it is omitted)

1 NDBUG Device to which debug output will be printed

2 ITDBUG Time-step size calculation output flag

= 0 No output

= 1 Initial ratios, final ratios

= 2 Initial ratios, final ratios and diagnostics

3 ICDBUG This option is not yet operational

4 IHDBUG Heat transfer output flag

= 0 No output

= 1 Tridiagonal elements of the matrix

= 2 Tridiagonal elements of the matrix plus intermediate matrix terms

= 3 Tridiagonal elements of the matrix plus intermediate matrix terms plus material properties

5 INDBUG Nuclear power calculation output flag

= 0 No output

If INUCFL = −1 (on Card 100100) and INDBUG

= 1 Components of reactivity calculated from each level of NKINPN (on Card 510000)

If INUCFL = −2 (on Card 100100) and INDBUG

= 1 Surface conditions used in back-calculation and modified matrices

= 2 Surface conditions used in back-calculation and modified matrices plus tridiagonal matrix elements (Output after convergence)

6 IPDBUG Pin deformation calculation output (Options not yet operational)

7 IADBUG Ideal electric power back-calculation output

= 0 No output

= 1 Surface conditions used in back-calculations and modified matrices

= 2 Surface conditions used in back-calculation, modified matrices, and tridiagonal matrix elements (Output after convergence)

8 IIDBUG Actual electric power calculation output

= 0 No output

If IACTFL = −1 (on Card 100100) and IFOLFL = −1 (on Card 700100) and IADBUG

= 1 Rod heater resistances, ideal voltage, and actual voltage

9 IFDBUG Debug output frequency control flag

= 0 No debug output (regardless of settings of other flags)

= 2 Output for transient calculations only

= 3 Output for steady-state and transient calculations

Card 210000 Minor Edit Control Card

1 MINOUT Logical unit to which minor edits will be routed

2 NMIN Number of time steps between minor edits

3 DELMIN Elapsed time between minor edits

Note If NMIN = 0 and DELMIN ≠ 0 0 DELMIN controls the output if NMIN ≠ 0 and DELMIN = 0 0, NMIN controls the output If neither NMIN nor DELMIN are set equal to 0, NMIN controls the output

Card 210001 Minor Edit Key Card

Enter up to nine minor edit variable keys and, where appropriate the dimensions of array members Enter only the first four characters of each key Valid minor edit keys are listed in Table C 1 Array dimensions should be enclosed in parentheses and separated by colons Minor edit key groups (i e , keys and dimensions) must be separated by semicolons Current problem time is automatically minor edited

Table C 1 Minor edit variable keys

Symbol	Definition	Problem unit	Maximum dimensions
APNPOW	Average system pin power	Power system	(3)
DELT	Calculational time-step size	Problem	(50)
DOTMW	Temporal derivative of nodal total mass	Coolant node	(50)
DOTUW	Temporal derivative of nodal internal energy	Coolant node	(50)
DOTWW	Temporal derivative of nodal mass flow rate	Coolant node	(50)
DPDMW	Derivative of pressure with density at constant energy density	Coolant node	(50)
DPDUW	Derivative of pressure with internal energy at constant density	Coolant node	(50)
DTDMW	Derivative of temperature with density at constant energy density	Coolant node	(50)
DTDUW	Derivative of temperature with internal energy at constant density	Coolant node	(50)
E	Demand voltage for inverse calculation of system power	Actual system	
EACT	System voltage	Actual system	
ESUBI	Demand voltage for forward calculation of system power	Actual system	
GAPH	Gas gap heat transfer coefficient	Pin level	(4 20)
GAPK	Equivalent gas gap conductivity	Pin level	(4 20)
GM	Nodal gas mass	Coolant node	(50)
H	Nodal enthalpy	Coolant node	(50)
HCFC	Mass flux	Coolant node	(50)
HIN	Nodal inlet enthalpy	Coolant node	(50)
HINL	Channel inlet enthalpy	Coolant channel	(4)
HOUT	Channel outlet enthalpy	Coolant channel	(4)
HTCIDL	System back-calculation surface heat transfer coefficient	Ideal system	
HTCNUC	Back-calculation surface heat transfer coefficient	Nuclear system	
HTCW	Surface heat transfer coefficient	Pin level	(4 20)
IDNB	DNB correlation selection parameter	Coolant node	(50)
IHT	Surface heat transfer mode	Pin level	(4 20)
PACT	System power	Actual system	
PHIIDL	System back-calculation surface heat flux	Ideal system	
PHINUC	System back-calculation surface heat flux	Nuclear system	
PHIW	Surface heat flux	Pin level	(4 20)
PIDL	System power	Ideal system	
PINL	Channel inlet pressure	Coolant channel	(4)

Table C 1 (continued)

Symbol	Definition	Problem unit	Maximum dimensions
PINPOW	Pin power	Pin	(4)
PNUC	System power	Nuclear system	
POUT	Channel outlet pressure	Coolant channel	(4)
POVPA	Axial power fraction	Pin level	(4 20)
POWLVL	Power generated on axial level	Pin level	(4 20)
PWAT	Nodal pressure	Coolant node	(50)
QDOTV	Heat generation rate	Pin level node	(4 20 20)
QUAINL	Enthalpy-based channel inlet quality	Coolant channel	(4)
QUAOUT	Enthalpy-based channel outlet quality	Coolant channel	(4)
RESACT	Current heater resistance of actual pin	Actual system	
RESIDL	Current heater resistance of ideal pin	Ideal system	
RKINL	Channel inlet friction factor	Coolant channel	(4)
RKOUT	Channel outlet friction factor	Coolant channel	(4)
SRFIDL	System back-calculated surface temperature	Ideal system	
SRFNUC	System back-calculated surface temperature	Nuclear system	
TAU	Elapsed problem time	Problem	
TEMINL	Channel inlet temperature	Coolant channel	(4)
TEMOUT	Channel outlet temperature	Coolant channel	(4)
TH2O	Nodal temperature	Coolant node	(50)
TMASSW	Nodal total mass	Coolant node	(50)
TMPIDL	System back-calculation sink temperature	Ideal system	
TMPNUC	System back-calculation sink temperature	Nuclear system	
TNOD	Node temperature	Pin level node	(4 20 20)
TPHI	Weighted surface heat flux	Pin level	(4 20)
TTUBWS	Pin surface temperature	Pin level	(4 20)
UBARW	Nodal internal energy	Coolant node	(50)
VSPBAR	Nodal specific volume	Coolant node	(50)
VSPINL	Channel inlet specific volume	Coolant channel	(4)
VSPOUT	Channel outlet specific volume	Coolant channel	(4)
VZERO	Initial rate of change of EACT in this time step	Actual system	
W	Nodal mass flow rate	Coolant node	(50)
WINL	Channel inlet flow rate	Coolant node	(50)
WM	Nodal water mass	Coolant node	(50)
WOUT	Channel outlet flow rate	Coolant channel	(4)
X	Enthalpy-based nodal quality	Coolant node	(50)
XL	Mass-based nodal quality	Coolant node	(50)

Card 220000 Major Edit Control Card

1 MAJOUT Logical unit to which major edits are to be routed

2 NMAJ Number of time steps between major edits

3 DELMAJ Elapsed time between major edits

Note If NMAJ = 0 and DELMAJ ≠ 0 0, DELMAJ controls the output, if NMAJ ≠ 0 and DELMAJ = 0 0, NMAJ controls the output If neither NMAJ nor DELMAJ are set equal to 0, NMAJ controls the output

Card 230000 Plot Control Card (Required if IDJOB on card 100000 is 2 or 3)

1 NPLT Number of time steps between plot record output

2 DELPLT Elapsed time between plot records

Note If NPLT = 0 and DELPLT ≠ 0 0 DELPLT controls the output, if NPLT ≠ 0 NPLT controls the output if both NPLT and DELPLT are 0, no plot record is written Plot records are written to logical unit 1

Card 240000 Restart Record Control Card (Required if IDJOB on card 100000 is 2 or 3)

1 NRST Number of time steps between restart record output

2 DELRST Elapsed time between restart records

Note If NRST = 0 and DELRST ≠ 0 0, DELRST controls the output, if NRST ≠ 0, NRST controls the output If both are 0, no restart record is written Restart records are written to logical unit 1

C 2 3 Hydraulics data

Card 300100 Miscellaneous Hydraulics Parameters

1 METHOD Flag for Hydraulics Solution Method
= 0 Implicit method
= 1 Explicit method

2 TWCHG Allowable water temperature change before recalculating thermotransport properties

3 DELTBC Period over which the boundary conditions are to be time-averaged

Card 3010II Coolant Node Description for Node II

This card, along with card 3020II, is required to define each coolant node in the problem The node number (II) must be sequential (II = 01, 02, 03,) The maximum II cannot exceed 50 Each coolant node described by these cards must be associated with a pin level (see NODWAT on card 4MNN00)

1	PWAT	Pressure Guess (psia) for Steady-State Search
2	H	Enthalpy Guess (Btu/lb_m) for Steady-State Search
3	FLOAW	Flow Area (ft^2)
4	TUBLEN	Axial Length of Water Node (ft)
5	TUBVOL	Node Volume (ft^3)
6	TUBLIN	Inlet Position (0 = Bottom, 1 = Top)
7	TUBOUT	Outlet Position (0 = Bottom 1 = Top)
8	NUPW	Upstream Water Node Number (20N if Node II is the inlet for the channel associated with Pin Number N)
9	NDOWNW	Downstream Water Node Number (21N if Node II is the outlet for the channel associated with Pin Number N)

Card 3020II Hydraulic Input for Node II

This card, along with Card 3010II, is required to define each coolant node in the problem The node number (II) must be sequential (II = 01 02 03,) The maximum II cannot exceed 50 Each coolant node described by these cards must be associated with a pin level (see NODWAT on Card 4MNN00)

1	W	Mass Flow Rate (lb_m/sec)
2	FINPFP	Form Loss Coefficient
3	EOVERD	Relative Surface Roughness
4	TUBEHD	Hydraulic Diameter (in)
5	IDNB	DNB Flux Flag

= 1 or 4 Correlation is supplied by user (Card 303001 is required)

= 2 or 5 Use W-3, Jansen, Levy correlation (Card 303001 is required)

= 3 or 6 Use B & W-2, Barnett, Modified Barnett

If 1 2 or 3 is entered, the code will not return to nucleate boiling once DNB has occurred If 4, 5, or 6 is entered, the code will return to nucleate boiling once DNB has occurred

6 H3 Minimum Post-DNB Heat Transfer Coefficient (Btu/hr-ft^2-°F)

7 IGR Film Boiling Correlation Switch

= 0 Dougall-Rohsenow

= 1 Groeneveld

Card 303001 DNB Correlation Input Card

(This card is required if any IDNB on Card 3020II is equal to 1 2 4 or 5)

1 BO(1) DNB Flux (Btu/hr-ft^2) for Zero Quality

[This is used only for IDNB (on Card 3020II) = 1 or 4]

2 BO(2) Quality at which DNB Occurs

[This is used only for IDNB (on Card 3020II) = 1 or 4]

3 BO(3) Quality at which DNB Flux Becomes Zero

[This is used only for IDNB (on Card 3020II) = 1 or 4]

4 BO(4) "E Factor" in Jansen-Levy Correlation (See Ref 16)

[This is used only for IDNB (on Card 3020II) = 2 or 5]

Card 31N000 Channel Inlet Condition Data

This card is required if NCHAN (on Card 100300) is not equal to 0 This card defines the coolant inlet boundary conditions for the channel associated with Pin Number N NPINS (on Card 100200) cards are required where N = 1, 2, , NPINS Up to 200 sets of entries (800 numbers) are allowed

1 TIME Time (sec)

2 TWINL Mass Flow Rate (lb_m/sec)

3 TPINL Pressure (psia)

4 THINL Enthalpy (Btu/lb_m)

Card 32N000 Channel Outlet Condition Data

This card is required if NCHAN (on Card 100300) is not equal to 0 This card defines the coolant channel outlet boundary conditions for the channel associated with Pin Number N NPINS (on Card 100200) cards are

required where N = 1, 2, NPINS Up to 200 sets of entries (800 numbers) are allowed

1 TIME Time (sec)

2 TWOUT Mass Flow Rate (lb_m/sec)

3 TPOUT Pressure (psia)

4 THOUT Enthalpy (Btu/lb_m)

C 2 4 Pin data

Card 4M0000 Pin Constants and Flags

NPINS (on Card 100300) cards are required, where M = 1, 2, , NPINS

1 ISYS System Identification Flag

= 1 Nuclear system

= 2 Ideal electric system

= 3 Actual electric system

2 I An Input Dummy

If I > 0 NLVL = 1, number of axial levels to be modeled ($1 \leq NLVL \leq 20$)

If I > 0, Flag indicates that Pin M is identical to Pin I (except for the ISYS designation)

Use of this option requires that no other cards in the 4M0000 series be supplied except Card 4M0001

3 NMAT Number of Materials to be Modeled in Pin M

4 IPOW PIN Power Flag

> 1 Indicates pin power is tabulated vs time Card 4M0003 is required

= +1 Indicates pin power is to be determined as a fraction of the appropriate system power

= 0 Indicates the pin is dead (no power)

= −N Indicates that pin power is equal to that of Pin Number N

5 POWFAC Pin Power Peaking Factor, equal to the ratio of pin power to average system pin power

6 IGAPFL Gap Calculation Flag

> 0 Indicates gap conductivity is tabulated vs temperature (Card 4M0019 is required)

= 0 Indicates no gap in pin

= −1 Indicates linear expansion gap model is to be used (Card 4M0010 is required)

= −2 Indicates GAPHTR Subcode is to be used to determine gap conductivity (Cards 4M0012 and 4M0013 are required)

7 INFLAG Internal Pin Data Flag

(If ISYS = 1, INFLAG refers to flux depression factors)

> 0 Flux depression factors tabulated (Card 4M0020 is required)

= 0 Flux depression factors are not used

(If ISYS = 2 or 3, INFLAG refers to heater element resistances)

> 0 Resistance is tabulated vs temperature (Card 4M0020 is required)

= 0 Resistance values are not used

= −1 Resistance is constant (Card 4M0020 is required)

8 ORIFAC Associated channel orificing factors factor by which the associated channel boundary condition flow rates (Cards 31N000 and 32N000) should be multiplied to determine the channel's inlet and outlet flow rates

9 IDFORM Pin Deformation Flag (Nuclear system only)

= 1 Pin is allowed to deform (Free Thermal Expansion)

= 0 Pin does not deform

Card 4M0001 Water Node Array Data

This card is required if I (Parameter 2 on Card 4M0000) is less than 0 If this is the case, defining the coolant nodes associated with Pin M is necessary This card performs that task Enter NLVL (on Card 4N0000, where N = 1 and I is Parameter 2 on Card 4M0000) coolant node numbers These will be assigned in sequence to each level of Pin M, the first node number will be assigned to Level 1, the second to Level 2, etc

Card 4M0003 Pin Power Card

NPINS (on Card 100300) cards are required, where M = 1, 2, , NPINS Card 4M0003 is required only if IPOW (on Card 4M0000) > 1 Enter IPOW

(on Card 4M0000) ordered pairs of time (sec) and pin power (kW)

Card 4M0010 Linear Gap Data

NPINS (on Card 100300) cards are required where M = 1 2, NPINS
Card 4M0010 is required only if IGAPFL (on Card 4M0000) = −1

1	GAPB	Bias gap width (mils)
2	TINB	Inner surface bias temperature (F)
3	TOTB	Outer surface bias temperature (F)
4	TMAX	Maximum temperature (°F) for use of expansion coefficients without extrapolation
5	C_1	Coefficients used in the linear expansion gap model
6	C_2	
7	C_3	

Card 4M0012 Internal Gas and Plenum Data

NPINS (on Card 100300) cards are required, where M = 1, 2 NPINS
Card 4M0012 is required only if IGAPFL (on Card 4M0000) = −2

1	GSMS	Amount of gas in Pin M (g-moles)
2	PO	Cold state pin gas pressure (psia)

Card 4M0013 Gas Composition Data

NPINS (on Card 100300) cards are required where M = 1, 2 NPINS
Card 4M0013 is required only if IGAPFL (on Card 4M0000) = −2

1	GMIX(1)	Fraction of helium
2	GMIX(2)	Fraction of argon
3	GMIX(3)	Fraction of krypton
4	GMIX(4)	Fraction of xenon
5	GMIX(5)	Fraction of hydrogen
6	GMIX(6)	Fraction of nitrogen
7	GMIX(7)	Fraction of water vapor

Card 4M0014 Gap Parameters

NPINS (on Card 100200) cards are required, where M = 1, 2, NPINS
Card 4M0014 is read only if IGAPFL (on Card 4M0000) = −3

1	RUFC	Arithmatic mean roughness of cladding (cm)
2	RUFF	Arithmatic mean roughness of the fuel (cm)
3	FNFLUX	Average fast neutron flux (m^2/sec)
4	TFNFLX	Time span of fast flux (sec)

Card 4M0019 Explicit Gap Data

NPINS (on Card 100300) cards are required where M = 1 2 , NPINS
Card 4M0019 is required only if IGAPFL (on Card 4M0000) > 0

Enter IGAPFL (on Card 4M0000) ordered pairs of temperature (°F) and gap conductivity (Btu/sec-ft-°F)

Card 4M0020 Pin Internal Data

NPINS (on Card 100300) cards are required where M = 1 2 NPINS
Card 4M0020 is required if INFLAG (on Card 4M0000) $\neq$ 0

* If ISYS = 1 (on Card 4M0000) enter INFLAG ordered pairs of radius (ft) and relative flux depression factor
* If ISYS = 2 or 3 (on Card 4M0000) and INFLAG > 0 enter INFLAG ordered pairs of temperature (F) and heater pin resistance (Ω)
* If ISYS = 2 or 3 (on Card 4M0000) and INFLAG = −1, enter constant heater pin resistance

Card 4MNN00 Level Data

NLVL (on Card 4M0000) cards are required for each Pin M where M = 1 2 , NPINS and NN = 1, 2, , NLVL

1	NREG	Number of radial regions to be modeled on this level ($1 \leq$ NREG ≤ 10)
2	POVPA	Axial power fraction (The code will normalize the POVPA values found on all the level data cards associated with Pin M so that their sum will equal 1 0)
3	ZLNGTH	Axial length of this level (ft)
4	NODWAT	Number of the associated water node (The associated water node is defined by Cards 3010II and 3030II, where II = NODWAT)

Card 4MNNPP Region Data

NREG (on Card 4MNN00) cards are required for each level NN where NN = 1, 2, , NLVL (on Card 4M0000), M = 1, 2, , NPINS (on Card 100300) and PP = 1, 2, , NREG (on Card 4MNN00)

1 RINREG Radius (ft) of inner surface of region

2 ROTREG Radius (ft) of outer surface of region

3 POVP Fraction of level power generated in this region (The code will normalize the POVP values found on all the region data cards associated with Level NN of Pin M so that their sum will equal 1 0)

4 NNOD Number of nodes to be placed in region (The total number of nodes distributed on Level NN must not exceed 20)

5 MATREG Region material identification number (0 < MATREG $\leq$ NMAT on Card 4M0000)

Card 4M9N00 Material Constants

NMAT (on Card 4M0000) cards are required for each pin M where M = 1 2, , NPINS and N = 1, 2, , NMAT

1 IMAT Known material flag

= 0 Material is unknown input property cards 4M9N10 4M9N20, and 4M9N30 are required

= 1 Material is uranium dioxide (Card 4M9001 is required)

= 2 Material is Zircaloy-4

= 3 Material is BN_3

= 4 Material is MgO

= 5 Material is Inconel

= 6 Material is cupro-nickel

= 7 Material is stainless steel 316

= 8 Material is a gas gap

2 NPROPS Number of properties for which data are input (Must equal 3)

3 TMELT Material melting point (°F)

Card 4M9001 UO_2 Fuel Data

NPINS (on Card 100300) cards are required, where M = 1 2 NPINS

Card 4M9001 is required if any IMAT (on Card 4M9N00) = 1

1	BU	Fuel burnup (MWsec/kg)
2	FRPO2	Weight fraction of PuO_2 in the fuel
3	FRADEN	Fractional density of the fuel (Default is 0 94)
4	CONINP	Conductivity integral (W/m-K) (Default is 0 97)

Card 4M9N10 Thermal Conductivity Data Card 1

NMAT (on Card 4M0000) cards are required for each Pin M where M = 1, 2 , NPINS and N = 1, 2, NMAT Card 4M9N11 is required

1 IMATFL Material calculation flag

= −1 The property is constant

= 0 The property has polynomial expansion with temperature

> 0 The property is tabulated vs temperature

2 TMATLO Lower limit of the range of valid temperatures for this property of this material on this pin If the temperature is less than TMATLO the property will be evaluated using TMATLO

3 TMATHI Upper limit of the range of valid temperatures for this property of this material on this pin If the temperature is greater than TMATHI the property will be evaluated using TMATHI

Card 4M9N11 Thermal Conductivity Data Card 2

NMAT (on Card 4M0000) cards are required for each Pin M, where M = 1, 2, NPINS and N = 1, 2, NMAT

* If IMATFL (on Card 4M9N10) = −1, enter a constant
* If IMATFL (on Card 4M9N10) = 0, enter the following

1 Polynomial constant coefficient

2 Polynomial coefficient of temperature (T)

3 Polynomial coefficient of T^2

4 Polynomial coefficient of T^3

5 Polynomial coefficient of T^4

* If IMATFL (on Card 4M9N10) > 0, enter IMATFL ordered pairs of temperature (°F) and thermal conductivity (Btu/hr-ft- F)

Card 4M9N20 Specific Heat Capacity Data Card 1

NMAT (on Card 4M0000) cards are required for each Pin M, where M = 1 2, , NPINS and N = 1, 2, , NMAT Card 4M9N21 is required

1 IMATFL Material calculation flag
  = −1 The property is constant
  = 0 The property has polynomial expansion with temperature
  > 0 The property is tabulated vs temperature

2 TMATLO Lower limit of the range of valid temperatures for this property of this material on this pin If the temperature is less than TMATLO the property will be evaluated using TMATLO

3 TMATHI Upper limit of the range of valid temperatures for this property of this material on this pin If the temperature is greater than TMATHI, the property will be evaluated using TMATHI

Card 4M9N21 Specific Heat Capacity Data Card 2

NMAT (on Card 4M0000) cards are required for each Pin M where M = 1, 2, , NPINS and N = 1, 2, , NMAT

* If IMATFL (on Card 4M9N20) = −1 enter a constant
* If IMATFL (on Card 4M9N20) = 0, enter the following
  1 Polynomial constant coefficient
  2 Polynomial coefficient of temperature (T)
  3 Polynomial coefficient of T^2
  4 Polynomial coefficient of T^3
  5 Polynomial coefficient of T^4
* If IMATFL (on Card 4M9N20) > 0, enter IMATFL ordered pairs of temperature (°F) and specific heat capacity (Btu/lb_m-°F)

Card 4M9N30 Density Data Card 1

NMAT (on Card 4M0000) cards are required for each Pin M, where M = 1, 2, , NPINS and N = 1, 2, , NMAT Card 4M9N31 is required

1 IMATFL Material calculation flag

= −1 The property is constant

= 0 The property has polynomial expansion with temperature

> 0 The property is tabulated vs temperature

2 TMATLO Lower limit of range of valid temperatures for this property of this material on this pin If the temperature is less than TMATLO the property will be evaluated using TMATLO

3 TMATHI Upper limit of range of valid temperatures for this property of this material on this pin If the temperature is greater than TMATHI, the property will be evaluated using TMATHI

Card 4M9N31 Density Data Card 2

NMAT (on Card 4M0000) cards are required for each Pin M where M = 1 2, NPINS and N = 1, 2, , NMAT

* If IMATFL (on Card 4M9N30) = −1, enter a constant
* If IMATFL (on Card 4M9N30) = 0, enter the following
  1 Polynomial constant coefficient
  2 Polynomial coefficient of temperature (T)
  3 Polynomial coefficient of T^2
  4 Polynomial coefficient of T^3
  5 Polynomial coefficient of T^4
* If IMATFL (on Card 4M9N30) > 0, enter IMATFL ordered pairs of temperature (°F) and density (lb_m/ft^3)

C 2 5 Nuclear power system data

Card 500010 Nuclear System Dimensions

This card is required if INUCFL (on Card 100100) ≠ 0

1 INPOWX Power table flag

= 0 No tabulated power

> 0 Number of entries in power table

2 NNPINS Number of fuel pins included in the nuclear system (The nuclear system power will be divided by this number to determine the average nuclear system pin power)

3 NNCHAN Dummy parameter not in use

Card 500050 Nuclear System Orders of Interpolation

This card is optional if it is omitted, all tables will be interpolated with a first-order polynomial (linear interpolation)

1 NRPNUC Nuclear system power table (Card 599000) order of interpolation

2 NRPHIN Nuclear system back-calculation surface heat flux table (Card 500121) order of interpolation

3 NRTMPN Nuclear system back-calculation surface temperature table (Card 500141) order of interpolation

4 NRHTCN Nuclear system back-calculation heat transfer coefficient table (Card 500131) order of interpolation

5 NRDUMN Dummy parameter not in use

Card 500100 Back-Calculation Card

This card is required if INUCFL (on Card 100100) = −2

1 INBCK Back-calculation flag

= 1 Surface conditions supplied (Card 500110 is required)

< 0 Power of pin NNPBCK is equal to that of the pin whose number is INBCK

2 NNPBCK The number of the pin in the input deck that will be used to back-calculate the power

3 NNLBCK The number of the axial level of pin NNPBCK at which the power back-calculation will be performed

4 DTNUC Period over which surface conditions should be time-averaged for the back-calculation

Card 500110 Back-Calculation Condition Flag Card

This card is required if INUCFL (on Card 100100) = −2

1 INQFL Boundary condition heat flux flag

> 0 Boundary condition heat flux is tabulated (Card 500121 is required)

= −1 Boundary condition heat flux is taken from another pin in the problem (Card 500120 is required)

2 INHFL Surface heat transfer coefficient flag

> 0 Surface heat transfer coefficient is tabulated (Card 500131 is required)

= −1 Surface heat transfer coefficient is taken from another pin in the problem (Card 500130 is required)

= 0 Surface heat transfer coefficient is ignored, and the surface temperature is set equal to the boundary condition temperature

3 INTFL Boundary condition temperature flag

> 0 Boundary condition temperature is tabulated (Card 500141 is required)

= −1 Boundary condition temperature is taken from another pin in the problem (Card 500140 is required)

Card 500120 Boundary Condition Heat Flux Link Card

[This card is required if INUCFL (on Card 100100) = −2 and if INQFL (on Card 500110) = −1]

1 NPQN The number of the pin from which the boundary condition heat flux is to be taken

2 NLQN The number of the level of the pin from which the boundary condition heat flux is to be taken

Card 500121 Boundary Condition Heat Flux Table Card

[This card is required if INUCFL (on Card 100100) = −2 and if INQFL (on Card 500110) > 0]

Enter time (sec) and relative boundary condition heat flux values in INQFL (on Card 500110) ordered pairs

Note Boundary condition heat flux table will be normalized to a value equal to the calculated steady-state heat flux at time (T) = 0

Card 500130 Surface Heat Transfer Coefficient Link Card

[This card is required if INUCFL (on Card 100100) = −2 and if INHFL (on Card 500110) = −1]

1 NPHN The number of the pin from which the surface heat transfer coefficient is to be taken

2 NLHN The number of the level of the pin from which the surface heat transfer coefficient is to be taken

Card 500131 Surface Heat Transfer Coefficient Table Card

[This card is required if INUCFL (on Card 100100) = −2 and if INHFL (on Card 500110) > 0]

Enter INHFL (on Card 500110) ordered pairs of time in seconds and surface heat transfer coefficient (Btu/hr-ft^2- F) values

Card 500140 Boundary Condition Temperature Link Card

[This card is required if INUCFL (on Card 100100) = −2 and if INTFL (on Card 500110) = −1]

1 NPTN The number of the pin from which the boundary condition temperature is to be taken

2 NLTN The number of the level of the pin from which the boundary condition temperature is to be taken

3 NNTN Boundary condition temperature source flag

= 0 The boundary condition temperature is taken from the coolant node NODWAT (on Card 4MNN00 where M = NPTN and NN = NLTN)

= −1 The boundary condition temperature is taken from the surface of the pin whose number is NPTN NLTN

Card 500141 Boundary Condition Temperature Table Card

[This card is required if INUCFL (on Card 100100) = −2 and if INTFL (on Card 500110) > 0]

Enter time (sec) and boundary condition temperature (°F) in INTFL (on Card 500110) ordered pairs

Card 500200 Nuclear Back-Calculation Power Filter Card

[This card is required if INUCFL (on Card 100100) = −2]

1 BPNUCL Low-pass filter breakpoint for back-calculated power (or minimum value)

2 BPNUCH High-pass filter breakpoint for back-calculated power (or maximum value)

3 IPNUCF Filter flag

= 0 No filter

= 1 Low-pass filter only

= 2 High-pass filter only

= 3 Notch filter

= 4 Maximum value—minimum value filter

Card 500210 Nuclear Back-Calculation Surface Heat Flux Filter Card

[This card is required if INUCFL (on Card 100100) = −2]

1 BPHINL Low-pass filter breakpoint for surface heat flux (or minimum value)

2 BPHINH High-pass filter breakpoint for surface heat flux (or maximum value)

3 IPHINF Filter flag

= 0 No filter

= 1 Low-pass filter only

= 2 High-pass filter only

= 3 Notch filter

= 4 Maximum value—minimum value filter

Card 500220 Nuclear Back-Calculation Temperature Filter Card

[This card is required if INUCFL (on Card 100100) = −2]

1 BTMPNL Low-pass filter breakpoint for temperature (or minimum value)

2 BTMPNH High-pass filter breakpoint for temperature (or maximum value)

3 ITMPNF Filter flag

= 0 No filter

= 1 Low-pass filter only

= 2 High-pass filter only

= 3 Notch filter

= 4 Maximum value—minimum value filter

Card 510000 Kinetics Flags and Constants

[This card is required if INUCFL (on Card 100100) = −1]

1 NODEL Power calculation flag

= 1 Six groups of delayed neutrons

= 2 Six groups of delayed neutrons plus eleven gamma emitters

= 3 Six groups of delayed neutrons plus eleven gamma emitters plus U-239 and Pu-239

2 KMUL Multiplying factor for decay energy

= 0 Use ANS decay energy release rates

≠ 0 Multiply ANS rates by 1 2

3 BOVL β/Λ, effective delayed neutron fraction per mean lifetime (sec^{-1})

4 RHOIN Initial reactivity ($)

5 UDUF U-238 atoms consumed per U-235 atoms fissioned (Default is 1 0)

6 PROMPT Fraction of total power released at time of fission

(If NODEL = 1, default is 1 0)

(If NODEL = 2 or 3, default is 0 93001)

7 IRHOFL Reactivity calculation flag

> 0 Total system reactivity is tabulated (Card 511099 is required)

= 0 Reactivity is determined by adding the contributions of feedback from Pin NKINPN and its associated channel and tabulated control reactivity (Card 514099 is required)

8 IFDBCK Feedback flag

= 0 Weighting coefficients same as power fractions for the designated nuclear pin

≠ 0 Input weighting factors on Card 511000

9 NKINPN Number of the pin which should be used to calculate feedback reactivity

Card 511000 Reactivity Tables Dimension Card

[This card is required if IRHOFL (on Card 510000) = 0]

1 NCNRHO Number of entries in the control reactivity table
[Note Enter 0 if control reactivity is not to be included in the determination of the total reactivity Card 512099 is required]

2 NDPRHO Number of entries in the Doppler reactivity table
[Note Enter 0 if Doppler reactivity is not to be included in the determination of the total reactivity Card 513099 is required]

3 NVDRHO Number of entries in the coolant density reactivity table
[Note Enter 0 if coolant density reactivity is not to be included in the determination of the total reactivity Card 514099 is required]

Card 511ONN Reactivity Coefficient Data Card

[This card is required if INUCFL (on Card 100100) = −1 and if IRHOFL (on Card 510000) = 0 and if IFDBCK (on Card 510000) ≠ 0]
[NLVL (on Card 4M0000) where M is equal to NKINPN (on Card 510000) cards are required, these cards supply reactivity weighting factors for each level of the pin model used to determine feedback reactivity]

1 VOIDWT Water density reactivity weighting factor for Level NN
2 DOPWT Doppler reactivity weighting factor for Level NN
3 ALPHTM Fuel temperature coefficient of reactivity for Level NN
4 ALPHTW Water temperature coefficient of reactivity for Level NN

Card 511099 Explicit Reactivity vs Time

[This card is required if INUCFL (on Card 100100) = −1 and if IRHOFL (on Card 510000) > 0]

Enter IRHOFL ordered pairs of time (sec) and reactivity ($)

Card 512099 Control Reactivity Table Data Card

[This card is required if IRHOFL (on Card 510000) = 0 and if NCNRHO (on Card 511000) ≠ 0]

Enter NCNRHO ordered pairs of time (sec) and control reactivity ($) values

Card 513099 Doppler Reactivity Table Data Card

[This card is required if IRHOFL (on Card 510000) = 0 and if NDPRHO (on Card 511000) ≠ 0]

Enter NDPRHO ordered pairs of fuel temperature (F) and Doppler reactivity ($) values

Card 514099 Coolant Density Reactivity Table Data Card

[This card is required if IRHOFL (on Card 510000) = 0 and if NVDRHO (on Card 511000) ≠ 0]

Enter NVDRHO ordered pairs of coolant density normalized to beginning value and coolant density reactivity ($) values

Card 599000 Nuclear Power Table

[This card is required if INPOWX (on Card 500010) > 1]

Enter INUCFL ordered pairs of time (sec) and system power (MW) values [Note This table is normalized so that the first power entry is equal to PNUC (on Card 100100)]

C 2 6 Ideal electric system data

Card 600010 Ideal System Power Flags

[This card is required if IIDLFL (on Card 100100) ≠ 0]

1 IIPOWX = 0 Back-calculation of system power
> 0 Forward-calculation of temperature distribution

2 NIPINS Number of pins included in the ideal system (The ideal system power will be divided by this number to determine the average ideal system pin power)

3 NICHAN Dummy parameter

Card 600050 Ideal System Orders of Interpolation

[This card is optional if it is omitted, all tables will be interpolated with a first-order polynomial (linear interpolation)]

1 NRPIDL Ideal system power table (Card 699000) order of interpolation

2 NRPHII Ideal system back-calculation surface heat flux table (Card 600121) order of interpolation

3 NRTMPI Ideal system back-calculation surface temperature table (Card 600141) order of interpolation

4 NRHTCI Ideal system back-calculation heat transfer coefficient table (Card 600131) order of interpolation

5 NRDUMI Dummy parameter not in use

Card 600100 Back-Calculation Card

[This card is required if IIDLFL (on Card 100100) = −1]

1 IBCKFL Back-calculation flag

= 1 Surface calculations supplied (Card 600110 is required)

< 0 Power of Pin NPBACK is equal to that of the pin whose number is |IBCKFL|

2 NPBACK The number of the pin in the input deck that will be used to back-calculate the power

3 NLBACK The number of the axial level at which the power calculation will be performed

4 DTIDL Period over which boundary conditions should be averaged for the back-calculations

Card 600110 Back-Calculation Flags

[This card is required if IIDLFL (on Card 100100) = −1]

1 IQFLAG Boundary condition heat flux flag

> 0 Boundary condition heat flux is tabulated (Card 600121 is required)

= −1 Boundary condition heat flux is taken from another pin in the problem (Card 600120 is required)

2 IHFLAG Surface heat transfer coefficient flag

> 0 Surface heat transfer coefficient is tabulated (Card 600131 is required)

= −1 Surface heat transfer coefficient is taken from another pin in the problem (Card 600130 is required)

= 0 Surface heat transfer coefficient is ignored, and the surface temperature is set equal to the boundary condition temperature

3 ITFLAG Boundary condition temperature flag

> 0 Boundary condition temperature is tabulated (Card 600141 is required)

= −1 Boundary condition temperature is taken from another pin in the problem (Card 600140 is required)

Card 600120 Boundary Condition Heat Flux Link Card

[This card is required if IIDLFL (on Card 100100) = −1 and if IQFLAG (on Card 600110) = −1]

1 NPQ The number of the pin from which boundary condition heat flux is to be taken

2 NLQ The number of the level of the pin from which boundary condition heat flux is to be taken

Card 600121 Boundary Condition Heat Flux Table Card

[This card is required if IIDLFL (on Card 100100) = −1 and if IQFLAG (on Card 600110) > 0]

Enter IQFLAG (on Card 600110) ordered pairs of time (sec) and relative boundary condition heat flux (Btu/hr-ft^2- F) values

[Note The boundary condition heat flux table will be normalized to a value equal to the calculated steady-state heat flux at time (T) = 0]

Card 600130 Surface Heat Transfer Coefficient Link Card

[This card is required if IIDLFL (on Card 100100) = −1 and if IHFLAG (on Card 600110) = −1]

1 NPH The number of the pin from which the surface heat transfer coefficient is taken

2 NLH The number of the level of the pin from which the surface heat transfer coefficient is taken

Card 600131 Surface Heat Transfer Coefficient Table Card

[This card is required if IIDLFL (on Card 100100) = −1 and if IHFLAG (on Card 600110) > 0]

Enter IHFLAG ordered pairs of time (sec) and surface heat transfer coefficient (Btu/hr-ft^2- F) values

Card 600140 Boundary Condition Temperature Link Card

[This card is required if IIDLFL (on Card 100100) = −1 and if ITFLAG (on Card 600110) = −1]

1 NPT The number of the pin from which the boundary condition temperature is taken

2 NLT The number of the level of the pin from which the boundary condition temperature is taken

3 NNT Boundary condition temperature source flag

= 0 The boundary condition temperature is taken from the coolant node NODWAT (on Card 4MNN00, where M = NPT and NN = NLT)

= −1 The boundary condition temperature is taken from the surface of the pin whose number is NPT NLT

Card 600141 Boundary Condition Temperature Table Card

[This card is required if IIDLFL (on Card 100100) = −1 and if ITFLAG (on Card 600110) > 0]

Enter ITFLAG ordered pairs of time (sec) and boundary condition temperature (F) values

Card 600200 Ideal Back-Calculation Power Filter Card

[This card is required if IIDLFL (on Card 100100) = −1]

1 BPIDLL Low-pass filter breakpoint for back-calculated power (or minimum value)

2 BPIDLH High-pass filter breakpoint for back-calculated power (or maximum value)

3 IPIDLF Filter flag

= 0 No filter

= 1 Low-pass filter only

= 2 High-pass filter only

= 3 Notch filter

= 4 Maximum value—minimum value filter

Card 600210 Ideal Back-Calculation Surface Heat Flux Filter Card

[This card is required if IIDLFL (on Card 100100) = −1]

1 BPHIIL Low-pass filter breakpoint for surface heat flux (or minimum value)

2 BPHIIH High-pass filter breakpoint for surface heat flux (or maximum value)

3 IPHIIF Filter flag

= 0 No filter

= 1 Low-pass filter only

= 2 High-pass filter only

= 3 Notch filter

= 4 Maximum value—minimum value filter

Card 600220 Ideal Back-Calculation Temperature Filter Card

[This card is required if IIDLFL (on Card 100100) = −1]

1 BTMPIL Low-pass filter breakpoint for temperature (or minimum value)

2 BTMPIH High-pass filter breakpoint for temperature (or maximum value)

3 ITMPIF Filter flag

= 0 No filter

= 1 Low-pass filter only

= 2 High-pass filter only

= 3 Notch filter

= 4 Maximum value—minimum value

Card 699000 Ideal Power Table

[This card is required if IIPOWX (on Card 600010) > 1]

Enter IIPOWX (on Card 600010) ordered pairs of time (sec) and power (kW) values

[Note This table is normalized so that the first power entry is equal to PIDL (on Card 100200)]

C 2 7 Actual electric system data

Card 700000 Actual System Power Control Card

[This card is required if IACTFL (on Card 100100) ≠ 0]

1 IAPOWX Actual system power reference flag

= 0 Indicates the number of entries in the actual system power table Actual system power is tabulated (Card 799000 is required)

= −1 Actual system power is determined by equating average actual pin power to average nuclear pin power

= −2 Actual system power is determined by equating average actual pin power to average ideal pin power

= −3 Actual system power is determined by equating average actual pin voltage to average ideal pin voltage

= −4 Actual system power is determined from the average actual pin voltage which is calculated as the response of a second-order transfer function to changes in the average ideal pin voltage (Card 700100 is required)

= −5 Actual system power is determined from the average actual pin voltage, which is calculated as the demand which must be supplied to a second-order transfer function to force the response to be equal to the average ideal pin voltage (Card 700100 is required)

2 NAPINS Number of pins included in the actual power system (The actual system power will be divided by this number to determine the power of the average pin in the actual system)

3 IFOLFL Actual system forward-calculation flag

= 1 A forward-calculation of the temperature distribution and the surface heat flux will be performed using the filtered actual system power and the nuclear system back-calculation surface temperature

= 2 A forward-calculation of the temperature distribution and the surface heat flux will be performed using the filtered actual system power and the ideal system back-calculation surface temperature

Card 700050 Actual System Orders of Interpolation

[This card is optional if it is omitted, all tables will be interpolated with a first-order polynomial (linear interpolation)]

1 NRPACT Actual system power table (Card 799000) order of interpolation

2 NRACT1 Dummy parameter, not in use

3 NRACT2 Dummy parameter not in use

4 NRACT3 Dummy parameter not in use

5 NRACT4 Dummy parameter, not in use

Card 700100 Actual system voltage control card

[This card is required if IACTFL (on Card 100100) ≠ 0]

1 EAMIN Minimum allowable actual system voltage

2 EAMAX Maximum allowable actual system voltage

3 DEMXUP Maximum allowable increase in actual system voltage (V/sec)

4 DEMXDN Maximum allowable decrease in actual system voltage (V/sec)

5 OMEGA System natural frequency (radians/sec)

6 XI System damping ratio

7 IAPN Number of the pin from which actual heater resistance is determined

8 IIPN Number of the pin from which ideal heater resistance is determined

Card 700200 Actual System Power Filter Card

1 BPACTL Low-pass filter breakpoint for power (or minimum value)

2 BPACTH High-pass filter breakpoint for power (or maximum value)

3 IPACTF Filter flag

= 0 No filter

= 1 Low-pass filter only

= 2 High-pass filter only

= 3 Notch filter

= 4 Maximum value—minimum value filter

Card 799000 Actual Power Table

[This card is required if IAPOWX > 0 on Card 700000]

Enter IACTFL (on Card 100100) ordered pairs of time (sec) and power (kW) values

[Note This table is normalized so that the first power entry is equal to PACT (on Card 100200)]

Appendix D

PARTIAL LISTING OF PINSIM-MOD1 OUTPUT FOR SAMPLE PROBLEM 1 (SIMULATION OF A NUCLEAR PIN TRANSIENT)

INPUT DATA
CASE NO 1

LISTING OF INPUT DATA FOR CASE 1

```
=G4IBEC DAT  BEST ESTIMATE ELECTRIC PIN MODEL  REV (3/1/79)
*
*      THIS MODEL INCLUDES
*        (1) TABULATED GAP CONDUCTIVITY
*        (2) BUNDLE AVERAGED THERMAL-PHYSICAL PROPERTIES
*        (3) POVPA VALUES CORRESPONDING TO ORINC
*        (4) ORINC BASED GAP THICKNESS
*        (5) ORINC BASED REGION DIMENSIONS
*        (6) HYDRAULIC CHANNEL MODEL
*
*
*        IDJOB RSTRTM  ENDT  NTIM
100000    1     0 0    5 0   2
*
*
*
*            TIME   DTMIN    DTMAX   ITIMFL
100001    0 0       5 0D-2    5 0D-2     2
100002    20 00     5 0D-2    5 0D-2     2
*
*
*        INUCFL     IIDLFL    IACTFL
100100    0          -1        0
*
*            PNUC      PIDL      PACT
100200       0         0         0
*
*          NPINS     NCHAN
100300      1         1
*
*
*        MAXTHT  EPSTHT  MAXSST  EPSSST  MAXBKQ  EPSBKQ
100400    499   1 0D-1   499     1 0D-1   499   1 0D-1
*
*       NDBUG IGDBUG ICDBUG IHDBUG IKDBUG IPDBUG IADBUG IIDBUG ISDBUG
200000   11     0      0      0      0      0      0      0      3
*
*        MINOUT  NMIN  DELMIN
210000    8       1     0 0
*
210001 TH20(1) TH20(3) TH20(5) TH20(7) TH20(9) TH20(11)
*
*        MAJOUT  NMAJ  DELMAJ
220000    6       0     1 0
*
*          NPLT        DELPLT
230000     0           0 05
*
*          NRST        DELRST
240000     0           0 0
*****************************************************************
*                                                               *
*************      BEST ESTIMATE ELECTRIC PIN MODEL       **** *********
*                                                               *
*         ISYS   NLVL  NMAT IPOW  POWFAC   IGAPFL  INFLAG  ORIFAC IDFORM*
410000    2      11    4    1     1 0       3       0       0 0     0  *
```

```
*                                                                    *
*       TABULATED GAP CONDUCTIVITY                                   *
*       TEMPERATURE   CONDUCTIVITY                                   *
*         (DEG-F)   (B/SEC/FT/DEG-F)                                 *
410019    200 0          4 811D-6                                    *
+         1000 0         9 611D-6                                    *
+         1600 0         1 321D-5                                    *
*                                                                    *
*                                                                    *
*         NREG    POVPA   ZLNGTH      NODWAT                         *
410100     5     -0 4205   1 5     1                                 *
*                                                                    *
*        RINREG   ROTREG    POVP   NNOD   MATREG                     *
410101  0 0       0 009067  0 0     4       1                        *
410102  0 009067 0 010167  1 0      1       2                        *
410103  0 010167 0 014333  0 0      3       3                        *
410104  0 014333 0 016833  0 0      3       4                        *
410105  0168428  0 017667  0 0      3       4                        *
*                                                                    *
*                                                                    *
*         NREG    POVPA   ZLNGTH      NODWAT                         *
410200     5     -0 5946   1 I25   2                                 *
*                                                                    *
*        RINREG   ROTREG    POVP   NNOD   MATREG                     *
410201  0 0       0 008408  0 0     4       1                        *
410202  0 008408 0 010167  1 0      1       2                        *
410203  0 010167 0 014333  0 0      3       3                        *
410204  0 014333 0 016833  0 0      3       4                        *
410205  0168428  0 017667  0 0      3       4                        *
*                                                                    *
*                                                                    *
*         NREG    POVPA   ZLNGTH      NODWAT                         *
410300     5     -1 0455   0 875    3                                *
*                                                                    *
*        RINREG   ROTREG    POVP   NNOD   MATREG                     *
410301  0 0       0 008408  0 0     4       1                        *
410302  0 008408 0 010167  1 0      1       2                        *
410303  0 010167 0 014333  0 0      3       3                        *
410304  0 014333 0 016833  0 0      3       4                        *
410305  01683674 0 017667  0 0      3       4                        *
*                                                                    *
*                                                                    *
*         NREG    POVPA   ZLNGTH      NODWAT                         *
410400     5     -1 2967   1 00    4                                 *
*                                                                    *
*         RINREG    ROTREG    POVP    NNOD   MATREG                  *
410401  0 0        0 008725   0 0     4       1                      *
410402  0 008725  0 010167   1 0      1       2                      *
410403  0 010167  0 014333   0 0      3       3                      *
410404  0 014333  0 016833   0 0      3       4                      *
410405  01683828  0 017667   0 0      3       4                      *
*                                                                    *
*                                                                    *
*         NREG   POVPA   ZLNGTH      NODWAT                         *
410500     5    -1 6648   1 0     5                                 *
*                                                                    *
*         RINREG    ROTREG   POVP   NNOD   MATREG                   *
410501  0 0        0 009067   0 0    4       1                      *
```

```
410502  0 009067  0 010167   1 0    1       2                    *
410503  0 010167  0 014333   0 0    3       3                    *
410504  0 014333  0 016833   0 0    3       4                    *
410505  01683793  0 017667   0 0    3       4                    *
*                                                               *
*                                                               *
*         NREG   POVPA   ZLNGTH          NODWAT                 *
410600    5   -1 70006   1 0       6                            *
*                                                               *
*         RINREG   ROTREG   POVP    NNOD  MATREG                 *
410601  0 0       0 009067  0 0      4      1                    *
410602  0 009067 0 010167  1 0       1      2                    *
410603  0 010167 0 014333  0 0       3      3                    *
410604  0 014333 0 016833  0 0       3      4                    *
410605  01684158 0 017667  0 0       3      4                    *
*                                                               *
*                                                               *
*         NREG   POVPA   ZLNGTH          NODWAT                 *
410700    5   -1 6659     1 0      7                            *
*                                                               *
*         RINREG    ROTREG   POVP   NNOD  MATREG                 *
410701  0 0        0 009067  0 0     4      1                    *
410702  0 009067  0 010167  1 0      1      2                    *
410703  0 010167  0 014333  0 0      3      3                    *
410704  0 014333  0 016833  0 0      3      4                    *
410705  01683740  0 017667  0 0      3      4                    *
*                                                               *
*                                                               *
*         NREG     POVPA   ZLNGTH      NODWAT                   *
410800    5      -1 27814   1 00  8                             *
*                                                               *
*         RINREG    ROTREG  POVP   NNOD   MATREG                 *
410801  0 0        0 008725   0 0    4       1                   *
410802  0 008725  0 010167   1 0    1       2                   *
410803  0 010167  0 014333   0 0    3       3                   *
410804  0 014333  0 016833   0 0    3       4                   *
410805  01684283  0 017667   0 0    3       4                   *
*                                                               *
*                                                               *
*         NREG     POVPA   ZLNGTH      NODWAT                   *
410900    5      -1 0317   0 875  9                              *
*                                                               *
*         RINREG    ROTREG   POVP   NNOD   MATREG                *
410901   0 0        0 008408  0 0     4       1                  *
410902   0 008408  0 010167  1 0     1       2                  *
410903   0 010167  0 014333  0 0     3       3                  *
410904   0 014333  0 016833  0 0     3       4                  *
410905   01684077  0 017667  0 0     3       4                  *
*                                                               *
*                                                               *
*         NREG    POVPA   ZLNGTH         NODWAT                 *
411000    5    -0 5862   1 125   10                             *
*                                                               *
*         RINREG   ROTREG    POVP   NNOD   MATREG                *
411001   0 0       0 007925  0 0     4       1                  *
411002   0 007925 0 010167  1 0     1       2                  *
411003   0 010167 0 014333  0 0     3       3                  *
411004   0 014333 0 016833  0 0     3       4                  *
```

```
411005   01683538 0 017667   0 0     3       4                          *
*                                                                       *
*                                                                       *
*         NREG   POVPA   ZLNGTH          NODWAT                        *
411100    5    -0 4205    1 5    11                                    *
*
*         RINREG   ROTREG   POVP   NNOD   MATREG                        *
411101  0 0       0 009067  0 0     4       1                           *
411102  0 009067 0 010167  1 0     1       2
411103  0 010167 0 014333  0 0     3       3                           *
411104  0 014333 0 016833  0 0     3       4                           *
411105 1 6889D-2 0 017667  0 0     3       4
*                                                                       *
*                                                                       *
*             ------- BUNDLE AVERAGED MATERIAL PROPERTIES -------      *
*                                                                       *
*    PIN 1  MATERIAL 1 (MGO)
*                                                                       *
*         IMAT    NPROPS   TMELT                                      *
419100    4        3       5000                                        *
*                                                                       *
*    PIN 1  MATERIAL 2 (INCONEL)                                        *
*
*         IMAT   NPROP    TMELT                                        *
419200    5        3       5000                                        *
*                                                                       *
*    PIN 1  MATERIAL 3 (BN)                                             *
*                                                                       *
*         IMAT    NPROPS   TMELT
419300    3       3     5000 0                                          *
*    PIN 1  MATERIAL 4 (314 S S )                                       *
*                                                                       *
*         IMAT    NPROPS   TMELT                                      *
419400    0        3       5000
*
*                                                                       *
419410    0  0 0  2300 0       *  THERMAL CONDUCTIVITY                 *
419411   7 54858398D 00   4 40406799D-03                                *
+        4 26080078D-07  -2 15948148D-10    0 0                        *
*                                                                       *
*                                                                       *
419420    0  0 0  2300 0       *  SPECIFIC HEAT                        *
419421   1 04247093D-01  6 055831911D-05                                *
+       -4 37721610D-08  2 01225703D-11   -3 16413562D-15               *
*                                                                       *
*                                                                       *
419430   -1  0 0  2300 0        *  DENSITY                             *
419431    496 0                                                         *
*                                                                       *
******************* **************** **** ******** ******************
*
************  IDEAL SYSTEM DATA **** ** ****
*
*         IIPOWX     IIPINS     IICHAN
600010      0          1         1
*
*         IBCKFL    NPBACK  NLBACK  DTIDL
600100     1          I       6      0 05
```

```
231    *
232    *        IQFLAG    IHFLAG   ITFLAG
233    600110   -100        0     100
234    *
235    *        BPIDLL  BPIDLH  IPIDLF
236    600200    0 0     0 0      0
237    *
238    *       BPHIIL  BPHIIH  IPHIIF
239    600210    0 0     0 0      0
240    *
241    *       B MPIL  BTMPIH  ITMPIF
242    600220    0 0     0 0      0
243    *
244    *
245    *
246    *         REPLACEMENT CARDS
247    *
248    ********************* ****************************** ********* *****
249    *
250    *
251    * CARDS REQUIRED  301077  302077  311000  321000  599000
252    *
253    *        ISYS   NLVL  NMAT IPOW  POWFAC   IGAPFL  INFLAG  HTCFAC IDFORM
254    410000    2      11    4    1    1 0       3       0       0      0
       CARD ABOVE IS REPLACEMENT CARD
255    *
256    *         NODEA      NODEZ       IFLAG        ORIFAC
257    310010      1          11          0            0
258    *
259    *     METHOD      TWCHG      DELTBC
260    300100   0          20         050
261    *
262    *  CHANL ALL
263    *
264    *  COOLANT CHANNEL MODEL CORRESPONDING TO 11-LEVEL PIN
265    *  NODALIZED AS RELAP CORE MODEL
266    *
267    *   FLOW AREA  HYDRAULIC DIAMETER  AND SLAB LENGTH ARE THE SAME AS
268    *   THOSE USED IN THE RELAP CORE MODEL    FORM LOSS COEFFICIENTS
269    *   HAVE BEEN MODIFIED BY MULTIPLING BY D/L
270    *
271    * CHANNEL DISTRIBUTIONS CORRESPOND TO INLTH 100 AND OTLTH 100
272    *  (TAKEN FROM HYDRAULICALLY-BOUNDED THTF CORE MODEL FOR TEST 100)
273    *
274    *
275    *
276    *
277    *          PWAT   ENTHALPY  FLOW AREA  LENGTH  VOL  IN OUT    UP    DN
278    301001  2306 01  544 34  6 3518E-02  1 5000  0 0  0  1    201     2
279    301002  2302 99  544 34  6 3518E-02  1 1250  0 0  0  1      1     3
280    301003  2300 48  544 34  6 3518E-02     8750  0    0  1      2     4
281    301004  2298 22  544 34  6 3518E-02  1 0000  0 0  0  1      3     5
282    301005  2295 88  544 34  6 3 18E-02  1 0 00  0 0  0  1      4     6
283    301006  2293 51  544 34  6 3518E-02  1 0000  0 0  0  1      5     7
284    301007  2291 14  544 34  6 3518E-02  1 0000  0 0  0  1      6     8
285    301008  2288 77  544 34  6 3518E-02  1 0000  0 0  0  1      7     9
286    301009  2286 51  544 34  6 3518E-02     8750  0 0  0  1      8    10
287    301010  2284 17  544 34  6 3518E-02  1 1250  0 0  0  1      9    11
```

```
288   301011  2281 20  544 34  6 3518E-02  1 5000  0 0  0  1      10   211
289   *
290   *       MASS FLOW  FORM LOSS    E/D    HYD DIA   IDNB    H3    IGR
291   302001  48 2500      010559   0 0003      2462    6     30 0    0
292   302002  48 2500      016669   0 0003      2462    6     30 0    0
293   302003  48 2500      016320   0 0003      2462    6     30 0    0
294   302004  48 2500      013397   0 0003      2462    6     30 0    0
295   302005  48 2500      014280   0 0003      2462    6     30 0    0
296   302006  48 2500      014280   0 0003      2462    6     30 0    0
297   302007  48 2500      014280   0 0003      2462    6     30 0    0
298   302008  48 2500      014280   0 0003      2462    6     30 0    0
299   302009  48 2500      015311   0 0003      2462    6     30 0    0
300   302010  48 2500      012693   0 0003      2462    6     30 0    0
301   302011  48 2500      012501   0 0003      2462    6     30 0    0
302   *
303   * THESE INLET BOUNDARY CONDITIONS
304   * WERE TAKEN FROM THE FOLLOWING DATA SET
305   * DSN=X D CRH15222 T100CORE SC13N RBND DISP=SHR
306   * RELAP VARIABLES ACCESSED
307   *
308   * JW17 AP17 JH17
309   *
310   *   0 0            4 8250000E 01  2 3084541E 03  5 4442725E 02
311   *
312   311000
313   +   0 0            4 8250000E 01  2307 61        5 4442725E 02
314   +   0 00000000001  4 8250000E 01  0 0            5 4442725E 02
315   +   9 9999993E-04  4 8249420E 01  0 0            5 4442651E 02
316   +   4 9999997E-02  3 1435867E 01  0 0            5 4075146E 02
317   +   9 9999964E-02  9 3575640E 00  0 0            5 4220190E 02
318   +   1 4999998E-01  9 4038649E 00  0 0            5 4196411E 02
319   +   1 9999999E-01  6 6068459E 00  0 0            5 4190552E 02
320   +   2 4999994E-01  3 8471155E 00  0 0            5 4189404E 02
321   +   2 9999995E-01  1 5706396E 00  0 0            5 4184692E 02
322   +   3 4999996E-01 -6 6991228E-01  0 0            5 4201538E 02
323   +   3 9999998E-01 -2 9293327E 00  0 0            5 4197144E 02
324   +   4 4999999E-01 -4 9552336E 00  0 0            5 4194995E 02
325   +   4 9999994E-01 -6 7296534E 00  0 0            5 4197510E 02
326   +   5 4999995E-01 -8 4164972E 00  0 0            5 4197900E 02
327   +   5 9999996E-01 -9 8432484E 00  0 0            5 4202783E 02
328   +   6 4999998E-01 -1 0774146E 01  0 0            5 4203979E 02
329   +   6 9999999E-01 -1 1493092E 01  0 0            5 4204883E 02
330   +   7 4999994E-01 -1 2102089E 01  0 0            5 4206982E 02
331   +   7 9999995E-01 -1 2590919E 01  0 0            5 4209351E 02
332   +   8 4999996E-01 -1 3517756E 01  0 0            5 4212549E 02
333   +   8 9999998E-01 -1 3929991E 01  0 0            5 4218872E 02
334   +   9 4999999E-01 -1 3733581E 01  0 0            5 4218774E 02
335   +   9 9999994E-01 -1 5404719E 01  0 0            5 4224414E 02
336   +   1 0499992E 00 -1 7413986E 01  0 0            5 4231030E 02
337   +   1 0999994E 00 -1 8226410E 01  0 0            5 4233057E 02
338   +   1 1499996E 00 -1 8030350E 01  0 0            5 4235010E 02
339   +   1 1999998E 00 -1 6935211E 01  0 0            5 4233276E 02
340   +   1 2499990E 00 -1 7542755E 01  0 0            5 4232129E 02
341   +   1 2999992E 00 -1 9303619E 01  0 0            5 4238110E 02
342   +   1 3499994E 00 -2 0570557E 01  0 0            5 4241846E 02
343   +   1 3999996E 00 -2 1546188E 01  0 0            5 4243994E 02
344   +   1 4499998E 00 -2 2133957E 01  0 0            5 4245044E 02
345   +   1 4999990E 00 -2 1913773E 01  0 0            5 4244556E 02
```

346	+	1	5499992E	00	-1	9436752E	01	0	0	5	4245605E	02
347	+	1	5999994E	00	-1	8839767E	01	0	0	5	4241943E	02
348	+	1	6499996E	00	-1	9862595E	01	0	0	5	4251782E	02
349	+	1	6999998E	00	-1	9805283E	01	0	0	5	4249243E	02
350	+	1	7499990E	00	-2	0530441E	01	0	0	5	4249023E	02
351	+	1	7999992E	00	-2	2239563E	01	0	0	5	4251758E	02
352	+	1	8499994E	00	-2	3671799E	01	0	0	5	4252905E	02
353	+	1	8999996E	00	-2	3695953E	01	0	0	5	4252393E	02
354	+	1	9499998E	00	-2	3605774E	01	0	0	5	4256372E	02
355	+	2	0000000E	00	-2	4126465E	01	0	0	5	4260425E	02
356	+	2	0499992E	00	-2	5024933E	01	0	0	5	4260376E	02
357	+	2	0999994E	00	-2	6475510E	01	0	0	5	4257617E	02
358	+	2	1499996E	00	-2	8290543E	01	0	0	5	4255884E	02
359	+	2	1999998E	00	-2	9893188E	01	0	0	5	4254126E	02
360	+	2	2499990E	00	-3	0636200E	01	0	0	5	4251953E	02
361	+	2	2999992E	00	-3	0662399E	01	0	0	5	4249268E	02
362	+	2	3499994E	00	-3	0506073E	01	0	0	5	4245703E	02
363	+	2	3999996E	00	-3	0473282E	01	0	0	5	4240356E	02
364	+	2	4499998E	00	-3	0391907E	01	0	0	5	4234375E	02
365	+	2	4999990E	00	-2	9673019E	01	0	0	5	4228784E	02
366	+	2	5499992E	00	-2	8474640E	01	0	0	5	4223608E	02
367	+	2	5999994E	00	-2	7335480E	01	0	0	5	4218994E	02
368	+	2	6499996E	00	-2	8296204E	01	0	0	5	4215674E	02
369	+	2	6999998E	00	-2	7098816E	01	0	0	5	4212231E	02
370	+	2	7499990E	00	-2	7047516E	01	0	0	5	4210034E	02
371	+	2	7999992E	00	-2	7676697E	01	0	0	5	4206958E	02
372	+	2	8499994E	00	-2	7568161E	01	0	0	5	4204346E	02
373	+	2	8999996E	00	-2	7 48294E	01	0	0	5	4202368E	02
374	+	2	9499998E	00	-2	7468796E	01	0	0	5	4201221E	02
375	+	2	9999990E	00	-2	8240036E	01	0	0	5	4202319E	02
376	+	3	0499992E	00	-2	8783203E	01	0	0	5	4202783E	02
377	+	3	0999994E	00	-2	7051132E	01	0	0	5	4204028E	02
378	+	3	1499996E	00	-2	6684143E	01	0	0	5	4207178E	02
379	+	3	1999998E	00	-2	6057938E	01	0	0	5	4211792E	02
380	+	3	2499990E	00	-2	5126892E	01	0	0	5	4217432E	02
381	+	3	2999992E	00	-2	5601288E	01	0	0	5	4224414E	02
382	+	3	3499994E	00	-2	735443E	01	0	0	5	4232275E	02
383	+	3	3999996E	00	-2	4158447E	01	0	0	5	4241162E	02
384	+	3	4499998E	00	-2	1642792E	01	0	0	5	4250293E	02
385	+	3	4999990E	00	-1	9211273E	01	0	0	5	4259448E	02
386	+	3	5499992E	00	-1	7668076E	01	0	0	5	4268433E	02
387	+	3	5999994E	00	-1	6265869E	01	0	0	5	4277075E	02
388	+	3	6499996E	00	-1	4833055E	01	0	0	5	4285449E	02
389	+	3	6999998E	00	-1	2839017E	01	0	0	5	4293384E	02
390	+	3	7499990E	00	-1	0905507E	01	0	0	5	430041 E	02
391	+	3	7999992E	00	-9	9031887E	00	0	0	5	4306043E	02
392	+	3	8499994E	00	-9	3576260E	00	0	0	5	4312085E	02
393	+	3	8999996E	00	-9	0881500E	00	0	0	5	4317432E	02
394	+	3	9499998E	00	-8	4549179E	00	0	0	5	4323267E	02
395	+	4	0000000E	00	-6	4125195E	00	0	0	5	4328198E	02
396	+	4	0499992E	00	-4	3478432E	00	0	0	5	4331274E	02
397	+	4	0999994E	00	-2	8126040E	00	0	0	5	4332764E	02
398	+	4	1499996E	00	-2	1724863E	00	0	0	5	4333374E	02
399	+	4	1999998E	00	-1	7200756E	00	0	0	5	4333960E	02
400	+	4	2499990E	00	-3	6642927E	-01	0	0	5	4334106E	02
401	+	4	2999992E	00	1	8683338E	00	0	0	5	4303394E	02
402	+	4	3499994E	00	4	4084587E	00	0	0	5	4300708E	02
403	+	4	3999996E	00	6	0386791E	00	0	0	5	4296875E	02

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404        4 4499998E 00  6 4781923E 00  0 0            5 4292480E 02
405   +    4 4999990E 00  5 9398098E 00  0 0            5 4288477E 02
406   +    4 5499992E 00  4 9726524E 00  0 0            5 4285010E 02
407   +    4 5999994E 00  4 3016872E 00  0 0            5 4282178E 02
408   +    4 6499996E 00  3 8268766E 00  0 0            5 4279834E 02
409   +    4 6999998E 00  3 3288069E 00  0 0            5 4277661E 02
410   +    4 7499990E 00  2 9 21950E 00  0 0            5 4275854E 02
411   +    4 7999992E 00  2 1942444E 00  0 0            5 4274341E 02
412   +    4 8499994E 00  1 7061958E 00  0 0            5 4273315E 02
413   +    4 8999996E 00  2 2692690E 00  0 0            5 4272461E 02
414   +    4 9499998E 00  2 9952593E 00  0 0            5 4272388E 02
415   +    4 9999990E 00  4 7396994E 00  0 0            5 4273242E 02
416   *
417   * THESE OUTLET BOUNDARY CONDITIONS
418   * WERE TAKEN FROM THE FOLLOWING DATA SET
419   * DSN=X D CRH15222 T100CORE SC13N RBND DISP=SHR
420   * RELAP VARIABLES ACCESSED
421   *
422   * JW28 AP29 JH28
423   *
424   *    0 0            4 8250000E 01  2 2784290E 03  5 4443311E 02
425   *
426   321000
427   +    0 0            4 8250000E 01  2279 30        5 4443311E 02
428   +    0 00000000001  4 8250000E 01  0 0            5 4443311E 02
429        0 0000001E-04  4 8250000E 01  0 0            5 4443311E 02
430   +    9 9999993E-04  4 8252975E 01  0 0            5 4443213E 02
431   +    4 9999997E-02  3 0230453E 01  0 0            5 4104980E 02
432   +    9 9999964E-02  7 0328579E 00  0 0            5 4243066E 02
433   +    1 4999998E-01  8 6830225E 00  0 0            5 4229883E 02
434   +    1 9999999E-01  6 9964371E 00  0 0            5 4227612E 02
435   +    2 4999994E-01  4 3251247E 00  0 0            5 4227637E 02
436   +    2 9999995E-01  1 8095818E 00  0 0              4223779E 02
437   +    3 4999996E-01 -5 7560521E-01  0 0            5 4221309E 02
438   +    3 9999998E-01 -2 8317986E 00  0 0            5 4215234E 02
439   +    4 4999999E-01 -4 8071585E 00  0 0            5 4208594E 02
440   +    4 9999994E-01 -6 5852442E 00  0 0              4203491E 02
441   +    5 4999995E-01 -8 2446079E 00  0 0            5 4193799E 02
442   +    5 9999996E-01 -9 7031860E 00  0 0            5 4185425E 02
443   +    6 4999998E-01 -1 0615935E 01  0 0            5 4172095E 02
444   +    6 9999999E-01 -1 1312548E 01  0 0            5 4157739E 02
445   +    7 4999994E-01 -1 1934666E 01  0 0            5 4144482E 02
446   +    7 9999995E-01 -1 2444631E 01  0 0            5 4131958E 02
447   +    8 4999996E-01 -1 3395912E 01  0 0            5 4121191E 02
448   +    8 9999998E-01 -1 3855474E 01  0 0            5 4113062E 02
449   +    9 4999999E-01 -1 3611980E 01  0 0            5 4101221E 02
450   +    9 9999994E-01 -1 5328725E 01  0 0            5 4096655E 02
451   +    1 0499992E 00 -1 7378464E 01  0 0            5 4091455E 02
452   +    1 0999994E 00 -1 8151779E 01  0 0            5 4083447E 02
453   +    1 1499996E 00 -1 7930588E 01  0 0            5 4076294E 02
454   +    1 1999998E 00 -1 6793686E 01  0 0            5 4067627E 02
455   +    1 2499990E 00 -1 7405640E 01  0 0            5 4061841E 02
456   +    1 2999992E 00 -1 9268448E 01  0 0            5 4061914E 02
457   +    1 3499994E 00 -2 0556625E 01  0 0            5 4060645E 02
458   +    1 3999996E 00 -2 1498657E 01  0 0            5 4058301E 02
459   +    1 4499998E 00 -2 2059296E 01  0 0            5 4055762E 02
460   +    1 4999990E 00 -2 1813232E 01  0 0            5 4052124E 02
461   +    1 5499992E 00 -1 9352051E 01  0 0            5 4050000E 02
```

462	+	1	5999994E	00	-1	8723846E	01	0	0		5	4047290E	02
463	+	1	6499996E	00	-1	9906082E	01	0	0		5	4055347E	02
464	+	1	6999998E	00	-1	9759537E	01	0	0		5	4053247E	02
465	+	1	7499990E	00	-2	0444962E	01	0	0		5	4054199E	02
466	+	1	7999992E	00	-2	2210709E	01	0	0		5	4059106E	02
467	+	1	8499994E	00	-2	3649429E	01	0	0		5	4063477E	02
468	+	1	8999996E	00	-2	3641769E	01	0	0		5	4067773E	02
469	+	1	9499998E	00	-2	3619141E	01	0	0		5	4079126E	02
470	+	2	0000000E	00	-2	4182358E	01	0	0		5	4092944E	02
471	+	2	0499992E	00	-2	5013824E	01	0	0		5	4105688E	02
472	+	2	0999994E	00	-2	6407654E	01	0	0		5	4119482E	02
473	+	2	1499996E	00	-2	8254227E	01	0	0		5	4138818E	02
474	+	2	1999998E	00	-2	9830887E	01	0	0		5	4163184E	02
475	+	2	2499990E	00	-3	0590240E	01	0	0		5	4193042E	02
476	+	2	2999992E	00	-3	0612106E	01	0	0		5	4228052E	02
477	+	2	3499994E	00	-3	0435898E	01	0	0		5	4267358E	02
478	+	2	3999996E	00	-3	0352875E	01	0	0		5	4310474E	02
479	+	2	4499998E	00	-3	0275330E	01	0	0		5	4358325E	02
480	+	2	4999990E	00	-2	9525284E	01	0	0		5	4409985E	02
481	+	2	5499992E	00	-2	8310257E	01	0	0		5	4465039E	02
482	+	2	5999994E	00	-2	7162704E	01	0	0		5	4522168E	02
483	+	2	6499996E	00	-2	8105316E	01	0	0		5	4585132E	02
484	+	2	6999998E	00	-2	6929276E	01	0	0		5	4649536E	02
485	+	2	7499990E	00	-2	6856186E	01	0	0		5	4717505E	02
486	+	2	7999992E	00	-2	7439941E	01	0	0		5	4789600E	02
487	+	2	8499994E	00	-2	7317642E	01	0	0		5	4864966E	02
488	+	2	8999996E	00	-2	7290344E	01	0	0		5	4942505E	02
489	+	2	9499998E	00	-2	7176285E	01	0	0		5	5022021E	02
490	+	2	9999990E	00	-2	7942780E	01	0	0		5	5106226E	02
491	+	3	0499992E	00	-2	8430054E	01	0	0		5	5192383E	02
492	+	3	0999994E	00	-2	6711304E	01	0	0		5	5275293E	02
493	+	3	1499996E	00	-2	6340179E	01	0	0		5	5355103E	02
494	+	3	1999998E	00	-2	5716461E	01	0	0		5	5430029E	02
495	+	3	2499990E	00	-2	4808731E	01	0	0		5	5496631E	02
496	+	3	2999992E	00	-2	5252502E	01	0	0		5	5563965E	02
497	+	3	3499994E	00	-2	5360840E	01	0	0		5	5635254E	02
498	+	3	3999996E	00	-2	1536911E	01	0	0		5	5704834E	02
499	+	3	4499998E	00	-1	9049133E	01	0	0		5	5761670E	02
500	+	3	4999990E	00	-1	6962311E	01	0	0		5	5813574E	02
501	+	3	5499992E	00	-1	4171146E	01	0	0		5	5857300E	02
502	+	3	5999994E	00	-1	2655560E	01	0	0		5	5895288E	02
503	+	3	6499996E	00	-1	0355585E	01	0	0		5	5927783E	02
504	+	3	6999998E	00	-9	5244646E	00	0	0		5	5956934E	02
505	+	3	7499990E	00	-8	1073961E	00	0	0		5	5983032E	02
506	+	3	7999992E	00	-6	1457710E	00	0	0		5	6003467E	02
507	+	3	8499994E	00	-5	3584785E	00	0	0		5	6019531E	02
508	+	3	8999996E	00	-5	0777578E	00	0	0		5	6033960E	02
509	+	3	9499998E	00	-4	2248430E	00	0	0		5	6047095E	02
510	+	4	0000000E	00	-3	2314987E	00	0	0		5	6058130E	02
511	+	4	0499992E	00	-9	3570852E	-01	0	0		5	6065356E	02
512	+	4	0999994E	00	1	9222093E	-01	0	0		5	5771436E	02
513	+	4	1499996E	00	9	7278583E	-01	0	0		5	5770728E	02
514	+	4	1999998E	00	1	4206905E	00	0	0		5	5769287E	02
515	+	4	2499990E	00	2	3301821E	00	0	0		5	5766968E	02
516	+	4	2999992E	00	4	2251644E	00	0	0		5	5760645E	02
517	+	4	3499994E	00	5	4942322E	00	0	0		5	5749390E	02
518	+	4	3999996E	00	6	9477921E	00	0	0		5	5733301E	02
519	+	4	4499998E	00	7	6063833E	00	0	0		5	5713135E	02

```
+   4 4999990E 00  7 5250978E 00  0 0          5 5692700E 02
+   4 5499992E 00  7 4660635E 00  0 0          5 5673584E 02
+   4 5999994E 00  6 7959871E 00  0 0          5 5656885E 02
+   4 6499996E 00  6 6502209E 00  0 0          5 5643237E 02
+   4 6999998E 00  6 8808784E 00  0 0          5 5630444E 02
+   4 7499990E 00  6 5243855E 00  0 0          5 5618311E 02
+   4 7999992E 00  6 6566162E 00  0 0          5 5608521E 02
+   4 8499994E 00  6 8227367E 00  0 0          5 5598242E 02
+   4 8999996E 00  7 4575005E 00  0 0          5 5588647E 02
+   4 9499998E 00  7 4412975E 00  0 0          5 5577563E 02
+   4 9999990E 00  8 1353598E 00  0 0          5 5565479E 02
*
*      CONSTANT ELECTRIC POWER TABLE
*
699000     0 0      0 0
+         20 0      0 0
*
*
*        IDJOB RSTRTM  ENDT  NTIM
100000     2      0 0     5 0   2
CARD ABOVE IS REPLACEMENT CARD
*
*
*         INUCFL   IIDLFL   IACTFL
100100     0         10       0
CARD ABOVE IS REPLACEMENT CARD
*
*          PNUC   PIDL   PACT
100200     0     1 D-20   0
CARD ABOVE IS REPLACEMENT CARD
*
*          NPINS      NCHAN
100300      1          1
CARD ABOVE IS REPLACEMENT CARD
*
*
210001 TH20(5) PWAT(5) HTCW(1 5) PHIW(1 5) W(5) TTUB(1 5) VSPB(5)
CARD ABOVE IS REPLACEMENT CARD
*
*         MAJOUT  NMAJ  DELMAJ
220000     6        0    0 1
CARD ABOVE IS REPLACEMENT CARD
*
*           NODEA   NODEZ   INPUTF   ORIFAC
310010        1       11      0        0 0
CARD ABOVE IS REPLACEMENT CARD
*
*         IIPOWX    IIPINS     IICHAN
600010      1         1          1
CARD ABOVE IS REPLACEMENT CARD
*
*********************************************************************
*
*
```

```
                                  ----- DATA DECK DIAGNOSTICS -----

                          MINIMUM LENGTH OF TABLE ARRAY IN COMMON /SCRTCH/ IS   1728 WORDS

                                  PROCESSING THE JOB CONTROL CARD

                                    PROCESSING PROBLEM OPTIONS

                                    PROCESSING HYDRAULICS DATA

                                       PROCESSING PIN DATA

                                   PROCESSING IDEAL SYSTEM DATA
++++++++ WARNING   CARD SERIES   699000 NO  OF TABLE PAIRS SPECIFIED AT       1
         IS BEING RESET TO ACTUAL NO  OF PAIRS FOUND IN INPUT =     2

                                    INITIALIZING PIN PARAMETERS
+++++++++ NOTICE  ORIFAC FOR PIN   1 HAS BEEN RESET TO  0 100000D 01

                                     PROCESSING EDIT OPTIONS


                  ****************************** ********************* *********************
                  ************************************************************* **************
                  ************************************************************************
                  ************************************************************************
                  ****                                                                ****
                  ****                                                                ****
                  ****                                                                ****
                  ****                                                                ****
                  ****    PLOT-RESTART FILE IS BEING PRODUCED ON UNIT 1               ****
                  ****           WITH FOLLOWING CHARACTERISTICS                       ****
                  ****                                                                ****
                  ****                                                                ****
                  ****    DATA SET NAME = PINSIM PLOT                                 ****
                  ****                                                                ****
                  ****    VOLUME SERIAL NO  = A26915                                  ****
                  ****                                                                ****
                  ****    CREATION DATE       04/17/79                                ****
                  ****                                                                ****
                  ****                                                                ****
                  ************************************************************************
                  ******************************************************** ****** ***********
                  ************************************************************************
                  ************************************************************************

                                 MINIMUM LENGTH OF DATA ARRAY IS        21 WORDS

******** THE FOLLOWING CARDS WERE NOT USED
```

```
600220
600210
600200
600110
600100
310010
        ********* TAU =  -0 866941D 18  WARN HAS BEEN CALLED  POSSIBLE PROBLEM ERROR *********

                                    END OF INPUT DATA PROCESSING

                                        NO FATAL DIAGNOSTICS
```

INITIALIZED INPUT DATA

----- GENERAL PROBLEM DATA -----

	SYSTEM FLAG
NUCLEAR	0
IDEAL ELECTRIC	10
ACTUAL ELECTRIC	0

PROBLEM END TIME = 5 0000 0D 00 SEC

TIME STEP CONTROL GROUPS

GROUP NO	BEGINNING TIME(SEC)	MINIMUM TIME STEP SIZE(SEC)	MAXIMUM TIME STEP SIZE(SEC)	STEP SIZE SEL FLAG
1	0 0	5 000000D-02	5 000000D-02	2
2	20 0000	5 000000D-02	5 000000D-02	2

OUTPUT CONTROL

	ELAPSED NO OF TIME STEPS	ELPASED TIME	ROUTED TO DEVICE NO
MAJOR EDIT	0	0 100000D 00	6
MINOR EDIT	1	0 0	6
PLOT RECORD	0	0 500000D-01	1
RESTART RECORD	0	0 0	1

PROBLEM CONVERGENCE LIMITS

TYPE OF CALCULATION	MAX NO OF ITERATIONS	ALLOWED ERROR IN ENERGY BALANCE
STEADY-STATE CONDUCTION	499	0 100000D 00
TRANSIENT CONDUCTION	499	0 100000D 00
TRANSIENT BACK-CALCULATION CONDUCTION	499	0 100000D 00

IDEAL ELECTRIC SYSTEM INPUT DATA

----- IDEAL ELECTRIC SYSTEM DIMENSIONS -----

POWER CROSS REFERENCE FLAG	NUMBER OF FUEL PINS	NUMBER OF COOLANT CHANNELS
2	1	1

ORDERS OF INTERPOLATION

TABLE	ORDER
SYSTEM POWER	2

-----INPUT IDEAL ELECTRIC SYSTEM POWER TABLE -----

TIME (SEC)	POWER (KW)	TIME (SEC)	POWER (KW)	TIME (SEC)	POWER (KW)	TIME (SEC)	POWER (KW)
0 0	0 0	0 200000D 02	0 0				

FOLLOWING ARE DESCRIPTIONS OF THE IDEAL ELECTRIC SYSTEM PIN(S)

----- PIN DATA -----
(PIN NO 1)

POWER SYSTEM	POWER FLAG	PIN TO AVG POW PEAK FAC	TOTAL PIN LENGTH FT	NUMBER OF AXIAL LEVELS	NUMBER OF MATERIALS
2	1	0 1000D 01	12 00	11	4

GAP CALCULATION FLAG	INTERNAL DATA FLAG	CHANNEL ORIFICING FACTOR	PIN DEFORMATION FLAG	
3	0	0 100000D 01		0

HEATER BAND RESISTANCE

IS IRRELEVANT TO THIS PROBLEM

----- GAP DATA -----

TEMPERATURE (F)	GAP CONDUCTIVITY (BTU/SEC-FT-F)	TEMPERATURE (F)	GAP CONDUCTIVITY (BTU/SEC-FT-F)	TEMPERATURE (F)	GAP CONDUCTIVITY (BTU/SEC-FT-F)	TEMPERATURE (F)	GAP CONDUCTIVITY (BTU/SEC-FT-F)
200 00	0 481100D-05	1000 00	0 961100D-05	1600 00	0 132100D-04		

----- LEVEL DATA -----
(PIN NO 1)

LEVEL NO	SURFACE HEAT TRANSFER AREA (FT**2)	AXIAL LENGTH (FT)	AXIAL PIN POWER FRACTION	ASSOCIATED WATER NODE	NO OF RADIAL REGIONS	NO OF RADIAL NODES
1	0 166508D 00	1 500	0 0350	1	5	14
2	0 124881D 00	1 125	0 0495	2	5	14
3	0 971294D-01	0 875	0 0871	3	5	14
4	0 111005D 00	1 000	0 1081	4	5	14
5	0 111005D 00	1 000	0 1387	5	5	14
6	0 111005D 00	1 000	0 1417	6	5	14
7	0 111005D 00	1 000	0 1388	7	5	14
8	0 111005D 00	1 000	0 1065	8	5	14
9	0 971294D-01	0 875	0 0860	9	5	14
10	0 124881D 00	1 125	0 0488	10	5	14
11	0 166508D 00	1 500	0 0350	11	5	14

----- REGION DATA -----
(PIN NO 1)

LEVEL NO	REGION NO	REGION INNER RADIUS FT	REGION OUTER RADIUS FT	RADIAL POWER PEAK FACTOR	NO OF NODES	MATERIAL I D NO
1	1	0 0	0 9067D-02	0 0	4	1
1	2	0 9067D-02	0 1017D-01	0 1000D 01	1	2
1	3	0 1017D-01	0 1433D-01	0 0	3	3
1	4	0 1433D-01	0 1683D-01	0 0	3	4
1	5	0 1684D-01	0 1767D-01	0 0	3	4
2	1	0 0	0 8408D-02	0 0	4	1
2	2	0 8408D-02	0 1017D-01	0 1000D 01	1	2
2	3	0 1017D-01	0 1433D-01	0 0	3	3
2	4	0 1433D-01	0 1683D-01	0 0	3	4
2	5	0 1684D-01	0 1767D-01	0 0	3	4
3	1	0 0	0 8408D-02	0 0	4	1
3	2	0 8408D-02	0 1017D-01	0 1000D 01	1	2
3	3	0 1017D-01	0 1433D-01	0 0	3	3
3	4	0 1433D-01	0 1683D-01	0 0	3	4
3	5	0 1684D-01	0 1767D-01	0 0	3	4
4	1	0 0	0 8725D-02	0 0	4	1
4	2	0 8725D-02	0 1017D-01	0 1000D 01	1	2
4	3	0 1017D-01	0 1433D-01	0 0	3	3
4	4	0 1433D-01	0 1683D-01	0 0	3	4
4	5	0 1684D-01	0 1767D-01	0 0	3	4
5	1	0 0	0 9067D-02	0 0	4	1
5	2	0 9067D-02	0 1017D-01	0 1000D 01	1	2
5	3	0 1017D-01	0 1433D-01	0 0	3	3
5	4	0 1433D-01	0 1683D-01	0 0	3	4
5	5	0 1684D-01	0 1767D-01	0 0	3	4
6	1	0 0	0 9067D-02	0 0	4	1
6	2	0 9067D-02	0 1017D-01	0 1000D 01	1	2
6	3	0 1017D-01	0 1433D-01	0 0	3	3
6	4	0 1433D-01	0 1683D-01	0 0	3	4
6	5	0 1684D-01	0 1767D-01	0 0	3	4
7	1	0 0	0 9067D-02	0 0	4	1
7	2	0 9067D-02	0 1017D-01	0 1000D 01	1	2
7	3	0 1017D-01	0 1433D-01	0 0	3	3
7	4	0 1433D-01	0 1683D-01	0 0	3	4
7	5	0 1684D-01	0 1767D-01	0 0	3	4
8	1	0 0	0 8725D-02	0 0	4	1
8	2	0 8725D-02	0 1017D-01	0 1000D 01	1	2
8	3	0 1017D-01	0 1433D-01	0 0	3	3
8	4	0 1433D-01	0 1683D-01	0 0	3	4
8	5	0 1684D-01	0 1767D-01	0 0	3	4
9	1	0 0	0 8408D-02	0 0	4	1

----- REGION DATA -----
(PIN NO 1)

LEVEL NO	REGION NO	REGION INNER RADIUS FT	REGION OUTER RADIUS FT	RADIAL POWER PEAK FACTOR	NO OF NODES	MATERIAL I D NO
9	2	0 8408D-02	0 1017D-01	0 1000D 01	1	2
9	3	0 1017D-01	0 1433D-01	0 0	3	3
9	4	0 1433D-01	0 1683D-01	0 0	3	4
9	5	0 1684D-01	0 1767D-01	0 0	3	4
10	1	0 0	0 7925D-02	0 0	4	1
10	2	0 7925D-02	0 1017D-01	0 1000D 01	1	2
10	3	0 1017D-01	0 1433D-01	0 0	3	3
10	4	0 1433D-01	0 1683D-01	0 0	3	4
10	5	0 1684D-01	0 1767D-01	0 0	3	4
11	1	0 0	0 9067D-02	0 0	4	1
11	2	0 9067D-02	0 1017D-01	0 1000D 01	1	2
11	3	0 1017D-01	0 1433D-01	0 0	3	3
11	4	0 1433D-01	0 1683D-01	0 0	3	4
11	5	0 1689D-01	0 1767D-01	0 0	3	4

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
1	1	0 0	0 320567D-02	0 453350D-02	0 968520D-04	0 0	1
1	2	0 453350D-02	0 555238D-02	0 641134D-02	0 968520D-04	0 0	1
1	3	0 641134D-02	0 716809D-02	0 785225D-02	0 968520D-04	0 0	1
1	4	0 785225D-02	0 848140D-02	0 906700D-02	0 968520D-04	0 0	1
1	5	0 906700D-02	0 963271D-02	0 101670D-01	0 997019D-04	0 100000D 01	2
1	6	0 101670D-01	0 109717D-01	0 117214D-01	0 160326D-03	0 0	3
1	7	0 117214D-01	0 124258D-01	0 130925D-01	0 160326D-03	0 0	3
1	8	0 130925D-01	0 137268D-01	0 143330D-01	0 160326D-03	0 0	3
1	9	0 143330D-01	0 147791D-01	0 152121D-01	0 122389D-03	0 0	4
1	10	0 152121D-01	0 156331D-01	0 160430D-01	0 122389D-03	0 0	4
1	11	0 160430D-01	0 164428D-01	0 168330D-01	0 122389D-03	0 0	4
1	12	0 168428D-01	0 169829D-01	0 171219D-01	0 446781D-04	0 0	4
1	13	0 171219D-01	0 172598D-01	0 173966D-01	0 446781D-04	0 0	4
1	14	0 173966D-01	0 175323D-01	0 176670D-01	0 446781D-04	0 0	4
2	1	0 0	0 297268D-02	0 420400D-02	0 624637D-04	0 0	1
2	2	0 420400D-02	0 514883D-02	0 594535D-02	0 624637D-04	0 0	1
2	3	0 594535D-02	0 664711D-02	0 728154D-02	0 624637D-04	0 0	1
2	4	0 728154D-02	0 786496D-02	0 840800D-02	0 624637D-04	0 0	1
2	5	0 840800D-02	0 932905D-02	0 101670D-01	0 115477D-03	0 100000D 01	2
2	6	0 101670D-01	0 109717D-01	0 117214D-01	0 120245D-03	0 0	3
2	7	0 117214D-01	0 124258D-01	0 130925D-01	0 120245D-03	0 0	3
2	8	0 130925D-01	0 137268D-01	0 143330D-01	0 120245D-03	0 0	3
2	9	0 143330D-01	0 147791D-01	0 152121D-01	0 917914D-04	0 0	4
2	10	0 152121D-01	0 156331D-01	0 160430D-01	0 917914D-04	0 0	4
2	11	0 160430D-01	0 164428D-01	0 168330D-01	0 917914D-04	0 0	4
2	12	0 168428D-01	0 169829D-01	0 171219D-01	0 335086D-04	0 0	4
2	13	0 171219D-01	0 172598D-01	0 173966D-01	0 335086D-04	0 0	4
2	14	0 173966D-01	0 175323D-01	0 176670D-01	0 335086D-04	0 0	4
3	1	0 0	0 297268D-02	0 420400D-02	0 485829D-04	0 0	1
3	2	0 420400D-02	0 514883D-02	0 594535D-02	0 485829D-04	0 0	1
3	3	0 594535D-02	0 664711D-02	0 728154D-02	0 485829D-04	0 0	1
3	4	0 728154D-02	0 786496D-02	0 840800D-02	0 485829D-04	0 0	1
3	5	0 840800D-02	0 932905D-02	0 101670D-01	0 898158D-04	0 100000D 01	2
3	6	0 101670D-01	0 109717D-01	0 117214D-01	0 935238D-04	0 0	3
3	7	0 117214D-01	0 124258D-01	0 130925D-01	0 935238D-04	0 0	3
3	8	0 130925D-01	0 137268D-01	0 143330D-01	0 935238D-04	0 0	3
3	9	0 143330D-01	0 147791D-01	0 152121D-01	0 713933D-04	0 0	4
3	10	0 152121D-01	0 156331D-01	0 160430D-01	0 713933D-04	0 0	4
3	11	0 160430D-01	0 164428D-01	0 168330D-01	0 713933D-04	0 0	4
3	12	0 168367D-01	0 169779D-01	0 171180D-01	0 262493D-04	0 0	4
3	13	0 171180D-01	0 172569D-01	0 173947D-01	0 262493D-04	0 0	4
3	14	0 173947D-01	0 175314D-01	0 176670D-01	0 262493D-04	0 0	4
4	1	0 0	0 308475D-02	0 436250D-02	0 597889D-04	0 0	1
4	2	0 436250D-02	0 534295D-02	0 616951D-02	0 597889D-04	0 0	1
4	3	0 616951D-02	0 689772D-02	0 755607D-02	0 597889D-04	0 0	1
4	4	0 755607D-02	0 816149D-02	0 872500D-02	0 597889D-04	0 0	1

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
4	5	0 872500D-02	0 947348D-02	0 101670D-01	0 855841D-04	0 100000D 01	2
4	6	0 101670D-01	0 109717D-01	0 117214D-01	0 106884D-03	0 0	3
4	7	0 117214D-01	0 124258D-01	0 130925D-01	0 106884D-03	0 0	3
4	8	0 130925D-01	0 137268D-01	0 143330D-01	0 106884D-03	0 0	3
4	9	0 143330D-01	0 147791D-01	0 152121D-01	0 815924D-04	0 0	4
4	10	0 152121D-01	0 156331D-01	0 160430D-01	0 815924D-04	0 0	4
4	11	0 160430D-01	0 164428D-01	0 168330D-01	0 815924D-04	0 0	4
4	12	0 168383D-01	0 169792D-01	0 171190D-01	0 299448D-04	0 0	4
4	13	0 171190D-01	0 172576D-01	0 173951D-01	0 299448D-04	0 0	4
4	14	0 173951D-01	0 175316D-01	0 176670D-01	0 299448D-04	0 0	4
5	1	0 0	0 320567D-02	0 453350D-02	0 645680D-04	0 0	1
5	2	0 453350D-02	0 555238D-02	0 641134D-02	0 645680D-04	0 0	1
5	3	0 641134D-02	0 716809D-02	0 785225D-02	0 645680D-04	0 0	1
5	4	0 785225D-02	0 848140D-02	0 906700D-02	0 645680D-04	0 0	1
5	5	0 906700D-02	0 963271D-02	0 101670D-01	0 664679D-04	0 100000D 01	2
5	6	0 101670D-01	0 109717D-01	0 117214D-01	0 106884D-03	0 0	3
5	7	0 117214D-01	0 124258D-01	0 130925D-01	0 106884D-03	0 0	3
5	8	0 130925D-01	0 137268D-01	0 143330D-01	0 106884D-03	0 0	3
5	9	0 143330D-01	0 147791D-01	0 152121D-01	0 815924D-04	0 0	4
5	10	0 152121D-01	0 156331D-01	0 160430D-01	0 815924D-04	0 0	4
5	11	0 160430D-01	0 164428D-01	0 168330D-01	0 815924D-04	0 0	4
5	12	0 168379D-01	0 169789D-01	0 171187D-01	0 299572D-04	0 0	4
5	13	0 171187D-01	0 172574D-01	0 173950D-01	0 299572D-04	0 0	4
5	14	0 173950D-01	0 175315D-01	0 176670D-01	0 299572D-04	0 0	4
6	1	0 0	0 320567D-02	0 453350D-02	0 645680D-04	0 0	1
6	2	0 453350D-02	0 555238D-02	0 641134D-02	0 645680D-04	0 0	1
6	3	0 641134D-02	0 716809D-02	0 785225D-02	0 645680D-04	0 0	1
6	4	0 785225D-02	0 848140D-02	0 906700D-02	0 645680D-04	0 0	1
6	5	0 906700D-02	0 963271D-02	0 101670D-01	0 664679D-04	0 100000D 01	2
6	6	0 101670D-01	0 109717D-01	0 117214D-01	0 106884D-03	0 0	3
6	7	0 117214D-01	0 124258D-01	0 130925D-01	0 106884D-03	0 0	3
6	8	0 130925D-01	0 137268D-01	0 143330D-01	0 106884D-03	0 0	3
6	9	0 143330D-01	0 147791D-01	0 152121D-01	0 815924D-04	0 0	4
6	10	0 152121D-01	0 156331D-01	0 160430D-01	0 815924D-04	0 0	4
6	11	0 160430D-01	0 164428D-01	0 168330D-01	0 815924D-04	0 0	4
6	12	0 168416D-01	0 169819D-01	0 171211D-01	0 298285D-04	0 0	4
6	13	0 171211D-01	0 172592D-01	0 173962D-01	0 298285D-04	0 0	4
6	14	0 173962D-01	0 175321D-01	0 176670D-01	0 298285D-04	0 0	4
7	1	0 0	0 320567D-02	0 453350D-02	0 645680D-04	0 0	1
7	2	0 453350D-02	0 555238D-02	0 641134D-02	0 645680D-04	0 0	1
7	3	0 641134D-02	0 716809D-02	0 785225D-02	0 645680D-04	0 0	1
7	4	0 785225D-02	0 848140D-02	0 906700D-02	0 645680D-04	0 0	1
7	5	0 906700D-02	0 963271D-02	0 101670D-01	0 664679D-04	0 100000D 01	2
7	6	0 101670D-01	0 109717D-01	0 117214D-01	0 106884D-03	0 0	3
7	7	0 117214D-01	0 124258D-01	0 130925D-01	0 106884D-03	0 0	3
7	8	0 130925D-01	0 137268D-01	0 143330D-01	0 106884D-03	0 0	3

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
7	9	0 143330D-01	0 147791D-01	0 152121D-01	0 815924D-04	0 0	4
7	10	0 152121D-01	0 156331D-01	0 160430D-01	0 815924D-04	0 0	4
7	11	0 160430D-01	0 164428D-01	0 168330D-01	0 815924D-04	0 0	4
7	12	0 168374D-01	0 169785D-01	0 171184D-01	0 299759D-04	0 0	4
7	13	0 171184D-01	0 172572D-01	0 173949D-01	0 299759D-04	0 0	4
7	14	0 173949D-01	0 175315D-01	0 176670D-01	0 299759D-04	0 0	4
8	1	0 0	0 308475D-02	0 436250D-02	0 597889D-04	0 0	1
8	2	0 436250D-02	0 534295D-02	0 616951D-02	0 597889D-04	0 0	1
8	3	0 616951D-02	0 689772D-02	0 7 5607D-02	0 597889D-04	0 0	1
8	4	0 755607D-02	0 816149D-02	0 872500D-02	0 597889D-04	0 0	1
8	5	0 872500D-02	0 947348D-02	0 101670D-01	0 855841D-04	0 100000D 01	2
8	6	0 101670D-01	0 109717D-01	0 117214D-01	0 106884D-03	0 0	3
8	7	0 117214D-01	0 124258D-01	0 130925D-01	0 106884D-03	0 0	3
8	8	0 130925D-01	0 137268D-01	0 143330D-01	0 106884D-03	0 0	3
8	9	0 143330D-01	0 147791D-01	0 152121D-01	0 815924D-04	0 0	4
8	10	0 152121D-01	0 156331D-01	0 160430D-01	0 815924D-04	0 0	4
8	11	0 160430D-01	0 164428D-01	0 168330D-01	0 815924D-04	0 0	4
8	12	0 168428D-01	0 169830D-01	0 171220D-01	0 297844D-04	0 0	4
8	13	0 171220D-01	0 172598D-01	0 173966D-01	0 297844D-04	0 0	4
8	14	0 173966D-01	0 175323D-01	0 176670D-01	0 297844D-04	0 0	4
9	1	0 0	0 297268D-02	0 420400D-02	0 485829D-04	0 0	1
9	2	0 420400D-02	0 514883D-02	0 594535D-02	0 485829D-04	0 0	1
9	3	0 594535D-02	0 664711D-02	0 728154D-02	0 485829D-04	0 0	1
9	4	0 728154D-02	0 786496D-02	0 840800D-02	0 485829D-04	0 0	1
9	5	0 840800D-02	0 932905D-02	0 101670D-01	0 898158D-04	0 100000D 01	2
9	6	0 101670D-01	0 109717D-01	0 117214D-01	0 935238D-04	0 0	3
9	7	0 117214D-01	0 124258D-01	0 130925D-01	0 935238D-04	0 0	3
9	8	0 130925D-01	0 137268D-01	0 143330D-01	0 935238D-04	0 0	3
9	9	0 143330D-01	0 147791D-01	0 152121D-01	0 713933D-04	0 0	4
9	10	0 152121D-01	0 156331D-01	0 160430D-01	0 713933D-04	0 0	4
9	11	0 160430D-01	0 164428D-01	0 168330D-01	0 713933D-04	0 0	4
9	12	0 168408D-01	0 169813D-01	0 171206D-01	0 261249D-04	0 0	4
9	13	0 171206D-01	0 172588D-01	0 173960D-01	0 261249D-04	0 0	4
9	14	0 173960D-01	0 175320D-01	0 176670D-01	0 261249D-04	0 0	4
10	1	0 0	0 280191D-02	0 396250D-02	0 554934D-04	0 0	1
10	2	0 396250D-02	0 485305D-02	0 560382D-02	0 554934D-04	0 0	1
10	3	0 560382D-02	0 626526D-02	0 686325D-02	0 554934D-04	0 0	1
10	4	0 686325D-02	0 741316D-02	0 792500D-02	0 554934D-04	0 0	1
10	5	0 792500D-02	0 911519D-02	0 101670D-01	0 143359D-03	0 100000D 01	2
10	6	0 101670D-01	0 109717D-01	0 117214D-01	0 120245D-03	0 0	3
10	7	0 117214D-01	0 124258D-01	0 130925D-01	0 120245D-03	0 0	3
10	8	0 130925D-01	0 137268D-01	0 143330D-01	0 120245D-03	0 0	3
10	9	0 143330D-01	0 147791D-01	0 152121D-01	0 917914D-04	0 0	4
10	10	0 152121D-01	0 156331D-01	0 160430D-01	0 917914D-04	0 0	4
10	11	0 160430D-01	0 164428D-01	0 168330D-01	0 917914D-04	0 0	4
10	12	0 168354D-01	0 169768D-01	0 171171D-01	0 338030D-04	0 0	4

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
10	13	0 171171D-01	0 172562D-01	0 173942D-01	0 338030D-04	0 0	4
10	14	0 173942D-01	0 175311D-01	0 176670D-01	0 338030D-04	0 0	4
11	1	0 0	0 320567D-02	0 453350D-02	0 968520D-04	0 0	1
11	2	0 453350D-02	0 555238D-02	0 641134D-02	0 968520D-04	0 0	1
11	3	0 641134D-02	0 716809D-02	0 785225D-02	0 968520D-04	0 0	1
11	4	0 785225D-02	0 848140D-02	0 906700D-02	0 968520D-04	0 0	1
11	5	0 906700D-02	0 963271D-02	0 101670D-01	0 997019D-04	0 100000D 01	2
11	6	0 101670D-01	0 109717D-01	0 117214D-01	0 160326D-03	0 0	3
11	7	0 117214D-01	0 124258D-01	0 130925D-01	0 160326D-03	0 0	3
11	8	0 130925D-01	0 137268D-01	0 143330D-01	0 160326D-03	0 0	3
11	9	0 143330D-01	0 147791D-01	0 152121D-01	0 122389D-03	0 0	4
11	10	0 152121D-01	0 156331D-01	0 160430D-01	0 122389D-03	0 0	4
11	11	0 160430D-01	0 164428D-01	0 168330D-01	0 122389D-03	0 0	4
11	12	0 168890D-01	0 170211D-01	0 171523D-01	0 422302D-04	0 0	4
11	13	0 171523D-01	0 172824D-01	0 174115D-01	0 422302D-04	0 0	4
11	14	0 174115D-01	0 175397D-01	0 176670D-01	0 422302D-04	0 0	4

----- MATERIAL DATA -----
(PIN NO 1)

IDENTIFIED MATERIALS

MATERIAL NO 1 IS MAGNESIUM OXIDE

MATERIAL NO 2 IS INCONEL

MATERIAL NO 3 IS BORON NITRIDE

FOLLOWING ARE DESCRIPTIONS OF THE OTHER MATERIALS

----- MATERIAL DATA -----
(PIN NO 1)

MATERIAL NO 4

MELTING TEMPERATURE (F)
5000 00

THERMAL CONDUCTIVITY
(BTU/HR-FT-F)

ALLOWED TEMPERATURE RANGE

HIGH	LOW
2300 00	0 0

K = C0 + C1*T + C2*T**2 + C3*T**3 + C4*T**4

C0	C1	C2	C3	C4
0 754858D 01	0 440407D-02	0 426080D-06	-0 215948D-09	0 0

SPECIFIC HEAT CAPACITY
(BTU/LBM-F)

ALLOWED TEMPERATURE RANGE

HIGH	LOW
2300 00	0 0

CP = C0 + C1*T + C2*T**2 + C3*T**3 + C4*T**4

C0	C1	C2	C3	C4
0 104247D 00	0 605583D-04	-0 437722D-07	0 201226D-10	-0 316414D-14

DENSITY
(LBM/FT**3)
0 496000D 03

```
*************************************
*                                   *
*                                   *
*     IMPLICIT SOLUTION TECHNIQUE   *
*                                   *
*                                   *
************************* ************
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----- WATER NODE INPUT -----

PRESSURE PSIA	ENTHALPY BTU/LBM	FLOW AREA FT**2	CHAN LENGTH FT	INLET POSITION 1=TOP	OUTLET POSITION 0=BOTTOM	VOLUME FT**3	UPSTREAM NODE	DNSTREAM NODE
0 230601D 04	0 544340D 03	0 635180D-01	0 150000D 01	0	1	0 952770D-01	201	2
0 230299D 04	0 544340D 03	0 635180D-01	0 112500D 01	0	1	0 714578D-01	1	3
0 230048D 04	0 544340D 03	0 635180D-01	0 875000D 00	0	1	0 555782D-01	2	4
0 229822D 04	0 544340D 03	0 635180D-01	0 100000D 01	0	1	0 635180D-01	3	5
0 229588D 04	0 544340D 03	0 635180D-01	0 100000D 01	0	1	0 635180D-01	4	6
0 229351D 04	0 544340D 03	0 635180D-01	0 100000D 01	0	1	0 635180D-01	5	7
0 229114D 04	0 544340D 03	0 635180D-01	0 100000D 01	0	1	0 635180D-01	6	8
0 228877D 04	0 544340D 03	0 635180D-01	0 100000D 01	0	1	0 635180D-01	7	9
0 228651D 04	0 544340D 03	0 635180D-01	0 875000D 00	0	1	0 555782D-01	8	10
0 228417D 04	0 544340D 03	0 635180D-01	0 112500D 01	0	1	0 714578D-01	9	11
0 228120D 04	0 544340D 03	0 635180D-01	0 150000D 01	0	1	0 952770D-01	10	211

----- WATER HYDRAULIC INPUT -----

MASS FLOW RATE LBM/SEC	CHAN HYDRAU DIA IN	DNB CORREL	MINIMUM H T COEF BTU/S-FT2-F	GROEN CORREL	CONSTANT FRIC FACT	EPS /DIA
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 105590D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 166690D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 163200D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 133970D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 142800D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 142800D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 142800D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 142800D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 153110D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 126930D-01	0 300000D-03
0 482500D 02	0 246200D 00	6	0 833333D-02	F	0 125010D-01	0 300000D-03

---------- WATER ALLOWABLE TEMPERATURE CHANGE ----------

ALLOWABLE TEMPERATURE CHANGE FOR WATER = 2 000000000D 01

---------- TIME AVERAGING PERIOD ----------

PERIOD OVER WHICH COOLANT CHANNEL BOUNDARY CONDITIONS ARE TIME-AVERAGED = 0 500000D-01 SEC

----- INLET FLOW CONDITIONS FOR CHANNEL 1 -----

TIME SEC	FLOW LBM/SEC	PRESSURE PSIA	ENTHALPY BTU/LBM
0 0	0 482500D 02	0 230761D 04	0 544427D 03
0 100000D-10	0 482500D 02	0 0	0 544427D 03
0 100000D-02	0 482494D 02	0 0	0 544427D 03
0 500000D-01	0 314359D 02	0 0	0 540751D 03
0 100000D 00	0 935756D 01	0 0	0 542202D 03
0 150000D 00	0 940386D 01	0 0	0 541964D 03
0 200000D 00	0 660685D 01	0 0	0 541906D 03
0 250000D 00	0 384712D 01	0 0	0 541894D 03
0 300000D 00	0 157064D 01	0 0	0 541847D 03
0 350000D 00	-0 669912D 00	0 0	0 542015D 03
0 400000D 00	-0 292933D 01	0 0	0 541971D 03
0 450000D 00	-0 495523D 01	0 0	0 541950D 03
0 500000D 00	-0 672965D 01	0 0	0 541975D 03
0 550000D 00	-0 841650D 01	0 0	0 541979D 03
0 600000D 00	-0 984325D 01	0 0	0 542028D 03
0 650000D 00	-0 107741D 02	0 0	0 542040D 03
0 700000D 00	-0 114931D 02	0 0	0 542049D 03
0 750000D 00	-0 121021D 02	0 0	0 542070D 03
0 800000D 00	-0 125909D 02	0 0	0 542094D 03
0 850000D 00	-0 135178D 02	0 0	0 542125D 03
0 900000D 00	-0 139300D 02	0 0	0 542189D 03
0 950000D 00	-0 137336D 02	0 0	0 542188D 03
0 100000D 01	-0 154047D 02	0 0	0 542244D 03
0 105000D 01	-0 174140D 02	0 0	0 542310D 03
0 110000D 01	-0 182264D 02	0 0	0 542331D 03
0 115000D 01	-0 180304D 02	0 0	0 42350D 03
0 120000D 01	-0 169352D 02	0 0	0 542333D 03
0 125000D 01	-0 175428D 02	0 0	0 542321D 03
0 130000D 01	-0 193036D 02	0 0	0 542381D 03
0 135000D 01	-0 205706D 02	0 0	0 542418D 03
0 140000D 01	-0 215462D 02	0 0	0 542440D 03
0 145000D 01	-0 221340D 02	0 0	0 542450D 03
0 150000D 01	-0 219138D 02	0 0	0 542446D 03
0 155000D 01	-0 194368D 02	0 0	0 542456D 03
0 160000D 01	-0 188398D 02	0 0	0 542419D 03
0 165000D 01	-0 198626D 02	0 0	0 542518D 03
0 170000D 01	-0 198053D 02	0 0	0 542492D 03
0 175000D 01	-0 205304D 02	0 0	0 542490D 03
0 180000D 01	-0 222396D 02	0 0	0 542518D 03
0 185000D 01	-0 236718D 02	0 0	0 542529D 03

----- INLET FLOW CONDITIONS FOR CHANNEL 1 -----

TIME SEC	FLOW LBM/SEC	PRESSURE PSIA	ENTHALPY BTU/LBM
0 190000D 01	-0 236960D 02	0 0	0 542524D 03
0 195000D 01	-0 236058D 02	0 0	0 542564D 03
0 200000D 01	-0 241265D 02	0 0	0 542604D 03
0 205000D 01	-0 250249D 02	0 0	0 542604D 03
0 210000D 01	-0 264755D 02	0 0	0 542576D 03
0 215000D 01	-0 282905D 02	0 0	0 542559D 03
0 220000D 01	-0 298932D 02	0 0	0 542541D 03
0 225000D 01	-0 306362D 02	0 0	0 542520D 03
0 230000D 01	-0 306624D 02	0 0	0 542493D 03
0 235000D 01	-0 305061D 02	0 0	0 542457D 03
0 240000D 01	-0 304733D 02	0 0	0 542404D 03
0 245000D 01	-0 303919D 02	0 0	0 542344D 03
0 250000D 01	-0 296730D 02	0 0	0 542288D 03
0 255000D 01	-0 284746D 02	0 0	0 542236D 03
0 260000D 01	-0 273355D 02	0 0	0 542190D 03
0 265000D 01	-0 282962D 02	0 0	0 542157D 03
0 270000D 01	-0 270988D 02	0 0	0 542122D 03
0 275000D 01	-0 270475D 02	0 0	0 542100D 03
0 280000D 01	-0 276767D 02	0 0	0 542070D 03
0 285000D 01	-0 275682D 02	0 0	0 542043D 03
0 290000D 01	-0 275483D 02	0 0	0 542024D 03
0 295000D 01	-0 274688D 02	0 0	0 542012D 03
0 300000D 01	-0 282400D 02	0 0	0 542023D 03
0 305000D 01	-0 287832D 02	0 0	0 542028D 03
0 310000D 01	-0 270511D 02	0 0	0 542040D 03
0 315000D 01	-0 266841D 02	0 0	0 542072D 03
0 320000D 01	-0 260579D 02	0 0	0 542118D 03
0 325000D 01	-0 251269D 02	0 0	0 542174D 03
0 330000D 01	-0 256013D 02	0 0	0 542244D 03
0 335000D 01	-0 257354D 02	0 0	0 542323D 03
0 340000D 01	-0 241584D 02	0 0	0 542412D 03
0 345000D 01	-0 216428D 02	0 0	0 542503D 03
0 350000D 01	-0 192113D 02	0 0	0 542594D 03
0 355000D 01	-0 176681D 02	0 0	0 542684D 03
0 360000D 01	-0 162659D 02	0 0	0 542771D 03
0 365000D 01	-0 148331D 02	0 0	0 542854D 03
0 370000D 01	-0 128390D 02	0 0	0 542934D 03
0 375000D 01	-0 109055D 02	0 0	0 543004D 03
0 380000D 01	-0 990319D 01	0 0	0 543065D 03
0 385000D 01	-0 935763D 01	0 0	0 543121D 03

--- INLET FLOW CONDITIONS FOR CHANNEL 1 -----

TIME SEC	FLOW LBM/SEC	PRESSURE PSIA	ENTHALPY BTU/LBM
0 390000D 01	-0 908815D 01	0 0	0 543174D 03
0 395000D 01	-0 845492D 01	0 0	0 543233D 03
0 400000D 01	-0 641252D 01	0 0	0 543282D 03
0 405000D 01	-0 434784D 01	0 0	0 543313D 03
0 410000D 01	-0 281260D 01	0 0	0 543328D 03
0 415000D 01	-0 217249D 01	0 0	0 543334D 03
0 420000D 01	-0 172008D 01	0 0	0 543340D 03
0 425000D 01	-0 366429D 00	0 0	0 543341D 03
0 430000D 01	0 186833D 01	0 0	0 543034D 03
0 435000D 01	0 440846D 01	0 0	0 543007D 03
0 440000D 01	0 603868D 01	0 0	0 542969D 03
0 445000D 01	0 647819D 01	0 0	0 542925D 03
0 450000D 01	0 593981D 01	0 0	0 542885D 03
0 455000D 01	0 497265D 01	0 0	0 542850D 03
0 460000D 01	0 430169D 01	0 0	0 542822D 03
0 465000D 01	0 382688D 01	0 0	0 542798D 03
0 470000D 01	0 332881D 01	0 0	0 542777D 03
0 475000D 01	0 290220D 01	0 0	0 542759D 03
0 480000D 01	0 219424D 01	0 0	0 542743D 03
0 485000D 01	0 170620D 01	0 0	0 542733D 03
0 490000D 01	0 226927D 01	0 0	0 542725D 03
0 495000D 01	0 299526D 01	0 0	0 542724D 03
0 500000D 01	0 473970D 01	0 0	0 542732D 03

----- OUTLET FLOW CONDITIONS FOR CHANNEL 1 -----

TIME SEC	FLOW LBM/SEC	PRESSURE PSIA	ENTHALPY BTU/LBM
0 0	0 482500D 02	0 227930D 04	0 544433D 03
0 100000D-10	0 482500D 02	0 0	0 544433D 03
0 100000D-10	0 482500D 02	0 0	0 544433D 03
0 100000D-02	0 482530D 02	0 0	0 544432D 03
0 500000D-01	0 302305D 02	0 0	0 541050D 03
0 100000D 00	0 703286D 01	0 0	0 542431D 03
0 150000D 00	0 868302D 01	0 0	0 542299D 03
0 200000D 00	0 699644D 01	0 0	0 542276D 03
0 250000D 00	0 432512D 01	0 0	0 542276D 03
0 300000D 00	0 180958D 01	0 0	0 542238D 03
0 350000D 00	-0 575605D 00	0 0	0 542215D 03
0 400000D 00	-0 283180D 01	0 0	0 542152D 03
0 450000D 00	-0 480716D 01	0 0	0 542086D 03
0 500000D 00	-0 658524D 01	0 0	0 542035D 03
0 550000D 00	-0 824461D 01	0 0	0 541938D 03
0 600000D 00	-0 970319D 01	0 0	0 541854D 03
0 650000D 00	-0 106159D 02	0 0	0 541721D 03
0 700000D 00	-0 113125D 02	0 0	0 541577D 03
0 750000D 00	-0 119347D 02	0 0	0 541445D 03
0 800000D 00	-0 124446D 02	0 0	0 541320D 03
0 850000D 00	-0 133959D 02	0 0	0 541212D 03
0 900000D 00	-0 138555D 02	0 0	0 541131D 03
0 950000D 00	-0 136120D 02	0 0	0 541012D 03
0 100000D 01	-0 153287D 02	0 0	0 540967D 03
0 105000D 01	-0 173785D 02	0 0	0 540915D 03
0 110000D 01	-0 181518D 02	0 0	0 540834D 03
0 115000D 01	-0 179306D 02	0 0	0 540763D 03
0 120000D 01	-0 167937D 02	0 0	0 540676D 03
0 125000D 01	-0 174056D 02	0 0	0 540618D 03
0 130000D 01	-0 192684D 02	0 0	0 540619D 03
0 135000D 01	-0 205566D 02	0 0	0 540606D 03
0 140000D 01	-0 214987D 02	0 0	0 540583D 03
0 145000D 01	-0 220593D 02	0 0	0 540558D 03
0 150000D 01	-0 218132D 02	0 0	0 540521D 03
0 155000D 01	-0 193521D 02	0 0	0 540500D 03
0 160000D 01	-0 187238D 02	0 0	0 540473D 03
0 165000D 01	-0 199061D 02	0 0	0 540553D 03
0 170000D 01	-0 197595D 02	0 0	0 540532D 03
0 175000D 01	-0 204450D 02	0 0	0 540542D 03
0 180000D 01	-0 222107D 02	0 0	0 540591D 03

----- OUTLET FLOW CONDITIONS FOR CHANNEL 1 -----

TIME SEC	FLOW LBM/SEC	PRESSURE PSIA	ENTHALPY BTU/LBM
0 185000D 01	-0 236494D 02	0 0	0 540635D 03
0 190000D 01	-0 236418D 02	0 0	0 540678D 03
0 195000D 01	-0 236191D 02	0 0	0 540791D 03
0 200000D 01	-0 241824D 02	0 0	0 540929D 03
0 205000D 01	-0 250138D 02	0 0	0 541057D 03
0 210000D 01	-0 264077D 02	0 0	0 541195D 03
0 215000D 01	-0 282542D 02	0 0	0 541388D 03
0 220000D 01	-0 298309D 02	0 0	0 541632D 03
0 225000D 01	-0 305902D 02	0 0	0 541930D 03
0 230000D 01	-0 306121D 02	0 0	0 542281D 03
0 235000D 01	-0 304359D 02	0 0	0 542674D 03
0 240000D 01	-0 303529D 02	0 0	0 543105D 03
0 245000D 01	-0 302753D 02	0 0	0 543583D 03
0 250000D 01	-0 295253D 02	0 0	0 544100D 03
0 255000D 01	-0 283103D 02	0 0	0 544650D 03
0 260000D 01	-0 271627D 02	0 0	0 545222D 03
0 265000D 01	-0 281053D 02	0 0	0 545851D 03
0 270000D 01	-0 269293D 02	0 0	0 546495D 03
0 275000D 01	-0 268562D 02	0 0	0 547175D 03
0 280000D 01	-0 274399D 02	0 0	0 547896D 03
0 285000D 01	-0 273176D 02	0 0	0 548650D 03
0 290000D 01	-0 272903D 02	0 0	0 549425D 03
0 295000D 01	-0 271763D 02	0 0	0 550220D 03
0 300000D 01	-0 279428D 02	0 0	0 551062D 03
0 305000D 01	-0 284301D 02	0 0	0 551924D 03
0 310000D 01	-0 267113D 02	0 0	0 552753D 03
0 315000D 01	-0 263402D 02	0 0	0 553551D 03
0 320000D 01	-0 257165D 02	0 0	0 554300D 03
0 325000D 01	-0 248087D 02	0 0	0 554966D 03
0 330000D 01	-0 252525D 02	0 0	0 555640D 03
0 335000D 01	-0 253608D 02	0 0	0 556353D 03
0 340000D 01	-0 215369D 02	0 0	0 557048D 03
0 345000D 01	-0 190491D 02	0 0	0 557617D 03
0 350000D 01	-0 169625D 02	0 0	0 558136D 03
0 355000D 01	-0 141711D 02	0 0	0 558573D 03
0 360000D 01	-0 126556D 02	0 0	0 58953D 03
0 365000D 01	-0 103556D 02	0 0	0 559278D 03
0 370000D 01	-0 952446D 01	0 0	0 559569D 03
0 375000D 01	-0 810740D 01	0 0	0 559830D 03
0 380000D 01	-0 614577D 01	0 0	0 560035D 03

----- OUTLET FLOW CONDITIONS FOR CHANNEL 1 -----

TIME SEC	FLOW LBM/SEC	PRESSURE PSIA	ENTHALPY BTU/LBM
0 385000D 01	-0 535848D 01	0 0	0 560195D 03
0 390000D 01	-0 507776D 01	0 0	0 560340D 03
0 395000D 01	-0 422484D 01	0 0	0 560471D 03
0 400000D 01	-0 323150D 01	0 0	0 560581D 03
0 405000D 01	-0 935709D 00	0 0	0 60654D 03
0 410000D 01	0 192221D 00	0 0	0 557714D 03
0 415000D 01	0 972786D 00	0 0	0 557707D 03
0 420000D 01	0 142069D 01	0 0	0 557693D 03
0 425000D 01	0 233018D 01	0 0	0 557670D 03
0 430000D 01	0 422516D 01	0 0	0 557606D 03
0 435000D 01	0 549423D 01	0 0	0 557494D 03
0 440000D 01	0 694779D 01	0 0	0 557333D 03
0 445000D 01	0 760638D 01	0 0	0 557131D 03
0 450000D 01	0 752510D 01	0 0	0 56927D 03
0 455000D 01	0 746606D 01	0 0	0 556736D 03
0 460000D 01	0 679599D 01	0 0	0 556569D 03
0 465000D 01	0 665022D 01	0 0	0 556432D 03
0 470000D 01	0 688088D 01	0 0	0 556304D 03
0 475000D 01	0 652439D 01	0 0	0 556183D 03
0 480000D 01	0 665662D 01	0 0	0 556085D 03
0 485000D 01	0 682274D 01	0 0	0 555982D 03
0 490000D 01	0 745750D 01	0 0	0 555886D 03
0 495000D 01	0 744130D 01	0 0	0 555776D 03
0 500000D 01	0 813536D 01	0 0	0 555655D 03

END OF INPUT DATA PROCESSING

STEADY-STATE OUTPUT

----- SYSTEM POWER DATA -----

SYSTEM	STEADY-STATE POWER	
NUCLEAR	0 0	MW
IDEAL ELECTRIC	0 100000D-19	KW
ACTUAL ELECTRIC	0 0	KW

IHC209I IBCOM - PROGRAM INTERRUPT (I) - DIVIDE CHECK OLD PSW IS FF45004012135BF4

TRACEBACK ROUTINE	CALLED FROM ISN	REG 14	REG 15	REG 0	REG 1
IDLNIT	0108	4219D57A	001A0A98	0000000A	00000000
SSTATE	0020	42122614	0019CD48	00000000	00000000
MAIN		00016F98	01122438	FD000008	0020E7F8

ENTRY POINT= 01122438

STANDARD FIXUP TAKEN EXECUTION CONTINUING
++++++ NOTE THE IDEAL SYSTEM POWER TABLE IS BEING NORMALIZED ++++++

STEADY-STATE POWER (PIDL) 0 100000D-19
RATIO = 0 100000D-19
TABULATED STEADY-STATE POWER - 0 0

STEADY-STATE IDEAL
ELECTRIC SYSTEM OUTPUT

-----NORMALIZED IDEAL ELECTRIC SYSTEM POWER TABLE -----

TIME (SEC)	POWER (KW)	TIME (SEC)	POWER (KW)	TIME (SEC)	POWER (KW)	TIME (SEC)	POWER (KW)
0 0	0 0	0 200000D 02	0 0				

FOLLOWING ARE SUMMARIES OF THE IDEAL ELECTRIC SYSTEM PIN(S) CONDITIONS

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

TAU (SEC)	DELT (SEC)
0 0	0 0

	BTU/SEC	KW
PIN POWER	0 947972D-20	0 100000D-19
SYSTEM AVG PIN POWER	0 947972D-20	0 100000D-19

LEVEL NO	LEVEL POWER (BTU/SEC)	SURF HEAT TRAN (BTU/SEC)	SURF HEAT FLUX (BTU/SEC-FT**2)	CENTERLINE TEMP (F)	HEATER NODE TEMP(F)	SURFACE TEMP (F)	ADJACENT COOL TEMP(F)	S URF HT TRANS COEFF(B/S-FT2-F)
1	0 332185D-21	0 332185D-21	0 199502D-20	0 547706D 03	0 547686D 03	0 547776D 03	0 547776D 03	0 199178D 01
2	0 469720D-21	0 469720D-21	0 376135D-20	0 547634D 03	0 547592D 03	0 547772D 03	0 547772D 03	0 199180D 01
3	0 825921D-21	0 825921D-21	0 850330D-20	0 547630D 03	0 547588D 03	0 547769D 03	0 547769D 03	0 199182D 01
4	0 102436D-20	0 102436D-20	0 922808D-20	0 547628D 03	0 547586D 03	0 547766D 03	0 547766D 03	0 199184D 01
5	0 131515D-20	0 131515D-20	0 118477D-19	0 547625D 03	0 547583D 03	0 547763D 03	0 547763D 03	0 199186D 01
6	0 134301D-20	0 134301D-20	0 120986D-19	0 547622D 03	0 547580D 03	0 547760D 03	0 547760D 03	0 199188D 01
7	0 131602D-20	0 131602D-20	0 118555D-19	0 547619D 03	0 547577D 03	0 547758D 03	0 547758D 03	199190D 01
8	0 100970D-20	0 100970D-20	0 909599D-20	0 547616D 03	0 547574D 03	0 547755D 03	0 547755D 03	0 199192D 01
9	0 815019D-21	0 815019D-21	0 839106D-20	0 547613D 03	0 547572D 03	0 547752D 03	0 547752D 03	0 199193D 01
10	0 463084D-21	0 463084D-21	0 370822D-20	0 547611D 03	0 547569D 03	0 547749D 03	0 547749D 03	0 199195D 01
11	0 332185D-21	0 332185D-21	0 199502D-20	0 547677D 03	0 547656D 03	0 547746D 03	0 547746D 03	0 199197D 01

LEVEL	EQUIVALENT GAP CONDUCTIVITY (BTU/SEC-FT-F)	GAP CONDUCTANCE (BTU/SEC-FT**2-F)	GAP THICKNESS (FT)	STEADY STATE GAP THICKNESS (FT)	NO OF ITERATIONS IN H T SOLUTION
1	0 689691D-05	0 0	0 0	0 980000D-05	2
2	0 689614D-05	0 0	0 0	0 980000D-05	1
3	0 689612D-05	0 0	0 0	0 374000D-05	1
4	0 689611D-05	0 0	0 0	0 528000D-05	1
5	0 689609D-05	0 0	0 0	0 493000D-05	1
6	0 689607D-05	0 0	0 0	0 858000D-05	1
7	0 689606D-05	0 0	0 0	0 440000D-05	1
8	0 689604D-05	0 0	0 0	0 983000D-05	1
9	0 689602D-05	0 0	0 0	0 777000D-05	1
10	0 689601D-05	0 0	0 0	0 238000D-05	1
11	0 689673D-05	0 0	0 0	0 560000D-04	2

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

PIN TEMPERATURE DISTRIBUTION

NODE

LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	547 71	547 70	547 70	547 69	547 69	547 68	547 68	547 67	547 66	547 66
2	547 63	547 62	547 61	547 60	547 59	547 58	547 57	547 56	547 55	547 54
3	547 63	547 62	547 61	547 60	547 59	547 58	547 57	547 56	47 55	547 54
4	547 63	547 62	547 61	547 60	547 59	547 58	547 56	547 55	547 54	547 53
5	547 62	547 61	547 60	547 59	547 58	547 57	547 56	547 55	547 54	547 53
6	547 62	547 61	547 60	547 59	547 58	547 57	547 56	547 55	47 54	547 53
7	547 62	547 61	547 60	547 59	547 58	547 57	547 56	547 55	547 54	547 52
8	547 62	547 61	547 60	547 58	547 57	547 56	547 55	547 54	547 3	547 52
9	547 61	547 60	547 59	547 58	547 57	547 56	547 55	547 54	47 53	547 52
10	547 61	547 60	547 59	547 58	547 57	547 56	547 55	47 54	547 53	547 52
11	547 68	547 67	547 67	547 66	547 66	547 65	547 65	47 64	47 64	547 63

NODE

LEVEL NO	11	12	13	14
1	547 65	547 65	547 64	547 64
2	547 53	547 52	547 51	547 50
3	547 53	547 52	547 50	547 49
4	547 52	547 51	547 50	547 49
5	547 52	547 51	547 50	547 49
6	547 52	547 51	547 50	547 49
7	547 51	547 50	547 49	547 48
8	547 51	547 50	547 49	547 48
9	547 51	547 50	547 49	547 48
10	547 51	547 50	547 49	547 47
11	547 62	547 62	547 61	547 61

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

TOTAL STORED ENERGY PIN 1 = 0 330041D 03 BTU

LEVEL	STORED ENERGY PER LEVEL(BTU)
1	0 412141D 02
2	0 310049D 02
3	0 241330D 02
4	0 275325D 02
5	0 274858D 02
6	0 274730D 02
7	0 274872D 02
8	0 275161D 02
9	0 241200D 02
10	0 311018D 02
11	0 409722D 02

TOTAL NODAL STORED ENERGY (BTU)

	NODE									
LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	0 2905D 01	0 2905D 01	0 2905D 01	0 2905D 01	0 3240D 01	0 3345D 01	0 3345D 01	0 3345D 01	0 3985D 01	0 3985D 01
2	0 1873D 01	0 1873D 01	0 1873D 01	0 1873D 01	0 3752D 01	0 2508D 01	0 2508D 01	0 2508D 01	0 2988D 01	0 2988D 01
3	0 1457D 01	0 1457D 01	0 1457D 01	0 1457D 01	0 2918D 01	0 1951D 01	0 1950D 01	0 1950D 01	0 2324D 01	0 2324D 01
4	0 1793D 01	0 1793D 01	0 1793D 01	0 1793D 01	0 2781D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
5	0 1937D 01	0 1936D 01	0 1936D 01	0 1936D 01	0 2160D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
6	0 1937D 01	0 1936D 01	0 1936D 01	0 1936D 01	0 2160D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
7	0 1937D 01	0 1936D 01	0 1936D 01	0 1936D 01	0 2160D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
8	0 1793D 01	0 1793D 01	0 1793D 01	0 1793D 01	0 2781D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
9	0 1457D 01	0 1457D 01	0 1457D 01	0 1457D 01	0 2918D 01	0 1950D 01	0 1950D 01	0 1950D 01	0 2324D 01	0 2324D 01
10	0 1664D 01	0 1664D 01	0 1664D 01	0 1664D 01	0 4658D 01	0 2508D 01	0 2508D 01	0 2508D 01	0 2988D 01	0 2988D 01
11	0 2905D 01	0 2905D 01	0 2905D 01	0 2905D 01	0 3240D 01	0 3344D 01	0 3344D 01	0 3344D 01	0 3985D 01	0 3985D 01

	NODE			
LEVEL NO	11	12	13	14
1	3 98	1 45	1 45	1 45
2	2 99	1 09	1 09	1 09
3	2 32	0 85	0 85	0 85
4	2 66	0 97	0 97	0 97
5	2 66	0 98	0 98	0 98
6	2 66	0 97	0 97	0 97
7	2 66	0 98	0 98	0 98
8	2 66	0 97	0 97	0 97
9	2 32	0 85	0 85	0 85
10	2 99	1 10	1 10	1 10
11	3 98	1 37	1 37	1 37

----- STEADY STATE OUTPUT -----

WATER SIDE

CORR INPUT FRICTION FACTOR	CALCULATED FRICTION FACTOR	TWO - PHASE MULTIPLIER	TRANSITION REGION PARAMETERS A	F=A*EXP(RE)**B B
0 84051434D-02	0 17354477D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 16668641D-01	0 17354390D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 16319646D-01	0 17354307D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 13396679D-01	0 17354244D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 14279665D-01	0 17354177D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 14279668D-01	0 17354109D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 14279668D-01	0 17354040D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 14279652D-01	0 17353971D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 15311100D-01	0 17353904D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
0 12676879D-01	0 17353840D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00
-0 27907879D-02	0 17353766D-01	0 10000000D 01	0 11407971D-02	0 42945763D 00

COOLANT CHANNEL DATA

NODE	PRESSURE PSIA	TOTAL MASS LBM	INTERNAL ENERGY BTU	TEMP DEG F	QUALITY	MASS FLOW RATE LBM/SEC	PRESSURE DROP (PSI) INERTIA	PRESSURE	STATIC HEAD	MOMENTUM	FRICTION
1	2305 80	4 48212D 00	2 39917D 03	547 78	-0 40	4 82500D 01	7 9086D-09	2 9832D 00	-4 9003D-01	1 7497D-04	-2 4934D 00
2	2302 82	3 36146D 00	1 79935D 03	547 77	-0 40	4 82500D 01	6 3967D-09	2 8376D 00	-3 6751D-01	-1 0259D-04	-2 4700D 00
3	2299 98	2 61437D 00	1 39947D 03	547 77	-0 40	4 82500D 01	5 0657D-09	2 1874D 00	-2 8583D-01	-9 7603D-05	-1 9015D 00
4	2297 79	2 98777D 00	1 59937D 03	547 77	-0 40	4 82500D 01	5 1691D-09	2 3113D 00	-3 2665D-01	-7 5252D-05	-1 9845D 00
5	2295 48	2 98768D 00	1 59935D 03	547 76	-0 40	4 82500D 01	5 4793D-09	2 3683D 00	-3 2664D-01	-7 9526D-05	-2 0416D 00
6	2293 11	2 98759D 00	1 59933D 03	547 76	-0 40	4 82500D 01	5 1692D-09	2 3684D 00	-3 2663D-01	-8 1502D-05	-2 0416D 00
7	2290 74	2 98749D 00	1 59930D 03	547 76	-0 40	4 82500D 01	4 9624D-09	2 3684D 00	-3 2662D-01	-8 1518D-05	-2 0417D 00
8	2288 38	2 98740D 00	1 59928D 03	547 75	-0 40	4 82500D 01	5 1693D-09	2 3684D 00	-3 2661D-01	-8 1534D-05	-2 0418D 00
9	2286 01	2 61390D 00	1 39935D 03	547 75	-0 39	4 82500D 01	4 2502D-09	2 1307D 00	-2 8578D-01	-8 1550D-05	-1 8448D 00
10	2283 88	3 36063D 00	1 79914D 03	547 75	-0 39	4 82500D 01	5 9663D-09	2 5482D 00	-3 6742D-01	-7 3376D-05	-2 1807D 00
11	2281 33	4 48069D 00	2 39882D 03	547 75	-0 39	4 82500D 01	7 7777D-09	1 9000D 00	-4 8988D-01	-8 7768D-05	-1 4101D 00

----- BOUNDARY CONDITION DATA -----

INLET

CHANNEL	PRESSURE PSIA	ENTHALPY BTU/LBM	FLOW RATE LBM/SEC	SPECIFIC VOLUME FT**3/LBM	TEMPERATURE DEG F	QUALITY
1	2307 40	0 54443D 03	0 48250D 02	0 21259D-01	547 84	-0 40

OUTLET

CHANNEL	PRESSURE PSIA	ENTHALPY BTU/LBM	FLOW RATE LBM/SEC	SPECIFIC VOLUME FT**3/LBM	TEMPERATURE DEG F	QUALITY
1	2279 43	0 54435D 03	0 48250D 02	0 21264D-01	547 75	-0 39

----- HEAT FLOW DATA -----

CHANNEL	LEVEL	ASSOC WATER NODE	SURFACE TEMP DEG F	WATER TRAN COEF BTU/HR-FT2-F	WATER HEAT FLUX BTU/HR-FT2	HEAT TRAN MODE	MASS FLUX LBM/HR-FT2	DNB FLUX BTU/HR-FT2
1	1	1	547 78	7 17041D 03	7 18206D-18	1	2 73466D 06	2 06784D 06
1	2	2	547 77	7 17050D 03	1 35409D-17	1	2 73466D 06	2 06716D 06
1	3	3	547 77	7 17056D 03	3 06119D-17	1	2 73466D 06	2 066 1D 06
1	4	4	547 77	7 17063D 03	3 32211D-17	1	2 73466D 06	2 066C8D 06
1	5	5	547 76	7 17069D 03	4 26517D-17	1	2 73466D 06	2 06563D 06
1	6	6	547 76	7 17077D 03	4 35550D-17	1	2 73466D 06	2 06516D 06
1	7	7	547 76	7 17085D 03	4 26799D-17	1	2 73466D 06	2 06469D 06
1	8	8	547 75	7 17091D 03	3 27456D-17	1	2 73466D 06	2 06421D 06
1	9	9	547 75	7 17095D 03	3 02078D-17	1	2 73466D 06	2 06374D 06
1	10	10	547 75	7 17103D 03	1 33496D-17	1	2 73466D 06	2 06331D 06
1	11	11	547 75	7 17110D 03	7 18206D-18	1	2 73466D 06	2 06279D 06

TRANSIENT OUTPUT

```
*************************************************      MAJOR EDIT NUMBER   1        ********** ************************************
*************************************************    TIME STEP NUMBER     1         ************************************** ****
****************************************** ******    TRANSIENT TIME =   0 0500 SEC   ************************************************
```

TYPE OF OUTPUT	CURRENT NO OF RECORDS WRITTEN
MAJOR EDIT	1
MINOR EDIT	1
PLOT RECORD	0
RESTART RECORD	0

----- SYSTEM DATA -----

SYSTEM	SYSTEM NO	SYSTEM POWER	AVERAGE PIN POWER (KW)	AVERAGE PIN POWER (BTU/SEC)
IDEAL E	2	0 0 (KW)	0 0	0 0

MAJOR EDIT NUMBER 1
TIME STEP NUMBER 1
TRANSIENT TIME = 0 0500 SEC

IDEAL SYSTEM DATA

INTERPOLATED SYSTEM POWER = 0 0 KW

FOLLOWING ARE SUMMARIES OF THE IDEAL ELECTRIC SYSTEM PIN(S) CONDITIONS

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

TAU (SEC)	DELT (SEC)
0 500D-01	0 500D-01

	BTU/SEC	KW
PIN POWER	0 0	0 0
SYSTEM AVG PIN POWER	0 0	0 0

LEVEL NO	LEVEL POWER (BTU/SEC)	SURF HEAT TRAN (BTU/SEC)	SURF HEAT FLUX (BTU/SEC-FT**2)	CENTERLINE TEMP (F)	HEATER NODE TEMP(F)	SURFACE TEMP (F)	ADJACENT COOL TEMP(F)	S URF HT TRANS COEFF(B/S-FT2-F)
1	0 0	-0 161618D-01	-0 970633D-01	0 547705D 03	0 547682D 03	0 547727D 03	547776D 03	0 199178D 01
2	0 0	-0 242430D-01	-0 194129D 00	0 547631D 03	0 547587D 03	0 547675D 03	0 547772D 03	0 199180D 01
3	0 0	-0 203336D-01	-0 209346D 00	0 547628D 03	0 547584D 03	0 547664D 03	0 547769D 03	0 199182D 01
4	0 0	-0 226631D-01	-0 204163D 00	0 547626D 03	0 547581D 03	0 547664D 03	0 547766D 03	0 199184D 01
5	0 0	-0 227809D-01	-0 205224D 00	0 547623D 03	0 547577D 03	0 547660D 03	0 547763D 03	0 199186D 01
6	0 0	-0 217902D-01	-0 196299D 00	0 547620D 03	0 547574D 03	0 547662D 03	0 547760D 03	0 199188D 01
7	0 0	-0 229729D-01	-0 206954D 00	0 547617D 03	0 547572D 03	0 547654D 03	0 547758D 03	0 199190D 01
8	0 0	-0 215428D-01	-0 194071D 00	0 547614D 03	0 547569D 03	0 547657D 03	0 547755D 03	0 199192D 01
9	0 0	-0 19225 D-01	-0 197935D 00	0 547611D 03	0 547567D 03	0 547652D 03	0 547752D 03	0 199193D 01
10	0 0	-0 268772D-01	-0 215223D 00	0 547608D 03	0 547566D 03	0 547641D 03	0 547749D 03	0 199195D 01
11	0 0	-0 140959D-01	-0 846560D-01	0 547676D 03	0 547653D 03	0 547704D 03	0 547746D 03	0 199197D 01

LEVEL	EQUIVALENT GAP CONDUCTIVITY (BTU/SEC-FT-F)	GAP CONDUCTANCE (BTU/SEC-FT**2-F)	GAP THICKNESS (FT)	STEADY STATE GAP THICKNESS (FT)	NO OF ITERATIONS IN H T SOLUTION
1	0 689709D-05	0 0	0 0	0 980000D-05	1
2	0 689650D-05	0 0	0 0	0 980000D-05	1
3	0 689648D-05	0 0	0 0	0 374000D-05	1
4	0 689646D-05	0 0	0 0	0 528000D-05	1
5	0 689644D-05	0 0	0 0	0 493000D-05	1
6	0 689643D-05	0 0	0 0	0 85800 D-05	1
7	0 689641D-05	0 0	0 0	0 440000D-05	1
8	0 689640D-05	0 0	0 0	0 983000D-05	1
9	0 689638D-05	0 0	0 0	0 777000D-05	1
10	0 689636D-05	0 0	0 0	0 238000D-05	1
11	0 689692D-05	0 0	0 0	0 560000D-04	1

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

PIN TEMPERATURE DISTRIBUTION

NODE

LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	547 71	547 70	547 69	547 69	547 68	547 68	547 67	547 67	47 67	547 67
2	547 63	547 62	547 61	547 60	547 59	547 58	547 57	47 56	547 56	547 56
3	547 63	547 62	547 61	547 60	547 58	547 57	547 57	547 56	47 56	547 56
4	547 63	547 61	547 60	547 59	547 58	547 57	547 57	547 56	547 56	547 56
5	547 62	547 61	547 60	547 59	547 58	547 57	547 56	547 56	47 55	547 56
6	547 62	547 61	547 60	547 59	547 57	547 57	547 56	547 55	47 55	547 55
7	547 62	547 61	547 60	547 58	547 57	547 56	547 56	547 5	547 55	547 55
8	547 61	547 60	547 59	547 58	547 57	547 56	547 55	547 55	547 54	547 54
9	547 61	547 60	547 59	547 58	547 57	547 56	547 55	547 54	547 54	547 54
10	547 61	547 60	547 59	547 58	547 57	547 56	547 55	547 54	547 54	547 55
11	547 68	547 67	547 66	547 66	547 65	547 65	547 64	547 64	47 64	547 64

NODE

LEVEL NO	11	12	13	14
1	547 67	547 71	547 72	547 72
2	547 56	547 64	547 65	547 67
3	547 57	547 63	547 64	47 65
4	547 56	547 63	547 64	547 65
5	547 56	547 62	547 64	547 65
6	547 55	547 63	547 64	547 65
7	547 56	547 62	547 63	547 64
8	547 55	547 63	547 63	547 65
9	547 55	547 62	547 63	547 64
10	7 56	547 60	547 61	547 63
11	54 3	547 69	547 69	47 70

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

TOTAL STORED ENERGY PIN 1 = 0 330053D 03 BTU

LEVEL	STORED ENERGY PER LEVEL(BTU)
1	0 412150D 02
2	0 310063D 02
3	0 241341D 02
4	0 275337D 02
5	0 274870D 02
6	0 274742D 02
7	0 274885D 02
8	0 275173D 02
9	0 241210D 02
10	0 311032D 02
11	0 409730D 02

TOTAL NODAL STORED ENERGY (BTU)

NODE

LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	0 2905D 01	0 2905D 01	0 2905D 01	0 2905D 01	0 3240D 01	0 3345D 01	0 3345D 01	0 3345D 01	0 3985D 01	0 3985D 01
2	0 1873D 01	0 1873D 01	0 1873D 01	0 1873D 01	0 3752D 01	0 2508D 01	0 2508D 01	0 2508D 01	0 2988D 01	0 2988D 01
3	0 1457D 01	0 1457D 01	0 1457D 01	0 1457D 01	0 2918D 01	0 1951D 01	0 1950D 01	0 1950D 01	0 2324D 01	0 2324D 01
4	0 1793D 01	0 1793D 01	0 1793D 01	0 1793D 01	0 2781D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
5	0 1937D 01	0 1936D 01	0 1936D 01	0 1936D 01	0 2160D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
6	0 1937D 01	0 1936D 01	0 1936D 01	0 1936D 01	0 2160D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
7	0 1937D 01	0 1936D 01	0 1936D 01	0 1936D 01	0 2160D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
8	0 1793D 01	0 1793D 01	0 1793D 01	0 1793D 01	0 2781D 01	0 2229D 01	0 2229D 01	0 2229D 01	0 2656D 01	0 2656D 01
9	0 1457D 01	0 1457D 01	0 1457D 01	0 1457D 01	0 2918D 01	0 1950D 01	0 1950D 01	0 1950D 01	0 2324D 01	0 2324D 01
10	0 1664D 01	0 1664D 01	0 1664D 01	0 1664D 01	0 4658D 01	0 2508D 01	0 2508D 01	0 2508D 01	0 2988D 01	0 2988D 01
11	0 2905D 01	0 2905D 01	0 2905D 01	0 2905D 01	0 3240D 01	0 3344D 01	0 3344D 01	0 3344D 01	0 3985D 01	0 3985D 01

NODE

LEVEL NO	11	12	13	14
1	3 99	1 45	1 45	1 45
2	2 99	1 09	1 09	1 09
3	2 32	0 85	0 85	0 85
4	2 66	0 97	0 97	0 97
5	2 66	0 98	0 98	0 98
6	2 66	0 97	0 97	0 97
7	2 66	0 98	0 98	0 98
8	2 66	0 97	0 97	0 97
9	2 32	0 85	0 85	0 85
10	2 99	1 10	1 10	1 10
11	3 98	1 38	1 38	1 38

MAJOR EDIT NUMBER 1
TIME STEP NUMBER 1
TRANSIENT TIME = 0 0500 SEC

COOLANT CHANNEL DATA

NODE	PRESSURE PSIA	TOTAL MASS LBM	INTERNAL ENERGY BTU	TEMP DEG F	QUALITY	MASS FLOW RATE LBM/SEC	PRESSURE DROP (PSI) INERTIA	PRESSURE	STATIC HEAD	MOMENTUM	FRICTION
1	2305 80	4 48058D 00	2 39731D 03	547 78	-0 40	9 38832D 00	-2 5487D 00	2 9832D 00	-4 9003D-01	-2 5485D 00	-2 4934D 00
2	2302 82	3 35972D 00	1 79840D 03	547 77	-0 40	9 42302D 00	6 0353D-09	2 8376D 00	-3 6751D-01	-1 0259D-04	-2 4700D 00
3	2299 98	2 61318D 00	1 39882D 03	547 77	-0 40	9 44678D 00	4 7795D-09	2 1874D 00	-2 8583D-01	-9 7603D-05	-1 9015D 00
4	2297 79	2 98656D 00	1 59871D 03	547 77	-0 40	9 47096D 00	4 8771D-09	2 3113D 00	-3 2665D-01	-7 5252D-05	-1 9845D 00
5	2295 48	2 98662D 00	1 59877D 03	547 76	-0 40	9 49207D 00	5 1698D-09	2 3683D 00	-3 2664D-01	-7 9526D-05	-2 0416D 00
6	2293 11	2 98669D 00	1 59884D 03	547 76	-0 40	9 51004D 00	4 8772D-09	2 3684D 00	-3 2663D-01	-8 1502D-05	-2 0416D 00
7	2290 74	2 98675D 00	1 59890D 03	547 76	-0 40	9 52486D 00	4 6821D-09	2 3684D 00	-3 2662D-01	-8 1518D-05	-2 0417D 00
8	2288 38	2 98682D 00	1 59896D 03	547 75	-0 40	9 53653D 00	4 8773D-09	2 3684D 00	-3 2661D-01	-8 1534D-05	-2 0418D 00
9	2286 01	2 61352D 00	1 39915D 03	547 75	-0 39	9 54403D 00	4 0101D-09	2 1307D 00	-2 8578D-01	-8 1550D-05	-1 8448D 00
10	2283 88	3 36031D 00	1 79897D 03	547 75	-0 39	9 55040D 00	5 6293D-09	2 5482D 00	-3 6742D-01	-7 3376D-05	-2 1807D 00
11	2281 33	4 48014D 00	2 39886D 03	547 75	-0 39	9 56149D 00	-1 8595D 00	4 0518D-02	-4 8988D-01	-8 7768D-05	-1 4101D 00

----- BOUNDARY CONDITION DATA -----

INLET

CHANNEL	PRESSURE PSIA	ENTHALPY BTU/LBM	FLOW RATE LBM/SEC	SPECIFIC VOLUME FT**3/LBM	TEMPERATURE DEG F	QUALITY
1	2305 86	0 54220D 03	0 93576D 01	0 21207D-01	546 03	-0 41

OUTLET

CHANNEL	PRESSURE PSIA	ENTHALPY BTU/LBM	FLOW RATE LBM/SEC	SPECIFIC VOLUME FT**3/LBM	TEMPERATURE DEG F	QUALITY
1	2281 29	0 54235D 03	0 70329D 01	0 21217D-01	546 13	-0 40

----- HEAT FLOW DATA -----

CHANNEL	LEVEL	ASSOC WATER NODE	SURFACE TEMP DEG F	WATER TRAN COEF BTU/HR-FT2-F	WATER HEAT FLUX BTU/HR-FT2	HEAT TRAN MODE	MASS FLUX LBM/HR-FT2	DNB FLUX BTU/HR-FT2
1	1	1	547 73	7 17041D 03	-3 49428D 02	1	2 73466D 06	2 06784D 06
1	2	2	547 67	7 17050D 03	-6 98865D 02	1	2 73466D 06	2 06716D 06
1	3	3	47 66	7 17056D 03	-7 53644D 02	1	2 73466D 06	2 066 1D 06
1	4	4	547 66	7 17063D 03	-7 34988D 02	1	2 73466D 06	2 06608D 06
1	5	5	547 66	7 17069D 03	-7 38806D 02	1	2 73466D 06	2 06563D 06
1	6	6	547 66	7 17077D 03	-7 06676D 02	1	2 73466D 06	2 06516D 06
1	7	7	547 65	7 17085D 03	-7 45035D 02	1	2 73466D 06	2 06469D 06
1	8	8	547 66	7 17091D 03	-6 98655D 02	1	2 73466D 06	2 064 1D 06
1	9	9	547 65	7 17095D 03	-7 12565D 02	1	2 73466D 06	2 06374D 06
1	10	10	547 64	7 17103D 03	-7 74802D 02	1	2 73466D 06	2 06331D 06
1	11	11	547 70	7 17110D 03	-3 04762D 02	1	2 73466D 06	2 06279D 06

RESTART TIME(SEC)	H2O TEMP (DEG F) (5)	NODAL PRES (PSIA) NODE# (5)	HT TRAN COEF B/S-FT**2-DF (1 5)	SURF HT FLUX B/S-F**2 (1 5)	MASS FLOW LBM/SEC NOD# (5)	PIN SUR TEMP DEG F (1 5)	NOD SPEC VOL FT**3/LBM (5)
0 0	547 76	2295 5	1 9919	0 11848E-19	48 250	547 76	0 64445E-01
0 500000D-01	547 76	2295 5	1 9919	-0 20522	9 4921	547 66	0 64445E-01
0 100000D 00	547 58	2254 6	0 54244	0 89903E-02	9 2635	547 60	0 64445E-01
0 150000	547 72	2285 0	0 53196	-0 49184E-01	6 6288	547 62	0 64445E-01
0 200000	547 69	2280 1	0 40702	-0 28920E-01	2 4463	547 62	0 64445E-01
0 250000	547 69	2279 1	0 18334	-0 13546E-01	0 18332	547 62	0 64445E-01
0 300000	547 70	2281 3	0 23069E-01	-0 21595E-02	-1 8002	547 61	0 64445E-01
0 350000	547 69	2280 1	0 14346	-0 12379E-01	-4 0409	547 61	0 64445E-01
0 400000	547 70	2280 7	0 27393	-0 22140E-01	-6 0703	547 62	0 64445E-01
0 450000	547 70	2280 9	0 37934	-0 27450E-01	-7 7246	547 63	0 64445E-01
0 500000	547 70	2280 9	0 46000	-0 29694E-01	-9 2846	547 63	0 64445E-01
0 550000	547 70	2281 5	0 53293	-0 31878E-01	-10 665	547 64	0 64445E-01
0 600000	547 71	2281 7	0 59543	-0 32503E-01	-11 467	547 65	0 64445E-01
0 650000	547 71	2282 4	0 63101	-0 33134E-01	-11 939	547 66	0 64445E-01
0 700000	547 71	2283 3	0 65167	-0 33416E-01	-12 441	547 66	0 64445E-01
0 750000	547 72	2283 8	0 67352	-0 33318E-01	-12 876	547 67	0 64445E-01
0 800000	547 72	2284 6	0 69230	-0 33788E-01	-13 743	547 67	0 64445E-01
0 850000	547 73	2285 4	0 72932	-0 34924E-01	-14 372	547 68	0 64445E-01
0 900000	547 73	2285 0	0 75593	-0 33080E-01	-13 923	547 68	0 64445E-01
0 950000	547 73	2285 1	0 73694	-0 31396E-01	-15 284	547 69	0 64445E-01
1 00000	547 73	2284 3	0 79407	-0 30334E-01	-18 225	547 69	0 64445E-01
1 05000	547 72	2282 7	0 91409	-0 28505E-01	-19 220	547 69	0 64445E-01
1 10000	547 73	2283 5	0 95380	-0 31071E-01	-18 429	547 70	0 64445E-01
1 15000	547 74	2284 6	0 92228	-0 31870E-01	-16 829	547 70	0 64445E-01
1 20000	547 74	2285 3	0 85764	-0 30395E-01	-16 980	547 70	0 64445E-01
1 25000	547 74	2284 5	0 86379	-0 26865E-01	-19 589	547 71	0 64445E-01
1 30000	547 73	2282 9	0 96843	-0 21828E-01	-21 444	547 70	0 64445E-01
1 35000	547 72	2283 1	1 0411	-0 17120E-01	-22 179	547 70	0 64445E-01
1 40000	547 70	2283 6	1 0696	-0 15997E-02	-22 624	547 69	0 64445E-01
1 45000	547 65	2283 8	1 0867	0 17358E-01	-22 216	547 67	0 64445E-01
1 50000	547 59	2284 8	1 0710	0 50523E-01	-19 344	547 63	0 64445E-01
1 55000	547 50	2287 1	0 95872	0 82052E-01	-17 609	547 59	0 64445E-01
1 60000	547 39	2287 1	0 88929	0 12393	-19 569	547 53	0 64445E-01
1 65000	547 22	2285 3	0 96765	0 20131	-20 343	547 43	0 64445E-01
1 70000	547 03	2286 3	0 99813	0 28111	-20 536	547 31	0 64445E-01
1 75000	546 79	2286 9	1 0057	0 37136	-22 643	547 16	0 64445E-01
1 80000	546 48	2286 6	1 0874	0 50863	-24 588	546 95	0 64445E-01
1 85000	546 11	2283 2	1 1616	0 67141	-24 495	546 69	0 64445E-01
1 90000	545 76	2284 3	1 1580	0 77695	-23 704	546 43	0 64445E-01
1 95000	545 43	2285 2	1 1280	0 84748	-24 172	546 18	0 64445E-01

RESTART

TIME(SEC)	H2O TEMP (DEG F) (5)	NODAL PRES (PSIA) NODE# (5)	HT TRAN COEF B/S-FT**2-DF (1 5)	SURF HT FLUX B/S-F**2 (1 5)	MASS FLOW LBM/SEC NOD# (5)	PIN SUR TEMP DEG F (1 5)	NOD SPEC VOL FT**3/LBM (5)
2 00000	545 13	2284 9	1 1458	0 92498	-25 387	545 93	0 64445E-01
2 05000	544 85	2284 6	1 1917	0 99122	-27 037	545 69	0 64445E-01
2 10000	544 63	2284 3	1 2532	1 0333	-29 142	545 45	0 64445E-01
2 15000	544 47	2283 9	1 3307	1 0456	-30 935	545 25	0 64445E-01
2 20000	544 37	2283 9	1 3958	1 0098	-31 575	545 10	0 64445E-01
2 25000	544 35	2284 7	1 4188	0 92700	-31 161	545 01	0 64445E-01
2 30000	544 38	2285 9	1 4040	0 82582	-30 630	544 97	0 64445E-01
2 35000	544 43	2286 6	1 3848	0 73517	-30 490	544 96	0 64445E-01
2 40000	544 49	2287 1	1 3797	0 66122	-30 456	544 97	0 64445E-01
2 45000	544 55	2287 6	1 3785	0 59698	-29 693	544 99	0 64445E-01
2 50000	544 62	2288 9	1 3508	0 53339	-28 165	545 01	0 64445E-01
2 55000	544 68	2290 5	1 2949	0 47176	-26 774	545 05	0 64445E-01
2 60000	544 75	2292 2	1 2434	0 41584	-27 743	545 09	0 64445E-01
2 65000	544 82	2290 0	1 2793	0 38226	-27 591	545 12	0 64445E-01
2 70000	544 91	2289 5	1 2737	0 32499	-26 455	545 16	0 64445E-01
2 75000	545 02	2290 6	1 2316	0 25706	-27 637	545 23	0 64445E-01
2 80000	545 14	2288 0	1 2754	0 20014	-27 867	545 30	0 64445E-01
2 85000	545 30	2288 3	1 2839	0 11861	-27 468	545 39	0 64445E-01
2 90000	545 49	2288 3	1 2692	0 32319E-01	-27 421	545 51	0 64445E-01
2 95000	545 69	2287 6	1 2674	-0 57503E-01	-28 152	545 65	0 64445E-01
3 00000	545 94	2287 0	1 2944	-0 16151	-29 106	545 81	0 64445E-01
3 05000	546 22	2286 5	1 3294	-0 28170	-27 261	546 01	0 64445E-01
3 10000	546 53	2288 4	1 2615	-0 38806	-25 746	546 22	0 64445E-01
3 15000	546 83	2289 3	1 2051	-0 47911	-25 787	546 44	0 64445E-01
3 20000	547 14	2285 4	1 2067	-0 57510	-24 728	546 66	0 64445E-01
3 25000	547 49	2286 8	1 1668	-0 67827	-25 030	546 91	0 64445E-01
3 30000	547 87	2286 2	1 1782	-0 80341	-25 854	547 19	0 64445E-01
3 35000	548 29	2286 2	1 2091	-0 95395	-24 110	547 51	0 64445E-01
3 40000	548 73	2288 8	1 1434	-1 0497	-20 745	547 81	0 64445E-01
3 45000	549 13	2291 3	1 0139	-1 0732	-17 852	548 08	0 64445E-01
3 50000	549 49	2292 7	0 89912	-1 0741	-16 352	548 30	0 64445E-01
3 55000	549 83	2293 2	0 83815	-1 1005	-15 395	548 51	0 64445E-01
3 60000	550 15	2293 9	0 79865	-1 1349	-14 040	548 73	0 64445E-01
3 65000	550 46	2295 1	0 74194	-1 1374	-12 042	548 93	0 64445E-01
3 70000	550 73	2296 6	0 65619	-1 0881	-9 8416	549 07	0 64445E-01
3 75000	550 95	2298 0	0 55836	-1 0023	-8 8658	549 16	0 64445E-01
3 80000	551 15	2296 3	0 51361	-0 97342	-8 7862	549 25	0 64445E-01
3 85000	551 34	2295 0	0 50992	-1 0005	-8 7486	549 38	0 64445E-01
3 90000	551 54	2295 3	0 50817	-1 0266	-8 2530	549 52	0 64445E-01
3 95000	551 73	2294 6	0 48501	-1 0107	-6 0508	549 64	0 64445E-01

RESTART

TIME(SEC)	H2O TEMP (DEG F) (5)	NODAL PRES (PSIA) NODE# (5)	HT TRAN COEF B/S-FT**2-DF (1 5)	SURF HT FLUX B/S-F**2 (1 5)	MASS FLOW LBM/SEC NOD# (5)	PIN SUR TEMP DEG F (1 5)	NOD SPEC VOL FT**3/LBM (5)
4 00000	551 87	2295 6	0 37837	-0 84204	-3 3011	549 65	0 64445E-01
4 05000	551 95	2295 9	0 23302	-0 57005	-1 7633	549 50	0 64445E-01
4 10000	551 99	2295 1	0 14110	-0 37629	-1 3925	549 32	0 64445E-01
4 15000	552 02	2294 9	0 11682	-0 32916	-1 3889	549 20	0 64445E-01
4 20000	552 05	2295 0	0 11658	-0 33876	-0 14253	549 15	0 64445E-01
4 25000	552 06	2296 0	0 18861E-01	-0 59283E-01	2 5202	548 92	0 64445E-01
4 30000	552 00	2297 1	0 18776	-0 53877	5 4773	549 13	0 64445E-01
4 35000	551 88	2297 7	0 34939	-0 84162	7 2495	549 47	0 64445E-01
4 40000	551 70	2297 5	0 43723	-0 87410	7 2381	549 71	0 64445E-01
4 45000	551 53	2296 6	0 43668	-0 75556	6 1142	549 80	0 64445E-01
4 50000	551 39	2295 9	0 38153	-0 60670	4 6690	549 80	0 64445E-01
4 55000	551 28	2295 5	0 30749	-0 47385	3 7888	549 74	0 64445E-01
4 60000	551 19	2295 7	0 26018	-0 39519	3 4647	549 67	0 64445E-01
4 65000	551 11	2295 9	0 24221	-0 35989	3 0691	549 63	0 64445E-01
4 70000	551 04	2295 8	0 21982	-0 32055	2 6341	549 58	0 64445E-01
4 75000	550 98	2295 8	0 19452	-0 28056	1 9673	549 54	0 64445E-01
4 80000	550 94	2295 7	0 15401	-0 22422	1 3426	549 48	0 64445E-01
4 85000	550 91	2295 7	0 11345	-0 16947	2 0081	549 41	0 64445E-01
4 90000	550 87	2296 5	0 15656	-0 22674	3 2522	549 42	0 64445E-01
4 95000	550 80	2297 0	0 23025	-0 30402	5 0656	549 48	0 64445E-01
5 00000	550 69	2297 6	0 32822	-0 36965	7 3051	549 56	0 64445E-01

Appendix E

PARTIAL LISTING OF PINSIM-MOD1 OUTPUT FOR SAMPLE PROBLEM 2 (ANALYSIS OF AN ELECTRIC PIN TRANSIENT)

INPUT DATA

LISTING OF INPUT DATA FOR CASE 1

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 1    -PINSIM SAMPLE PROBLEM 2
 2
 3    *            IDJOB      RSTRTM      ENDT       NTIM
 4    100000         1          0 0       20 00       2
      *
 6    *           TIME   DTMIN    DTMAX   ITIMFL
 7    100001     0 0     5 0D-2   5 0D-2     3
 8    100002     20 0    1 0D-2   1 0D-2     3
 9    *
10            INUCFL     IIDLFL    IACTFL
11    100100    -2          0         0
12
13                PNUC       PIDL      PACT
14    100200      0 0      0 0       0 0
15    *
16            NPINS      NCHAN
17    100300      1          0
18    *
19    *
20
21            MAXTHT  EPSTHT  MAXSST  EPSSST  MAXBKQ  EPSBKQ
22    100400   499    1 0D-2   499    1 0D-2   499    1 0D-2
23    *
24           NDBUG IGDBUG ICDBUG IHDBUG IKDBUG IPDBUG IADBUG IIDBUG ISDBUG
25    200000  11     0      0      0      0      0      0      0      3
26    *
27            MINOUT  NMIN  DELMIN
28    210000    8      1      0 0
29    *
30    210001  PNUC PHIN PHIW(1 5) TNOD(1 5 1)  TNOD(1 5 3)  TNOD(1 5 5)
31    +        TNOD(1 5 8)  TNOD(1 5 10)  SRFN
32    *
33    *       MAJOUT  NMAJ  DELMAJ
34     20000    6        0    1 0
35    *
36    *            NPLT       DELPLT
37    230000        0          0 0
38    *
39    *            NRST       DELRST
40    240000        0          0 0
41    *
42    *
43    * *****  NUCLEAR PIN *******
44    *   (WESTINGHOUSE RESSAR-1  TBL 3-5)
45    *       ISYS  NLVL NMAT  IPOW  POWFAC IGAPFL  INFLAG  HTCFAC  IDFORM
46    410000   1     11   2     1     1 0     -3      0      1 0      0
47    *
48                GSMS       PO
49    410012     0 030         1500 0
50
51    * (INITIAL PRESSURE OF 1 00 0 PSI IS CONSIDERED TYPICAL OF
52        THE FIRST 10 SECONDS OF THE TRANSIENT )
53    *
54    *     (GAS FRACTIONS)
55    410013     1 0    0 0  0 0  0 0  0 0  0 0  0 0
 6    *
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 57     *
 58     *          RUFC      RUFF       TFNFLX     FNFLUX
 59     410014   8 5D-07   4 5D-07       0 0        0 0
 60     *
 61     *      LEVEL 1
 62     *
 63              NREG   POVPA    ZLNGTH   NOD AT
 64     410100    2     -0 4205    1 5      0
 65     *
 66     *        RINREG     ROTREG    POVP   NNOD    MATREG
 67     410101    0 0     0 0152458  1 0    10        1
 68     410102  0 015583 0 0175830  0 0     3        2
 69     *
 70     *      LEVEL 2
 71     *
 72     *        NREG   POVPA    ZLNGTH   NODWAT
 73     410200    2     -0 5946    1 125    0
 74     *
 75              RINREG     ROTREG    POVP   NNOD    MATREG
 76     410201    0 0     0 01524 8  1 0    10        1
 77     410202  0 015583  0 0175830  0 0     3        2
 78     *
 79     *      LEVEL 3
 80     *
 81              NREG   POVPA    ZLNGTH   NODWAT
 82     410300    2     -1 060     0 875    0
 83     *
 84     *        RINREG     ROTREG    POVP   NNOD    MATREG
 85     410301    0 0     0 0152458  1 0    10        1
 86     410302  0 015583  0 0175830  0 0     3        2
 87     *
 88     *      LEVEL 4
 89     *
 90     *        NREG   POVPA    ZLNGTH   NODWAT
 91     410400    2     -1 279     1 00     0
 92     *
 93     *        RINREG     ROTREG    POVP   NNOD    MATREG
 94     410401    0 0     0 0152458  1 0    10        1
 95     410402  0 01 583  0 0175830  0 0     3        2
 96     *
 97     *      LEVEL 5
 98     *
 99              NREG   POVPA    ZLNGTH   NODWAT
100     410500   2      -1 663     1 00     0
101     *
102              RINREG     ROTREG    POVP   NNOD    MATREG
103     410501   0 0     0 0152458   1 0    10      1
104     410502 0 015583  0 0175830   0 0     3      2
105
106     *      LEVEL 6
107     *
108              NREG   POVPA    ZLNGTH   NODWAT
109     410600   2      -1 663     1 00     0
110     *
111     *        RINREG     ROTREG    POVP   NNOD    MATREG
112     410601    0 0     0 0152458   1 0    10      1
113     410602  0 015583  0 0175830   0 0     3      2
114     *
```

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*      LEVEL 7

          NRE    POVPA    ZLNGTH   NODWAT
410700    2      -1 663     1 00      0
*
*         RINREG     ROTREG    POVP   NNOD    MATREG
410701      0 0     0 0152458    1 0    10    1
410702  0 015583  0 0175830    0 0     3    2
*
*       LEVEL 8

          NREG   POVPA    ZLNGTH   NODWAT
410800    2      -1 279     1 00      0

*         RINRE      ROTREG    POVP   NNOD    MATREG
410801      0 0      0 01 2458    1 0     10    1
410802  0 01 583    0 017 830    0 0      3    2
*
       LEVEL 9
*
          NREG   POVPA    ZLNGTH   NODWAT
410900    2       -1 060     0 875     0

*         RINREG     ROTREG    POVP   NNOD    MATREG
410901      0 0      0 0152458    1 0     10    1
410902  0 015583    0 017 830    0 0      3    2

*      LEVEL 10

          IREG   POVPA    ZLNGTH   NODWAT
411000            -0 5946    1 125     0

          RINRE      ROTREG    POVP   NNOD    MATREG
 11001      0 0      0 0152458    1 0     10    1
411002  0 01 583    0 017 830    0 0      3    2

*      LEV L 11
*
          NREG   POVPA    ZL IGTH   NOD AT
411100            -0 4205    1 500    0

*         RINREG     ROTREG    POVP   NNOD    MATREG
411101      0 0      0 0152458    1 0     10    1
411102  0 01  83    0 0175830    0 0      3    2

*
419100      1     0     0

419 00      2     0     0

*        U02 FUEL PELLET DATA
          RO         FRPO2        FRADEN        CONINP
 19001  0 0        0 0          0 94          0 07
*
 ** * * **      NUCLEAR SYSTEM DATA    * *     ***

          INPOWX      NNPINS      NNCHAN
500010      0         1000        1
```

```
173     *
174     *          INBCK     INPBCK   INLBCK   DTNUC
175     500100      1          1        5        0 05
176
177     *
178     *
179     *        INQFL     INHFL    INTFL
180     500110     601          0     601
181     *
182
183     *
184              BPNJCL   BPNUCH   IPNUCF
185     500200     0 0      0 0       0
186
187     *        BPHINL   BPHINH   IPHINF
188     500210     0 0      0 0       0
189
190     *        BTMPNL   BTMPNH   ITMPNF
191     500220     0 0      0 0       0
192     *
193     *
194     ******* * ** ************************************** **  ***
195     ************** ***********************************************
196     ******** *********** END OF B4NTST DAT *********************
197     ******* ************************************************ * **
198       ********** ***** ** ****** *** * ******** ******** *******
199     *
200     210001     PNUC PHIW(1 4) TNOD(1 4 1) TNOD(1 4 3) TNOD(1 4 5)
201                  TNOD(1 4 8) TNOD(1 4 11) TNOD(1 4 12) SRFN
        CARD ABOVE IS REPLACEMENT CARD
202     *
203     410400       2    -1 296659    1 00      0
        CARD ABOVE IS REPLACEMENT CARD
204     *
205     *          INBCK     INPBCK    INLBCK    DTNUC
206     500100       1         1          4       0 05
        CARD ABOVE IS REPLACEMENT CARD
207     *
208     *            INQFL     INHFL     INTFL
209     500110       -601        0        601
        CARD ABOVE IS REPLACEMENT CARD
210     *
211     *
212
213     *      SURFACE FLUX VALUE  FOR ORINC TEST 105
214     *      FOR T/C=317105  TE=317AE
215            DSN=Y LJO F223 ORINC BD#105 COPY#3 VOL=SER=A27043
 16     *      ON 11-JAN-79
217     *
218     500121     0 0                0 400522E 06
219      +       0 500000E-01       0 399488E+06
 20              0 100000E+00       0 395936E 06
 21      +       0 150000E+00       0 372617E 06
222      +       0 200000E+00       0 371533E 06
223      +       0 250000E+00       0 351615E 06
224      +       0 300000E+00       0 359730E 06
225              0 350000E+00       0 370212E 06
226              0 400000E+00       0 377210E 06
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227		0 450000E+00	0 366701E+06
228		0 500000E+00	0 370106E+06
229		0 550000E+00	0 368789E 06
230		0 600000E+00	0 387209E 06
231		0 650000E+00	0 380608E 06
2 2		0 700000E+00	0 384929E 06
233		0 750000E+00	0 377770E 06
234		0 800000E 00	0 279479E 06
235		0 850000E 00	0 189465E 06
236		0 900000E+00	0 777638E 05
237		0 950000E 00	0 883940E+05
238		0 100000E+01	0 789228E 05
239		0 105000E+01	0 885857E 05
240		0 110000E 01	0 851931E 0
41		0 115000E 01	0 102295E 06
242		0 120000E 01	0 117504 06
243		0 12 000E+01	0 112243E+06
244		0 130000E+01	0 125956E 06
245		0 135000E+01	0 132 80E 06
246		0 140000E+01	0 140664E 06
247		0 14 000E 01	0 137441E 06
248		0 150000E+01	0 143760E 06
249		0 155000E 01	0 154837E 06
250		0 160000E+01	0 145476E 06
251	+	0 16 000E+01	0 148123E+06
252		0 170000E+01	0 141338E+06
253		0 175000E+01	0 155446E 06
254		0 180000E+01	0 145093E 06
255		0 18 000E+01	0 152781E 06
256		0 190000E+01	0 138967E 06
257		0 19 000E+01	0 1411 0E 06
258		0 200000E+01	0 145647E 06
259		0 20 000E+01	0 143474E+06
260		0 210000E 01	0 143317E+06
61		0 215000E+01	0 118808E 06
262		0 220000E+01	0 121128E 06
263		0 2 000E+01	0 100559E 06
264		0 230000E 01	0 868008E 05
65		0 235000E 01	0 707194E 05
266		0 240000E 01	0 5977 9E 05
267		0 245000E 01	0 472385E 05
268		0 2 0000E+01	0 226308E 05
269		0 2 5000E+01	0 140336E 05
270		0 260000E+01	0 262715E 04
71		0 26 000E 01	0 122474E+05
272		0 270000E 01	0 126378E 0
273		0 7 000E 01	0 1021 1E 0
274		0 280000E 01	0 898174 04
75		0 28 000E 01	-0 168267E 05
276		0 90000E+01	-0 196177E 05
277		0 29 000E 01	-0 328078E 04
278		0 300000E 01	-0 162651 05
279		0 305000E+01	-0 9004 7E 04
280		0 310000E 01	-0 409181E+04
281		0 31 000E 01	-0 472163E 04
282		0 _ 0000E 01	-0 309597E 04
283		0 3 000E 01	-0 142990E 05
284		0 3 0000E+01	0 271 86E 04

285		0 335000E 01	-0 184 93E 04
286		0 340000E+01	-0 541699E+04
287		0 345000E 01	0 59002 E 04
288	+	0 350000E+01	0 150742E 04
289		0 3 000E 01	0 136771E 05
290		0 3 0000E 01	0 34326 E 04
291		0 36 000E 01	0 428974E 04
292		0 370000E+01	0 339796E 04
293		0 375000E 01	0 223231E 05
294		0 38 000E 01	0 242988E 05
295		0 38 000E 01	0 102177E 05
296		0 390000E 01	0 664045 04
297		0 395000E 01	0 812008E 03
298		0 400000E 01	0 770489E+04
299		0 40 000E+01	0 119066E 05
300		0 410000E+01	0 327417E 04
301		0 415000E+01	0 174815E+05
302		0 420000E 01	0 766341E+04
303		425000E+01	0 222836E 05
304		0 430000E+01	0 127779E+0
305		0 43 000E+01	0 212074E 05
306		0 440000E+01	0 199319E 05
307	+	0 445000E+01	0 268924E 05
308		0 450000E 01	0 259956E 05
309		0 45 000E+01	0 398541E+05
310		0 460000E 01	0 510818E 05
311		0 46 000E+01	0 434243E 05
312		0 470000E+01	0 40109 E+05
313		0 47 000E 01	0 229859E 05
314		0 480000E 01	0 338111E 05
315		0 48 000E 01	0 187709E 05
316		0 490000E 01	0 27774 05
317		0 49 000E+01	0 123286E 05
318		0 500000E 01	0 276412E 05
319		0 505000E 01	0 10764 E 05
320		0 510000E 01	0 196712E+05
321		0 515000E+01	0 240039E 05
322		0 5 0000E 01	0 223 77E 05
323		0 52 000E+01	0 915945E 04
324		0 530000E+01	0 498 30E 04
325	+	0 535000E 01	0 250495E+05
326		0 540000E 01	0 335002E+05
327		0 54 000E+01	0 247061E 5
328		0 5 0000E 01	0 621468E 03
329		0 555000E+01	-0 703086E 03
330		0 60000E+01	0 123408 05
331		0 56 000E 01	0 216667E 05
332		0 570000E 01	0 121509E+05
333		0 57 000E+01	0 712851E+04
334		0 580000E 01	0 822035E+04
335		0 585000E+01	0 769071E+04
336		0 590000E 01	0 203220 05
337	+	0 595000E 01	0 4101 3E+04
338		0 600000E 01	0 200891E 05
339		0 605000E 01	0 378 41E 04
340		0 610000E+01	0 330944E+05
341		0 615000E+01	0 209422E 05
342		0 620000E+01	0 300799E 05

343	+	0 62 000E 01	0 294376E+05
344	+	0 630000E 01	0 370566E 05
345		0 635000E+01	0 432384E+05
346		0 640000E 01	0 366468E+05
347		0 645000E 01	0 591440E+05
348		0 6 0000E+01	0 628355E+05
349		0 655000E 01	0 703034E 05
350		0 660000E 01	0 713278E 05
351		0 66 000E 01	0 803492E 05
352		0 670000E 01	0 107258E 06
353	+	0 675000E 01	0 111163E+06
354	+	0 680000E+01	0 113814E+06
355		0 685000E 01	0 982307E+05
356	+	0 690000E 01	0 111921E 06
357	+	0 695000E+01	0 105712E+06
358		0 700000E+01	0 115353E+06
359		0 705000E+01	0 962623E+05
360		0 710000E+01	0 108157E+06
361		0 715000E+01	0 113640E+06
362		0 720000E 01	0 119379E 06
363	+	0 725000E 01	0 106501E+06
364	+	0 730000E+01	0 110805E 06
365		0 735000E+01	0 1175 9E 06
366		0 740000E+01	0 116950E 06
367		0 74 000E 01	0 111228E 06
368	+	0 750000E+01	0 106938E+06
369	+	0 75 000E+01	0 121369E 06
370	+	0 760000E+01	0 106019E 06
371		0 76 000E 01	0 103073E+06
372		0 770000E+01	0 977084E+05
373		0 775000E 01	0 111341E+06
374	+	0 780000E+01	0 120896E+06
375		0 785000E+01	0 118615E+06
376		0 790000E+01	0 106948E 06
77		0 795000E+01	0 974727E 05
78		0 800000E 01	0 100172E 06
379		0 805000E+01	0 111885E+06
380		0 810000E 01	0 102379E 06
81		0 815000E 01	0 912542E 05
382		0 820000E+01	0 935887E 05
83		0 825000E+01	0 104952E 06
384	+	0 830000E+01	0 102097E 06
85		0 835000E+01	0 955726E+05
386		0 840000E+01	0 843188E 05
387		0 845000E+01	0 927499E 05
388		0 850000E+01	0 905799E 05
389		0 855000E 01	0 896795E+05
390	+	0 860000E+01	0 829851E 05
391		0 86 000E+01	0 774666E 05
392		0 870000E+01	0 778354E 05
393	+	0 875000E 01	0 638496E 0
394		0 880000E+01	0 89101E 05
395		0 88 000E+01	0 453990E 05
396		0 890000E+01	0 589543E 05
397	+	0 895000E+01	0 538662E 05
398		0 900000E+01	0 590444E 05
399		0 905000E+01	0 435104E 05
400		0 910000E+01	0 517969E 05

401		0 915000E 01	0 619906E 05
402		0 920000E+01	0 650686E 05
403		0 925000E 01	0 508546E 05
404		0 930000E 01	0 602973E 05
405		0 935000E+01	0 519487E+05
406		0 940000E+01	0 725308E 05
407		0 94 000E+01	0 552814E 05
408		0 950000E+01	0 844844E 05
409		0 955000E 01	0 596749E+05
410	+	0 960000E 01	0 653051E+05
411		0 965000E 01	0 651322E+05
412		0 970000E 01	0 781026E 05
413		0 97 000E+01	0 754473E 0
414		0 980000E 01	0 636068E 05
415		0 985000E 01	0 732669E+05
416		0 990000E 01	0 651652E+05
417	+	0 995000E+01	0 798063E+05
418		0 100000E+02	0 574148E+05
419		0 100500E+02	0 685955E 05
420		0 101000E 02	0 599897E 05
421		0 101 00E 02	0 740892E+05
422		0 10 000E+02	0 965843E 05
423	+	0 102500 02	0 851939E+05
424		0 103000E 02	0 114617E 06
425		0 103500E 02	0 846191E 05
426		0 104000E 02	0 118664E 06
427		0 104500E+02	0 882081E 05
428		0 10 000E 02	0 102664 06
429		0 105500E+02	0 884154E 05
430		0 10 000E+02	0 857613E+05
431	+	0 106500E 02	0 927855E 05
432		0 107000E 02	0 718924E+05
433		0 107500E 02	0 954332E+05
434		0 108000E 02	0 641130E 05
435		0 108 00E 02	0 763667E+05
436		0 109000E+02	0 668821E+05
437	+	0 109500E 02	0 802211E+05
438		0 110000E+02	0 827611E 05
439		0 110500E 02	0 813574E+05
440		0 111000E 02	0 751237E 05
441		0 111500E 02	0 640312E+0
442		0 112000E+02	0 531685E 05
443		0 112500E 02	0 547110E+05
444		0 113000E+02	0 658777E+05
445		0 113500E 02	0 680996E 05
446		0 114000E+02	0 729223E 05
447		0 114500E 02	0 519297E 05
448		0 115000E+02	0 499502E+05
449	+	0 11 500E+02	0 372685E+05
450		0 116000E 02	0 515741E 05
451		0 116 00E 02	0 402099E 05
452		0 117000E 02	0 474745E+05
453		0 117500E+02	0 381793E+05
454		0 118000E 02	0 259404E+05
455		0 118500E 02	0 274991E 05
456		0 11 000E 02	0 191585E 05
457		0 119500E+02	0 189670E 05
458		0 120000E 02	0 170676E+05

4 9		0 120500E+02	0 887738E 04
460	+	0 121000E+02	0 879732E 04
461		0 121500E+02	-0 610303E 04
462	+	0 12_000E+02	0 804196E 04
463	+	0 122500E+02	0 162159E+05
464		0 123000E+02	0 124185E 05
465	+	0 123500E 02	0 553044E 04
466		0 124000E+02	0 654727E 04
467		0 124500E+02	0 122603E 05
468		0 125000E+02	0 233912E 05
469		0 125500E+02	0 139283E 0
470		0 126000E+02	0 223546E 05
471	+	0 12 500E 02	-0 510291E+04
472	+	0 127000E+02	0 716553E 04
473		0 127500E+02	-0 206583E+04
474		0 128000E+02	0 116808E 05
475		0 128500E+02	0 144335E+05
476		0 129000E+02	0 641221E 04
477	+	0 129500E+02	0 210013E 05
478		0 130000E+02	0 114000E+05
479		0 130500E+02	0 199993E 05
480		0 131000E+02	0 554404E 04
481		0 131500E 02	0 152731E 05
482		0 13 000E+02	0 369518E 03
483		0 132500E+02	0 303942E 04
484		0 133000E+02	0 874310E 04
485	+	0 133500E+02	0 667766E 04
486	+	0 134000E 02	0 644991E 04
487		0 134500E+02	-0 689609E 04
488		0 135000E+02	0 216920E 0
489		0 13 500E 02	0 153007E 05
490		0 136000E+02	0 944288E 04
491		0 136500E 02	0 484610E 04
492		0 137000E+02	0 128005E 05
493		0 13 00E+02	0 110687E 05
494		0 138000E+02	0 474496E 04
495		0 138500E+02	0 607835E 04
496		0 139000E+02	0 123101E 05
497		0 139500E+02	0 171684E 05
498		0 140000E+02	0 940120E 04
499		0 140500E 02	0 112830E 0
500		0 141000E+02	-0 180853E 04
01		0 141500E+02	0 889254E 03
502		0 142000E+02	0 659789E 04
503		0 14 500E+02	0 461349E 04
504		0 143000E+02	0 109196E+05
505		143500E+02	-0 102837E 05
506		0 144000E 02	0 701065E+04
507		0 144 00E 02	0 328865E 04
508		0 145000E 02	0 294348E 05
509	+	0 145 00E+02	0 239079E 05
510	+	0 146000E+02	0 319385E+05
11		0 146500E 02	0 449953E 05
512		0 147000E+02	0 372597E 0
13		0 147500E+02	0 343697E 05
14		0 148000E+02	0 306491E 05
515		0 148500E+02	0 393928E 0
516		0 149000E+02	0 581121E 05

17		0 149 00E 02	0 481833 05
518		0 150000E 02	0 517384E 05
519		0 1 0 00E 02	0 334543E 0
520		0 151000E 0	0 322 63E 05
21		0 151 00E 02	0 463261E 05
22		0 1 000E 02	0 366432E 0
23		0 15 500 02	0 319305E 05
24		0 153000E+02	0 267310E 05
525		0 153 00E 02	0 276151 0
526		0 15 000E 02	0 3999 4E 05
27		0 15 500E 0	0 299733E 05
28	+	0 15 000E 02	0 447155E 0
29		0 15 500E 02	0 287671 0
30		0 15 000E 02	0 192696E 05
31		0 15 00E 02	0 150433E 05
32	+	0 1 7000E 02	0 219405E 05
33		0 1 7500E 02	0 258717E+05
34		0 153000E+02	0 238095E 0
35		0 154 00E 02	0 171085E 05
536		0 159000E+02	-0 133019E 04
37		0 159500E 02	0 208234E 04
38		0 160000E 02	0 277503E+03
39		0 160500E 02	0 185206E 05
540		0 161000E 02	0 130983E 05
41		0 161 00 02	0 2736 E 02
542		0 16 000 02	0 270984E 04
43		0 16 00E 02	-0 4719 0E 04
44		0 163000E 02	0 902517E 04
45		0 16 500E 02	-0 133544E 04
546		0 164000E 02	0 130075E 05
47		0 16 500E 02	-0 3403 9E 04
48		0 16 000E+0	0 127286E 0
549		0 165 00E 02	-0 372432E 04
50		0 166000 02	0 124356E 05
51		0 16 500E 02	-0 398872E 04
552		0 167000E 02	0 121204E 05
53		0 167 00E 02	0 228260E 04
54		0 1 3000E+02	0 170762E 05
555		0 168500E 02	0 106619E 04
556		0 169000E 02	0 444413E 04
57		0 169500E 02	0 416 25E 04
558		0 170000E 02	0 105153E+0
559		0 170 00E+02	0 899904E 04
560		0 171000 02	0 921329E+04
61		0 171500E 0	0 937370E 04
562		0 17 000E+02	0 226584E 05
563		0 17 500E+02	0 694 25 04
64		0 173000E+02	-0 249520E+04
565		0 173500E 02	-0 643553E 04
566		0 174000E+02	0 665034E 03
567		0 17 500E 02	0 11 799E 05
568		0 175000E 02	0 153210 04
69		0 17 00E 02	0 974 03E 04
570		0 17 000E 02	0 818761E 04
71		0 17 500E 02	0 149939E 05
72		177000E+02	-0 581357E 04
73		0 177500E 02	0 541675E 04
74		0 17 000E+02	-0 324852E 04

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 75            0 178500E+02      0 110561E 05
576            0 179000E+02      0 119892E 04
 77            0 179500E+02      0 939003E 04
578            0 180000E+02      0 1324 5E 04
579     +      0 180500E+02     -0 363290E+04
580            0 181000E 02      0 408841E+04
581            0 181500E+02     -0 437534E 04
582            0 182000E+02      0 344246E+04
 83            0 182500E+02      0 158486E+0
 84            0 183000E+02      0 212363E+05
585            0 183500E+02      0 398192E+04
586            0 184000E+02      0 135846E 04
587            0 184500E+02      0 371365E 04
588            0 185000E 02      0 10 809E 05
 89            0 185500E 02      0 702892E+03
590            0 186000E+02      0 238132E+04
591            0 186500E+02     -0 436844E 04
592            0 187000E+02      0 338368E 04
593            0 187500E+02      0 152131E+04
 94     +      0 188000E+02      0 147079E+04
595            0 188500E+02      0 140248E 04
596            0 189000E 02      0 132 72E 04
597            0 189500E+02      0 128860E 04
 98            0 190000E+02      0 121894E 04
 99            0 190500E+02      0 120485E+04
600            0 191000E+02      0 769207E 04
601            0 191500E 02      0 128256E 05
602            0 192000E+02      0 529948E 04
603            0 192500E+02     -0 576587E+04
604            0 193000E+02      0 369771E+04
605     +      0 193500E+02     -0 479936E 04
606     +      0 194000E 02      0 302222E+04
607     +      0 194500E+02      0 112964E+04
608            0 195000E+02      0 141806E 05
609     +      0 195500E+02      0 179940E 05
610            0 196000E+02      0 108435E+05
611            0 196500E 02      0 670438E 04
612            0 197000E+02      0 854 72E 04
613            0 197500E+02      0 206816E+04
614            0 198000E 02      0 231487E 05
615            0 198500E+02      0 121860E 05
616     +      0 199000E+02      0 799600E+04
617            0 199500E+02      0 311006E 04
618            0 200000E+02      0 444656E 04
619
620     *
621     *      SURFAC  TEMPERATURE VALUES FOR ORINC TEST 105
622            FOR T/C-317105  TE=317AE
623     *      DSN-Y LJO F223 ORINC BD#105 COPY#3 VOL=SER=A27043
624     *      ON 11-JAN-79
625     *
626     500141     0 0                0 625844E 03
627            0 500000E-01      0 626250E+03
628            0 100000E+00      0 627079E+03
629            0 150000E+00      0 632039E+03
630     +      0 200000E+00      0 635010E 03
631            0 250000E+00      0 641000E 03
632     +      0 300000E+00      0 643180E 03
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633		0 350000E+00	0 643337E 03
634	+	0 400000E+00	0 642803E 03
635		0 450000E 00	0 645 02E 03
63		0 500000E 00	0 646210 03
637		0 550000E 00	0 647572E 03
6 8		0 600000E 00	0 645164E 03
639		0 650000E+00	0 64574 E 03
640		0 700000E 00	0 645270E 03
641		0 750000E 00	0 646693E+03
642		0 800000E+00	0 666686E 03
64	+	0 850000E+00	0 695226E+03
644		0 900000E 00	0 734799E+03
645		0 9 0000E 00	0 758790E 03
646		0 10 000 +01	0 780094E+03
647		0 105000E 01	0 795853E+03
648		0 110000E 01	0 8109 8E 03
649		11 000E 01	0 8213 7E 03
650		0 120000E 01	0 829 83E+03
651		0 12 000E 01	0 839 5E 03
6 2		0 1 0000E+01	0 846463 03
6 3		13 000E+01	0 853371E 03
654		0 140000E+01	0 859498E 03
655		0 14 000E 01	0 867161 +03
656		0 150000E 01	0 8737 0 03
657		0 1 000E 01	0 878771E 03
658		0 160000E 01	0 886 99E 03
659		0 16 000 01	0 893768E+03
660		0 170000E 01	0 902265E 03
661		0 17 000E+01	0 907586E+03
6 2		0 180000E+01	0 91 803E 03
663		0 185000E 01	0 92 08 E+03
66		0 190000E+01	0 931339E 03
665		0 19 000E 01	0 939206E 03
666		0 200000E 01	0 946110E 03
667		0 20 000E 01	0 953 41E+03
668		0 10000 01	0 961010 03
669		0 215000E+01	0 972789E 03
670		0 220000E+01	0 981924E 03
671		0 22 000E 01	0 993851E 03
672		0 230000E+01	0 100585 04
673		0 2 000 01	0 101850E 04
674		0 240000E+01	0 10 999E 04
675		0 245000E 01	0 1041 0E 04
676		0 250000E+01	0 105500E 04
677		0 255000E 01	0 106664E 04
678		0 260000E+01	0 107786E 04
679		0 26 000E 01	0 108492E+04
680		0 70000E 01	0 109117E+04
681		0 75000E+01	0 109708E+04
682		0 80000E 01	0 110561E+04
683		0 8 000E+01	0 111348E+04
684		0 290000E 01	0 112018E+04
68		0 95000E 01	0 112275E 04
686		0 300000E 01	0 1128 8E 04
687		0 305000E 01	0 113102E 04
688		0 310000E 01	0 113 04E 04
689		0 315000E 01	0 113531E 04
690		0 320000E 01	0 113716E 04

691		0 32 000E+01	0 114100E 04
692		0 330000E+01	0 114182E 04
693		0 335000E 01	0 114290E 04
694	+	0 340000E 01	0 114470E+04
695		0 345000E+01	0 114420E+04
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698		0 360000E+01	0 114514E+04
699		0 365000E+01	0 114585E 04
700		0 370000E+01	0 114663E 04
701	+	0 37 000E+01	0 114389E+04
702		0 380000E+01	0 114210E 04
703	+	0 385000E+01	0 114344E 04
704		0 390000E+01	0 114467E+04
705	+	0 395000E 01	0 114647E+04
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707		0 405000E 01	0 114573E 04
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710	+	0 420000E+01	0 114585E 04
711		0 425000E 01	0 114355E+04
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713		0 435000E 01	0 114236E 04
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715		0 445000E+01	0 113968E+04
716		0 450000E+01	0 113851E+04
717		0 45 000E+01	0 11 502E 04
718		0 460000E+01	0 113065E+04
719	+	0 465000E+01	0 112894E 04
720	+	0 470000E+01	0 112783E+04
721		0 475000E+01	0 112967E 04
722		0 480000E+01	0 112830E 04
723		0 48 000E+01	0 112997E 04
724		0 490000E+01	0 112896E 04
725	+	0 495000E+01	0 113100E+04
726	+	0 500000E 01	0 112918E+04
727	+	0 505000E 01	0 113110E 04
728	+	0 10000E+01	0 113034E 04
729	+	0 51 000E+01	0 112910E 04
730		0 520000E+01	0 112851E+04
731	+	0 525000E+01	0 113028E 04
732	+	0 530000E+01	0 113185E+04
733	+	0 535000E 01	0 112915E+04
734	+	0 540000E+01	0 112609E+04
735		0 545000E+01	0 112 62E 04
736	+	0 550000E+01	0 112925E+04
737	+	0 555000E 01	0 113153E 04
738		0 560000E+01	0 113031E+04
739		0 565000E+01	0 112818E+04
740		0 70000E+01	0 112857E+04
741	+	0 57 000E 01	0 112946E 04
742		0 580000E+01	0 112970E+04
743	+	0 585000E+01	0 112991E+04
744		0 590000E+01	0 112774E+04
745	+	0 59 000E+01	0 112935E+04
746		0 600000E+01	0 112718E+04
747	+	0 605000E 01	0 112863E 04
748		0 610000E+01	0 112429E+04

749		0 615000E 01	0 112381E+04
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751		0 62 000E 01	0 111987E+04
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753		0 635000E 01	0 111407E 04
754		0 640000E+01	0 111293E 04
755	+	0 645000E+01	0 110761E 04
756		0 650000E 01	0 110331E 04
757		0 55000E+01	0 109860E+04
758		0 660000E+01	0 109477E+04
759		0 66 000E+01	0 108988E+04
760		0 670000E+01	0 108116E+04
761	+	0 675000E 01	0 107422E+04
762	+	0 680000E+01	0 106814E 04
763		0 685000E+01	0 106579E 04
764		0 690000E+01	0 106029E+04
765	+	0 695000E+01	0 105686E 04
766		0 700000E+01	0 105160E+04
767		0 705000E+01	0 105058E 04
768		0 710000E 01	0 104628E 04
769	+	0 715000E+01	0 104156E 04
770	+	0 720000E+01	0 103 40E+04
771		0 725000E 01	0 103430E+04
772	+	0 730000E 01	0 103072E+04
773		0 735000E+01	0 102608E+04
774		0 740000E+01	0 102209E+04
775		0 745000E+01	0 101934E 04
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778		0 760000E+01	0 101018E 04
779		0 765000E 01	0 100830E 04
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781		0 77 000E 01	0 100245E+04
782	+	0 780000E+01	0 997004E+03
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787		0 805000E+01	0 983949E+03
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792		0 830000E+01	0 972787E 03
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794		0 840000E+01	0 971113E+03
795		0 845000E+01	0 968491E+03
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797		0 855000E+01	0 964505E 03
798		0 860000E+01	0 963676E 03
799		0 865000E+01	0 963248E+03
800		0 870000E+01	0 962091E 03
801		0 87 000E+01	0 963258E+03
802	+	0 880000E 01	0 964103E+03
803		0 885000E+01	0 966599E 03
804		0 890000E+01	0 965093E+03
805	+	0 895000E+01	0 964911E 03
806		0 900000E+01	0 963362E+03

807		0 90 000E+01	0 964933E+03
808		0 910000E 01	0 963793E 03
809		0 915000E+01	0 960952E+03
810	+	0 920000E+01	0 958279E+03
811		0 925000E+01	0 958761E+03
812		0 930000E+01	0 956607 +03
813		0 935000E 01	0 956449E 03
814	+	0 940000E+01	0 951914E+03
815		0 945000E+01	0 951999E+03
816		0 950000E+01	0 945785E+03
817		0 955000E 01	0 946240E+03
818		0 960000E+01	0 944448E+03
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820		0 970000E 01	0 938719E+03
821		0 975000E+01	0 936129E+03
822	+	0 980000E+01	0 935927E 03
823		0 985000E+01	0 9331 3E 03
824		0 990000E+01	0 932346E 03
825		0 995000E+01	0 928323E 03
826		0 100000E+02	0 929498E+03
827		0 100500E+02	0 927157E+03
828		0 101000E 02	0 926844E 03
829		0 101500E+02	0 923278E+03
830		0 102000E+02	0 916362E+03
831	+	0 102500E+02	0 913634E+03
832		0 103000E 02	0 905260E 03
833		0 103500E 02	0 904980E 03
834		0 104000E+02	0 896878E 03
835	+	0 104500E+02	0 896862E 03
836		0 105000E+02	0 892561E 03
837		0 105500E+02	0 891689E 03
838		0 106000E+02	0 890418E 03
839		0 106500E+02	0 887360E+03
840		0 107000E+02	0 888595E+03
841		0 107500E+02	0 883770E+03
84		0 108000E+02	0 886192E 03
843		0 108500E+02	0 884186E 03
844		0 109000E 02	0 884209E 03
845		0 109500E+02	0 880918E 03
846		0 110000E+02	0 877869E 0
847		0 110500E 02	0 875 86E 03
848		0 111000E+02	0 874367E+03
849		0 111500E 02	0 874897E 03
850		0 112000E+02	0 876499E 03
8 1		0 112500E+02	0 876540E+0
852		0 113000E+02	0 874020E+03
853		0 113500E+02	0 871670E 03
854		0 114000E 02	0 868707E 03
855		0 114500E+02	0 870283E 0
856		0 115000E+02	0 870791E 03
857		0 11 500E 02	0 873067E 03
858		0 116000E 02	0 871259E 03
859		0 116500E+02	0 872163E 03
860		0 117000E+02	0 870899E 03
861		0 117500E+02	0 871641E 03
862		0 118000E 02	0 874026E 03
863		0 118500E+02	0 874879E 03
864		0 119000E+02	0 876913E 03

86		0 119500E 02	0 878064E 03
866		0 120000E 02	0 879133E 03
867	+	0 120500E 02	0 881352E 03
868		0 121000E 02	0 882710E+03
869		0 121500E 02	0 886 24E+03
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871		0 12 500E 02	0 884814E 03
872		0 123000E+02	0 884825E 03
873		0 123500E 02	0 886098 +03
874		0 124000E 0	0 886647E+03
875		0 1 4500E 02	0 885973 03
876		0 125000E+02	0 83510E 03
877		0 1 5500E 02	0 883824E 03
878		0 1 6000E 02	0 862166E 03
879		0 12 500E 02	0 886373E+03
880		0 1 7000E 02	0 886302E 03
881		0 127500E 02	0 888268E 03
882	+	0 1 8000E+02	0 886848E 03
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885		0 129500E 02	0 883967E+03
886		0 130000E 02	0 884344E 03
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888		0 131000E 02	0 884417E 03
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890		0 132000E+02	0 885604E 03
891		0 13 500E 02	0 886295E 03
892		0 133000E 02	0 885718E 03
893		0 133500E 02	0 885837E 03
8 4		0 134000E 02	0 885920E 03
895		0 134500E 02	0 886520E+03
896		0 135000E+02	0 884564E+03
897		0 13 500E 02	0 883638E 03
898		0 136000E 02	0 883944E 03
899		0 136500E+02	0 884828E 03
900		0 137000E 02	0 883742E 03
901	+	0 137500E 02	0 883433E 03
902		0 138000E 02	0 884330E 03
903		0 138500E 02	0 884506E 03
904		0 139000E+02	0 883418E+03
905		0 139500E 02	0 881810E+03
906		0 140000E 02	0 882227E 03
907		0 140 00E 02	0 881898E 03
908		0 141000E+02	0 884135E 03
909		0 141500E 02	0 884859E 03
910		0 14 000E+02	0 884267E 03
911		0 142500E 02	0 88 37 E+03
912		0 143000E 02	0 883191E 03
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914		144000E 02	0 885109E 03
915		0 144500E 02	0 885193E+03
916		0 145000E 02	0 880168E 03
917		0 14 500E 02	0 878229E+03
918		0 146000E+02	0 875098E+03
919		0 146500E 02	0 870360E 03
920		0 147000E 02	0 868547E 03
921		0 147500E 02	0 867326E+03
922		0 148000E 02	0 866760E 03

923	+	0	148500E+02	0 864255E 03
924		0	149000E+02	0 858754E+03
925		0	149500E 02	0 856873E+03
926		0	150000E 02	0 854218E+03
927		0	150500E+02	0 855481E 03
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930		0	152000E+02	0 852541E 03
931		0	152500E+02	0 852722E 03
9 2		0	153000E 02	0 853398E 03
933	+	0	153500E 02	0 853284E+03
934		0	154000E 02	0 850564E 03
935		0	154500E+02	0 8506 3E+03
936		0	155000E+02	0 847330E 03
937		0	15 500E+02	0 848137E 03
938	+	0	156000E+02	0 849883E 03
939	+	0	156500E+02	0 851429E 03
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946		0	160000E 02	0 856732E+03
947	+	0	160500E+02	0 854178E+03
948		0	161000E 02	0 853844E 03
949		0	161500E 02	0 856000E+03
950	+	0	162000E+02	0 856601E 03
951		0	162500E+02	0 858604E 03
952	+	0	163000E+02	0 857170E+03
953		0	163500E+02	0 858498E 03
954		0	164000E+02	0 856462E+03
955	+	0	164500E+02	0 858532E+03
956	+	0	165000E+02	0 856504E+03
957	+	0	16 500E+02	0 858603E 03
958	+	0	166000E+02	0 856590E 03
959		0	166500E+02	0 858697E+03
960		0	167000E 02	0 856693E 03
961	+	0	167500E 02	0 857528E 03
962		0	168000E+02	0 855018E 03
963		0	168500E+02	0 856640E+03
964		0	169000E 02	0 856729E 03
965		0	169500E+02	0 856866E+03
966	+	0	170000E 02	0 855705E+03
967	+	0	170500E 02	0 855297E+03
968	+	0	171000E 02	0 854892E+03
969	+	0	171500E 02	0 854521E+03
970	+	0	172000E+02	0 851623E 03
971	+	0	172500E+02	0 852836E 03
972	+	0	173000E+02	0 855061E 03
973		0	173500E+02	0 857086E 03
974	+	0	174000E+02	0 857030E+03
975	+	0	174500E 02	0 85 098E+03
976		0	175000E+02	0 855903E 03
977	+	0	175500E+02	0 854657E+03
978		0	176000E+02	0 854228E+03
979		0	176500E+02	0 852535E+03
980		0	177000E+02	0 855452E+03

```
 981            0 177500E+02      0 854816E 03
 982            0 178000E 02      0 856250E 03
 983            0 178500E+02      0 854301E 03
 984      +     0 179000E+02      0 855145E+03
 985            0 179500E 02      0 853921E+03
 986            0 180000E+02      0 854771E+03
 987      +     0 180500E+02      0 856118E+03
 988            0 181000E+02      0 855441E 03
 989            0 181500E+02      0 856776E+03
 990      +     0 182000E+02      0 856031E+03
 991            0 182500E+02      0 85 051E+03
 992      +     0 183000E+02      0 852232E 03
 993            0 183500E+02      0 853290E+03
 994            0 184000E 02      0 854099E 03
 995            0 184500E+02      0 855520E 03
 996      +     0 18 000E+02      0 853601E 03
 997            0 18 500E 02      0 854470E 03
 998            0 186000E+02      0 854522E+03
 999      +     0 186500E+02      0 855876E+03
1000            0 187000E+02      0 855173E+03
1001            0 187500E+02      0 855216E+03
1002      +     0 188000E+02      0 855227E 03
1003            0 188500E 02      0 855245E 03
1004            0 189000E+02      0 855264E+03
1005            0 189500E+02      0 855282E 03
1006            0 190000E+02      0 855301E 03
1007            0 190500E+02      0 855317E 03
1008      +     0 191000E+02      0 854063E+03
1009            0 191500E+02      0 852320E+03
1010            0 192000E 02      0 852618E+03
1011            0 192500E+02      0 854744E 03
1012            0 193000E 02      0 854104E+03
1013            0 193500E 02      0 855492E+03
1014            0 194000E+02      0 854773E+03
1015            0 194500E+02      0 854815E+03
1016      +     0 195000E+02      0 852279E+03
1017            0 195500E+02      0 850025E+03
1018      +     0 196000E+02      0 849843E+03
1019            0 196500E 02      0 850247E+03
1020      +     0 197000E+02      0 849963E+03
1021            0 197500E+02      0 850962E+03
1022            0 198000E+02      0 847357E+03
1023      +     0 198500E+02      0 847335E+03
1024            0 199000E+02      0 847794E 03
1025            0 199500E+02      0 848832E 03
1026            0 200000E+02      0 849105E 03
1027      *
1028
```

```
                    ----- DATA DECK DIA NOSTICS -----

          MINIMUM LENGTH OF TABLE ARRAY IN COMMON /SCRTCH/ IS   2042 WORDS

                (LENGTH OF THE ARRAY IS NOW   10000WORDS)

                    PROCESSING THE JOB CONTROL CARD

                     PROCESSING PROBLEM OPTIONS

                       PROCESSING PIN DATA

                    PROCESSING NUCLEAR SYSTEM DATA

  + +   NOT   THE SURFACE HEAT FLUX TABLE (CARD 500121) IS BEING DIVIDED BY 3600
            THIS ACTION WAS PERFORMED BECAUSE INQFL (CARD 500110)  A  LESS THAN -1

+ +      ARNING    CARD SERIES   500121 NO  OF TABL  PAIRS SPECIFIED AT     601
         IS BEING  ESET TO ACTUAL NO  OF PAIRS FOUND IN INPUT     401

+ ++     ARNING    CARD SERIES   500141 NO  OF TABLE PAIRS SPECIFIED AT     601
         IS BEING R SET TO ACTUAL NO  OF PAIRS FOUND IN INPUT -   401

                    INITIALIZING PIN PARAMETERS

                     PROCESSING EDIT OPTIONS


          MINIMUM LENGTH OF DATA ARRAY IS      1604 WORDS

                (LENGTH OF THE ARRAY IS NOW    5000WORDS)

                    END OF INPUT DATA PROCESSING

                      NO FATAL DIAGNOSTICS
```

INITIALIZED INPUT DATA

---- GENERAL PROBLEM DATA -----

	SYSTEM FLAG
NUCLEAR	-2
IDEAL ELECTRIC	0
ACTUAL ELECTRIC	0

PROBLEM END TIME 000000D 01 SEC

TIME TEP CONTROL GROUPS

GROUP NO	BEGINNING TIME(SEC)	MINIMUM TIME STEP SIZE(SEC)	MAXIMUM TIME STEP SIZE(SEC)	STEP SIZE SEL FLAG
1	0 0	5 000000D-02	5 000000D-02	3
2	20 0000	1 000000D-02	1 000000D-02	3

OUTPUT CONTROL

	ELAP ED NO OF TIME STEPS	ELPASED TIME	ROUTED TO DEVICE NO
MAJOR EDIT	0	0 100000D 01	6
MINOR EDIT	1	0 0	8
PLOT RECORD	0	0 0	1
RESTART RECORD	0	0 0	1

PROBL M CONVERGENCE LIMITS

TYPE OF CALCULATION	MAX NO OF ITERATIONS	ALLO ED ERROR IN ENERGY BALANCE
STEADY-STATE CONDUCTION	499	0 100000D-01
TRANSIENT CONDUCTION	499	0 100000D-01
TRANSIENT BACK-CALCULATION CONDUCTION	499	0 100000D-01

NUCLEAR SYSTEM INPUT DATA

----- NUCLEAR SYSTEM DIMENSIONS -----

NO ENTRIES IN POWER TABLE	NUMBER OF FUEL PINS	NUMBER OF COOLANT CHANNELS
0	1000	1

---- ------- ORDERS OF INTERPOLATION ----------

TABLE	ORDER
BACK-CALCULATION HEAT FLUX	2
ACK-CALCULATION TEMPERATURE	2

THE NUCLEAR SYSTEM POWER IS BACK-CALCULATED ON PIN NO 1 AT LEVEL NO 4

ELAPSED TIME BETWEEN SUCCESSIVE BACK-CALCULATIONS 0 5000000-01 SEC

BACK-CALCULATION FILTER PARAMETERS

	LOW-PASS BREAKPOINT	HIGH-PASS BREAKPOINT	FILTER FLAG
HEAT FLUX	0 0	0 0	0
TEMPERATURE	0 0	0 0	0
POWER	0 0	0 0	0

SURFACE HEAT FLUX IS OBTAINED FROM THE FOLLOWING TABLE

----- URFACE HEAT FLUX TABLE -----

TIME (SEC)	HEAT FLUX (BTU/SEC-FT* 2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT* 2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)
0 0	0 111256D 03	0 500000D-01	0 110969D 03	0 100000D 00	0 109982D 03	0 150000D 00	0 103505D 03
0 200000D 00	0 103204D 03	0 250000D 00	0 976708D 02	0 300000D 00	0 999250D 02	0 350000D 00	0 102837D 03
0 400000D 00	0 104781D 03	0 450000D 00	0 101861D 03	0 00000D 00	0 102807D 03	0 550000D 00	0 102441D 03
0 600000D 00	0 107558D 03	0 650000D 00	0 105724D 03	0 700000D 00	0 106925D 03	0 750000D 00	0 104936D 03
0 800000D 00	0 776331D 02	0 850000D 00	0 526292D 02	0 900000D 00	0 216011D 02	0 950000D 00	0 245539D 02
0 100000D 01	0 219230D 02	0 10 000D 01	0 246071D 02	0 110000D 01	0 236648D 02	0 115000D 01	0 284153D 02
0 120000D 01	0 326400D 02	0 125000D 01	0 311786D 02	0 130000D 01	0 349878D 02	0 135000D 01	0 367722D 02
0 140000D 01	0 390733D 02	0 145000D 01	0 381781D 02	0 150000D 01	0 399333D 02	0 15 000D 01	0 430103D 02
0 160000D 01	0 404100D 02	0 165000D 01	0 411453D 02	0 170000D 01	0 392606D 02	0 175000D 01	0 431794D 02
0 180000D 01	0 403036D 02	0 185000D 01	0 424392D 02	0 190000D 01	0 386019D 02	0 19 000D 01	0 392083D 02
0 200000D 01	0 404575D 02	0 205000D 01	0 398539D 02	0 210000D 01	0 398103D 02	0 215000D 01	0 330022D 02
0 220000D 01	0 336467D 02	0 225000D 01	0 279331D 02	0 230000D 01	0 241113D 02	0 235000D 01	0 196443D 02
0 40000D 01	0 166044D 02	0 245000D 01	0 131218D 02	0 250000D 01	0 628633D 01	0 255000D 01	0 389822D 01
0 260000D 01	0 729764D 00	0 265000D 01	0 340206D 01	0 270000D 01	0 351050D 01	0 275000D 01	0 283697D 01
0 280000D 01	- 249493D 01	0 285000D 01	- 467408D 01	0 290000D 01	- 5449[illegible]6D 01	0 295000D 01	- 911328D 00
0 00000D 01	- 451808D 01	0 305000D 01	- 250127D 01	0 310000D 01	- 113661D 01	0 315000D 01	- 131156D 01
0 3 0000D 01	- 859992D 00	0 325000D 1	- 397194D 01	0 330000D 01	- 754406D 00	0 335000D 01	- 511925D 00
0 340000D 01	- 150528D 01	0 345000D 01	0 163896D 01	0 350000D 01	0 418728D 00	0 355000D 01	0 379919D 01
0 360000D 01	0 953514D 00	0 365000D 01	0 119159D 01	0 370000D 01	0 943878D 00	0 375000D 01	0 620086D 01
0 380000D 01	0 674967D 01	0 385000D 01	0 283825D 01	0 390000D 01	0 184457D 01	0 395000D 01	0 225558D 00
0 400000D 01	0 214025D 01	0 405000D 01	0 330739D 01	0 410000D 01	0 909492D 00	0 415000D 01	0 485557D 01
0 420000D 01	0 212873D 01	0 425000D 01	0 618989D 01	0 430000D 01	0 354942D 01	0 435000D 01	0 589094D 01
0 440000D 01	0 3664D 01	0 445000D 01	0 747011D 01	0 450000D 01	0 722100D 01	0 455000D 01	0 110706D 02
0 460000D 01	0 141894D 02	0 465000D 01	0 120623D 02	0 470000D 01	0 111416D 02	0 475000D 01	0 638497D 01
0 480000D 01	0 939197D 01	0 48 000D 01	0 521414D 01	0 490000D 01	0 771506D 01	0 495000D 01	0 342467D 01
0 500000D 01	0 767811D 01	0 505000D 01	0 299569D 01	0 510000D 01	0 546422D 01	0 515000D 01	0 666775D 01
0 520000D 01	0 620214D 01	0 525000D 01	0 254429D 01	0 300000D 01	0 138425D 01	0 535000D 01	0 695819D 01
0 540000D 01	0 9305 1D 01	0 545000D 01	0 686281D 01	0 50000D 01	0 172630D 00	0 555000D 01	- 195302D 00
0 560000D 01	0 342800D 01	0 565000D 01	0 601853D 01	0 570000D 01	0 337525D 01	0 575000D 01	0 198014D 01
0 580000D 01	0 228343D 01	0 585000D 01	0 213631D 01	0 90000D 01	0 564500D 01	0 595000D 01	0 113929D 01
0 600000D 01	0 558031D 01	0 605000D 01	0 105095D 01	0 610000D 01	0 919289D 01	0 615000D 01	0 581728D 01
0 620000D 01	0 8355 3D 01	0 625000D 01	0 817711D 01	0 630000D 01	0 102935D 02	0 635000D 01	0 120107D 02
0 640000D 01	0 101797D 02	0 645000D 01	0 164289D 02	0 650000D 01	0 174543D 02	0 655000D 01	0 195287D 02
0 660000D 01	0 198133D 0	0 665000D 01	0 223192D 02	0 670000D 01	0 297939D 02	0 675000D 01	0 308786D 02
0 680000D 01	0 3161 0D 02	0 685000D 01	0 272863D 02	0 690000D 01	0 310892D 02	0 695000D 01	0 293644D 02
0 700000D 01	0 324[illegible]5D 02	0 705000D 01	0 267451D 02	0 710000D 01	0 300436D 02	0 715000D 01	0 315667D 02
0 720000D 01	0 331608D 02	0 725000D 01	0 295836D 02	0 730000D 01	0 307792D 02	0 735000D 01	0 326497D 02
0 740000D 01	0 324861D 02	0 745000D 01	0 308967D 02	0 750000D 01	0 297050D 02	0 755000D 01	0 337136D 02
0 760000D 01	0 294497D 02	0 765000D 01	0 286314D 02	0 770000D 01	0 271412D 02	0 775000D 01	0 309281D 02
0 780000D 01	0 335822D 02	0 785000D 01	0 329486D 02	0 790000D 01	0 297078D 02	0 795000D 01	0 270758D 02

----- SURFACE HEAT FLUX TABLE -----

TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)
0 800000D 01	0 278236D 02	0 805000D 01	0 310792D 02	0 810000D 01	0 284386D 02	0 815000D 01	0 253484D 02
0 820000D 01	0 2 9969D 02	0 825000D 01	0 291533D 02	0 830000D 01	0 283603D 02	0 835000D 01	0 265479D 02
0 840000D 01	0 234219D 02	0 845000D 01	0 257639D 02	0 850000D 01	0 251611D 02	0 855000D 01	0 249110D 02
0 860000D 01	0 230514D 02	0 865000D 01	0 215185D 02	0 870000D 01	0 216209D 02	0 875000D 01	0 177360D 02
0 880000D 01	0 163 39D 02	0 885000D 01	0 126110D 02	0 890000D 01	0 163706D 02	0 895000D 01	0 149628D 02
0 900000D 01	0 164012D 02	0 905000D 01	0 120862D 02	0 910000D 01	0 143880D 02	0 915000D 01	0 172196D 02
0 920000D 01	0 180746D 02	0 925000D 01	0 141263D 02	0 930000D 01	0 167493D 02	0 935000D 01	0 144302D 02
0 40000D 01	0 201474D 02	0 945000D 01	0 153559D 02	0 950000D 01	0 234679D 02	0 955000D 01	0 165764D 02
0 960000D 01	0 181433D 02	0 9 5000D 01	0 180923D 02	0 970000D 01	0 216952D 02	0 975000D 01	0 209576D 02
0 980000D 01	0 176686D 02	0 985000D 01	0 203519D 02	0 990000D 01	0 181014D 02	0 995000D 01	0 221684D 02
0 100000D 02	0 159486D 02	0 100500D 02	0 190543D 02	0 101000D 02	0 166638D 02	0 101500D 02	0 205803D 02
0 102000D 02	0 68230D 02	0 102500D 02	0 236650D 02	0 103000D 02	0 318381D 02	0 103500D 02	0 235053D 02
0 104000D 02	0 329622D 02	0 104500D 02	0 245023D 02	0 105000D 02	0 285178D 02	0 105500D 02	0 245598D 02
0 106000D 02	0 236226D 02	0 106500D 02	0 257738D 02	0 107000D 02	0 199701D 02	0 107500D 02	0 265092D 02
0 108000D 02	0 178092D 02	0 108500D 02	0 212130D 02	0 109000D 02	0 185784D 02	0 109500D 02	0 222836D 02
0 110000D 02	0 229892D 02	0 110500D 02	0 225993D 02	0 111000D 02	0 208677D 02	0 111500D 02	0 177864D 02
0 112000D 02	0 147690D 02	0 112500D 02	0 151975D 02	0 113000D 02	0 182994D 02	0 113500D 02	0 189166D 02
0 114000D 02	0 202562D 02	0 114 00D 02	0 144249D 02	0 115000D 02	0 138751D 02	0 115500D 02	0 103524D 02
0 116000D 02	0 143261D 02	0 116500D 02	0 111694D 02	0 117000D 02	0 131874D 02	0 117500D 02	0 106054D 02
0 118000D 02	0 720 67D 01	0 118500D 02	0 763864D 01	0 119000D 02	0 532181D 01	0 119500D 02	0 526861D 01
0 120000D 02	0 474100D 01	0 120500D 02	0 246594D 01	0 121000D 02	0 244370D 01	0 121500D 02	- 169529D 01
0 122000D 02	0 23338D 01	0 122500D 02	0 450442D 01	0 123000D 02	0 344958D 01	0 123500D 02	0 153623D 01
0 124000D 02	0 181869D 01	0 124500D 02	0 340564D 01	0 125000D 02	0 649756D 01	0 125500D 02	0 386897D 01
0 126000D 02	0 620961D 01	0 126 00D 02	- 141748D 01	0 127000D 02	0 199043D 01	0 127500D 02	- 573842D 00
0 128000D 02	0 324467D 01	0 128500D 02	0 400931D 01	0 129000D 02	0 178117D 01	0 129500D 02	0 583369D 01
0 130000D 0	0 319167D 01	0 130500D 02	0 555536D 01	0 131000D 02	0 154001D 01	0 131500D 02	0 424253D 01
0 132000D 02	0 102644D 00	0 132500D 02	0 844283D 00	0 133000D 02	0 242864D 01	0 133500D 02	0 185491D 01
0 134000D 02	0 179164D 01	0 134500D 02	- 191558D 01	0 135000D 02	0 602556D 01	0 135500D 02	0 425019D 01
0 136000D 02	0 262302D 01	0 136500D 02	0 134614D 01	0 137000D 02	0 355569D 01	0 137500D 02	0 307464D 01
0 138000D 02	0 131804D 01	0 138 00D 02	0 168843D 01	0 139000D 02	0 341947D 01	0 139500D 02	0 476900D 01
0 140000D 02	0 261144D 01	0 140500D 02	0 313417D 01	0 141000D 02	- 502369D 00	0 141500D 02	0 247015D 00
0 142000D 02	0 18327 D 01	0 142500D 02	0 128153D 01	0 143000D 02	0 303322D 01	0 143500D 02	- 285658D 01
0 144000D 02	0 194740D 01	0 144500D 02	0 913514D 00	0 145000D 02	0 817633D 01	0 145500D 02	0 664108D 01
0 146000D 02	0 887181D 01	0 146500D 02	0 124987D 02	0 147000D 02	0 103499D 02	0 147500D 02	0 954714D 01
0 148000D 02	0 851364D 01	0 148500D 02	0 109424D 02	0 149000D 02	0 161423D 02	0 149500D 02	0 133843D 02
0 150000D 02	0 143718D 02	0 150500D 02	0 929286D 01	0 151000D 02	0 895400D 01	0 151500D 02	0 128684D 02
0 1 2000D 02	0 101787D 02	0 152500D 02	0 886958D 01	0 153000D 02	0 742528D 01	0 153500D 02	0 767086D 01
0 1 4000D 0	0 111090D 02	0 154500D 02	0 832592D 01	0 155000D 02	0 124210D 02	0 155500D 02	0 799086D 01
0 156000D 02	0 535267D 01	0 156500D 02	0 417869D 01	0 157000D 02	0 609458D 01	0 157500D 02	0 718658D 01
0 158000D 02	0 661375D 01	0 158500D 02	0 475236D 01	0 159000D 02	- 369497D 00	0 159500D 02	0 578428D 00

----- SURFACE HEAT FLUX TABLE -----

TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)
0 160000D 02	0 770842D-01	0 160500D 02	0 514461D 01	0 161000D 02	0 363842D 01	0 161500D 02	0 631572D-02
0 162000D 02	0 7 2733D 00	0 162500D 02	- 131097D 01	0 163000D 02	0 250699D 01	0 163500D 02	- 370956D 00
0 164000D 02	0 361319D 01	0 164500D 02	- 945442D 00	0 165000D 02	0 353572D 01	0 165500D 02	- 103470D 01
0 166000D 02	0 345433D 01	0 166500D 02	- 110798D 01	0 167000D 02	0 336678D 01	0 167500D 02	0 634056D 00
0 168000D 02	0 4743 9D 01	0 168500D 02	0 296164D 00	0 169000D 02	0 123448D 01	0 169500D 02	0 115618D 01
0 170000D 02	0 292092D 01	0 170500D 02	0 249973D 01	0 171000D 02	0 255925D 01	0 171500D 02	0 260381D 01
0 172000D 02	0 629400D 01	0 172500D 02	0 192840D 01	0 173000D 02	- 693111D 00	0 173500D 02	- 178765D 01
0 174000D 02	0 184748D 00	0 174500D 02	0 316108D 01	0 175000D 02	0 425583D 00	0 175500D 02	0 270640D 01
0 176000D 02	0 2274 4D 01	0 176500D 02	0 416497D 01	0 177000D 02	- 161488D 01	0 177500D 02	0 150465D 01
0 178000D 02	- 902367D 00	0 178500D 02	0 307114D 01	0 179000D 02	0 333033D 00	0 179500D 02	0 260834D 01
0 180000D 02	0 367931D 00	0 180500D 02	- 100914D 01	0 181000D 02	0 113567D 01	0 181500D 02	- 121537D 01
0 182000D 02	0 9 6239D 00	0 182500D 02	0 440239D 00	0 183000D 02	0 589897D 01	0 183500D 02	0 110609D 01
0 184000D 02	0 377350D 00	0 184500D 02	- 103157D 01	0 185000D 02	0 293914D 01	0 185500D 02	0 195248D 00
0 186000D 02	0 661478D 00	0 186500D 02	- 121346D 01	0 187000D 02	0 939911D 00	0 187500D 02	0 422586D 00
0 188000D 02	0 408353D 00	0 188500D 02	0 389578D 00	0 189000D 02	0 368256D 00	0 189500D 02	0 357944D 00
0 190000D 02	0 338574D 00	0 190500D 02	0 334681D 00	0 191000D 02	0 213669D 01	0 191500D 02	0 356267D 01
0 192000D 02	0 147208D 01	0 192500D 02	- 160163D 01	0 193000D 02	0 102714D 01	0 193500D 02	- 133316D 01
0 194000D 02	0 8 9536D 00	0 194500D 02	0 313789D 00	0 195000D 02	0 393906D 01	0 195500D 02	0 499833D 01
0 196000D 02	0 301208D 01	0 196500D 02	0 186233D 01	0 197000D 02	0 237326D 01	0 197500D 02	0 574489D 00
0 198000D 02	0 643019D 01	0 198500D 02	0 338500D 01	0 199000D 02	0 222111D 01	0 199500D 02	0 863906D 00
0 200000D 02	0 123516D 01						

THE SURFACE HEAT TRANSFER COEFFICIENT OPTION IS IRRELEVANT

THE PIN SURFACE TEMPERATURE IS OBTAINED FROM THE FOLLOWING TABLE

----- TEMPERATURE TABLE -----

TIME (SEC)	TEMPERATURE ( )	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)
0 0	0 6 844D 03	0 00000D-01	0 6262 0D 03	0 100000D 00	0 627079D 03	0 150000D 00	0 632039D 03
0 200000D 00	0 635010D 03	0 250000D 00	0 641000D 03	0 300000D 00	0 643180D 03	0 350000D 00	0 643337D 03
0 400000D 00	0 42603D 03	0 4 0000D 00	0 645202D 03	0 500000D 00	0 646210D 03	0 550000D 00	0 647572D 03
0 600000D 00	0 6451 4D 03	0 650000D 00	0 645743D 03	0 700000D 00	0 645270D 03	0 750000D 00	0 646693D 03
0 800000D 00	0 6 6 36D 03	0 8 0000D 00	0 695226D 03	0 900000D 00	0 734799D 03	0 950000D 00	0 758790D 03
0 100000D 01	0 730094D 03	0 105000D 01	0 795853D 03	0 110000D 01	0 810958D 03	0 115000D 01	0 821327D 03
0 120000D 01	0 829283D 03	0 125000D 01	0 839265D 03	0 130000D 01	0 846463D 03	0 135000D 01	0 853371D 03
0 140000D 01	0 859498D 03	0 145000D 01	0 867161D 0	0 150000D 01	0 873730D 03	0 155000D 01	0 878771D 03
0 160000D 01	0 88 99D 03	0 165000D 01	0 893768D 03	0 170000D 01	0 902265D 03	0 175000D 01	0 907586D 03
0 180000D 01	0 91580 D 03	0 185000D 01	0 92 086D 03	0 190000D 01	0 931339D 03	0 195000D 01	0 939206D 03
0 200000D 01	0 946110D 03	0 205000D 01	0 953641D 03	0 210000D 01	0 961010D 03	0 215000D 01	0 972789D 03
0 20000D 01	0 981924D 03	0 225000D 01	0 93851D 03	0 230000D 01	0 100585D 04	0 235000D 01	0 101830D 04
0 40000D 01	0 102 99D 04	0 245000D 01	0 104150D 04	0 250000D 01	0 105 00D 04	0 255000D 01	0 106664D 04
0 260000D 01	0 107786D 04	0 2 5000D 01	0 108492D 04	0 270000D 01	0 109117D 04	0 275000D 01	0 109708D 04
0 280000D 01	0 110561D 04	0 285000D 01	0 111348D 04	0 290000D 01	0 112018D 04	0 295000D 01	0 112275D 04
0 300000D 01	0 112808D 04	0 305000D 01	0 113102D 04	0 310000D 01	0 113304D 04	0 315000D 01	0 113531D 04
0 320000D 01	0 113716D 04	0 325000D 01	0 114100D 04	0 330000D 01	0 114182D 04	0 335000D 01	0 114290D 04
0 340000D 01	0 1144 0D 04	0 345000D 01	0 114420D 04	0 350000D 01	0 114517D 04	0 355000D 01	0 114382D 04
0 360000D 01	0 114 14D 04	0 365000D 01	0 114585D 04	0 370000D 01	0 114663D 04	0 375000D 01	0 114389D 04
0 80000D 01	0 114210D 04	0 385000D 01	0 114344D 04	0 390000D 01	0 114467D 04	0 395000D 01	0 114647D 04
0 400000D 01	0 114636D 04	0 405000D 01	0 114573D 04	0 410000D 01	0 114695D 04	0 415000D 01	0 114509D 04
0 420000D 01	0 1145 5D 04	0 425000D 01	0 114355D 04	0 430000D 01	0 114390D 04	0 435000D 01	0 114236D 04
0 440000D 01	0 114160D 04	0 445000D 01	0 113968D 04	0 450000D 01	0 1138 1D 04	0 455000D 01	0 113502D 04
0 460000D 01	0 113065D 04	0 465000D 01	0 112694D 04	0 470000D 01	0 112783D 04	0 475000D 01	0 112967D 04
0 480000D 01	0 112830D 04	0 48 000D 01	0 112997D 04	0 490000D 01	0 112896D 04	0 495000D 01	0 113100D 04
0 500000D 01	0 112 18D 04	0 505000D 01	0 113110D 04	0 10000D 01	0 113034D 04	0 515000D 01	0 112910D 04
0 520000D 01	0 1128 1D 04	0 5 5000D 01	0 113028D 04	0 530000D 01	0 113185D 04	0 535000D 01	0 112915D 04
0 540000D 01	0 112 09D 04	0 54 000D 01	0 112562D 04	0 550000D 01	0 112925D 04	0 555000D 01	0 113133D 04
0 560000D 01	0 113031D 04	0 565000D 01	0 112818D 04	0 70000D 01	0 112857D 04	0 575000D 01	0 112946D 04
0 580000D 01	0 11 970D 04	0 58 000D 01	0 112991D 04	0 90000D 01	0 112774D 04	0 595000D 01	0 112935D 04
0 600000D 01	0 11 718D 04	0 605000D 01	0 112883D 04	0 610000D 01	0 112429D 04	0 615000D 01	0 112381D 04
0 620000D 01	0 112143D 04	0 25000D 01	0 111987D 04	0 630000D 01	0 111717D 04	0 635000D 01	0 111407D 04
0 640000D 01	0 111293D 04	0 645000D 01	0 110761D 04	0 650000D 01	0 1103 1D 04	0 65 000D 01	0 109860D 04
0 660000D 01	0 109477D 04	0 6 5000D 01	0 108988D 04	0 670000D 01	0 108116D 04	0 675000D 01	0 107422D 04
0 680000D 01	0 106814D 04	0 685000D 01	0 106579D 04	0 690000D 01	0 106029D 04	0 695000D 01	0 105686D 04
0 00000D 01	0 105160D 04	0 705000D 01	0 105058D 04	0 710000D 01	0 1046 8D 04	0 715000D 01	0 104156D 04
0 720000D 01	0 1036 0D 04	0 725000D 01	0 103430D 04	0 730000D 01	0 103072D 04	0 735000D 01	0 102608D 04
0 740000D 01	0 102239D 04	0 745000D 01	0 101934D 04	0 750000D 01	0 101706D 04	0 755000D 01	0 101174D 04
0 760000D 01	0 1010180 04	0 765000D 01	0 100830D 04	0 770000D 01	0 100694D 04	0 775000D 01	0 100245D 04
0 780000D 01	0 997034D 03	0 785000D 01	0 992943D 03	0 790000D 01	0 9912 0D 03	0 795000D 01	0 990573D 03

-- -- TEMPERATURE TABLE -----

TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)
0 8[illegible]0000D 01	0 988428D 03	0 8[illegible]0 000D 01	0 983949D 03	0 810000D 01	0 981593D 03	0 815000D 01	0 981596D 03
0 820000D 01	0 979769D 03	0 825000D 01	0 975 62D 0	0 830000D 01	0 972787D 03	0 835000D 01	0 971145D 03
0 840000D 01	0 971113D 03	0 845000D 01	0 968491D 03	0 850000D 01	0 966500D 03	0 855000D 01	0 964535D 03
0 860000D 01	0 963676D 03	0 8 5000D 01	0 963248D 03	0 870000D 01	0 962091D 03	0 875000D 01	0 963258D 03
0 880000D 01	0 964103D 03	0 885000D 01	0 966599D 03	0 890000D 01	0 965093D 03	0 895000D 01	0 964911D 03
0 900000D 01	0 963362D 03	0 905000D 01	0 964933D 03	0 910000D 01	0 963793D 03	0 915000D 01	0 960952D 03
0 920000D 01	0 958279D 03	0 925000D 01	0 958761D 03	0 930000D 01	0 956607D 03	0 935000D 01	0 956449D 03
0 940000D 01	0 951[illegible]14D 03	0 945000D 01	0 951999D 03	0 950000D 01	0 945785D 03	0 955000D 01	0 946240D 03
0 960000D 01	0 944448D 03	0 965000D 01	0 942804D 03	0 970000D 01	0 938719D 03	0 975000D 01	0 936129D 03
0 980000D 01	0 935927D 03	0 985000D 01	0 933123D 03	0 990000D 01	0 932346D 03	0 995000D 01	0 928323D 03
0 100000D 02	0 929498D 03	0 100500D 02	0 927157D 03	0 101000D 02	0 926844D 03	0 101500D 02	0 923278D 03
0 102000D 02	0 91636 D 03	0 102500D 02	0 913634D 03	0 103000D 02	0 905 60D 03	0 103500D 02	0 904980D 03
0 104000D 02	0 896878D 03	0 104500D 02	0 896862D 03	0 10 000D 02	0 892561D 03	0 105500D 02	0 891689D 03
0 10 000D 02	0 890418D 03	0 106500D 02	0 887360D 03	0 107000D 02	0 888595D 03	0 107500D 02	0 883770D 03
0 108000D 02	0 886192D 03	0 108500D 02	0 884188D 03	0 109000D 02	0 884209D 03	0 109500D 02	0 880918D 03
0 110000D 02	0 877869D 03	0 110500D 0	0 875486D 03	0 111000D 02	0 874367D 03	0 111500D 02	0 874897D 03
0 112000D 02	0 876499D 03	0 112 00D 02	0 876540D 03	0 113000D 02	0 874020D 03	0 113500D 02	0 871670D 03
0 114000D 02	0 8 8737D 03	0 114500D 02	0 870283D 03	0 115000D 02	0 870791D 03	0 115500D 02	0 873067D 03
0 116000D 02	0 871259D 03	0 116500D 02	0 872183D 03	0 117000D 02	0 870899D 03	0 117500D 02	0 871641D 03
0 118000D 02	0 874026D 03	0 118500D 02	0 87 879D 03	0 119000D 02	0 876913D 03	0 119500D 02	0 878064D 03
0 120000D 02	0 879133D 03	0 120500D 02	0 881352D 03	0 121000D 02	0 882710D 03	0 121500D 02	0 886524D 03
0 122000D 02	0 886209D 03	0 122500D 02	0 884814D 03	0 123000D 02	0 884825D 03	0 123500D 02	0 886098D 03
0 124000D 02	0 8866 7D 03	0 124500D 02	0 885973D 03	0 125000D 02	0 883510D 03	0 125500D 02	0 883824D 03
0 126000D 02	0 882166D 03	0 126500D 02	0 886373D 03	0 127000D 02	0 886302D 03	0 127500D 02	0 888268D 03
0 128000D 02	0 886848D 03	0 128500D 02	0 885653D 03	0 129000D 02	0 886426D 03	0 129500D 02	0 883967D 03
0 130000D 02	0 884344D 03	0 130500D 02	0 882699D 03	0 131000D 02	0 884417D 03	0 131500D 02	0 883357D 03
0 132000D 02	0 885604D 03	0 132500D 02	0 886295D 03	0 133000D 02	0 885718D 03	0 133500D 02	0 885837D 03
0 134000D 02	0 885920D 03	0 134500D 02	0 888520D 03	0 135000D 02	0 884564D 03	0 135500D 02	0 883638D 03
0 136000D 02	0 883944D 03	0 136500D 02	0 884828D 03	0 137000D 02	0 883742D 03	0 137500D 02	0 883433D 03
0 138000D 02	0 884330D 03	0 138500D 02	0 884506D 03	0 139000D 02	0 883418D 03	0 139500D 02	0 881810D 03
0 140000D 02	0 882227D 03	0 140500D 02	0 881898D 03	0 141000D 02	0 884135D 03	0 141500D 02	0 884839D 03
0 142000D 02	0 884267D 03	0 142500D 02	0 884375D 03	0 143000D 02	0 883191D 03	0 143500D 02	0 886553D 03
0 144000D 02	0 88 109D 03	0 144500D 02	0 885193D 03	0 145000D 02	0 880168D 03	0 145500D 02	0 878229D 03
0 146000D 02	0 875098D 03	0 146500D 02	0 870360D 03	0 147000D 02	0 868 47D 03	0 147500D 02	0 867326D 03
0 148000D 02	0 866760D 03	0 148500D 02	0 8642 5D 03	0 149000D 02	0 858754D 03	0 149500D 02	0 856873D 03
0 150000D 02	0 8 4218D 03	0 150500D 02	0 855481D 03	0 151000D 02	0 8 5743D 03	0 151500D 02	0 852785D 03
0 152000D 02	0 852541D 03	0 152500D 02	0 852722D 03	0 153000D 02	0 853398D 03	0 153500D 02	0 853284D 03
0 154000D 02	0 850564D 03	0 154500D 02	0 850623D 03	0 155000D 02	0 847330D 03	0 155500D 02	0 848137D 03
0 156000D 02	0 849883D 03	0 156500D 02	0 851429D 03	0 157000D 02	0 850887D 03	0 157500D 02	0 849746D 03
0 158000D 02	0 849289D 03	0 158500D 02	0 850053D 03	0 159000D 02	0 853843D 03	0 159500D 02	0 855319D 03

----- TEMPERATURE TABLE -----

TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)
0 160000D 02	0 8 6732D 03	0 160500D 0	0 8 4178D 03	0 161000D 02	0 853844D 03	0 161500D 02	0 856000D 03
0 162000D 0	0 85666 1D 03	0 162 00D 02	0 858604D 03	0 163000D 02	0 8 7170D 03	0 163500D 02	0 858498D 03
0 164000D 02	0 85 2D 03	0 1 4500D 02	0 8 8 32D 03	0 16 000D 02	0 856504D 03	0 165500D 02	0 858603D 03
0 166000D 02	0 8545 D 03	0 166500L 02	0 858697D 03	0 167000D 02	0 856693D 03	0 167500D 02	0 857528D 03
0 168000I 02	0 8 5018D 03	0 168500L 02	0 8 6640D 03	0 169000D 02	0 85 729D 03	0 169500D 02	0 856866D 03
0 170000D 02	0 35 7D D 0	0 170500D 02	0 855297D 03	0 171000) 02	0 85489 D 03	0 171500D 02	0 854521D 03
0 172000D 02	0 3 1 3D 03	0 172500D 0	0 852836D 03	0 173000D 02	0 855061D 03	0 173500D 02	0 857086D 03
0 174000D 02	0 857000D 03	0 174500D 02	0 8 0 8D 03	175000D 02	0 855903D 03	0 175500D 02	0 854657D 03
0 176000D 0	0 8 42 8D 03	0 176500L 02	0 85 535D 03	0 177000D 02	0 855452D 03	0 177500D 02	0 854816D 03
0 178000 02	0 3562 0D 03	0 178500D 0	0 85 01D 03	0 179000D 02	0 855145D 03	0 179500D 02	0 853921D 03
0 180000D 2	0 854771D 03	0 180500D 02	0 8 6118D 03	0 181000D 02	0 855441D 03	0 181500D 02	0 856776D 03
0 182000D 02	0 8 60 1D 03	0 18 500D 02	0 8560 1D 03	0 183000D 02	0 852232D 03	0 183500D 02	0 853290D 03
0 184000D 02	0 8540 9D 03	184500D 02	0 85 5 0D 03	0 18 000D 02	0 853601D 03	0 185500D 02	0 854470D 03
0 186000D 02	0 54 2D 03	0 1 6500D 02	0 855876D 03	0 187000D 2	0 855170D 03	0 187500D 02	0 855216D 03
0 188000D 02	0 855 27D 03	0 188500L 02	0 8552 5D 03	0 189000D 02	0 855264D 03	0 189500D 02	0 855282D 03
0 190000D 0	0 85 01D 03	0 190500D 02	0 855317D 03	0 191000D 02	0 854063D 03	0 191500D 02	0 852320D 03
0 192000D 02	0 852618D 03	0 192500D 02	0 8 744D 03	0 193000D 02	0 8 4104D 03	0 193500D 02	0 855492D 03
0 194000D 02	0 8 47 3D 03	0 194500D 0	0 854815D 03	0 19 000D 02	0 852279D 03	0 195500D 02	0 850025D 03
0 19 000D 02	0 8498 3D 03	0 196500D 02	0 850247D 03	0 197000D 02	0 849963D 03	0 197500D 02	0 850962D 03
0 19 000D 02	0 8473 7D 03	0 198500D 02	0 84733 D 03	0 199000D 0	0 847794D 03	0 199500D 02	0 848832D 03
0 200000D 2	0 8 9105D 03						

FOLLOWING ARE DESCRIPTIONS OF THE NUCLEAR SYSTEM PIN( )

----- PIN DATA -----
(PIN NO I)

PO ER SYSTEM	POWER FLAG	PIN TO AVG POW PEAK FAC	TOTAL PIN LENGTH FT	NUMBER OF AXIAL LEVELS	NUMBER OF MATERIALS
I	I	0 1000D 01	12 00	11	2

GAP CALCULATIO FLAG	INTERNAL DATA FLAG	HEAT TRANSFER AREA SCALING FACTOR	PIN DEFORMATION FLAG
-3	0	0 100000D 01	0

FLUX DEPRESSION FACTORS

WERE NOT USED

----- GAP DATA ROSS-STOUTE MODEL -----

WEIGHTED AVERAGE GAS MOLECULAR WEIGHT	MASS OF GAS (GM-MOLES)	GAP GAS PRESSURE
0 400260D 01	0 300000D-01	0 150000D 04

GAS COMPOSITION FRACTION

HELIUM	ARGON	KRYPTON	XENON	HYDROGEN	NITROGEN	WATER VAPOR
1 00000	0 0	0 0	0 0	0 0	0 0	0 0

MEAN ROUGHNESS OF CLADDING(CM)	MEAN ROUGHNESS OF FUEL(CM)	F NEUTRON FLUX TIME SPAN(SEC)	AVG F NEUTRON FLUX(M**-2 SEC**-1)
0 850000D-06	0 450000D-06	0 0	0 0

----- LEVEL DATA -----
(PIN NO 1)

LEVEL NO	SURFACE HEAT TRANSFER AREA (FT**2)	AXIAL LENGTH (FT)	AXIAL PIN POWER FRACTION	ASSOCIATED ATER NODE	NO OF RADIAL REGIONS	NO OF RADIAL NODES
1	0 165716D 00	1 00	0 05 6	0	2	13
2	0 124287D 00	1 125	0 0557	0	2	13
3	0 966676D-01	0 87	0 0773	0	2	13
4	0 110477D 00	1 000	0 1081	0	2	13
5	0 110477D 00	1 000	0 1386	0	2	13
6	0 110477D 00	1 000	0 1386	0	2	13
7	0 110477D 00	1 000	0 1386	0	2	13
8	0 110477D 00	1 000	0 1066	0	2	13
9	0 966676D-01	0 875	0 0773	0	2	13
10	0 124287D 00	1 12	0 0557	0	2	13
11	0 165716D 00	1 500	0 052	0	2	13

----- REGION DATA -----
(PIN NO 1)

LEVEL NO	REGION NO	REGION INNER RADIUS FT	REGION OUTER RADIU FT	RADIAL POWER PEAK FACTOR	NO OF NODES	MATERIAL I D NO
1	1	0 0	0 1525D-01	0 1000D 01	10	1
1	2	0 1558D-01	0 1758D-01	0 0	3	2
2	1	0 0	0 1525D-01	0 1000D 01	10	1
	2	0 1558D 01	0 1758D-01	0 0	3	2
3	1	0 0	0 1525D-01	0 1000D 01	10	1
3	2	0 1558D-01	0 1758D-01	0 0	3	2
4	1	0 0	0 1 25D-01	0 1000D 01	10	1
4	2	0 1558D-01	0 1758D-01	0 0	3	2
5	1	0 0	0 1 25D-01	0 1000D 01	10	1
5	2	0 1558D-01	0 1758D-01	0 0	3	2
6	1	0 0	0 1 25D-01	0 1000D 01	10	1
6	2	0 1558D-01	0 1758D-01	0	3	2
7	1	0 0	0 1525D-01	0 1000D 01	10	1
7	2	0 1558D-01	0 1758D-01	0	3	2
8	1	0 0	0 152 D-01	0 1000D 01	10	1
8	2	0 1558D-01	0 1758D-01	0 0		2
9	1	0 0	0 1525D-01	0 1000D 01	10	1
9	2	0 1558D-01	0 1758D-01	0 0	3	2
10	1	0 0	0 1525D-01	0 1000D 01	10	1
10	2	0 1558D-01	0 1758D-01	0 0	3	2
11	1	0 0	0 1525D-01	0 1000D 01	10	1
11	2	0 1558D-01	0 1758D-01	0 0	3	2

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
1	1	0 0	0 340906D-02	0 482115D-02	0 109532D-03	0 100000D 00	1
1	2	0 482115D-02	0 590467D-02	0 681813D-02	0 109532D-03	0 100000D 00	1
1	3	0 681813D-02	0 762290D-02	0 835047D-02	0 109532D-03	0 100000D 00	1
1	4	0 835047D-02	0 901954D-02	0 964229D-02	0 109532D-03	0 100000D 00	1
1	5	0 964229D-02	0 102272D-01	0 107804D-01	0 109532D-03	0 100000D 00	1
1	6	0 107804D-01	0 113066D-01	0 118093D-01	0 109532D-03	0 100000D 00	1
1	7	0 118093D-01	0 122916D-01	0 127556D-01	0 109532D-03	0 100000D 00	1
1	8	0 127556D-01	0 132033D-01	0 136363D-01	0 109532D-03	0 100000D 00	1
1	9	0 136363D-01	0 140559D-01	0 144634D-01	0 109532D-03	0 100000D 00	1
1	10	0 144634D-01	0 148598D-01	0 152458D-01	0 109532D-03	0 100000D 00	1
1	11	0 155830D-01	0 159338D-01	0 162770D-01	0 104194D-03	0 0	2
1	12	0 162770D-01	0 166131D-01	0 169426D-01	0 104194D-03	0 0	2
1	13	0 169426D-01	0 172658D-01	0 175830D-01	0 104194D-03	0 0	2
2	1	0 0	0 34090 D-02	0 482115D-02	0 821491D-04	0 100000D 00	1
2	2	0 482115D-02	0 590467D-02	0 681813D-02	0 821491D-04	0 100000D 00	1
2	3	0 681813D-02	0 762290D-02	0 835047D-02	0 821491D-04	0 100000D 00	1
2	4	0 63 047D-02	0 901954D-02	0 964229D-02	0 821491D-04	0 100000D 00	1
2	5	0 964229D-02	0 102272D-01	0 107804D-01	0 821491D-04	0 100000D 00	1
2	6	0 107804D-01	0 113066D-01	0 118093D-01	0 821491D-04	0 100000D 00	1
2	7	0 118093D-01	0 122916D-01	0 127556D-01	0 821491D-04	0 100000D 00	1
2	8	0 127556D-01	0 132033D-01	0 136363D-01	0 821491D-04	0 100000D 00	1
2	9	0 136363D-01	0 140559D-01	0 144634D-01	0 821491D-04	0 100000D 00	1
2	10	0 144634D-01	0 148598D-01	0 152458D-01	0 821491D-04	0 100000D 00	1
2	11	0 155830D-01	0 159338D-01	0 162770D-01	0 781455D-04	0 0	2
2	12	0 162770D-01	0 166131D-01	0 169426D-01	0 781455D-04	0 0	2
2	13	0 169426D-01	0 172658D-01	0 175830D-01	0 781455D-04	0 0	2
3	1	0 0	0 340906D-02	0 482115D-02	0 638937D-04	0 100000D 00	1
3	2	0 482115D-02	0 590467D-02	0 681813D-02	0 638937D-04	0 100000D 00	1
3	3	0 681813D-02	0 762290D-02	0 835047D-02	0 638937D-04	0 100000D 00	1
3	4	0 835047D-02	0 901954D-02	0 964229D-02	0 638937D-04	0 100000D 00	1
3	5	0 964229D-02	0 102272D-01	0 107804D-01	0 638937D-04	0 100000D 00	1
3	6	0 107804D-01	0 113066D-01	0 118093D-01	0 638937D-04	0 100000D 00	1
3	7	0 118093D-01	0 122916D-01	0 127556D-01	0 638937D-04	0 100000D 00	1
3	8	0 127556D-01	0 132033D-01	0 136363D-01	0 638937D-04	0 100000D 00	1
3	9	0 136363D-01	0 140559D-01	0 144634D-01	0 638937D-04	0 100000D 00	1
3	10	0 144634D-01	0 148598D-01	0 152458D-01	0 638937D-04	0 100000D 00	1
3	11	0 155830D-01	0 159338D-01	0 162770D-01	0 607799D-04	0 0	2
3	12	0 162770D-01	0 166131D-01	0 169426D-01	0 607799D-04	0 0	2
3	13	0 169426D-01	0 17 658D-01	0 175830D-01	0 607799D-04	0 0	2
4	1	0 0	0 340906D-02	0 482115D-02	0 730214D-04	0 100000D 00	1
4	2	0 482115D-02	0 590467D-02	0 681813D-02	0 730214D-04	0 100000D 00	1
4	3	0 681813D-02	0 762290D-02	0 835047D-02	0 730214D-04	0 100000D 00	1
4	4	0 835047D-02	0 901954D-02	0 964229D-02	0 730214D-04	0 100000D 00	1
4	5	0 964229D-02	0 102272D-01	0 107804D-01	0 730214D-04	0 100000D 00	1
4	6	0 107804D-01	0 113066D-01	0 118093D-01	0 730214D-04	0 100000D 00	1
4	7	0 118093D-01	0 122916D-01	0 127556D-01	0 730214D-04	0 100000D 00	1

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NOD OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
4	8	0 127556D-01	0 132033D-01	0 136363D-01	0 730214D-04	0 100000D 00	1
4	9	0 136363D-01	0 140559D-01	0 144634D-01	0 730214D-04	0 100000D 00	1
4	10	0 144634D-01	0 148598D-01	0 152458D-01	0 730214D-04	0 100000D 00	1
4	11	0 155830D-01	0 159338D-01	0 162770D-01	0 694627D-04	0 0	2
4	12	0 162770D-01	0 166131D-01	0 169426D-01	0 694627D-04	0 0	2
4	13	0 169426D-01	0 172658D-01	0 175830D-01	0 694627D-04	0 0	2
5	1	0 0	0 340906D-02	0 482115D-02	0 730214D-04	0 100000D 00	1
5	2	0 482115D-02	0 590467D-02	0 681813D-02	0 730214D-04	0 100000D 00	1
5	3	0 681813D-02	0 762290D-02	0 835047D-02	0 730214D-04	0 100000D 00	1
5	4	0 835047D-02	0 901954D-02	0 964229D-02	0 730214D-04	0 100000D 00	1
5	5	0 964229D-02	0 102272D-01	0 107804D-01	0 730214D-04	0 100000D 00	1
5	6	0 107804D-01	0 113066D-01	0 118093D-01	0 730214D-04	0 100000D 00	1
5	7	0 118093D-01	0 122916D-01	0 127556D-01	0 730214D-04	0 100000D 00	1
5	8	0 127556D-01	0 132033D-01	0 136363D-01	0 730214D-04	0 100000D 00	1
5	9	0 136363D-01	0 140559D-01	0 144634D-01	0 730214D-04	0 100000D 00	1
5	10	0 144634D-01	0 148598D-01	0 152458D-01	0 730214D-04	0 100000D 00	1
5	11	0 155830D-01	0 159338D-01	0 162770D-01	0 694627D-04	0 0	2
5	12	0 162770D-01	0 166131D-01	0 169426D-01	0 694627D-04	0 0	2
5	13	0 169426D-01	0 172658D-01	0 175830D-01	0 694627D-04	0 0	2
6	1	0 0	0 340906D-02	0 482115D-02	0 730214D-04	0 100000D 00	1
6	2	0 482115D-02	0 590467D-02	0 681813D-02	0 730214D-04	0 100000D 00	1
6	3	0 681813D-02	0 762290D-02	0 835047D-02	0 730214D-04	0 100000D 00	1
6	4	0 835047D-02	0 901954D-02	0 964229D-02	0 730214D-04	0 100000D 00	1
6	5	0 964229D-02	0 102272D-01	0 107804D-01	0 730214D-04	0 100000D 00	1
6	6	0 107804D-01	0 113066D-01	0 118093D-01	0 730214D-04	0 100000D 00	1
6	7	0 118093D-01	0 122916D-01	0 127556D-01	0 730214D-04	0 100000D 00	1
6	8	0 127556D-01	0 132033D-01	0 1363 3D-01	0 730214D-04	0 100000D 00	1
6	9	0 136363D-01	0 140559D-01	0 144634D-01	0 730214D-04	0 100000D 00	1
6	10	0 144634D-01	0 148598D-01	0 152458D-01	0 730214D-04	0 100000D 00	1
6	11	0 155830D-01	0 159338D-01	0 162770D-01	0 694627D-04	0 0	2
6	12	0 16 770D-01	0 166131D-01	0 169426D-01	0 694627D-04	0 0	2
6	13	0 169426D-01	0 172658D-01	0 175830D-01	0 694627D-04	0 0	2
7	1	0 0	0 340906D-02	0 482115D-02	0 730214D-04	0 100000D 00	1
7	2	0 482115D-02	0 590467D-02	0 681813D-02	0 730214D-04	0 100000D 00	1
7	3	0 681813D-02	0 762290D-02	0 835047D-02	0 730214D-04	0 100000D 00	1
7	4	0 835047D-02	0 901954D-02	0 964229D-02	0 730214D-04	0 100000D 00	1
7	5	0 964229D-02	0 102272D-01	0 107804D-01	0 730214D-04	0 100000D 00	1
7	6	0 107804D-01	0 113066D-01	0 118093D-01	0 730214D-04	0 100000D 00	1
7	7	0 118093D-01	0 122916D-01	0 127556D-01	0 730214D-04	0 100000D 00	1
7	8	0 127556D-01	0 132033D-01	0 136363D-01	0 730214D-04	0 100000D 00	1
7	9	0 136363D-01	0 140559D-01	0 144634D-01	0 730214D-04	0 100000D 00	1
7	10	0 144634D-01	0 148598D-01	0 152458D-01	0 730214D-04	0 100000D 00	1
7	11	0 1 5830D-01	0 159338D-01	0 162770D-01	0 694627D-04	0 0	2
7	12	0 162770D-01	0 166131D-01	0 169426D-01	0 694627D-04	0 0	2
7	13	0 169426D-01	0 172658D-01	0 175830D-01	0 694627D-04	0 0	2

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
8	1	0 0	0 340906D-02	0 482115D-02	0 730214D-04	0 100000D 00	1
8	2	0 482115D-02	0 590467D-02	0 681813D-02	0 730214D-04	0 100000D 00	1
8	3	0 681813D-02	0 762 90D-02	0 835047D-02	0 730214D-04	0 100000D 00	1
8	4	0 835047D-02	0 901954D-02	0 964229D-02	0 730214D-04	0 100000D 00	1
8	5	0 964229D-02	0 102272D-01	0 1078 D-01	0 730214D-04	0 100000D 00	1
8	6	0 107804D-01	0 113066D-01	0 118093D-01	0 730214D-04	0 100000D 00	1
8	7	0 118093D-01	0 122916D-01	0 1275 6D-01	0 730214D-04	0 100000D 00	1
8	8	0 127556D-01	0 132033D-01	0 136363D-01	0 730214D-04	0 100000D 00	1
8	9	0 136363D-01	0 140559D-01	0 144634D-01	0 730214D-04	0 100000D 00	1
8	10	0 144634D-01	0 148598D-01	0 152458D-01	0 730214D-04	0 100000D 00	1
8	11	0 155830D-01	0 159338D-01	0 162770D-01	0 694627D-04	0 0	2
8	12	0 162770D-01	0 166131D-01	0 16942 D-01	0 694627D-04	0 0	2
8	13	0 169426D-01	0 172658D-01	0 175830D-01	0 694627D-04	0 0	2
9	1	0 0	0 340906D-02	0 48211 D-02	0 638937D-04	0 100000D 00	1
9	2	0 482115D-02	0 590467D-02	0 81813D-02	0 638937D-04	0 100000D 00	1
9	3	0 681813D-02	0 762 90D-02	0 835047D-02	0 638937D-04	0 100000D 00	1
	4	0 835047D-0	0 901954D-02	0 964229D-02	0 638937D-04	0 100000D 00	1
9		0 964229D-02	0 102272D-01	0 107804D-01	0 638937D-04	0 100000D 00	1
9		0 107804D 01	0 113066D-01	0 118093D-01	0 638937D-04	0 100000D 00	1
9	7	0 118093D 01	0 122916D-01	0 1275 6D-01	0 638937D-04	0 100000D 00	1
9	8	0 127556D-01	0 1 033D-01	0 1363 3D-01	0 638937D-04	0 100000D 00	1
9	9	0 136363D-01	0 140559D-01	0 14463 D-01	0 638937D-04	0 100000D 00	1
9	10	0 144634D-01	0 148 98D-01	0 152458D-01	0 638937D-04	0 100000D 00	1
9	11	0 155830D-01	0 159 38D-01	0 162770D-01	0 607799D-04	0 0	2
9	12	0 162770D-01	0 166131D-01	0 169426D-01	0 607799D-04	0 0	2
9	13	0 169426D-01	0 172658D-01	0 175830 -01	0 607799D-04	0 0	2
10	1	0 0	0 3 090 D-02	0 48211 D-02	0 821491D-04	0 100000D 00	1
10	2	0 48211 D-02	0 590467D-02	0 681813D-02	0 821491D-04	0 100000D 00	1
10	3	0 681813D-02	0 762 90D-02	0 835047D-02	0 821491D-04	0 100000D 00	1
10	4	0 835047D-02	0 90195 D-02	0 964229D-02	0 821491D-04	0 100000D 00	1
10		0 964229D-02	0 102272D 01	0 107804D-01	0 821491D-04	0 100000D 00	1
10	6	0 107804D-01	0 113066D-01	0 118093D-01	0 821491D-04	0 100000D 00	1
10	7	0 1180 3D-01	0 12291 D-01	0 127556D-01	0 821491D-04	0 100000D 00	1
10	8	0 12755 D-01	0 13203 D-01	0 136363D-01	0 821491D-04	0 100000D 00	1
10		0 1363 3D-01	0 140559D-01	0 144634D-01	0 821491D-04	0 100000D 00	1
10	10	0 144634D-01	0 148 98D-01	0 152458D-01	0 821491D-04	0 100000D 00	1
10	11	0 15 830D-01	0 159 38D-01	0 162770D-01	0 781455D-04	0 0	2
10	12	0 162770D 01	0 1 6131D-01	0 169426D-01	0 781455D-04	0 0	2
10	13	0 1 9426D-01	0 172658D-01	0 175830D-01	0 781455D-04	0 0	2
11	1	0 0	0 340906D-02	0 48211 D-02	0 109532D-03	0 100000D 00	1
11	2	0 482115D-0	0 590467D-02	0 681813D-02	0 109532D-03	0 100000D 00	1
11	3	0 681813D-02	0 762 90D-02	0 835047D-02	0 109532D-03	0 100000D 00	1
11	4	0 83 047D-02	0 901954D-02	0 964229D-02	0 109532D-03	0 100000D 00	1
11	5	0 964229D-02	0 102 72D-01	0 107804D-01	0 109532D-03	0 100000D 00	1
11	6	0 107804D-01	0 113066D-01	0 118093D 01	0 109532D-03	0 100000D 00	1
11	7	0 118093D-01	0 122916D-01	0 1275 6D-01	0 109532D-03	0 100000D 00	1

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
11	8	0 127556D-01	0 132033D-01	0 136363D-01	0 109532D-03	0 100000D 00	1
11	9	0 136363D-01	0 140559D-01	0 144634D-01	0 109532D-03	0 100000D 00	1
11	10	0 144634D-01	0 148598D-01	0 152458D-01	0 109532D-03	0 100000D 00	1
11	11	0 155830D-01	0 159338D-01	0 162770D-01	0 104194D-03	0 0	2
11	12	0 162770D-01	0 166131D-01	0 169426D-01	0 104194D-03	0 0	2
11	13	0 169426D-01	0 172658D-01	0 175830D-01	0 104194D-03	0 0	2

----- MATERIAL DATA -----
(PIN NO 1)

IDENTIFIED MATERIALS

MATERIAL NO 1 IS URANIUM DIOXIDE

FRACTIONAL DENSITY OF UO2	FRACTION OF PU-O2 IN THE FUEL	BURN UP (MW-SEC/KG)	ROD AVERAGE BURNUP DURING TIME STEP (MWD/MTU)	CONDUCTIVITY INTEGRAL FOR NUCLEAR FUEL
0 94000	0 0	0 0	0 0	0 970000D 00

MATE IAL NO 2 IS ZIRCALOY-4

END OF INPUT DATA PROCESSING

STEADY-STATE OUTPUT

```
                                  ----- SYSTEM POWER DATA -----

                                                        STEADY-STATE
                                   SYSTEM                  POWER

                                 NUCLEAR                0 119993D 03 MW

                                 IDEAL ELECTRIC         0 0          KW

                                 ACTUAL ELECTRIC        0 0          KW
+ ++   NOTE   THE NUCLEAR SYSTEM SURFACE HEAT FLUX TABLE IS BEING NORMALIZED   + +++

          STEADY-STATE POWER (PNUC)  =   0 119993D 03

          STEADY- TATE FLUX (PHINUC) -   0 111256D 03
                                   RATIO =   0 100000D 01
       TABULATED STEADY-STATE FLUX     0 111256D 03
```

STEADY-STATE NUCLEAR SYSTEM OUTPUT

BOUNDARY CONDITIONS FOR POWER BACK-CALCULATION

(BACK-CALCULATED ON PIN NO 1 AT LEVEL NO 4)

SURFACE HEAT FLUX (BTU/SEC-FT**2)	SURFACE TEMPERATURE (F)
0 111256D 03	625 84

----- NORMALIZED HEAT FLUX TABLE -----

TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)
0 0	0 111256D 03	0 00000D-01	0 110969D 03	0 100000D 00	0 109982D 03	0 150000D 00	0 103505D 03
0 200000D 00	0 103204D 03	0 250000D 00	0 97 708D 02	0 300000D 00	0 9992 0D 02	0 350000D 00	0 102837D 03
0 40000CD 0	0 104781D 03	0 450000D 00	0 101861D 03	0 500000D 00	0 102807D 03	0 550000D 00	0 102441D 03
0 600000D 00	0 107538D 03	0 650000D 00	0 105724D 03	0 700000D 00	0 1065 5D 03	0 750000D 00	0 104936D 03
0 800000D 00	0 776331D 02	0 850000D 00	0 526292D 02	0 900000D 00	0 216011D 02	0 950000D 00	0 245539D 02
0 1000000 01	0 219230D 0	0 10 000D 01	0 246071D 02	0 110000D 01	0 236647D 02	0 115000D 01	0 284153D 02
0 120000D 01	0 326400D 02	0 125000D 01	0 311786D 02	0 130000D 01	0 349878D 02	0 135000D 01	0 367722D 02
0 140000D 01	0 390733D 02	0 145000D 01	0 381781D 02	0 150000D 01	0 399333D 02	0 155000D 01	0 430103D 02
0 160000D 01	0 404100D 02	0 165000D 01	0 411453D 02	0 170000D 01	0 392606D 02	0 175000D 01	0 431794D 02
0 180000D 01	0 403036D 02	0 185000D 01	0 424392D 02	0 190000D 01	0 386019D 02	0 195000D 01	0 392083D 02
0 200000D 01	0 40457 D 02	0 205000D 01	0 398539D 02	0 210000D 01	0 398103D 02	0 215000D 01	0 330022D 02
0 220000D 01	0 336467D 02	0 225000D 01	0 279331D 02	0 230000D 01	0 241113D 02	0 235000D 01	0 196443D 02
0 240000D 01	0 166044D 02	0 245000D 01	0 131218D 02	0 2500 0D 01	0 628633D 01	0 255000D 01	0 389822D 01
0 260000D 01	0 729764D 00	0 265000D 01	0 340206D 01	0 270000D 01	0 351050D 01	0 275000D 01	0 283697D 01
0 280000D 01	- 2 9493D 01	0 285000D 01	- 467408D 01	0 290000D 01	- 544936D 01	0 295000D 01	- 911328D 00
0 300000D 01	- 451808D 01	0 305000D 01	- 2 0127D 01	0 310000D 01	- 113661D 01	0 315000D 01	- 131156D 01
0 3 0000D 01	- 859992D 00	0 325000D 01	- 397194D 01	0 330000D 01	- 754406D 00	0 33 000D 01	- 5119 5D 00
0 40000D 01	- 150528D 01	0 345000D 01	0 163696D 01	0 350000D 01	0 418728D 00	0 355000D 01	0 379919D 01
0 360000D 01	0 953514D 00	0 365000D 01	0 119159D 01	0 370000D 01	0 943878D 00	0 375000D 01	0 620086D 01
0 380000D 01	0 674967D 01	0 385000D 01	0 28 825D 01	0 390000D 01	0 184457D 01	0 395000D 01	0 225558D 00
0 400000D 01	0 2140 5D 01	0 405000D 01	0 330739D 01	0 10000D 01	0 909492D 00	0 415000D 01	0 485597D 01
0 4 0000D 01	0 212873D 01	0 425000D 01	0 618989D 01	0 430000D 01	0 3 4942D 01	0 43 000D 01	0 589094D 01
0 440000D 01	0 536 4D 01	0 445000D 01	0 747011D 01	0 450000D 01	0 722100D 01	0 455000D 01	0 110706D 02
0 460000D 01	0 141894D 02	0 465000D 01	0 120623D 02	0 470000D 01	0 111416D 02	0 47 000D 01	0 638497D 01
0 480000D 01	0 939197D 01	0 485000D 01	0 521414D 01	0 490000D 01	0 771506D 01	0 495000D 01	0 342467D 01
0 500000D 01	0 767811D 01	0 05000D 01	0 299569D 01	0 510000D 01	0 546422D 01	0 515000D 01	0 666775D 01
0 520000CD 01	0 620214D 01	0 525000D 01	0 254429D 01	0 30000D 01	0 1384 D 01	0 53 000D 01	0 695819D 01
0 40000D 01	0 930561D 01	0 5 0000D 01	0 686281D 01	0 0000D 01	0 172630D 00	0 555000D 01	- 195302D 00
0 560000D 01	0 342800D 01	0 565000D 01	0 601853D 01	0 570000D 01	0 337525D 01	0 575000D 01	0 198014D 01
0 580000D 01	0 228343D 01	0 585000D 01	0 213631D 01	0 90000D 01	0 564500D 01	0 590000D 01	0 113929D 01
0 600000D 01	0 558031D 01	0 60 000D 01	0 105095D 01	0 10000D 01	0 919289D 01	0 615000D 01	0 581728D 01
0 620000D 01	0 8355 3D 01	0 625000D 01	0 817711D 01	0 630000D 01	0 102935D 02	0 635000D 01	0 120107D 02
0 640000D 01	0 101797D 02	0 645000D 01	0 1 4289D 02	0 650000D 01	0 174543D 02	0 655000D 01	0 195287D 02
0 660000D 01	0 198133D 02	0 665000D 01	0 223192D 02	0 670000D 01	0 297939D 02	0 675000D 01	0 308786D 02
0 680000D 01	0 3161 0D 02	0 685000D 01	0 272863D 02	0 690000D 01	0 310892D 02	0 695000D 01	0 293644D 02
0 700000D 01	0 320425D 02	0 705000D 01	0 2 74 1D 02	0 710000D 01	0 300436D 02	0 715000D 01	0 315667D 02
0 720000CD 01	0 331608D 02	0 725000D 01	0 295836D 02	0 730000D 01	0 30779 D 02	0 735000D 01	0 326497D 02
0 740000D 01	0 3248 1D 02	0 745000D 01	0 308967D 02	0 750000D 01	0 297050D 02	0 755000D 01	0 337136D 02
0 760000D 01	0 294497D 02	0 765000D 01	0 286314D 02	0 770000D 01	0 271412D 02	0 775000D 01	0 309281D 02
0 780000D 01	0 3358 2D 02	0 785000D 01	0 329486D 02	0 790000D 01	0 297078D 02	0 795000D 01	0 270758D 02

----- NORMALIZ D HEAT FLUX TABLE -----

TIME (EC)	HEAT FLUX (BTU/SEC-FT)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)
0 800000D 01	0 2782 6D 02	0 805000D 01	0 310792D 02	0 810000D 01	0 284386D 02	0 815000D 01	0 253484D 02
0 820000D 01	0 259969D 02	0 825000D 01	0 291533D 02	0 830000D 01	0 28360 D 02	0 835000D 01	0 265479D 02
0 840000D 01	0 34 19D 02	0 84 000D 01	0 257639D 02	0 850000D 01	0 251611D 02	0 855000D 01	0 249110D 02
0 860000D 01	0 230514D 02	0 865000D 01	0 21518 D 02	0 870000D 01	0 216209D 02	0 875000D 01	0 177360D 02
0 880000D 01	0 163639D 02	0 885000D 01	0 12 110D 02	0 890000D 01	0 163706D 02	0 895000D 01	0 149628D 02
0 900000D 01	0 1 4012D 02	0 905000D 01	0 120862D 02	0 910000D 01	0 143880D 02	0 915000D 01	0 172196D 02
0 920000D 01	0 180746D 0	0 925000D 01	0 141263D 02	0 930000D 01	0 167493D 02	0 935000D 01	0 144302D 02
0 940000D 01	0 01 4D 02	0 945000D 01	0 15 559D 02	0 950000D 01	0 234679D 02	0 955000D 01	0 165764D 02
0 960000 01	0 181403D 02	0 965000D 01	0 18092JD 0	0 970000D 01	0 216952D 02	0 975000D 01	0 209576D 02
0 980000D 01	0 176636D 02	0 985000D 01	0 203 19D 02	0 990000D 01	0 1 1014D 02	0 995000D 01	0 221684D 02
0 100000D 02	0 1 9436D 02	0 100500D 02	0 190543D 02	0 101000D 02	0 166638D 02	0 101500D 02	0 205803D 02
0 102000D 02	0 268290D 02	0 102500D 02	0 236650D 02	0 103000D 02	0 318381D 02	0 103500D 02	0 235053D 02
0 104000D 02	0 0 9622D 02	0 104500D 02	0 245022D 02	0 105000D 02	0 285178D 02	0 105500D 02	0 245598D 02
0 106000D 02	0 382 6D 0	0 106500D 02	0 257738D 02	0 107000D 02	0 199701D 02	0 107500D 02	0 265952D 02
0 108000D 02	0 178092D 02	0 108500D 02	0 212130D 02	0 109000D 02	0 185784D 02	0 109500D 02	0 222836D 02
0 110000D 0	0 298 2D 02	0 110500D 0	0 225993D 02	0 111000D 02	0 208677D 02	0 111500D 02	0 177864D 02
0 112000D 02	0 147690D 02	0 112500D 02	0 151975D 02	0 113000D 02	0 182994D 02	0 11 500D 02	0 189166D 02
0 114000D 02	0 202 2D 02	0 114500D 02	0 144249D 02	0 115000D 02	0 138751D 02	0 115500D 02	0 103524D 02
0 116000D 02	0 143261D 02	0 116500D 0	0 111694D 02	0 117000D 02	0 131874D 02	0 117500D 02	0 106054D 02
0 118000D 02	0 720 7D 01	0 118500D 02	0 763864D 01	0 119000D 02	0 532181D 01	0 119500D 02	0 526861D 01
0 120000D 02	0 474100D 01	0 120500D 02	0 246594D 01	0 121000D 02	0 244370D 01	0 121500D 02	- 169529D 01
0 122000D 02	0 223338D 01	0 122 000D 02	0 450442D 01	0 123000D 02	0 344958D 01	0 123500D 02	0 153623D 01
0 124000 02	0 181859D 01	0 124500D 02	0 340564D 01	0 125000D 02	0 649756D 01	0 125500D 02	0 386897D 01
0 126000D 02	0 620951D 01	0 126500D 02	- 141748D 01	0 127000D 02	0 199043D 01	0 127500D 02	- 573842D 00
0 128000D 02	0 0 4467D 01	0 128500D 02	0 400931D 01	0 129000D 02	0 178117D 01	0 129500D 02	0 583369D 01
0 130000D 02	0 3191 7D 01	0 130500D 02	0 5 5536D 01	0 131000D 02	0 154001D 01	0 131500D 02	0 424253D 01
0 132000D 02	0 10 644D 00	0 132500D 02	0 844283D 00	0 133000D 02	0 242864D 01	0 133500D 02	0 185491D 01
0 1 4000D	0 179164D 01	0 134500D 02	- 191 58D 01	0 135000D 02	0 602556D 01	0 135500D 02	0 425019D 01
0 136000D 02	0 62302D 01	0 136500D 02	0 134614D 01	0 137000D 02	0 355569D 01	0 137500D 02	0 307464D 01
0 138000D 02	0 131804D 01	0 138500D 02	0 168843D 01	0 139000D 02	0 341947D 01	0 139500D 02	0 476900D 01
0 140000D 02	0 2611 4D 01	0 140500D 02	0 313417D 01	0 141000D 02	- 502369D 00	0 141500D 02	0 247015D 00
0 14 000D 02	0 183275D 01	0 142 00D 02	0 1 8153D 01	0 143000D 02	0 303322D 01	0 143500D 02	- 285658D 01
0 144000D 02	0 194740D 01	0 144500D 02	0 913 14D 00	0 145000D 02	0 817633D 01	0 145500D 02	0 664108D 01
0 146000D 02	0 887181D 01	0 146500D 02	0 12 987D 02	0 147000D 02	0 103499D 02	0 147500D 02	0 954714D 01
0 148000D 02	0 851364D 01	0 148500D 02	0 109424D 0	0 149000D 02	0 161422D 02	0 149500D 02	0 133843D 02
0 1 0000D 02	0 143718D 02	0 1 0500D 0	0 929286D 01	0 151000D 02	0 80545 D 01	0 1 1500D 02	0 128684D 02
0 152000D 02	0 101787D 02	0 152500D 02	0 8869 8D 01	0 153000D 02	0 742528D 01	0 153500D 02	0 767086D 01
0 154000D 02	0 111090D 02	0 1 4500D 02	0 832592D 01	0 155000D 02	0 124210D 02	0 155500D 02	0 799086D 01
0 1 6000D 02	0 535267D 01	0 1 6500D 02	0 417869D 01	0 157000D 02	0 609458D 01	0 157500D 02	0 718658D 01
0 158000D 02	0 661375D 01	0 158500D 02	0 475236D 01	0 159000D 02	- 369497D 00	0 159500D 02	0 578428D 00

----- NORMALIZED HEAT FLUX TABLE -----

TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)
0 160000D 02	0 770842D-01	0 160500D 02	0 514461D 01	0 161000D 02	0 363842D 01	0 161500D 02	0 631572D-02
0 162000D 02	0 752733D 00	0 162500D 02	- 131097D 01	0 163000D 02	0 250699D 01	0 163500D 02	- 370956D 00
0 164000D 02	0 361319D 01	0 164500D 02	- 945442D 00	0 165000D 02	0 353572D 01	0 165500D 02	- 103470D 01
0 166000D 02	0 345433D 01	0 166500D 02	- 110798D 01	0 167000D 02	0 336678D 01	0 167500D 02	0 634056D 00
0 168000D 02	0 474339D 01	0 168500D 02	0 296164D 00	0 169000D 02	0 123448D 01	0 169500D 02	0 115618D 01
0 170000D 02	0 292092D 01	0 170 00D 02	0 249973D 01	0 171000D 02	0 25592 D 01	0 171500D 02	0 260381D 01
0 172000D 02	0 629400D 01	0 172500D 02	0 192840D 01	0 173000D 02	- 693111D 00	0 173500D 02	- 178765D 01
0 174000D 02	0 184748D 00	0 174500D 02	0 316108D 01	0 175000D 02	0 425583D 00	0 175500D 02	0 270640D 01
0 176000D 02	0 227434D 01	0 176500D 02	0 41 497D 01	0 177000D 02	- 161488D 01	0 177500D 02	0 150465D 01
0 178000D 02	- 902367D 00	0 178500D 02	0 307114D 01	0 179000D 02	0 333033D 00	0 179500D 02	0 260834D 01
0 180000D 02	0 367931D 00	0 180500D 02	- 100914D 01	0 181000D 02	0 113 67D 01	0 181500D 02	- 121537D 01
0 182000D 02	0 956239D 00	0 182500D 02	0 440239D 00	0 183000D 02	0 589897D 01	0 183500D 02	0 110609D 01
0 184000D 02	0 3773 0D 00	0 184500D 02	- 103157D 01	0 185000D 02	0 293914D 01	0 185500D 02	0 195248D 00
0 186000D 02	0 661478D 00	0 186500D 02	- 121346D 01	0 187000D 02	0 939911D 00	0 187500D 02	0 422586D 00
0 188000D 02	0 408553D 00	0 188500D 02	0 389578D 00	0 189000D 02	0 368256D 00	0 189500D 02	0 357944D 00
0 190000D 02	0 338594D 00	0 190500D 02	0 334681D 00	0 191000D 02	0 213669D 01	0 191500D 02	0 356267D 01
0 192000D 02	0 147208D 01	0 192500D 02	- 160163D 01	0 193000D 02	0 102714D 01	0 193500D 02	- 133316D 01
0 194000D 02	0 839506D 00	0 194500D 02	0 313789D 00	0 195000D 02	0 393906D 01	0 19 500D 02	0 499833D 01
0 196000D 02	0 301208D 01	0 196500D 02	0 18 233D 01	0 197000D 02	0 237326D 01	0 197500D 02	0 574489D 00
0 198000D 02	0 643019D 01	0 198500D 02	0 338500D 01	0 199000D 02	0 222111D 01	0 199500D 02	0 863906D 00
0 200000D 02	0 123516D 01						

FOLLOWING ARE SUMMARIES OF THE NUCLEAR SYSTEM PIN(S) CONDITIONS

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 1

TAU (C)	DELT (SEC)
0 0	0 0

	BTU/SEC	KW
PIN POWER	0 113750D 03	0 119993D 03
SYSTEM AVG PIN POWER	0 1137 0D 03	0 119993D 03

LEVEL NO	LEV L POWL (TU/SEC)	SURF HEAT TRAN (BTU/SEC)	SURF HEAT FLUX (BTU/SEC-FT**2)	CENTERLINE TEMP (F)	HEATER NODE TEMP(F)	SURFACE TEMP (F)	ADJACENT COOL TEMP(F)	S URF HT TRANS COEFF(B/S-FT2-F)
1	0 97900D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	0 634086D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	0 879194D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	0 122913D 02	0 122913D 02	0 111256D 03	0 396843D 04	0 165249D 04	0 625844D 03	0 625844D 03	0 0
5	0 1576 9D 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	0 157639D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	0 1 7639D 02	0	0 0	0 0	0	0 0	0 0	0 0
8	0 121L39D 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 8791C4D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	0 6 4086D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	0 97900D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0

LEVEL	EQUIVALENT GAP CONDUCTIVITY (BTU/SEC-FT-F)	GAP CONDUCTANCL (BTU/S C-FT *2-F)	GAP THICKNESS (FT)	STEADY STATE GAP THICKNESS (FT)	NO OF ITERATIONS IN H T SOLUTION
1	0 0	0 0	0 337200D-03	0 0	0
2	0 0	0 0	0 337200D-03	0 0	0
3	0 0	0 0	0 337200D-03	0 0	0
4	0 513538D-04	0 152295D 00	0 337200D-03	0 337200D-03	16
5	0 0	0 0	0 337200D-03	0 0	0
	0 0	0 0	0 337200D-03	0 0	0
7	0 0	0 0	0 337200D-03	0 0	0
8	0 0	0 0	0 337200D-03	0 0	0
9	0 0	0 0	0 337200D-03	0 0	0
10	0 0	0 0	0 337200D-03	0 0	0
11	0 0	0 0	0 337200D-03	0 0	0

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 1

PIN TEMPERATURE DISTRIBUTION

NODE

LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	3968 43	3703 52	3439 87	3165 33	2883 94	2607 60	2344 94	2097 83	1867 01	16 2 49
	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

NODE

LEVEL NO	11	12	13
1	0 0	0 0	0 0
2	0 0	0 0	0 0
3	0 0	0 0	0 0
4	697 48	667 34	639 20
5	0 0	0 0	0 0
6	0 0	0 0	0 0
7	0 0	0 0	0 0
8	0 0	0 0	0 0
9	0 0	0 0	0 0
10	0 0	0 0	0 0
11	0 0	0 0	0 0

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 1

TOTAL STORED ENERGY PIN 1 - 0 129773D 03 BTU

LEVEL	STORED ENERGY PER LEVEL(BTU)
1	0 0
2	0 0
3	0 0
4	0 129773D 03
5	0 0
6	0 0
7	0 0
8	0 0
9	0 0
10	0 0
11	0 0

TOTAL NODAL STORED ENERGY (BTU)

	NODE									
LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	0 2246D 0	0 1913D 02	0 1641D 02	0 1410D 02	0 1217D 02	0 1057D 02	0 9252D 01	0 8112D 01	0 7102D 01	0 6193D 01
5	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

	NODE		
LEV L NO	11	12	13
1	0 0	0 0	0 0
2	0 0	0 0	0 0
3	0 0	0 0	0 0
4	1 50	1 42	1 35
5	0 0	0 0	0 0
6	0 0	0 0	0 0
7	0 0	0 0	0 0
8	0 0	0 0	0 0
9	0 0	0 0	0 0
10	0 0	0 0	0 0
11	0 0	0 0	0 0

TRANSIENT OUTPUT

```
******   **** *   **  **   ** *    ****** *  *        MAJOR EDIT NUMBER   1          *  *** ****** ****  *********** *** ***********
***      * * * *   *   * **    **  *      ** * *      TIME STEP NUMBER    20          *  ** ******** ******************* *************
**  *** **** **  *** * * * *** * **  * ** *** *      TRANSIENT TIME -   1 0000 SEC   ** * ***************************** ***************
```

TYPE OF OUTPUT	CURRENT NO OF RECORD RITTEN
MAJOR EDIT	1
MINOR EDIT	20
PLOT RECORD	0
RESTART RECORD	0

----- SYSTEM DATA -----

SYSTEM	SYSTEM NO	SYSTEM PO ER	AVERAGE PIN PO ER (KW)	AVERAGE PIN PO ER (BTU/SEC)
NUCLEAR	1	0 556256D 03(MW)	-0 556256D 03	-0 527315D 03

MAJOR EDIT NUMBER 1
TIME STEP NUMBER 20
TRANSIENT TIME - 1 0000 SEC

NUCLEAR SYSTEM DATA

BOUNDARY CONDITIONS FOR POWER BACK-CALCULATION

(BACK-CALCULATED ON PIN NO 1 AT LEVEL NO 4)

SURFACE HEAT FLUX (BTU/SEC-FT* 2)	SURFACE TEMPERATURE (F)
0 219230D 02	780 09

BACK-CALCULATED SYSTEM POWER - -0 556256D 03 MW

BACK-CALCULATION ENERGY BALANCE ERRORS CONVERGED TO WITHIN 0 100000D-01 IN 1 ITERATIONS

EFFECT OF FILTERING IN BACK-CALCULATION

	UNFILTERED SIGNAL		FILTERED SIGNAL		FILTER
	LAST STEP	THIS STEP	LAST STEP	THIS STEP	FLAG
HEAT FLUX	0 0	0 219230D 02	0 219230D 02	0 219230D 02	0
TEMPERATURE	0 780094D 03	0 780094D 03	0 780094D 03	0 780094D 03	0
POWER	0 556256D 03	-0 556256D 03	-0 556256D 03	-0 556256D 03	0

FOLLOWING ARE SUMMARIES OF THE NUCLEAR SYSTEM PIN(S) CONDITIONS

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 1

TAU (SEC)	DELT (SEC)
0 100D 01	0 500D-01

	BTU/SEC	KW
PIN POWER	-0 527315D 03	-0 556256D 03
SYSTEM AVG PIN POWER	-0 527315D 03	-0 556256D 03

LEVEL NO	LEVEL POWER (BTU/SEC)	SURF HEAT TRAN (BTU/SEC)	SURF HEAT FLUX (BTU/SEC-FT *2)	CENTERLINE TEMP (F)	HEATER NODE TEMP(F)	SURFACE TEMP (F)	ADJACENT COOL TEMP(F)	S URF HT TRANS COEFF(B/S-FT2-F)
1	-0 277170D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	-0 293945D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	-0 407570D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	-0 569790D 02	0 242228D 01	0 219256D 02	0 347060D 04	0 121865D 04	0 780094D 03	0 780094D 03	0 0
5	-0 7 0771D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	-0 730771D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	-0 730771D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	-0 562030D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	-0 407570D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	-0 293945D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	-0 277170D 02	0 0	0 0	0 0	0 0	0 0	0 0	0 0

LEVEL	EQUIVALENT GAP CONDUCTIVITY (BTU/SEC-FT-F)	GAP CONDUCTANCE (BTU/SEC-FT**2-F)	GAP THICKNESS (FT)	STEADY STATE GAP THICKNESS (FT)	NO OF ITERATIONS IN H T SOLUTION
1	0 0	0 0	0 337200D-03	0 0	0
2	0 0	0 0	0 337200D-03	0 0	0
3	0 0	0 0	0 337200D-03	0 0	0
4	0 476855D-04	0 141416D 00	0 337200D-03	0 337200D-03	1
5	0 0	0 0	0 337200D-03	0 0	0
6	0 0	0 0	0 337200D-03	0 0	0
7	0 0	0 0	0 337200D-03	0 0	0
8	0 0	0 0	0 337200D-03	0 0	0
9	0 0	0 0	0 337200D-03	0 0	0
10	0 0	0 0	0 337200D-03	0 0	0
11	0 0	0 0	0 337200D-03	0 0	0

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 1

PIN TEMPERATURE DISTRIBUTION

NODE

LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	3470 60	3160 02	2853 00	2542 66	2243 51	1965 68	1717 30	1505 97	1338 33	1218 65
5	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0.0

NODE

LEVEL NO	11	12	13
1	0 0	0 0	0 0
2	0 0	0 0	0 0
3	0 0	0 0	0 0
4	800 04	789 94	782 59
5	0 0	0 0	0 0
6	0 0	0 0	0 0
7	0 0	0 0	0 0
8	0 0	0 0	0 0
9	0 0	0 0	0 0
10	0 0	0 0	0 0
11	0 0	0 0	0 0

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 1

TOTAL STORED ENERGY PIN 1 = 0 958335D 02 BTU

LEVEL	STORED ENERGY PER LEVEL(BTU)
1	0 0
2	0 0
3	0 0
4	0 958335D 02
5	0 0
6	0 0
7	0 0
8	0 0
9	0 0
10	0 0
11	0 0

TOTAL NODAL STORED ENERGY (BTU)

	NODE									
LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0	0 0
2	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0	0 0
3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	0 1670D 02	0 1406D 02	0 1197D 02	0 1023D 02	0 8775D 01	0 7529D 01	0 6465D 01	0 5583D 01	0 4895D 01	0 4409D 01
5	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

	NODE		
LEVEL NO	11	12	13
1	0 0	0 0	0 0
2	0 0	0 0	0 0
3	0 0	0 0	0 0
4	1 76	1 73	1 72
5	0 0	0 0	0 0
6	0 0	0 0	0 0
7	0 0	0 0	0 0
8	0 0	0 0	0 0
9	0 0	0 0	0 0
10	0 0	0 0	0 0
11	0 0	0 0	0 0

```
**** ***** *  ********* ********************        MAJOR EDIT NUMBER   2        **************** ******************************
******************** *************************     TIME STEP NUMBER    40           ********* *** ***********************************
** ***  *** ******************************  ****    TRANSIENT TIME     2 0000 SEC    *** *******************************************
```

TYPE OF OUTPUT	CURRENT NO OF RECORDS WRITTEN
MAJOR EDIT	2
MINOR EDIT	40
PLOT RECORD	0
RESTART RECORD	0

----- SYSTEM DATA -----

SYSTEM	SYSTEM NO	SYSTEM POWER	AVERAGE PIN POWER (KW)	AVERAGE PIN POWER (BTU/SEC)
*******	******	** ******* *** **	** *********	* ***********
NUCLEAR	1	0 632401D 02(MW)	0 632401D 02	0 599499D 02

MAJOR EDIT NUMBER 2
TIME STEP NUMBER 40
TRANSIENT TIM = 2 0000 SEC

NUCLEAR SY TEM DATA

BOUNDARY CONDITIONS FOR POWER BACK-CALCULATION

(BACK-CALCULATED ON PIN NO 1 AT LEVEL NO 4)

SURFACE HEAT FLUX (BTU/SEC-FT**2)	SURFACE TEMPERATURE (F)
0 404575D 02	946 11

BACK-CALCULATED SYSTEM POWER = 0 632401D 02 MW

BACK-CALCULATION ENERGY BALANCE ERRORS CONVERGED TO WITHIN 0 100000D-01 IN 1 ITERATIONS

EFFECT OF FILTERING IN BACK-CALCULATION

	UNFILTERED SIGNAL		FILTERED SIGNAL		FILTER
	LAST STEP	THIS STEP	LA T STEP	THIS STEP	FLAG
HEAT FLUX	0 0	0 40 575D 02	0 404575D 02	0 404575D 02	0
TEMPERATURE	0 946110D 03	0 946110D 03	0 946110D 03	0 946110D 03	0
PO ER	0 632401D 0	0 632401D 02	0 632401D 02	0 632401D 02	0

FOLLO ING ARE SUMMARIES OF THE NUCLEAR SYSTEM PIN(S) CONDITIONS

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 1

TAU (SEC)	DELT (SEC)
0 200D 01	0 00D-01

	BTU/SEC	KW
PIN POWER	0 99499D 02	0 632401D 02
SYSTEM AVG PIN POWER	0 99499D 02	0 632401D 02

LEVEL NO	L VEL POWER (BTU/SEC)	SURF HEAT TRAN (BTU/SEC)	SURF HEAT FLUX (BTU/SEC-FT**2)	CENTERLINE TEMP (F)	HEATER NODE TEMP(F)	SURFACE TEMP (F)	ADJACENT COOL TEMP(F)	S URF HT TRANS COEFF(B/S-FT2-F)
1	0 15112D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	0 334183D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	0 46 363D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	0 647788D 01	0 447197D 01	0 404786D 02	0 320556D 04	0 139157D 04	0 946110D 03	0 946110D 03	0 0
5	0 8 0805D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	0 830805D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	0 830805D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	0 6 8966D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 463363D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	0 334183D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	0 315112D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0

LEVEL	EQUIVALENT GAP CONDUCTIVITY (BTU/SEC-FT-F)	GAP CONDUCTANCE (BTU/SEC FT**2-F)	GAP THICKNESS (FT)	STEADY STATE GAP THICKNESS (FT)	NO OF ITERATIONS IN H T SOLUTION
1	0 0	0 0	0 337200D-03	0 0	0
2	0 0	0 0	0 337200D-03	0 0	0
3	0 0	0 0	0 337200D-03	0 0	0
	0 514635D-04	0 152620D 00	0 337200D-03	0 337200D-03	1
5	0 0	0 0	0 337200D-03	0 0	0
6	0 0	0 0	0 337200D-03	0 0	0
7	0 0	0 0	0 337200D-03	0 0	0
8	0 0	0 0	0 337200D-03	0 0	0
9	0 0	0 0	0 337200D-03	0 0	0
10	0 0	0 0	0 337200D-03	0 0	0
11	0 0	0 0	0 337200D-03	0 0	0

RESTART	TIME(SEC)	NUC SYS POWR (MW)	SURF HT FLUX B/S-F**2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
0	0	119 99	111 26	3968 4	3439 9	2883 9	2097 8	697 48	667 34	625 84
0	500000D-01	133 13	110 99	3969 6	3441 3	2885 6	2099 5	697 82	667 68	626 25
0	100000D 00	65 240	109 98	3964 7	3435 4	2878 9	2092 4	698 07	668 16	627 08
0	150000	-108 48	103 50	3944 0	3410 9	2851 0	2062 8	699 77	671 00	632 04
0	200000	72 258	103 26	3939 6	3405 7	2844 9	2057 4	702 24	673 71	635 01
0	250000	-149 20	97 670	3914 9	3376 4	2811 6	2023 5	705 19	677 79	641 00
0	300000	117 05	99 944	3914 6	3376 0	2810 7	2025 2	708 00	680 49	643 18
0	350000	144 28	102 85	3916 8	3378 4	2813 3	2030 7	709 41	681 52	643 34
0	400000	148 18	104 79	3919 3	3381 3	2816 5	2036 8	709 84	681 62	642 80
0	450000	30 135	101 86	3911 0	3371 3	2805 4	2027 4	710 97	683 15	645 20
0	500000	135 99	102 82	3912 4	3372 9	2807 2	2031 9	712 34	684 40	646 21
0	550000	78 033	102 46	3908 5	3368 1	2802 1	2028 8	713 48	685 63	647 57
0	600000	263 81	107 56	3921 5	3383 5	2819 9	2049 8	713 48	684 82	645 16
0	650000	74 084	105 72	3917 3	3378 4	2814 6	2045 8	713 43	684 93	645 74
0	700000	170 57	106 93	3921 8	3383 7	2821 2	2054 1	713 57	684 84	645 27
0	750000	61 229	104 93	3916 4	3377 2	2814 5	2048 0	714 11	685.66	646 69
0	800000	-798 34	77 632	3829 7	3275 0	2700 6	1929 4	720 82	696 95	666 69
0	8 0000	-870 81	52 629	3753 0	3161 2	257 2	1802 9	735 98	717 00	695 23
0	900000	-1290 0	21 600	3588 9	2993 1	2392 9	1623 6	758 93	746 18	734 80
0	950000	-324 10	24 562	3542 5	2937 8	2333 4	1578 7	781 59	769 98	758 79
1	00000	-556 26	21 926	3470 6	2853 0	2243 5	1506 0	800 04	789 94	780 09
1	0 000	-214 61	24 614	3434 3	2808 9	2198 2	1482 0	815 91	806 11	795 85
1	10000	-260 88	23 669	3392 5	2758 4	2147 6	1453 5	829 96	820 72	810 96
1	15000	-6 6600	28 4 2	3377 9	2739 2	2131 1	1460 0	841 97	832 31	821 33
1	20000	24 837	32 646	3366 7	2723 9	2120 0	1470 6	851 64	841 45	829 28
1	2 000	-93 221	31 198	3342 4	2694 0	2094 5	1465 0	861 00	851 03	839.26
1	30000	110 63	34 994	3340 3	2689 7	2096 7	1486 2	869 82	859 29	846 46
1	35000	37 205	36 796	3330 1	2676 7	2090 4	1496 7	877 55	866 73	853 37
1	40000	93 532	39 079	3326 0	2671 0	2092 3	1514 0	884 77	873 54	859 50
1	45000	3 9535	38 198	3311 9	2654 6	2083 2	1518 4	892 15	880 98	867 16
1	50000	95 581	39 959	3307 9	2650 0	2086 7	1534 4	899 49	888 04	873 73
1	55000	124 29	43 016	3307 0	2649 5	2094 5	1553 4	905 89	893 96	878 77
1	60000	-26 265	40 426	3289 4	2630 6	2083 1	1551 6	912 81	901 19	886 70
1	6 000	78 843	41 169	3283 3	2625 2	2085 8	1563 4	920 15	908 42	893 77
1	70000	-28 310	39 277	3265 3	2606 8	2074 7	1560 5	927 77	916 35	902 26
1	75000	156 05	43 185	3267 8	2611 9	2088 0	1581 8	934 64	922 71	907 59
1	80000	-51 352	40 317	3247 0	2591 3	2074 4	1575 0	941 66	930 13	915 80
1	85000	130 1	42 466	3246 6	2593 9	2084 7	1592 3	948 79	936 96	922 09
1	90000	-90 870	38 613	3221 3	2569 0	2066 2	1579 7	956 33	945 11	931.34
1	95000	65 390	39 231	3213 6	2564 0	2068 2	1588 0	964 29	953 05	939 21

RESTART

TIME(SEC)	NUC SYS PO R (MW)	SURF HT FLUX B/S-F *2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
00000	63 240	40 479	3205 6	2559 1	2070 1	1595 8	971 59	960 25	946 11
2 0000	21 691	39 872	3192 9	2549 2	2066 7	1597 8	978 81	967 59	953 64
10000	43 393	39 830	3182 6	2542 2	2066 1	1602 6	986 07	974 89	961 01
2 15000	-174 83	33 009	3147 4	2507 9	2037 0	1578 3	994 85	984 72	972 79
2 20000	19 997	33 667	3134 3	2498 3	2033 5	1580 5	1003 9	993 86	981 92
2 2 000	-242 19	27 934	3090 9	2455 6	1995 4	1547 8	1013 0	1004 1	993 85
2 30000	-180 78	24 120	3054 2	2420 5	1965 5	1524 3	1022 9	1014 8	1005 8
2 3 000	-260 22	19 645	3007 9	2375 2	1924 9	1490 9	1032 8	1025 8	1018 3
2 40000	-236 8	16 610	2963 9	2332 9	1887 6	1461 8	1042 6	1036 4	1030 0
2 4 000	-269 83	13 125	2915 4	2286 1	1845 8	1429 3	1052 1	1046 8	1041 5
2 50000	-381 29	6 2862	2852 8	2224 5	1789 3	1382 8	1062 2	1058 2	1055 0
2 5 000	-265 10	3 9004	2803 7	2178 0	1748 3	1353 4	1072 1	1069 0	1066 6
60000	-31 41	0 73027	2748 2	2124 9	1701 2	1318 5	1081 4	1079 1	1077 9
2 65000	117 65	3 4054	2716 4	2097 5	1680 6	1311 1	1089 0	1086 7	1084 9
2 70000	-182 31	3 5127	2676 4	2061 7	1651 9	1295 3	1094 9	1092 9	1091 2
2 7 000	-161 44	2 8389	2638 8	2028 8	1626 4	1282 6	1100 3	1098 5	1097 1
2 80000	-299 40	-2 4946	2583 6	1977 8	1582 8	12-1	1106	1105 6	110 6
2 85000	-212 11	-4 6742	2539 0	1938 4	1551 3	1232 9	1113 1	1112 7	1113 5
2 90000	-201 03	-5 4495	2495 5	1900 6	1521 7	1216 1	1119 1	1119 1	1120 2
2 95000	-24 018	-0 91320	2474 4	1886 6	1516 7	1223 6	1123 2	1122 7	1122 7
00000	-249 84	-4 5171	2 4 4	1842 8	1481 4	1200 1	1127 0	1127 1	1128 1
3 0 000	-38 149	-2 5049	01 4	1827 5	1475 3	1205 6	1130 6	1130 5	1131 0
10000	-81 1 3	-1 1366	373 0	1806 9	1463 8	1204 9	1133 1	1132 9	1133 0
15000	-98 692	-1 3114	342 2	1784 3	1450 2	1201 4	1135 3	1135 1	1135 3
3 0000	-68 478	-0 86005	2315 4	1766 1	1441 0	1201 9	1137 3	1137 1	1137 2
25000	180 26	-3 9713	74 1	1733 2	1416 9	1186 8	1139 8	1140 1	1141 0
30000	11 175	-0 75846	2257 7	1726 3	1419 1	1197 7	1141 8	1141 7	1141 8
3 3 000	-90 151	-0 51169	2228 3	1706 3	1407 6	1194 4	1143 0	1142 8	1142 9
3 40000	-96 397	-1 5051	2198 1	1685 7	1395 5	1189 9	1144 4	1144 4	1144 7
3 45000	29 171	1 6360	2184 4	1682 3	1400 6	1202 3	1145 1	1144 7	1144 2
50000	-105 00	0 41911	2153 5	1661 2	1387 6	1195 9	1145 6	1145 4	114 2
3 5 000	57 258	3 7964	21 3 9	1662 2	1396 8	1211 4	1145 6	1144 9	1143 8
3 0000	-142 24	0 95396	2108 4	1636 8	1378 8	1199 0	1145 9	1145 5	1145 1
3 65000	-28 829	1 1915	2087 9	1626 8	1376 3	1202 1	1146 7	1146 3	1145 8
3 70000	-73 321	0 94467	2061 9	1611 1	1367 8	1198 9	1147 4	1147 0	1146 6
3 75000	10 79	6 1975	2059 5	1619 7	1383 7	1219 7	1146 7	1145 6	1143 9
3 80000	-26 326	6 7473	20 0 2	1610 9	1381 6	1221 9	1145 2	1144 0	1142 1
3 85000	-126 80	2 8383	2007 9	1588 7	1365 7	1210 1	1145 2	1144 4	1143 4
90000	-60 9 4	1 8453	1984 4	1575 5	1358 8	1207 3	1146 0	1145 3	1144 7
3 95000	113 10	0 22584	1954 2	1555 5	1344 8	1197 3	1147 0	1146 7	1146 5

RESTART

TIME(SEC)	NUC SYS PO R (MW)	SURF HT FLUX B/S-F 2 (1 4)	NODAL TEMP (DLG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
4 00000	-8 9574	2 1402	1938 1	1 49 6	1344 9	1201 5	1147 6	1147 0	1146 4
4 05000	-25 0 7	3 072	19 0 1	1541 8	1342 8	1203 4	1147 4	1146 7	114 7
4 10000	-115 20	0 90975	1890 4	1521 9	1328 4	1192 8	1147 7	1147 3	1146 9
4 15000	82 597	4 8543	1887 2	1528 9	1341 0	1209 1	1147 3	1146 5	1145 1
4 20000	-130 33	2 1288	1856 1	1507 2	1324 4	1196 0	1147 1	1146 6	1145 8
4 25000	104 23	6 1883	1856 4	1517 4	1339 9	1214 8	1146 4	1145 3	1143 5
4 30000	-119 64	3 5492	1827 2	1497 5	1324 8	1202 6	1145 8	1145 0	1143 9
4 35000	57 9 9	5 8904	1822 0	1501 7	1333 8	1214 6	1145 2	1144 1	1142 4
4 40000	-44 3 0	5353	1803	1492 1	1328 9	1212 3	1144 3	1143 2	1141 6
4 4 000	42 769	7 690	1796 9	1494 5	1335 8	1221 6	1143 2	1141 8	1139 7
4 50000	-26 06	7 2188	1781 4	1487 6	1333 2	12 1 2	1142 1	1140 6	1138 5
4 5 000	110 45	11 069	1784 4	1499 3	1349 1	1239 1	1140 2	1138 2	1135 0
4 60000	90 265	14 183	1785 1	1508 4	1362 3	1253 7	1137 2	1134 7	1130 6
4 5000	-41 52	12 054	1768 6	1499 8	1357 3	1249 8	1134 9	1132 5	1128 9
4 70000	-4 2674	11 138	1757 3	1496 3	1357 3	1250 8	1133 5	1131 2	1127 8
4 75000	-157 39	6 3783	1725 7	1472 0	1336 3	1230 9	1133 4	1131 8	1129 7
4 80000	65 237	9 3943	1724 2	1477 9	1345 5	1241 5	1133 1	1131 1	1128 3
4 85000	-180 2	5 2126	1690 0	1450 5	1321 1	1218 6	1133 1	1131 7	1130 0
4 90000	51 798	7 7170	1687 1	1454 7	1328 4	12 7 6	1132 9	1131 3	1129 0
4 95000	-181 98	3 4237	1653 1	1427 1	1303 6	1204 7	1133 3	1132 2	1131 0
00000	102 0	7 6802	1657	1438 2	1317 8	1220 9	1133 0	1131 4	1129 2
05000	-193 78	2 9947	1622 2	1409 1	1291 3	1196 4	1133 1	1132 2	1131 1
10000	55 632	5 4656	1620 8	1413 9	1299 0	1206 4	1133 2	1132 0	1130 3
5 1 000	-10 268	6 6666	1610 7	1409 8	1297 6	1207 2	1132 4	1131 1	1129 1
20000	-31 523	6 2008	1598 0	1402 8	1293 4	1204 9	1131 7	1130 4	1128 5
5 2 000	-127 14	2 427	1572 5	1382 8	1276 0	1189 6	1132 0	1131 2	1130 3
30000	-64 484	1 3846	1555 7	1371 4	1267 2	1183 1	1133 0	1132 4	1131 8
5 3 000	118 31	6 9583	1565 8	1385 0	1283 5	1201 6	1132 4	1131 1	1129 1
40000	37 574	9 3020	1561 2	1387 6	1288 7	1208 6	1130 [illegible]	1128 7	1126 1
45000	-57 120	6 8594	1546 1	1377 4	1280 9	1202 4	1129 1	1127 7	1125 6
50000	-197 22	0 16925	1512 1	1348 0	1253 8	1177 0	1130 1	1129 6	1129 2
55000	-45 868	-0 19 06	1498 7	1339 3	1247 6	1172 9	1131 8	1131 5	1131 3
5 60000	37 302	3 283	1496 8	1342 1	1252 7	1180 2	1132 0	1131 3	1130 3
5 65000	36 0 3	6 0174	1494 9	1344 7	1257 7	1187 1	1130 9	1129 9	1128 2
5 70000	-85 905	3 3739	1476 7	1330 7	1246 0	1177 2	1130 4	1129 6	1128 6
5 75000	-43 8 3	1 9802	1464 3	1322 5	1240 0	1173 1	1130 7	1130 1	1129 5
80000	-18 852	2 2837	1455 4	1317 8	1237 5	1172 4	1131 0	1130 4	1129 7
5 8 000	-39 2 5	2 1363	1444 0	1310 3	1232 1	1169 0	1131 1	1130 6	1129 9
5 90000	8 561	3 6447	1449 7	1320 0	1244 0	1182 5	1130 3	1129 3	1127 7
95000	-154 84	1 1375	1422 8	1296 8	1222 7	1162 9	1130 2	1129 8	1129 3

RESTART

TIME(EC)	NUC SYS POWR (MW)	SURF HT FLUX B/S-F**2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
6 00000	135 71	5 807	1435 6	1313 4	1241 5	1183 2	1129 8	1128 8	1127 2
6 05000	-171 05	1 0487	1406 8	1288 0	1218 0	1161 2	1129 7	1129 3	1128 8
6 10000	252 47	9 1928	1435 8	1320 8	1252 8	1197 3	1128 3	1126 8	1124 3
6 1 000	-124 13	5 8110	1413 8	1301 9	1235 7	1181 2	1126 7	1125 6	1123 8
6 20000	114 41	8 3562	1424 3	1315 9	1251 5	1197 7	1125 4	1123 8	1121 4
6 2 000	-7 6973	8 1736	1418 4	1313 1	1250 4	1197 1	1123 8	1122 3	1119 9
6 30000	81 890	10 292	1424 9	1322 7	1261 6	1208 6	1122 1	1120 2	1117 2
6 35000	64 845	12 007	1429 1	1329 9	1270 3	1217 4	1119 8	1117 6	1114 1
6 40000	-30 156	10 173	1420 6	1324 2	1265 9	1213 0	1118 1	1116 0	1112 9
6 45000	219 33	16 429	1446 1	1352 6	1295 7	1242 3	1115 3	1112 3	1107 6
6 50000	47 027	17 440	1448 4	1357 5	1301 7	1247 5	1111 6	1108 4	1103 3
6 5 000	127 36	19 521	1461 7	1373 3	1318 6	1263 2	1108 0	1104 3	1098 6
6 60000	62 456	19 800	1466 3	1380 3	132 5	1269 6	1104 5	1100 7	1094 8
6 000	129 89	22 310	1480 2	1396 5	1343 4	1284 9	1100 8	1096 5	1089 9
6 70000	283 39	29 791	1515 0	1433 5	1381 1	1320 3	1095 3	1089 9	1081 2
6 7 000	10 66	30 840	1525 8	1446 4	1394 3	1330 7	1089 2	1083 4	1074 2
6 80000	136 67	31 587	1540 9	1463 4	1411 6	1344 7	1083 8	1077 6	1068 1
6 85000	-48 385	27 276	1531 2	1455 2	1403 5	1333 3	1080 0	1074 2	1065 8
6 90000	176 86	31 087	1551 9	1477 6	1425 8	1352 3	1076 1	1069 7	1060 3
6 95000	-25 123	29 354	1545 4	1472 5	1420 4	1343 7	1072 0	1065 9	1056 9
7 00000	139 74	32 039	1561 2	1489 7	1437 2	1357 3	1068 0	1061 4	1051 6
7 05000	-131 33	26 733	1540 6	1470 1	1417 0	1334 1	1064 9	1059 0	1050 6
7 10000	142 22	30 042	15 6 9	1487 5	1433 8	1348 3	1061 9	1055 6	1046 3
7 15000	49 094	31 534	1560 6	1492 2	1437 7	1349 7	1057 8	1051 3	1041 6
7 20000	94 376	33 133	1570 6	1502 9	1447 7	1357 1	1053 5	1046 6	1036 4
7 2 000	-61 113	29 573	1559 6	1492 5	1436 5	1343 4	1050 0	1043 6	1034 3
7 30000	72 401	30 761	1566 7	1500 1	1443 2	1347 9	1046 9	1040 3	1030 7
7 35000	70 564	32 623	1573 5	1507 4	1449 6	1352 1	1043 1	1036 2	1026 1
7 40000	22 775	32 449	1574 0	1508 1	1449 4	1349 8	1039 1	1032 2	1022 1
7 45000	-8 9511	30 861	1570 2	1504 5	1444 8	1343 2	1035 8	1029 1	1019 3
7 50000	-10 775	29 675	1566 1	1500 5	1439 8	1336 5	1033 0	1026 5	1017 1
7 5 000	140 49	33 711	1582 5	1516 9	1455 3	1350 3	1029 3	1022 2	1011 7
7 60000	-119 83	29 437	1563 8	1498 1	1435 4	1328 8	1026 1	1019 6	1010 2
7 65000	6 7376	28 611	1562 1	1496 2	1432 6	1324 7	1023 8	1017 4	1008 3
7 70000	-51 339	27 135	1552 6	1486 5	1421 9	1312 9	1021 8	1015 6	1006 9
7 75000	113 04	30 926	1565 3	1498 9	1433 4	1323 7	1018 8	1012 1	1002 4
7 80000	85 351	33 555	1574 2	1507 5	1441 2	1330 6	1014 5	1007 5	997 00
7 85000	20 422	32 910	1574 4	1507 3	1440 2	1328 4	1010 4	1003 3	992 94
7 90000	-52 347	29 699	1564 7	1497 2	1429 2	1316 3	1007 5	1000 8	991 25
7 95000	-62 746	27 069	1553 7	1485 6	1416 8	1303 1	1005 6	999 35	990 57

RESTART

TIME(S C)	NUC SYS POWR (MW)	SURF HT FLUX B/S-F* 2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
8 00000	10 7 1	27 809	1 52 5	1483 9	1414 3	1300 1	1003 6	997 35	988 43
8 05000	67 411	31 065	1561 6	1492 6	1422 3	1307 6	1000 4	993 76	983 95
8 10000	-74 511	28 429	1548 9	1479 3	1408 2	1293 0	997 46	991 12	981 99
8 15000	-74 638	25 342	1536 1	1465 8	1394 0	1278 7	995 77	989 86	981 60
8 20000	9 8218	25 984	1534 8	1463 8	1391 4	1276 2	994 07	988 15	979 77
8 2 000	82 198	29 142	1 43 1	1471 6	1398 7	1283 6	991 22	984 90	975 66
8 30000	-26 331	28 327	1536 8	1464 7	1391 2	1276 1	988 08	981 85	972 79
8 35000	-29 301	6 523	1530 0	1457 3	1383 4	1268 3	985 74	979 72	971 14
8 40000	92 8 7	23 416	1514 7	1441 3	1366 8	1252 0	984 35	978 81	971 11
8 45000	61 158	25 760	1 20 1	1446 1	1371 3	1256 9	982 57	976 77	968 49
8 50000	-43 219	25 155	1511 3	1436 7	1361 6	1247 7	980 29	974 62	966 50
8 55000	-2 4007	24 895	1508 1	1432 9	1357 6	1244 1	978 21	972 58	964 53
8 60000	-60 070	23 046	1 97 0	1421 2	1345 6	1232 8	976 55	971 20	963 68
8 6 000	-56 387	21 515	1486 4	1410 0	1334 2	1222 2	975 39	970 31	963 25
8 70000	-17 867	21 610	1480 9	1404 1	1328 1	1217 1	974 15	969 14	962 09
8 75000	-148 11	17 730	1457 7	1380 3	1304 2	1194 4	973 60	969 20	963 26
8 80000	-67 652	16 356	1443 4	1367 5	1291 4	1183 1	973 68	969 59	964 10
8 85000	-166 68	12 607	1419 6	1341 1	1265 0	1158 7	974 40	970 97	966 60
8 90000	70 306	16 379	1425 9	1347 1	1271 4	1167 3	974 22	970 41	965 09
8 95000	-101 90	14 959	1408 8	1329 6	12 4 1	1152 2	973 38	969 83	964 91
9 00000	34 342	16 402	1410 2	1330 7	1255 8	1156 1	972 39	968 66	963 36
9 0 000	-159 42	12 082	1385 1	1305 4	1230 9	1133 3	972 13	969 04	964 93
9 10000	59 726	14 394	1389 9	1310 1	1236 3	1141 0	971 83	968 47	963 79
9 15000	49 765	17 17	1393 4	1313 5	1240 4	1147 1	970 13	966 42	960 95
9 0000	22 546	18 066	1393 1	1313 2	1240 9	1149 2	967 91	964 03	958 28
9 25000	-107 75	14 122	1375 0	1295 1	1223 6	1133 3	966 84	963 45	958 76
9 30000	90 3 3	16 754	1384 0	1304 3	1233 6	1144 8	965 73	961 99	956 61
9 35000	-99 546	14 414	1367 0	1287 5	1217 5	1130 0	964 59	961 20	956 45
9 40000	188 02	20 150	1389 2	1310 1	1241 0	1154 7	962 44	958 24	951 91
9 45000	-161 80	15 349	1363 8	1284 8	1216 4	1130 9	960 65	957 06	952 00
9 50000	292 89	23 472	1400 3	1322 0	1254 5	1169 7	9 7 87	953 09	945 78
9 55000	-224 33	16 566	1366 3	1288 2	1221 3	1136 8	955 62	951 73	946 24
9 60000	100 79	18 142	1376 7	1299 1	1232 9	1148 9	954 47	950 34	944 45
9 65000	-25 477	18 079	1369 9	1292 8	1227 2	1143 5	952 76	948 68	942 80
9 70000	121 51	21 695	1383 2	1306 6	1241 6	1158 2	950 23	945 61	938 72
9 75000	-15 853	20 937	1377 8	1301 6	1237 2	1153 7	947 45	942 87	936 13
9 80000	-71 128	17 650	1364 8	1289 1	1225 1	1141 7	945 94	941 78	935 93
9 8 000	96 324	20 354	1374 6	1299 5	1236 0	1152 7	944 22	939 70	933 12
9 90000	-83 322	18 096	1360 0	1285 3	1222 2	1138 9	942 51	938 31	932 35
9 95000	142 85	22 169	1376 3	1302 2	1239 5	1156	940 19	935 41	928 32

RESTART

TIME(SEC)	NUC SYS POWR (MW)	SURF HT FLUX B/S-F**2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
10 0000	-200 59	15 940	1345 6	1271 9	1209 4	1126 2	938 82	934 89	929 50
10 0500	119 56	19 056	1358 8	1285 6	1223 5	1140 6	937 69	933 36	927 16
10 1000	-107 06	16 658	1340 9	1268 2	1206 3	1123 7	936 33	932 38	926 84
10 1500	131 32	20 582	1355 7	1283 5	1222 0	1139 7	934 38	929 89	923 28
10 2000	195 02	26 828	1379 2	1307 5	1246 4	1164 1	930 24	924 79	916 36
10 2500	58 973	23 656	1368 0	1296 8	1235 9	1153 0	926 48	921 31	913 63
10 3000	332 37	31 839	1410 2	1339 6	1279 1	1195 3	921 78	915 30	905 26
10 3500	-229 58	23 488	1375 9	1305 5	1245 0	1159 9	918 25	912 81	904 98
10 4000	385 08	32 964	1425 3	1355 5	1295 2	1208 8	914 25	907 37	896 88
10 4500	-267 22	24 482	1385 9	1316 3	1255 8	1167 7	910 83	905 07	896 86
10 000	202 62	28 521	1410 5	1341 4	1280 8	1191 4	908 24	901 87	892 56
10 5500	-139 42	24 548	1388 6	1319 6	1258 7	1168 0	905 68	899 90	891 69
10 6000	1 7633	23 808	1385 9	1317 1	1256 0	1164 3	904 02	898 38	890 42
10 6500	54 932	25 763	1390 4	1321 9	1260 5	1168 0	901 72	895 85	887 36
10 7000	-190 7	19 959	1361 5	1293 0	1231 1	1138 1	900 45	895 45	888 59
10 7500	214 42	26 514	1387 8	1319 5	1257 4	1164 2	898 28	892 41	883 77
10 8000	-307 80	17 794	1342 7	1274 3	1211 8	1118 3	897 00	892 40	886 19
10 8500	132 27	21 217	1357 9	1289 6	1226 8	1133 8	896 28	891 26	884 19
10 9000	-138 79	18 571	133 9	1267 5	1204 5	1111 9	895 06	890 51	884 21
10 9500	118 28	22 285	1349 1	1280 8	1217 7	1125 7	893 28	888 24	880 92
11 0000	3 1855	22 970	1346 6	1278 2	1215 0	1123 5	890 58	885 43	877 87
11 0500	10 184	22 583	1345 0	1276 7	1213 4	1122 1	888 12	882 97	875 49
11 1000	-37 745	20 848	1336 9	1268 5	1205 1	1114 2	886 30	881 37	874 37
11 1500	-96 45	17 781	1320 7	1252 2	1188 8	1098 3	885 45	881 00	874 90
11 2000	-111 10	14 765	1302 5	1233 8	1170 4	1080 8	885 59	881 67	876 50
11 2500	-25 643	15 194	1295 9	1227 2	1163 9	1075	885 58	881 74	876 54
11 3000	55 279	18 300	1300 5	1231 8	1168 7	1081	884 26	880 07	874 02
11 3500	-0 68558	18 905	1297 4	1228 7	1165 8	1079 6	882 21	877 92	871 67
11 4000	55 155	20 250	1301 9	1233 3	1170 7	1085 4	879 91	875 37	868 71
11 4500	-175 59	14 418	1274 7	1206 0	1143 6	1059 2	879 04	875 32	870 28
11 000	-11 761	13 874	1270 0	1201 4	1139 3	1056 1	879 16	875 59	870 79
11 500	-160 27	10 348	1244 8	1176 2	1114 4	1032 6	879 73	876 80	873 07
11 6000	91 169	14 328	1254 3	1185 8	1124 6	1044 4	879 42	876 03	871 26
11 6500	-148 67	11 165	1230 6	1162 2	1101 4	1022 9	878 94	876 06	872 18
11 7000	61 891	13 193	1236 0	1167 9	1107 7	1030 8	878 4	875 32	870 90
11 7500	-117 10	10 592	1216 7	1148 7	1089 1	1013 9	878 03	875 31	871 64
11 8000	-118 06	7 1983	1197 2	1129 5	1070 5	997 15	878 86	876 69	874 03
11 8500	-22 210	7 6400	1191 0	1123 5	1065 3	994 07	879 69	877 58	874 88
11 9000	-130 43	5 3155	1169 7	1102 5	1045 1	976 10	880 57	878 90	876 91
11 9500	-57 099	5 2693	1161 4	1094 6	1038 0	971 48	881 54	879 98	878 06

RESTART

TIME(SEC)	NUC SYS POWR (MW)	SURF HT FLUX B/S-F**2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
12 0000	-66 266	4 7397	1148 9	1082 6	1027 0	962 94	882 24	880 85	879 13
12 0500	-110 47	2 4634	1130 4	1064 6	1009 9	948 43	883 37	882 39	881 35
12 1000	-37 642	2 4444	1121 9	1056 7	1003 2	944 37	884 57	883 68	882 71
12 1500	-183 02	-1 6985	1093 2	1028 5	976 16	920 15	886 47	886 27	886 52
12 2000	85 549	2 2355	1101 8	1038 0	987 04	933 86	887 63	886 98	886 21
12 2500	12 234	4 5043	1100 3	1037 4	987 75	937 06	887 17	886 24	884 81
12 3000	-41 534	3 4487	1091 4	1029 3	981 03	932 58	886 82	885 99	884 82
12 3500	-58 054	1 5358	1080 1	1019 0	972 08	925 77	887 30	886 73	886 10
12 4000	-6 0495	1 8192	1076 2	1016 0	970 54	926 27	887 90	887 32	886 65
12 4500	22 906	3 4062	1076 3	1017 3	973 16	930 73	887 86	887 09	885 97
12 5000	84 030	6 4981	1085 0	1027 1	984 42	943 47	886 76	885 52	88 51
12 00	-82 822	3 8655	1070 5	1013 7	972 26	932 60	886 08	885 15	883 82
12 6000	96 629	6 2120	1081 0	1025 5	985 36	946 78	885 46	884 15	882 17
12 6500	-257 41	-1 4195	1042 1	987 67	948 60	911 26	886 44	886 22	886 37
12 7000	110 99	1 9924	1054 8	1001 6	963 79	927 82	887 63	887 01	886 30
12 7500	-145 21	-0 57585	1031 7	979 66	942 91	908 38	888 40	888 24	888 27
1 8000	110 60	3 2456	1044 4	993 70	958 13	924 96	888 52	887 86	886 85
12 8500	-5 8298	4 0083	1040 9	991 46	956 98	924 95	887 70	886 91	885 65
12 9000	-61 055	1 7801	1029 7	981 49	948 07	917 14	887 60	887 08	886 43
12 9500	136 90	5 8356	1046 3	999 40	967 05	936 97	886 87	885 76	883 97
13 0000	-96 973	3 1879	1030 2	984 50	953 10	923 74	886 22	885 44	884 34
13 0500	98 296	3 5574	1041 6	997 08	966 65	937 87	885 61	884 46	882 70
13 1000	-138 72	1 5355	1019 8	976 39	946 79	918 64	885 65	885 07	884 42
13 1500	97 214	4 2450	1031 0	988 90	960 18	932 63	885 68	884 73	883 36
13 2000	-162 20	0 98535E-01	1006 0	964 94	936 97	910 17	886 14	885 81	885 60
1 2500	24 381	0 84497	1007 2	967 28	940 12	914 20	887 04	886 66	886 29
13 3000	14 348	2 4289	1007 1	968 25	941 86	916 79	887 06	886.51	885 72
13 3500	-3 741	1 8544	1000 2	962 47	936 83	912 58	886 94	886 47	88 84
13 4000	-1 7362	1 7918	997 91	961 23	936 33	912 89	887 00	886 54	885 92
13 4500	129 17	-1 9169	977 72	942 03	917 84	895 38	887 99	888 08	888 52
13 5000	244 8	6 0257	1010 1	975 50	952 10	930 33	887 3	886.32	884 56
13 5 00	-86 7 4	4 2456	996 02	962 38	939 66	918 34	885 78	884 98	883 64
13 6000	-7 4436	2 6228	993 14	960 46	938 40	917 52	885 51	884 85	883 94
13 6500	-35 838	1 3456	986 31	954 56	933 13	912 72	885 83	885 36	884 83
13 7000	59 990	3 5567	993 00	962 19	941 37	921 37	885 63	884 87	883 74
13 7 00	29 702	3 0734	987 14	957 20	936 95	917 30	885 14	884 45	883 43
13 8000	-49 807	1 3172	978 49	949 39	929 68	910 47	885 30	884 85	884 33
13 8500	8 7440	1 6888	978 11	949 86	930 68	911 94	885 58	885 10	884 51
13 9000	39 386	3 4199	982 10	954 67	936 01	917 66	885 20	884 50	883 42
13 9500	37 494	4 7687	985 86	959 22	941 06	922 95	884 21	883 30	881 81

RESTART

TIME(SEC)	NUC SYS PUWR (MW)	SURF HT FLUX B/S-F**2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
14 0000	-37 183	2 6095	976 35	950 45	932 73	914 87	883 79	883 14	882 23
14 0 00	30 391	3 1349	979 20	954 03	936 76	919 12	883 68	882 94	881 90
14 1000	-127 68	-0 50303	959 81	935 31	918 43	901 22	884 34	884 14	884 13
14 1500	17 888	0 24735	960 97	937 16	920 70	904 04	885 24	885 00	884 84
14 2000	16 491	1 8329	961 97	938 83	922 78	906 66	885 26	884 85	884 27
14 2500	-30 879	1 2812	956 33	933 82	918 18	902 60	885 14	884 82	884 37
14 3000	58 734	3 0336	963 3	941 47	926 25	911 11	884 71	884 13	883 19
14 3500	-194 30	-2 8592	934 68	913 35	898 52	884 04	885 59	885 84	886 55
14 4000	158 38	1 9470	955 61	935 11	920 73	906 83	886 06	885 68	885 11
14 4500	-75 491	0 912 7	944 00	923 86	909 88	896 52	885 71	885 50	885 19
14 000	249 58	8 1764	977 99	958 46	944 92	931 65	883 84	882 55	880 17
14 00	-43 102	6 6346	970 85	951 85	938 66	925 17	881 50	880 29	878 23
14 6000	137 35	8 8734	989 19	970 73	9 7 87	943 85	879 52	877 85	875 10
14 6500	1 75	12 498	1008 6	990 69	978 07	963 06	876 53	874 22	870 36
14 7000	-23 958	10 339	1004 3	986 81	974 32	958 14	874 04	871 89	868 55
14 7500	32 749	9 448	1008 0	990 89	978 45	961 07	872 59	870 47	867 33
14 8000	-13 520	8 5089	1005 1	988 46	975 97	957 47	871 60	869 61	866 76
14 8500	89 864	10 944	1016 8	1000 5	987 93	968 28	870 13	867 80	864 25
14 9000	174 93	16 142	1040 4	1024 4	1011 7	990 62	866 97	863 83	858 75
14 9500	-52 969	13 365	1032 2	1016 4	1003 4	980 81	864 14	861 6	856 87
15 000	98 562	14 372	104 1	1029 6	1016 3	992 10	862 05	858 92	854 22
1 0500	-146 37	9 2719	1023 8	1006 4	994 64	969 16	861 15	858 75	855 48
15 1000	11 9 5	8 9546	1024 7	1009 3	995 16	968 70	861 16	858 85	855 74
15 1500	101 73	12 872	1038 1	1022 8	1008 2	980 80	859 77	856 98	852 78
15 2000	-96 426	10 163	10 3 8	1008 4	993 41	965 18	858 41	855 99	852 54
1 2500	-14 283	8 8665	1021 0	1005 6	990 10	961 31	858 02	855 79	852 72
15 3000	-56 113	7 4197	1012 4	996 78	980 87	951 77	857 97	856 01	853 40
15 3500	-6 1242	7 6697	1010 7	994 98	978 67	949 46	857 65	855 92	853 28
15 4000	92 632	11 112	1022 9	1007 0	990 36	960 98	856 56	854 17	850 56
15 4500	-94 036	8 3144	1008 9	992 79	975 81	946 31	855 48	853 47	850 62
15 5000	158 63	12 423	10 0 3	1014 0	996 77	967 02	853 98	851 35	847 33
15 5500	149 06	7 9735	1008 5	992 04	974 49	944 52	852 94	850 92	848 14
15 000	-56 494	5 3494	999 75	983 03	965 42	935 33	853 49	851 87	849 88
15 6500	63 397	4 1759	989 99	973 02	954 99	925 46	854 4	853 01	851 43
15 7000	27 861	6 0964	993 03	975 85	9 7 66	928 61	854 47	852 96	850 89
15 7 00	6 3818	7 1853	993 05	975 64	957 35	928 74	853 76	852 13	849 75
15 8000	-19 348	6 6112	989 44	971 82	953 45	925 28	853 08	851 52	849 29
15 8 00	-55 364	4 7492	980 74	962 92	944 51	916 84	853 04	851 75	850 05
15 9000	-172 94	-0 37614	955 44	937 39	918 97	892 16	854 2	854 03	853 84
15 9500	5 1652	0 57937	955 22	937 01	918 68	892 98	856 16	855 67	855 32

RESTART TIME(SEC)	NUC SYS POWR (MW)	SURF HT FLUX B/S-F**2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
16 0000	-76 707	0 76107E 01	943 43	925 08	906 89	882 45	857 18	856 89	8 6 73
16 0500	136 37	3 1464	961 07	943 26	92 32	901 94	856 73	855 76	854 18
16 1000	70 018	3 353	950 83	932 34	914 65	892 15	855 84	855 05	8 3 84
16 1 00	-62 6 7	0 45992E 02	936 76	918 22	900 82	879 32	856 48	856 17	856 00
16 2000	18 613	0 75333	938 40	919 87	902 82	882 34	857 3	856 99	856 66
16 00	-102 10	1 120	922 96	904 46	887 77	868 41	858 1	858 32	858 60
16 000	106 6	2 5075	936 99	918 61	902 34	883 97	858 42	857 94	857 17
16 3500	-121 42	-0 37225	918 82	900 53	884 67	867 29	858 54	858 47	858 50
16 4000	140 90	3 137	937 72	919 63	904 24	887 62	858 20	857 55	856 46
16 4500	-165 19	-0 94792	913 35	895 41	880 44	864 63	858 7	858 36	858 53
16 000	163 3	3 5365	9 5 2	917 75	903 25	888 05	858 2	857 57	856 50
16 500	-174 88	-1 0375	909 68	892 22	878 13	863 62	858 40	858 40	858 60
16 6000	164 84	3 4551	932 01	914 86	901 23	887 22	858 27	857 64	856 59
16 6500	-175 54	-1 1107	906 19	889 30	876 06	862 66	858 45	858 47	858 70
16 7000	163 64	3 3674	928 38	911 83	899 03	886 06	858 32	857 71	856 69
16 7500	114 40	0 63190	911 26	895 01	882 58	870 05	858 02	857 80	857 53
16 8000	153 72	4 7446	932 07	916 19	904 15	891 82	857 30	856 45	855 02
16 8 00	152 99	0 29238	909 52	893 94	882 23	870 18	857 09	856 85	856 64
16 9000	56 001	1 2352	916 57	901 35	889 97	878 21	857 54	857 17	856 73
16 9500	-26 638	1 1558	911 94	897 05	885 99	874 54	857 59	857 28	856 87
17 0000	53 070	2 9213	918 61	904 07	893 31	882 07	857 19	856 62	855 70
17 0500	-16 116	2 4990	915 51	901 31	890 83	879 75	856 65	856 11	855 30
17 1000	14 182	2 5593	916 71	902 85	892 63	881 67	856 30	855 74	854 89
17 1500	4 6320	2 60 6	916 59	903 05	893 07	882 18	855 97	855 38	854 52
17 2000	123 44	6 2952	933 26	920 06	910 31	899 25	854 69	853 55	851 62
17 2500	-135 40	1 9230	913 36	900 44	890 85	879 70	854 14	853 57	852 84
17 3000	-55 146	-0 69414	904 81	892 18	882 75	871 75	855 19	855 01	855 06
17 3500	-59 011	-1 7885	895 73	883 37	874 11	863 51	856 58	856 66	857 09
17 4000	29 059	0 18485	899 14	887 07	877 99	867 86	857 22	857 11	857 03
7 4 00	67 997	3 1610	908 08	896 29	887 40	877 60	856 55	856 03	855 10
17 5000	-88 520	0 42437	894 86	883 31	874 62	865 17	856 27	856 10	855 90
17 500	95 081	2 7071	907 66	896 39	887 90	878 69	856 01	855 49	854 66
17 6000	-24 157	2 2735	903 60	892 57	884 28	875 21	855 44	854 9	854 23
17 6500	75 989	4 1656	913 73	902 96	894 86	885 76	854 61	853 85	8 2 53
17 7000	-183 75	-1 6188	887 04	876 48	868 54	859 65	855 08	855 12	855 45
17 7500	116 37	1 5054	902 92	892 61	884 8	876 16	855 68	855 31	854 82
17 8000	-117 47	-0 90373	885 66	875 57	867 96	859 61	856 03	856 05	8 6 25
17 8500	132 49	3 0715	903 85	894 00	886 58	878 41	855 74	855 21	854 30
17 9000	-106 34	0 3 134	888 20	878 55	871 29	863 38	855 46	855 31	85 14
17 9500	94 740	2 6090	901 07	891 65	884 57	876 78	855 22	854 73	853 92

RESTART

TIME(SEC)	NUC SYS POWR (MW)	SURF HT FLUX B/S-F**2 (1 4)	NODAL TEMP (DEG F) (1 4 1)	NODAL TEMP (DEG F) (1 4 3)	NODAL TEMP (DEG F) (1 4 5)	NODAL TEMP (DEG F) (1 4 8)	NODAL TEMP (DEG F) (1 4 11)	NODAL TEMP (DEG F) (1 4 12)	BC N SRF TMP (DEG F)
18 0000	-82 932	0 36662	888 76	879 54	872 61	865 01	855 14	854 96	854 77
18 0500	-34 303	-1 0094	883 36	874 35	867 58	860 29	855 86	855 89	856 12
18 1000	5 018	1 1359	890 65	881 85	875 25	868 22	856 02	855 79	85 44
18 1500	-94 986	-1 2159	876 65	868 04	861 60	854 9	856 34	856 46	856 78
18 2000	74 656	0 95607	886 75	878 35	872 10	865 76	856 48	856 31	856 03
18 2500	-33 818	0 44004	881 46	873 26	867 19	861 14	856 29	856 20	856 05
18 3000	186 33	5 8989	907 38	899 39	893 50	887 37	854 87	853 95	852 23
18 500	-151 10	1 1017	885 48	877 67	871 92	865 75	854 03	853 72	853 29
18 4000	20 971	0 37765	888 00	880 38	874 78	868 62	854 54	854 30	854 10
18 4500	61 819	-1 0322	878 78	871 35	865 87	859 87	855 27	855 29	855 52
18 5000	113 90	2 9396	894 51	887 26	881 91	875 94	854 97	854 47	853 60
18 5500	-105 35	0 19364	879 13	872 05	866 80	860 96	854 71	854 59	854 47
18 6000	35 307	0 66171	883 73	876 82	871 69	865 98	854 96	854 76	854 52
18 6500	-73 900	-1 2139	872 83	866 08	861 06	855 61	855 47	855.57	855 88
18 7000	65 095	0 9 990	881 68	875 10	870 20	864 97	855 63	855 45	855 17
18 7500	-34 175	0 42237	876 44	870 01	865 24	860 22	855 46	855 36	855 22
18 8000	6 7245	0 40858	877 03	870 75	866 10	861 29	855 47	855 37	855 23
18 8500	-2 4540	0 38957	876 32	870 19	865 67	861 05	855 48	855 38	855 24
18 9000	-2 6622	0 36825	875 58	869 61	865 22	860 77	855 49	855 39	855 26
18 9500	-1 4825	0 35795	875 03	869 20	864 94	860 66	855 50	855 41	855 28
19 0000	-2 5779	0 33859	874 32	868 64	864 51	860 39	855 51	855 42	855 30
19 0500	-0 95975	0 33468	873 86	868 32	864 31	860 34	855 52	855 43	855 32
19 1000	56 934	2 1367	881 62	876 23	872 34	868 40	855 0	854 70	854 06
19 1500	48 619	3 5624	888 20	882 96	879 18	875 08	853 99	853 39	852 32
19 2000	-51 253	1 4708	880 63	875 52	871 81	867 57	853 49	853 13	852 62
19 2500	-79 544	-1 6027	869 02	864 04	860 40	856 22	854 28	854 37	854 74
19 3000	76 651	1 0274	879 61	874 76	871 19	867 05	854 65	854 42	854 10
19 3500	-103 85	-1 3339	864 56	859 82	856 31	852 36	855 00	855 14	855 49
19 4000	74 228	0 83934	874 83	870 21	866 78	862 98	855 16	855 02	854 77
19 4500	-34 130	0 31361	869 71	865 20	861 84	858 21	854 99	854 92	854 81
19 000	125 69	3 9390	887 28	882 89	879 60	875 89	854 04	853 43	852 28
19 00	39 036	4 9969	892 56	888 27	885 04	881 02	852 38	851 54	850 02
19 6000	-29 668	3 0103	888 11	883 91	880 71	876 32	851 49	850 84	849 84
19 6500	-9 4630	1 8620	886 53	882 41	879 21	874 50	851 43	850 92	850 25
19 7000	16 783	2 3735	888 67	884 64	881 42	876 40	851 32	850 76	849 96
19 7500	-65 624	0 57312	879 12	875 15	871 89	866 73	851 52	851 24	850 96
19 8000	190 97	6 43 4	905 93	902 03	898 73	893 16	850 41	849 29	847 36
19 8500	-106 89	3 3793	890 55	886 68	883 31	877 36	849 20	848 47	847 33
19 9000	6 2505	2 2212	891 22	887 38	883 92	877 67	849 21	848 59	847 79
19 9500	-48 620	0 86280	884 10	880 28	876 72	870 32	849 60	849 22	848 83

Appendix F

PARTIAL LISTING OF PINSIM-MOD1 OUTPUT FOR SAMPLE PROBLEM 3 (DETERMINATION OF AN ELECTRIC PIN POWER PROGRAM)

INPUT DATA
CASE NO 1

LISTIN OF INPUT DATA FOR CASE 1

```
 1    =POWER PROGRAMMING SAMPLE PROBLEM
 2    *
 3    *
 4    *        IDJOB RSTRTM  ENDT  NTIM
 5    100000     1      0 0  10 0   2
 6    *
 7    *
 8    *
 9    *            TIME   DTMIN    DTMAX   ITIMFL
10    100001     0 0      5 0D-2    5 0D-2     2
11    100002     20  0      5 0D-2      0D-2     2
12    *
13    *
14    *        INUCFL      IIDLFL    IACTFL
15    100100     0           -1        0
16    *
17    *            PNUC       PIDL       PACT
18    100200        0 0         0          0 0
19    *
20    *          NPINS      NCHAN
21    1003 0       1          0
22    *
23
24    *        MAXTHT  EPSTHT  MAXSST  EPSSST  MAXBKQ  EPSBKQ
25    1 0400     499   1 0D 1   499     1 0D-1   499   1 0D-1
26    *
27    *       NDBUG IGDBUG ICDBUG IHDBUG IKDBUG IPDBUG IADBUG IIDBUG ISDBUG
28    20 000   11      0      0      0      0      0      0      0      3
29    *
30    *        MINOUT  NMIN  DELMIN
31    2100 0     8       1      0 0
32
33    210001  PIDL PHII PHI#(1 5) TNOD(I    I)  TNOD(1 5 5)  TNOD(1 5 10)
34             TMP1  HTC1  TTUB(1 5)
35    *
36            MAJOUT  NMAJ  DELMAJ
37    220       6            1 0
38    *
39    *          NPLT        DELPLT
40    2300 0     0              0
41    *
42    *          N ST        DELR T
43    24 00      0              0
44    *
45    * ***    ** **  *  **    **  ******* * ** **   ***** *  *  *PIN167 DAT *
46                                                                            *
47    *  PINSIM STANDARD ELECTRIC PIN   TEST 167
48    *
49    *  THIS 11-LEVEL ELECTRIC PIN IS REPRESENTATIVE OF A T PICAL ELECTRIC
50    *  PIN IN THTF TE T 167   THE PIN RADIAL DIMENSIONS A E THOSE          *
51    *  USED IN THE ORTCAL/ORINC CALCULATIONS FOR THE CORRE PONDING
52    *  LEVEL   TH   AP DIM NSIONS ARE BUNDLE-AVERAGED MEAN GAPS             *
53    *                                                                      *
54    *  PIN RADIAL DIMENSIONS TAKEN FROM A LISTING OF ORINC
55
56       (THE LISTING U ED IS FROM A SLOPX COMPILATION  JOB PODSLOP
```

```
 57    *   DATED 79 027 6 00 00  MICROFICHE FRAME M14  SEQUENCE # MOD3347 FF) *
 58    *                                                                      *
 59    *  GAP DIMENSIONS TAKEN FROM THE OUTPUT FROM CALIBRATION RUN 24 1
 60    *                                                                      *
 61    *  PIN MODEL CREATED ON 14-FEB-79 BY BOB HAGAR                         *
 62    *                                                                      *
 63    * ***** *****   * *   * *  ****  *** * * *** ** * *     *      ***  ****
 64
 65    *         ISYS   NLVL  NMAT IPOW  POWFAC   IGAPFL  INFLA   HTCFAC IDFORM*
 66    410000     2      11     6    1     1 0                        1 0
 67
 68    *  AXIAL LEVEL 1   ORINC T/C LEVEL B                                   *
 69                                                                           *
 70    *         NREG   POVPA   ZLNGTH    NOD AT                              *
 71    410100     7     -0 4 2    1 5    0                                   *
 72    *
 73    *        RINREG      ROTREG      POV    NNOD   MATREG
 74    4101 1  0 0           0 7467    0        4       1  *MGO REGION        *
 75    4101 2  0 0 7467    0 009425   0 4 2 83 4       2  *INCONEL HEATER
 76    410103  0 009425    0 010167   0 597717 1       3   CUPRO NICKEL  EGION
 77    410104  0 010167      14333    0 0      3       4  *BN3 REGION
 78    41010   0 01 333      016833   0 0      3          *INNER  HEATH       *
 79    410106  0 016833    0 0168366  0 0      1       6  *INTE - HEATH GAP
 80    410107  0 0168366   0  17667   0 0      3       5  *OUTER SHEATH
 81    *                                                                      *
 82    *                                                                      *
 83       AXIAL LEVEL 2   ORINC T/C LEVEL C
 84    *                                                                      *
 85    *         NREG   POVPA   ZLNGTH    NODWAT
 86    4102 0     7     -0 597   1 125   0                                   *
 87    *                                                                      *
 88    *        RINREG      ROTREG      POVP   NNOD   MATREG
 89    410201  0 0          0  07925    0 0      4       1   M O REGION
 90    4102 2  0 007925      009708   0 573754 4       2   INCONEL HEATER
 91    410203  0 0097 8      010167   0 426246 1       3  *CUPRO-NICKEL REGION
 92    4102 4  0 010167    0  14333    0 0      3       4   BN3 REGION        *
 93    410205  0 014333    0 016833   0 0      3       5  *INNE  SHEATH       *
 94    410206  0 016833    0 01683742 0        1       6  *INTER-SHEATH GAP   *
 9     410207  0 01683742 0 017667    0 0      3          *OUTER SHEATH       *
 96    *
 97    *
 98    *  AXIAL LEVEL 3   ORINC T/C LEVEL D                                   *
 99    *
100    *         NREG   POVPA   ZLNGTH    NOD AT                              *
101    410300     7     -1  65   0 875    0                                   *
102    *
103    *        RINREG      ROTREG      POVP   NNOD   MATREG                   *
104    410301  0 0           008408   0 0      4       1   MGO REGION
105    410302  0 008408    0 010167   1 0      4       2  *INCONEL HEATER     *
106    410303  0 010167    0 01016701 0 0      1       3   CUPRO-NICKEL REGION *
107    *       (A VERY THIN CU-NI REGION IS MODELED FOR NODAL CON ISTENCY)     *
108    410304  0 01016701 0 014333    0 0      3       4  *BN3 REGION         *
109    410305  0 014333    0 016833   0 0      3          *INNER SHEATH
110    410306  0 016833    0 01683817 0 0      1       6   INTER-SHEATH GAP    *
111    410307  0  1683817 0 017667    0 0      3       5  *OUTER SHEATH       *
112    *
113    *
114    *  AXIAL LEVEL 4   ORINC T/C LEVEL E                                   *
```

```
115    *                                                                    *
116    *        NREG    POVPA    ZLNGTH    NODWAT
117    410400    7       -1 85    1 00      0
118    *
119    *       RINREG      ROTREG      POVP    NNOD    MATREG                *
120    410401  0 0         0 008725    0 0     4       1    MGO RE ION       *
121    410402  0 008725    0 010167    1 0     4       2   *INCONEL HEATER
122    410403  0 010167    0 01016701  0 0     1       3   *CUPRO-NICKEL REGION
123    *       (A VERY THIN CU-NI REGION IS MODELED FO  NODAL CONSISTENCY)   *
124    410404  0 01016701    014333    0 0     3       4    BN3 REGION
125    410405  0 014333      016833    0 0     3       5   *INNER SHEATH    *
126    410406  0 016833    0 01683919  0 0     1       6   *INTER-SHEATH GAP
127    410407  0  1683919    017667    0 0     3       5   *OUTER SHEATH    *
128                                                                         *
129    *
130    *  AXIAL LEVEL 5   ORINC T/C LEVEL F
131    *                                                                    *
132    *        NREG    POVPA    ZLNGTH    NODWAT
133    4105 0    7      -1 67     1 0       0                              *
134    *
135    *       RINREG      ROTREG      POVP    NNOD    MATREG                *
136    410 01  0 0         0 0 9 67    0 0     4       1   *MGO RE ION
137    410502  0 009067    0 010167    1 0     4       2   *INCONEL HEATER  *
138    410503  0 010167    0  10167 1  0 0     1       3   *CUPRO-NICKEL REGION *
139    *       (A VERY THIN CU-NI REGION IS MODELED FOR NODAL CONSISTENCY)   *
140    410504  0 01016701 0 014333     0 0     3       4   *BN3 REGION
141    410505  0 014333      16933     0       3       5   *INNER SHEATH    *
142    410506  0 016833    0 01683984  0 0     1       6    INTER- HEATH GAP *
143    410507  0  1683984    17667     0       3       5   *OUTER SHEATH
144    *
145    *                                                                    *
146    *  AXIAL LEVEL 6   ORINC T/C LEVEL
147    *                                                                    *
148    *        NREG    POVPA    ZLNGTH    NODWAT
149    410600    7     -1 67     1 0       0                              *
150    *
151    *       RINREC      ROTREG      POVP    NNOD    MATREG                *
152    410601  0              009 67     0       4       1   *MGO REGION      *
153    410602  0 009067    0 010167    1 0     4       2    INCONEL HEATER
154    410603  0 010167    0 01016701  0 0     1       3   *CUPRO-NICKEL REGION *
155    *       (A VERY THIN CU-NI REGION IS MODELED FOR NODAL CONSISTENCY)
156    410604  0 01016701 0 014333     0 0     3       4    BN3 REGION       *
157    410605  0 014333    0 016833    0 0     3       5   *INNER SHEATH    *
158    410606  0 016833    0  1683963    0       1       6   *INTER-SHEATH GAP *
159    410607  0 01683963 0 017667     0 0     3            OUTER SHEATH    *
160    *                                                                    *
161    *                                                                    *
162    *  AXIAL LEVEL 7   ORINC T/C LEVEL H
163
164             NREG    POVPA    ZLNGTH    NODWAT                           *
165    410700    7     -1 67     1 0       0                              *
166                                                                         *
167    *       RINREG      ROTREG      POVP    NNOD    MATREG                *
168    410701  0 0         0 009067      0     4       1   *MGO REGION      *
169    410702  0 009067    0  10167    1 0     4       2   *INCONEL HEATER  *
170    410703  0 010167    0 01016701  0 0     1       3    CUPRO-NICKEL REGION *
171    *       (A VERY THIN CU-NI REGION IS MODELED FOR NODAL CONSISTENCY)   *
172    4107 4  0 01016701 0 014333     0 0     3       4   *BN3 RE ION      *
```

```
410705  0 014333      016833     0 0      3        5  *INNER SHEATH          *
410706  0 016833    0 01683944  0 0      1        6  *INTER- HEATH GAP
410707    01683944 0  17667     0 0      3        5  *OUTER SHEATH          *
                                                                            *
*                                                                           *
*  AXIAL LEVEL      ORINC T/C LEVEL I                                       *
*                                                                           *
*         NREG    POVPA    ZLNGTH    NODWAT                                 *
41 900      7        -1 285    1 00  0                                      *
*                                                                           *
*        RINREG      ROTRE        POVP    NNOD    MATREG                    *
410801  0 0          0 008725     0 0      4        1  *MGO REGION          *
4108 2  0 008725       10167      1 0      4        2   INCONEL HEATER      *
410803  0 010167    0 01016701   0 0      1        3  *CUPRO-NICKEL REGION *
        (A VER  THI I CU-NI REGION IS MODELED FOR NODAL CONSIST NCY)        *
410804  0 01016701 0 014333      0 0      3        4   BN3 REGION          *
410805  0 014333      016833     0        3        5  *INNEP SHEATH         *
410806  0 016833    0 01683978   0 0      1        6   INTER-SHEATH  AP     *
410807  0 01683978 0 017667      0 0      3        5   OUTER  HEATH         *
*                                                                           *
                                                                            *
*  AXIAL LEVEL 9   ORINC T/C LEVEL K
*
*         NREG    POVPA    ZLNGTH    NODWAT                                 *
410900     7        -1 065    0 875  0                                      *
*                                                                           *
*        RINREG      ROTREG       POVP    NNOD    MATREG                    *
410901  0 0          0 008408     0 0      4        1   MGO REGION
410902  0  08408     0 010167     1 0      4        2   INCONEL H ATER      *
410903  0 010167    0 01016701   0 0      1        3  *CUPRO-NICKEL REGION *
*       (A VERY THIN CU-NI REGION IS MODELED FOR NODAL CONSISTENCY)         *
410904  0 01016701 0 014333      0 0      3        4  *BN3 REGION           *
410905  0 014333    0 016833     0 0      3        5  *INNER SHEATH         *
4109 6  0 016833    0 01683982   0 0      1        6  *INTER-SHEATH GAP
410907  0 01683982 0 017667      0 0      3        5  *OUTER  HEATH         *
*                                                                           *
*
   AXIAL LEVEL 10   ORINC T/C LEVEL M                                       *
*                                                                           *
*         NREG    POVPA    ZLNGTH    NODWAT
411000     7      -0 597    1 125     0                                     *
*                                                                           *
*        RINREG      ROTREG       POVP    NNOD    MATREG                    *
4110 1  0 0          0 00792      0 0      4        1  *MGO REGION          *
411002     0 7925      09709     0 573754 4        2   INCONEL H ATER
411 03  0 009708      010167    0 426246 1        3  *CUPRO-NICKEL REGION *
411004  0 010167    0 014333     0 0      3        4   BN3 REGION          *
411005     14333    0  16833     0 0      3        5  *INNER  HEATH
411006  0 016833      01683308   0 0      1        6  *INTER-SHEATH GAP     *
4110 7  0  1683808    017667     0 0      3           *OUTER SHEATH         *
*                                                                           *
*                                                                           *
   AXIAL LEVEL 11   ORINC T/C LEVEL N                                       *
*                                                                           *
*         NREG    POVPA    ZLNGTH    NODWAT                                 *
411100     7      -  422    1 5       0                                     *
*                                                                           *
*        RINREG      ROTREG       POVP    NNOD    MATREG                    *
```

```
231   4111 1  0 0          0 007467    0 0      4        1  *MGO REGION            *
232   411102  0 007467    0 0 9250    0 402283 4        2  *INCONEL HEATER        *
233   4111 3  0 009250    0  10167    0 597717 1        3  *CUPRO-NICKEL REGION *
234   411104  0 010167    0  14333     0 0      3        4  *BN3 RE ION
235   4111 5  0 014333    0 016833     0 0      3        5  *INNER SHEATH
236   4111 6  0 016833    0 0168334      0      1        6  *INTLR-SHEATH CAP      *
237   411107  0 01683945 0 017667     0 0      3        5   OUTER SHEATH
238   *
239                                                                                *
240
241   *                                                                            *
242   *    PIN 1  MATERIAL 1 (MGO)                                                 *
243   *                                                                            *
244   *         IMAT     NPROPS    TMELT                                           *
245   419100     4          3       5000                                           *
246   *                                                                            *
247   *    PIN 1  MATERIAL 2 (INCONEL)                                             *
248   *                                                                            *
249              IMAT    NPROPS    TMELT                                           *
250   4192 0     5          3       50 0                                           *
251   *                                                                            *
252   *    PIN 1  MATLRIAL 3 (CUPRO-NICKEL)                                        *
253   *                                                                            *
254   *         IMAT     NPROPS    TMELT                                           *
255   419300     6          3       000 0                                          *
256   *
257   *    PIN 1  MATERIAL 4 (BN3)                                                 *
258                                                                                *
2 9              IMAT     NPROPS    TMELT
260   41940      3          3       5000 0
261   *
262                                                                                *
263   *    PIN 1  MATERIAL 5 (STAINLESS STEEL)
264   *                                                                            *
265   *         IMAT     NPROPS    TMELT                                           *
266   4195 0     7          3         0  0                                         *
267                                                                                *
268   *    PIN 1  MATERIAL 5 (AIR GAP)
269                                                                                *
270   419600    0   3   5000                                                       *
271                                                                                *
272                                                                                *
273   419010    3   0 0   2100 0                                                   *
274   *                                                                            *
275   *       TEMPERATURE    CONDUCTIVITY
276             (DEG-F)    (B/HR/FT/DEG-F)                                        *
277   419 11     20              1 731 6D-2
278              1000 0          3  5996D-2                                        *
279              16 0 0          4 7556D-2                                         *
280                                                                                *
281   *                                                                            *
282   *
283   41962     -1   0 0   2300 0                                                  *
284
285   419021    0           PECIFIC HEAT CAPACITY                                 *
286   *
287   *                                                                            *
288   419630    -1   0 0    300 0                                                  *
```

```
289
290    419 31          * DENSITY *
291    *                                                                  *
29     * ****  * ** * **      *    * *     * *** * *      *            **     *
293    *
294
295    *** *  ****    ID AL  YSTEM DATA * *  * *
296
297    *          IIPOWX      IIPINS      IICHAN
298    600010       0           1         1
299
300    *          ISCKFL     NPBACK  NLBACK  DTIDL
301    600100      1           1       5      0  5
302    *
303             IQFLAG     IHFLA     ITFLA
304    600110     400               400
305    *
306              BPIDLL  BPIDLH  IPIDLF
307    6 020        0      1   0      4
308
309             BPHIIL  BPHIIH  IPHIIF
310    600210       0      0          0
311    *
312    *        BTMPIL  BTM IH  ITMI IF
313    60022      0 0      0 0      0
314    *
315    *
316    *
317
318    *  THESE SURFACE HEAT FLUXES WERE TAKEN FROM THE FOLLOWING TAP
319    *//GO FT 1F001 DD DSN PINSIM L3Z BINTST TWO DISP-SHR
320     //      LAB L-(1 SL) UNIT=TAPE62 VOL  FR-02 701
321       ON FEBRUARY 13  1979
322    *  PINSIM VARIABLES ACCESSED
323
324       PHIW 1 5
325    600121
326           0 00000E 00       976 4E 02
327           0 500 0E- 1       914 7E+0
328           0 10 0 E  0     0 7841 E+0
329           0 15000E 00     0  3007E+02
330              00 0E 0      0 40385E+02
331           0 2 000E        0 73716E+02
332           0 30000E 00     0 84782E 0
333             35000E 0        88925E+02
334           0 400 0E 0        9 033E+02
335           0 45000E 00       92220E+02
336           0  0 0 E        0 9 840E+02
337           0 5500CE 00     0 9 654E+02
338           0 60 0 E 00     0 92539E 02
339      +    0 650 0E          92240E+02
340           0 70000E 00     0 9 56 E+0
341           0 75 00E          91686E+02
342           0 800  E 00       884 7E 02
343           0 35 0 E          90416E 02
344           0 9 000E  0     0 21639E 01
345           0 95000E 00     0 70038E+00
346           0 1  00E 01     0 12529E 01
```

347	+	10500E 01	0 77303E 0
348		0 11 0E 1	0 12878E+01
349	+	0 11500E+01	0 1 682E+01
350	+	12000E+01	0 3471 E 01
351	+	0 12500E 01	0 76601E 01
352		0 13000E 01	0 838 0E+01
353	+	0 13500E 01	0 10731E+02
354	+	0 14000E+01	0 98404E+01
355		0 14500E 01	0 19151E+02
356		0 15000E+01	0 22625E 02
357	+	0 15500E+01	0 12505E 02
358	+	0 16000E 01	0 72177E+01
359		0 16500E 01	0 10055E+02
360		0 16700E 01	0 88727E 01
361	+	0 17200E+01	17020E 02
362	+	0 177 E 1	16854E 02
363		0 182 0E 01	19602E 02
364		0 18700E+01	0 11596E 02
365		0 19200E 01	0 14731E+02
366	+	0 19700E 01	0 16561E 02
367	+	0 20200E 01	0 1605 E 02
368		0 20700E+01	0 17483E 02
369		0 21200E 01	15056E+02
370		0 217 0E+01	11949E 0
371	+	0 222 0E 01	0 11858E 02
372		0 227 0E+01	0 13879E+02
373		0 23200E+01	0 16500E 02
374		23700E 01	0 19242E 02
375		0 24200E+01	0 17212E 02
376		0 24700E 01	0 14987E 02
377		0 2 2 0E 01	0 15877E 02
378		0 254 0E 01	0 13208E 02
379		0 2 9 E 01	0 17385E 02
380	+	0 264 E+ 1	17655E 02
381		0 26900E+01	0 13586E 02
382		0 27400E 01	12500E 02
383		0 27900E 1	0 15548E 02
384		0 28400E+01	0 15191E 02
385		0 289 0E+01	0 17978E 02
386		0 2940 E 01	17684E 02
387	+	0 29900E 01	0 13703E 02
388		0 304 0E 01	0 15016E 02
389		0 30900E 01	0 16974E 02
390		0 314 0E+01	19021E 02
391	+	0 319 0E 01	0 19893E+02
39		0 32400E 01	0 17824E 02
393		0 32900E+01	0 17239E+02
394		0 334 0E 01	0 18532E 02
395		0 33900E 01	0 16416E 02
396		0 3410 E 01	1 775E 02
397		0 34600E 01	0 15525E 02
398		0 3510CE+01	0 1 712E 02
399	+	0 356 0E 01	0 1 896E 02
400		0 36100E 01	0 16075E+02
401		0 366 0E+01	16249E+02
402	+	37100E+ 1	90336E+01
403		0 3760CE 01	10612E+02
404		0 381 0E 1	0 12926E 02

```
405            386  E  1      13218E 02
406            391  E 01    0 12166E 02
407          0 396 CE 01    0 74159E 01
4 8     +    0 4 1  E  1    0  6820E 01
409          0 40600  01    0 6209 E 00
410            411 0E+ 1      2 6 9E 02
411            416  E  1    0 68 81E 01
412          0 42100E 01      365 7E 01
413            4 6  E  1      89103E  1
414            428 0E 01    0 60479E 00
415            4330 E 01      12481E 02
416          0 438 0E  1      11405E 02
417          0 44300E 01    0 97032E 01
418            44 0 E  1      1293 E 02
419          0 45   E  1      1413 E  2
420            456 0   1      13541E 02
421          0 463  E  1      1106 E
42           0 46800E 01    0 1434 E 02
423            473 0E  1      122 1E 02
424            478 0E 01      12618E 02
425     +    0 483 0E 01    0 10 32E 02
426          0 488  E  1      104  E 02
427     +    0 493 0E  1      79785E 01
428            498 0E 01      899 9E 01
429            503 0E  1      1 28 E 02
430     +    0 50800E 01    0 10789E 02
431          0 513 0E  1      11190E 02
432          0 515 0E 01      1 971E 02
433          0 52000E 01    0 10681E 0
434          0  2   E+01    0 1 674E 02
43      +    0 53   E 01      1089 E 02
436          0 535 0E  1      1 443E 02
437     +    0 540  E+ 1      1 589E 02
438          0 54 00E 01    0 10391E 02
439          0 55  0E  1      10504E 02
440     +    0  55 0E 01      10413E 02
441          0 56000E 01    0 95802E 01
442          0 565  E 01       74 6E  1
443     +    0 57   E  1    0 93492E 01
444          0  75 0E 01      91890E 01
445            58   E  1      97892E 01
446          0 58500E 01    0 98411E 01
447          0  9   E 01       3025E 01
448          0 595 0E 01    0 91286E  1
449          0 60000E 01    0 86804E 01
450          0 602 0E+01      82174E 01
451     +    0 6 7 0E 01      72507E  1
452          0  1200E+ 1      79429E 01
453          0 6170 E  1    0 86450E 01
454          0 62200E 01    0 79957E 01
45           0 627  E 01    0 81387E 01
456     +    0 632 0E  1    0 85150E 01
457          0 63700E 01    0 82804E 01
458            642  E  1    0 7915 E 01
459          0 647  E  1      7896 E 01
460            652  E 01    0 75 78E 01
461            657 0E+ 1    0 82152E 01
462     +    0 66200E 01    0 81463E 01
```

463		0 667 0E+01	0 79558E+01
464		0 67200E+01	83922E 01
465	+	0 677CCE 01	80226E 01
466	+	0 68200E+01	0 8 796E+01
467		0 68700E+01	0 8 753E+01
468	+	0 689 0E+01	0 90443E 01
469	+	0 69400E+01	0 72069E 01
470	+	0 69900E+01	0 62454E+01
471	+	0 70400E 01	0 69575E 01
472	+	0 70900E+01	0 67696E 01
473	+	0 71400E+01	0 65655E 01
474	+	0 71900E+01	0 63249E 01
475	+	0 72400E+01	0 61998E 01
476	+	0 729 0E+01	0 6 3 5E+01
477	+	0 73400E+01	0 68559E 01
478		0 73900E 01	0 71537E 01
479	+	0 74400E+01	0 73591E 01
480		0 74900E 1	72939E+01
481		0 75400E+01	0 71382E 01
482	+	0 75900E+01	0 72971E 01
483	+	0 76400E 01	0 73856E 01
484	+	0 769 0E 1	0 751 3E 01
485		0 77400E 01	0 75340E 01
486		0 77600E 1	0 74528E+01
487	+	0 78100E+01	0 75170E 01
488	+	0 78600E 01	0 71275E+01
489	+	0 79100E+01	0 56145E+01
490	+	0 79600E+01	0 56371E 01
491		0 8 1 0E 01	82365E 01
492	+	0 80600E+01	0 91041E+01
493	+	0 81100E+01	0 93021E+01
494		0 816 0E 01	0 94572E 01
495		0 82100E 01	0 89739E+01
496		0 82600E 01	0 89323E+01
497	+	0 83100E+01	0 92391E 01
498		0 83600E+01	0 91441E 01
499		0 84100E 01	0 91316E 01
500	+	0 84600E 01	92102E 01
501	+	0 85100E 01	0 88583E+01
502		0 85600E 01	0 83241E+01
503	+	0 86100E+01	0 82126E 01
504		0 86300E+01	0 82460E 01
505		0 86800E+01	82396E 01
506	+	0 87300E 01	0 78543E+01
507		0 87800E 01	0 76029E+01
508		0 88300E 01	0 72958E 01
509		0 88800E 01	70039E 01
510		0 893 0E+01	0 71056E+01
511	+	0 89800E 01	0 72277E+01
512	+	0 90300E 1	72536E 01
513	+	0 90800E+01	0 71416E 01
514		0 91300E 01	0 72902E 01
515		0 91800E+ 1	0 63796E 01
516	+	0 92300E+01	0 61680E 01
517		0 92800E 1	0 60703E 01
518	+	0 933 E 01	59761E 01
519		0 93800E 01	0 58870E 01
520	+	0 94300E+01	0 58254E 01

```
 +      9480CE  1     0 58641E 01
 +      95 00E  1     0  882 E 01
       0 95500F 01     0  7696E 01
 +     0 96000E+ 1     0 48844E 01
 +     0 96  0E  1     0 49904F+01
 +     0 97000E+01       50299E 01
       0 97500E  1     0 50628E+ 1
       0 98000E 01     0 49332E 01
       0 98500F+01       48504E+01
 +     0 9900 E+ 1     0 48778E 01
       0 99500E 01     0 48194E 01
       0 10000E 02     0 48494E 01

*  THESE SURFACE TEMPERATURES WERE TAKEN FROM THE FOLLOWING TAPE
*//GO FT01F001 DD DSN-PINSIM LBZ BINTST TWO DISP-SHR
*//     LABEL (1 SL) UNIT=TAPE62 VOL=SER=025701
*  ON FEBRUARY 13  1979
   PINSIM VARIABLES ACCESSED
*
*  TTUB 1 5
600141
       0 00000E 00     0 62133E+03
       0 10000F- 1       62158E 03
 +       20000E-01     0 62196F+03
 +     0 3000 E-01     0 62 43E 03
       0 40000E-01       6L296E+ 3
 +     0 50000F-01     0 62355E 03
       0 6000 E-01     0 6244 E+03
 +       70000E-01     0 62 56E+03
       0 80000E-01     0 6 687E+03
 +     0 9 00 E-01     0 62831E 03
       0 100  F 00       62992E+03
       0 11000F 00     0 63169E+03
 +       120 0E  0     0 63363E+03
         13000E+00     0 63575E+03
 +     0 14000E  0     0 63807E+03
 +     0 150 0E+00       64061E+03
       0 16000E 00     0 64338E+03
       0 170 0E 00     0 64642E+03
 +     0 180 0E+00       64975E+03
       0 190 0E 00     0 65343E+03
       0 200 0E 00       65750E+03
 +     0 21000F+00     0 65825E+03
       0 22000F+00     0 65858E+03
 +     0 23000E 0      0 6 88 E+03
       0  4000E 00     0 65905E+03
       0 25 00E 00       65929E 03
 +     0 260 0E  0       65941E+03
 +     0 2700 E 00       65950E+03
 +       28   E+0        65959E 03
 +     0 29000E 00     0 65967E+03
 +     0 3000 E+ 0     0 65975E+ 3
 +       31000E+00     0 6598 E+03
       0 32000E+00     0 65994E+03
 +       33 0CE 00       66004E+03
 +     0 34000E+00       66012E+03
 +     0 35000E 00     0 66022E+03
 +     0 36 00E+00       66 04E+03
```

```
579          0 370  E 0        66009E 03
580     +    0 38000E+         66008E+03
581          0 39000E 0        66008E 03
582          0 400 0E          66006E+03
583          0 41000E 00     0 66012E 03
584     +    0 42000E 00       66015E 03
585          0 43  0E 0        66019E 03
586          0 44000E 00     0 66024E 03
587          0 4  00E 00       66027E 03
588          0 46  0E        0 66010E 03
589     +    0 47000  00     0 66012E 03
590            48000E  0       66 11E 03
591     +    0 49000E 00     0 66010E 03
592          0 5000 0E 00      66011E 03
593     +    0 51  0E+00     0 66013E 03
594          0 52000E 00     0 66017E 03
595            530  E+00     0 66021E 03
596          0 5400 E  0       66032E 03
597          0 550 0E+00     0 66013E 03
598          0 560  E 0        66 10E 03
599          0 57000E 00     0 66013E 03
600          0 580  E 0      0 66009E 03
601     +    0 59000E 0      0 66012E 03
602          0 60000E 00     0 66011E+03
603          0 61000E 0      0 6  12E 03
604          0 62   E 00       65998E 03
605     +    0 630 0E 00     0 65994E 03
606          0 64 00E 00        5999E 03
607          0 65000E 00     0 66002E 03
608     +    0 66  0E 00       66001E 03
609          0 67000E 0      0 66006E 03
610          0 68000E 00     0 66009E 03
611          0 6900 E 00     0 66012E 03
612          0 7 000E 00       65997E 03
613            710 0E 00     0 65999E 03
614          0 720 0E  0       66002E 03
615          0 73000E 00     0 65998E 03
616            7400 0E  0       6599 E 03
617          0 750 0E 0      0 65998E 03
618          0 76000E 00     0 66002E 03
619     +    0 77000E  0     0 66005E 03
620            780 0E 0      0 6 997E 03
621          0 79000E  0     0 660 0E 03
622          0 80  0E+ 0     0 6 05 E 03
623          0 81000E 00     0 66072E 03
624          0 82000E+ 0     0 66068E 03
625     +    0 830  E  0     0 66012E+03
626          0 84000E 00     0 65974E+03
627            850 0E 00     0 6 015E 03
628     +      860 0E  0       66044E 03
629     +    0 87000E+ 0     0 6606 E 03
630            980 0E  0     0 66054E 03
631          0 89000E 00     0 67477E 03
632            900 0E 00       67633E 03
633          0 91  0E        0 67724E 03
634          0 92000  00     0 67794E 03
635            93000E 00     0 67869E 03
636            94 00E 00       66936E+03
```

```
637          0 95000E 00    0 6792 E 03
638          0 96000E 00    0  7983E 03
639            970  E  0      680 3 +03
640          0 98000E 00    0 68021E+03
641     +    0 99 00E  0      68025E+03
642          0 10  0E 01      680 7E+03
643          0 10100E 01    0 68086E+03
644          0 1 2 0E  1      68102E+03
64      +    0 103 0E 01      68133E+03
646          0 10400E  1    0 68149E 03
647          0 105 0E 01    0 681 8E 03
648          0 10600E 01    0 68164E+03
649          0 1 70 E 01      68161E+03
650          0 1 8 0E  1    0  816 E 03
651          0 10900E 01    0 68200E 03
652          0 11 00E 01      68210E 03
653          0 111  E 01       3215E 03
654          0 112  E 01    0  8199E 03
655          0 113  E+ 1      68194E+03
656          0 11400E 01    0 68193E 03
657          0 115  E  1      68201E+03
658     +    0 11600E  1    0 684 5E+03
659     +    0 11700E 01    0 68949E 03
660          0 118  E 01      69736E+03
661          0 119  E  1    0 70355E 03
662          0 12000E 01    0 738 4E+03
663          0 12100E 01    0 71360E+03
664          0 12200E+01    0 71816E 03
665          0 12300E 01      72253E+03
666          0 12400E 01      72639E+03
667     +    0 12500E 01    0 72990E 03
668          0 126  E  1      73398E+03
669     +    0 1270 E 01      73865E 03
670          0 1 8 0E 01    0 74247E+03
671     +      129 0E 01      74588E+03
672     +    0 13000E 01    0 74936E 03
673          0 131 0E+01    0 75348E+03
674          0 132 0E 01    0 75808E 03
675     +    0 13300E 01    0 76175E 03
676     +    0 13400E 01    0 76607E 03
677     +    0 1350 E+01      76882E 03
678          0 1360 E 01      77110E 03
679          0 137 0E 01      77398E 03
680          0 13800 +01    0 77718E+03
681     +    0 13900E 01      78102E 03
682     +    0 14000E+01      73 90E 03
683          0 14100E 01    0 78814E 03
684          0 142 0E 01      79069E+03
685     +    0 143  E 01      79305E 03
686          0 144  E 01    0 79563E 03
687     +    0 145 0E  1    0 79857E 03
688          0 14600E 01    0 80163E 03
689     +    0 14700E  1    0 80452E 03
690     +    0 14800E 01    0 80738E+03
691          0 14900E 01    0 80967E 03
692          0 150 0E 01      81216E 03
693     +      151 0E 01      81 61E 03
694          0 152 0E 01      8191 E 03
```

```
695    +    0 153 0E 01      82243E 03
696    +    0 15400E 01      82597E 03
697         0 15500E 01    0 82933E 03
698         0 15600E 01    0 83290E 03
699    +    0 15700E+01    0 83656E 03
700    +    0 15800E+01    0 84031E+03
701    +    0 15900E 01    0 84398E 03
702    +    0 16000E 01    0 84731E 03
703    +    0 161 0E 01      85031E 03
704    +    0 162 0E 01    0 85307E 03
705         0 16300E+01    0 85580E 03
706         0 164 0E 01    0 85888E 03
707    +    0 16500E+01    0 86213E+03
708         0 16600E 01    0 86562E+03
709         0 16700E 01    0 86876E+03
710    +    0 168 0E 01      87178E 03
711         0 169 0E 01    0 8744 E 03
712    +    0 17000E+01      87677E 03
713    +    0 17100E+01    0 87919E 03
714    +    0 17200E+01    0 88155E  3
715    +    0 17300E 01    0 88398E 03
716         0 17400E 01    0 88641E+03
717    +    0 175 0E+01    0 88891E+03
718    +    0 176 0E 01    0 89154E 03
719    +    0 17700E+01    0 89424E 03
720    +    0 17800E+01    0 89693E+03
721    +    0 17900E+01    0 89953E+03
722         0 18000E 01    0 90194E 03
723    +    0 18100E+ 1      90419E+03
724    +    0 18200E 01    0 90643E+03
725    +    0 18300E 01    0 90881E  3
726    +    0 18400E+01    0 91140E 03
727    +    0 185 0E  1    0 91423E 03
728         0 186  E+01    0 91724E  3
729         0 18700E 01    0 92043E 03
730         0 188 0E+01    0 92299E 03
731         0 18900E+01    0 92549E 03
732         0 19000E 01    0 9 843E 03
733    +    0 19100E 01      9308 E 03
734    +    0 192 0E 01    0 93322E 03
735    +    0 193 0E 01    0 93525E+03
736    +    0 194 0E+01      93788E+03
737         0 19500E 01    0 94041E+03
738    +    0 19600E 01    0 94248E+03
739         0 19700E 01    0 94484E+03
740         0 19800E 01    0 94748E 03
741    +    0 19900E 01    0 94967E+03
742         0 20000E+ 1    0 95188E+ 3
743         0 201 0E 01      95414E 03
744         0 20200E  1      95667E 03
745    +    0  0300E+01    0 95871E 03
746         0 204 0E+ 1    0 96105E 03
747    +    0 20500E+01    0 96315E+03
748         0  0600E 01    0 96542E 03
749         0 2070 E 01    0 96766E 03
750    +    0 208 0E  1      96995E 03
751    +    0 20900E 01    0 97230E+03
752         0 210  E+ 1    0 97461E 03
```

753	+	0 211 0E 01	0 97701E 03
754	+	0 21200E 01	0 97943E 03
755	+	0 21300E+01	0 98165E 03
756	+	0 21400E+ 1	0 98451E 03
757		0 21500E 01	0 98710E 03
758	+	0 21600E 01	0 98971E 03
759		0 21700E 01	0 99212E 03
760		0 21800E 01	0 99449E 03
761	+	0 21900E+01	0 99689E 03
762	+	0 22000E 01	0 99935E 03
763	+	0 221 0E 01	0 10018E 04
764	+	0 22200E+01	0 10041E+04
765	+	0 22300E 01	0 10063E 04
766	+	0 22400E 01	0 10083E 04
767	+	0 22500E 01	0 10104E 04
768	+	0 22600E 01	0 10126E 04
769	+	0 2270 E+01	0 10148E 04
770	+	0 22800E+01	0 10169E+04
771	+	0 22900E 1	0 10189E 04
772	+	0 23000E 01	0 10210E+04
773		0 23100E+01	0 10227E 04
774		0 23200E+01	0 10247E 04
775	+	0 23300E+01	0 10267E 04
776		0 23400E 01	10288E 04
777	+	235 0E 1	0 10306E 04
778		0 23600E 01	0 10323E+04
779	+	0 23700E 01	0 10340E 04
780	+	0 23800E 01	0 10360E 04
781	+	0 23900E+01	0 10380E 04
782	+	0 24000E+ 1	10401E 04
783	+	0 24100E 01	0 10420E 04
784		0 24200E+01	0 10439E 04
785	+	0 24300E 01	0 1046 E 04
786		0 24400E+01	0 10481E+04
787		0 24500E 01	10503E 04
788	+	0 24600E 01	0 10524E 04
789		0 24700E 01	0 10543E 04
790		0 24800E 01	0 10563E 04
791	+	0 24900E+01	10584E+04
792		0 25000E+01	0 10604E 04
793	+	0 25100E+01	0 10623E 04
794		0 25200E 01	0 10641E+04
795		0 25300E+01	0 10658E 04
796	+	0 25400E+01	0 10681E+04
797		0 25500E+01	0 10694E 04
798	+	0 25600E 01	0 10711E 04
799	+	0 25700E+ 1	0 10727E 04
800		0 25800E+01	0 10747E+04
801		0 25900E+ 1	0 10764E 04
802		0 26000E 01	0 10780E 04
803		0 26100E+01	0 10794E 04
804	+	0 26200E+01	0 10810E 04
805		0 26300E 01	0 10829E 04
806		0 26400E 01	0 10847E 04
807	+	0 26500E+01	0 10865E 04
808		0 26600E 01	0 10882E+04
809	+	0 26700E 01	10902E+04
810		0 26800E 01	0 10922E+04

```
811          0 26900E 01    0 10944E 04
812     +    0 27000E+01      10965E+04
813          0 27100E  1    0 1098 E+04
814     +    0 27200E 01    0 11004E+0
815          0 27300E 01      11024E 04
816          0 27400E+ 1    0 11043E+04
817          0 27500E 01      11061E 04
818     +    0 27600E  1      11077E 04
819     +    0  7700E+01    0 11092E 04
820     +    0 27800E  1      11108E  4
821          0 27900E+01      11126E 04
822     +    0 28000E 01    0 11143E 04
823     +    0 2810 E 01    0 11161E 04
824          0 28200E+01      11178E 04
825          0 2830 E  1      11195E 04
826          0 284 0E 01    0 11212E  4
827     +    0 28500E 01    0 11229E 04
828          0 286  E  1      11244E 04
829          0 28700E  1      11259E 0
830          0  9800E+01    0 11274E 04
831     +    0 28900E  1      11288E 04
832     +    0 290 0E 01      11303E 04
833          0 29100E 01    0 11317E 04
834          0 292  E  1    0 11331E 04
835     +    0 29300E 01    0 11346E+04
836          0 294 0E 01      11362E 04
837     +    0 29500E 01      1138 E 04
838          0 296 0E 01      11400E 04
839          0  9700E 01    0 11419E 04
840          0  9800E 01    0 11437E 04
841          0  99 0E  1      11454E 0
842            30000E+01      11471E 04
843          0 30100E+01    0 11488E 04
844          0 3 2 0E+ 1      115 4E 04
845            303 0E  1      11520E 04
846          0 304  E 01    0 115  E 0
847          0 305  E 01      115 0E
848          0 30600E 01    0 11566E 04
849          0 30700E  1      1159 E+04
850            3 8 0E  1      11 94E 04
851          0 30900E 01    0 11608E 04
852          0 31 0 E  1      11622E 04
853     +    0 311 0E  1    0 11636E  4
854          0 31200E 01    0 11649E 04
855            313  E  1    0 11662E 04
856          0 31400E 01    0 11 75E 04
857          0 31  0E 01      11687E 04
858          0 31600E+ 1      11699E 04
859          0 31700E 01    0 11712E 04
860          0 318 0E 01      11724E 04
861     +      31 0E 01       11737E 04
862          0 320 0E  1    0 11751E  4
863          0 32100E  1      11765E 04
864          0 32 00E 01    0 11779E 04
865          0 3 3 0E  1      11793E 04
866          0 3 4  E  1      11807E 04
867     +    0 3 500  01    0 118  E 04
868     +    0 32      01       11837E  4
```

```
869     +    0 32700E+ 1    0 11851E 04
870     +    0 3280 E 01    0 11865E  4
871     +    0 3 900E 01    0 11879E 04
872     +    0 33000E 01    0 11891E+04
873            3310 E+01    0 11904E 04
874          0 3320 E  1      11916E+04
875     +    0 333 0E  1      11928E 04
876          0 33400E+01    0 11941E 04
877          0 33500E+01    0 11954E 04
878     +    0 33600E 01    0 11968E 04
879     +    0 33700E+01    0 11983E 04
880          0 33800E  1    0 11997E 04
881     +    0 339 0E 01      12011E 04
882          0 34000E 01      12026E+04
883     +    0 34100E+01    0 12040E+04
884     +    0 34200E 01    0 12055E 04
885          0 34300E 01    0 12069E+04
886          0 344 0E 01      12083E 04
887     +    0 34500E+01    0 12096E 04
888     +    0 346 0E+01    0 1 110E 04
889          0 34700E 01    0 12124E+04
890          0 348  E+01    0 12137E+04
891          0 34900E+01    0 12151E+04
892     +    0 35000E+01    0 12164E 04
893     +    0 35100E+01    0 12177E 04
894          0 3520 E+01      12191E 04
895          0 35300E 01    0 12204E 04
896     +    0 354 0E 01    0 12217E+04
897          0 35500E+01    0 12230E  4
898     +    0 35600E 01    0 12243E+04
899     +    0 357 0E+ 1      12256E 04
900     +    0 35800E 01    0 12269E+04
901     +    0 35900E+ 1      12282E 04
902     +    0 36000E+01    0 12294E 04
903          0 36100E 01    0 12307E 04
904     +    0 36200E 01      1232 E+04
9 5            363 0E 01    0 12332E+04
906     +    0 364 0E+01    0 12345E 04
907          0 36500E+01    0 12357E 04
908     +    0 36600E+01    0 12369E 04
909          0 367 0E+01    0 12389E 04
910          0 36800E+01      12405E 04
911          0 36900E 01    0 12418E 04
912          0 37  0E+01    0 12432E 04
913     +    0 37100E+01      12451E+04
914          0 37200E+01    0 12467E 04
915     +    0 37300E 01    0 12483E+04
916     +    0 37400E+01    0 12499E+04
917          0 37500E 01    0 12513E 04
918     +    0 37600E+01    0 12527E 04
919          0 37700E 01    0 12542E+04
920     +    0 378 0E+01    0 12556E+04
921     +      37900E+01    0 12570E 04
922     +    0 38000E 01    0 12582E+04
923     +    0 38100E+01    0 12594E+04
924          0 38200E 01    0 12606E 04
925          0 38300E+01    0 12618E 04
926     +    0 38400E+01    0 12630E 04
```

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927     +     0 38500E+01     0 12643E 04
928           0 38600E+01     0 12656E+04
929           0 3870 E  1       12669E+04
930           0 38800E 01       12681E 04
931     +     0 38900E 01     0 12695E+04
932           0 3990 E 01       12709E 04
933     +     0 39100E 01     0 12723E 04
934           0 392 0E 01       12736E 04
935           0 39300E 01       12751E 04
936           0 39400E+01     0 12764E 04
937             395 0E 01     0 12776E 04
938             39600E+ 1     0 12797E  4
939           0 39700_  1     0 12818E 04
940             398 0E  1     0 12836E 04
941           0 39900E+01     0 12849E 04
942             400 0E+01     0 12868E 04
943     +       4 1 0L 01     0 12882E 04
944           0 40200E 01     0 12902E 04
945     +     0 40300E 01     0 12921E 04
946           0 4 4  E  1       1294 E 04
947           0 40500E 01     0 12959E 04
948           0 4 60 E+01       12978E 04
949           0 40700E 01     0 12995E+04
950           0 4080 E 01     0 13039E 04
951           0 409  E 01     0 13025E 04
952           0 41000E 01     0 13039E+04
953     +       41100E  1       13023E 04
954           0 4120 E  1     0 12998E+04
955             41300E 01       12998E 04
956           0 41  0E 01     0 13302E+04
957     +     0 41500E 01     0 13032E 04
958           0 41600E 01     0 13064E 04
959     +       41700E  1       13075E 04
960           0 41800E 01     0 13082E 04
961     +     0 419  E  1       13 84E 04
962           0 420  E 01       13097E 04
963           0 4210 E 01       13126E 04
964     +       4 20 E+ 1       131 2E 04
965           0 42300E 01     0 131 8E 04
966           0 424 0E  1       13161E+04
967           0 4 5  E+01     0 131 5E 04
968           0 42600E 01     0 13184E 04
969             427  E  1       13206E+04
970             428  E 01       13229E 04
971           0 429    + 1       13249E 04
972           0 43000E  1       13266E+04
973           0 43100E 01     0 13279E 04
974             432  E+ 1     0 13287E 04
975             433  E 01       13291E 04
976           0  3400E+01     0 13295E+04
977             43 00E 01       13303E 04
978           0 436  E  1     0 1331 E+04
979           0 437C E 01       13329E+04
98            0 438  E  1       13341E 04
981           0 43900E 01     0 13351E 04
982     +       44  0E  1       13363E+04
983             44100E 01       1337 E 04
984           0 44200E 01     0 13388E+04
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 985          0 44300E+01    0 13401E 04
 986     +    0 444 0E 01    0 13413F 04
 987          0 44500  01      1342 F 04
 988          0 446 0E  1    0 13432E 04
 989          0 447 0E  1      13442E 04
 990     +    0 44810E 01    0 13451E 04
 991          0 44900F 01    0 13463F 04
 992          0 450 0F  1    0 13 73F 04
 993     +    0 4 100E+01    0 13482E 04
 994            452 0E 01      13491E 04
 99      +    0 4530 E 01      13500E 04
 996          0 454  F 01    0 13509E 04
 997     +    0 455  E  1    0 13518E 04
 998          0 45600E 01    0 13528E 04
 999          0 457 0E 01    0 13538E 04
1000     +      45800E 01    0 13548E 04
1001     +    0 45900E+01    0 13559E 04
1002     +    0 46000E  1    0 13570E 04
1003          0 46100E 01    0 13 83E 04
1004          0 462 0E 01    0 13595E 04
1005     +      463 0E  1      13606E 04
1006          0 46400E 01    0 13616E 04
1 07          0 465 0E  1    0 13625E 04
1008          0 46600E  1    0 13632E 04
1009     +    0 46700E 01    0 13640E+04
1010          0 46800E  1      13649E 04
1011          0 46900E  1    0 13658E 04
1012     +    0 470 0E 01    0 13668E 04
1013     +    0 471 0E 01    0 13679E 04
1014     +    0 47200E+01    0 13690E 04
1015          0 473 0E  1    0 13700E 04
1016     +    0 47400E 01      13711E 04
1017     +    0 47500E 01    0 13721E 04
1018     +    0 476 0E  1    0 13730E 04
1019     +    0 47700E 01      13740E  4
1020          0 47800E  1    0 13749F 04
1021          0 47900E  1    0 13759E+04
1022     +    0 48000E 01    0 13770F 04
1023          0 48100E 01      13781E 04
1024            4820 E  1    0 13793F 04
1025          0 48300E 01    0 13804E 04
1026          0 484 0E 01    0 1381 E 04
1027            485 0E 01      13825E 04
1028          0 48600E  1    0 13835E+04
1029          0 48700E+ 1    0 13845E 04
1030          0 48800F 01    0 13856E+04
1031     +    0 48900E+ 1    0 13867E+04
1032          0 49000E 01    0 13879E+04
1033     +    0 49100E 01    0 13891E 04
1034          0 492  E  1    0 13903E 04
1035     +    0 49300F 01      1391 E 04
1036          0 49400E 01    0 13927E+04
1037          0 49500F+01    0 13938E 04
1038     +    0 49600E 01    0 13949F+04
1039     +    0 4970 E 01    0 13959F 04
1040          0 49800E+ 1    0 13969E+04
1041     +    0 49900F 01    0 13979E 04
1042          0 50000F 01    0 13989E+04
```

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1043          0 5010 E+01    0 13999E 04
1044          0 502 0E  1      14009E 04
1045          0 50300F 01    0 14018E 04
1046     +    0 5 400F 01    0 14028E 04
1047          0 5050 E 01    0 14038E 04
1048          0 50600F 01    0 140 7E+ 4
1049          0 50700E+01      14057E 04
1050          0  0800F+01    0 14066E+04
1051            509 0E+01    0 14075E+04
1052             1000E+01      14084E+04
1053          0 51100F  1    0 14093E 04
1054          0 512  E+ 1      14103E+ 4
1055          0 51300E+01    0 14112E 04
1056            5140 E 01      14121E+04
1057     +    0 515 0E+ 1      14131E 04
1058          0  1600E+01    0 14140E 04
1059          0 5170 E  1      1415 E 04
1060          0 51800E  1    0 14159E+04
1061          0 51900E 01    0 14169E 04
1062     +      520 0E  1    0 14178E 04
1063     +    0 52100E 01    0 14187E 04
1064          0 52200E  1    0 14197E 04
1065     +    0 52300E  1    0 14206E+04
1066          0 52400E 01    0 14215E 04
1067          0 525 0E  1    0 14224E 04
1068          0 526 0E  1      14233E 04
1069          0 527 0E 01    0 14242E 04
1070     +      528 0E  1    0 142 1E 04
1071     +    0 52900E 01    0 14  0E+04
1 72          0  30 0E  1    0 1426 E+04
1073     +    0 5310 E 01    0 14 78E+04
1074          0 53200E 01    0 14287E 04
1075     +    0 53300E+01    0 14296E 04
1076     +    0 534 0E  1    0 143 5E 04
1077          0 53500E+ 1    0 14315E 04
1078          0 536  E  1    0 14324E+ 4
1079          0 53700E+01    0 14333E 04
1080          0  38  E 01    0 14342E 04
1081          0 5390 E  1    0 14351E 04
1082          0 54000E 01    0 14360E 04
1083          0 541 0E  1      143 8E+04
1084          0 5420 E+01    0 14376E 04
1085          0 54300E 01    0 14385E 04
1086     +    0 5440 E+ 1      14394E 04
1087          0 54500E 01    0 14403E 04
1088          0 54600E  1    0 14413E 04
1089            54700E 01    0 14422E 04
1090          0 54800E+01    0 14430E 04
1091          0 5490 E 01    0 14438E 04
1092          0 550  E  1    0 14447E 04
1093          0  51 0E 01    0 1445 E 04
1094          0 5 2 0E  1    0 14463E 04
1095          0 55300E 01    0 14472E 04
1096          0 554  E 01    0 14481E 04
1097            5550 E  1    0 14489E 04
1098          0 55600E 01    0 14499E 04
1099          0 55700E 01    0 14508E+04
1100          0 558  E 01    0 14517E 04
```

```
1101    +    0  590 E+ 1      14526E+04
1102         0 560 0E  1      14535E+04
1103         0 561 0E  1      14544E 04
1104         0 56200E 01    0 14553E 04
1105         0 56300E+ 1      14561E+04
1106         0 564  E  1    0 1457 E+04
1107         0 56 00E 01    0 14579E 04
1108         0 566  E+ 1      14587E+04
1109    +    0 567  E  1      14596E 04
1110         0 568 0E 01      14 05E+04
1111           5 90E 01       14614E 04
1112    +    0 57000E 01    0 14622E+04
1113         0 571  E 01    0 14632E+ 4
1114         0  72 0E  1    0 14641E+04
1115         0  7300E 01    0 14649E 04
1116         0 5740 E  1    0 146 8E 04
1117         0 5750 E+ 1    0 14607E 04
1118         0  760E 01       14675E+04
1119         0 577 0E+ 1    0 14684E 04
1120         0 57800E 01    0 14692E 04
1121            79  E  1      1470E+04
1122         0 580  E  1    0 14708E 04
1123         0  8100E 01    0 14716E+04
1124         0 582 0E  1    0 14724E+04
1125    +    0 5830 E+01      14732E+04
1126         0 58400E+ 1    0 14740E+04
1127         0 585  E  1      14749E+ 4
1128    +    0 58600E 01    0 14757E 04
1129         0 587 0E 01      14765E 04
1130         0 5880 E+01    0 14774E+04
1131         0 58900E 01    0 14782E 04
1132         0 59000E 01    0 14791E+04
1133           591 0E  1    0 14799E 04
1134    +      5920 E 01    0 14808E+04
1135            93  E  1    0 14916E+04
1136         0 594 0E+01    0 14824E+0
1137         0 5950E 01     0 14833E 04
1138         0 596  E  1    0 14841E+04
1139         0 59700E 01    0 14849E+04
1140    +    0 59800E  1    0 14858E+04
1141    +    0  99 0E  1    0 14866E+04
1142         0 600 0E 01      14875E+04
1143           601 0E+01      14883E+04
1144    +    0 60200E 01    0 14892E+04
1145         0 603  E+ 1      14901E+04
1146         0 604 0E 01      14910E+04
1147         0 60500E 01    0 14919E 04
1148         0 606  E 01    0 14929E  4
1149         0 607 E+ 1     0 14938E+04
1150           608 0E  1    0 14947E 04
1151         0 609  E  1      14955E+04
1152         0 61000E 01    0 14964E+04
1153            11  E  1      14972E 04
1154    +      612 0E  1      14980E+04
1155    +    0 61300E 01    0 14988E+04
1156    +      614 0E 01    0 14995E+ 4
1157           615  E 01    0 15002E+04
1158         0 6160 E 01      1  09E 04
```

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1159          0 61700E 01     0 15016E 04
1160          0 618 0   1     0 15023E 04
1161          0 619 0E+ 1     0 1 030E 04
1162          0 620 0E 01     0 15036E 04
1163     +    0 62100E 01     0 1 043E+04
1164          0 62200E 01     0 15049E 04
1165          0 623 0E 01       15056E 04
1166          0 62400E  1       15 62E+04
1167          0 625 0E 01       15 68E+04
1168          0 626  E+01     0 15074E 04
1169     +    0 62700E 01     0 15079E 04
1170          0 628 0E+01       15085E 04
1171          0 62900E 01       15091E 04
1172     +    0 63000E 01     0 15096E+04
1173     +    0 63100E  1       15102E 04
1174     +      632  E 01       15108E  4
1175          0 633 0E+ 1     0 15113E 04
1176     +      63400E 01       1 119E 04
1177     +    0 63500E+01     0 15125E 04
1178          0 636 0  01       1513 E 04
1179          0 63700E 01     0 15136E 04
1180          0 63800E+ 1     0 15142E 04
1181     +      63900E 01       15148E+04
1182          0 64  0E+01     0 1 1 4E 04
1183     +    0 641  E 01       151  E 04
1184          0 64200  01     0 15165E+04
1185          0 64300E  1       15171E 04
1186          0 644 0E 01     0 1 176E 04
1187          0 64500E 01     0 15182E 04
1188            646 0E  1     0 15188E 04
1189          0 647  E  1       15194E 04
1190          0 648 0 +01       15199E 04
1191     +    0 64900E 01       1520 E+04
1192          0 65000E 01     0 15 11E 04
1193          0 65100E 01     0 1521 E 04
1194          0 652 0E 01       1 222E 04
1195     +    0 65300E 01     0 15228E 04
1196          0 654 0E  1     0 1  33E 04
1197          0 655 0E 01     0 15238E 04
1198          0 65  0E 01       15243E 04
1199          0 657 0E+ 1       15249E  4
1200          0  5800E 01     0 15254E 04
1201          0 6 9  E  1     0 15259E  4
1202     +    0 660  E  1     0 152 4E 04
1203          0 66100E 01     0 15269E 04
1204          0 662 0E  1       1527 E 04
1205          0 663 0E 01     0 1528 E  4
1206          0 664  E 01     0 1528 E 04
1207          0 665 0E  1       1 291E 04
1208          0 66600E+01     0 15296E 04
1209          0 667 0E 01     0 15301E 04
1210            668 0  01     0 1530 E 04
1211          0 66900E 01     0 15311E+04
1212            670 0E 01     0 15316E 04
1213          0 671  E 01     0 1531E+04
1214          0 672 0E  1     0 15326E 04
1215          0 673 0 + 1       15331E  4
1216          0 67 00E 01     0 15336E 04
```

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1217            67500  01     0 1 341E+04
1218          0 676  E 01       1 346E+04
1219     +      677  E  1     0 153 1E+04
1220          0 67800E 01     0 1 357E 04
1221          0 679 0E  1     0 1 3 2E 04
1222          0 68 0 E  1     0 15367E+04
1223          0 681 0E 01       1 371E  4
1224             82  E  1     0 1 37(E 04
12 5          0 68300E 01     0 1 381E+04
1226          0 684  E 01     0 1 386E+04
1227     +    0 68 0 E  1       1 39 E+04
1228          0 68600E 01     0 1 395E+04
1229     +    0 687  E  1       15399E  4
1230            688  E 01       15 04E 04
1231          0 689      1       15403E+04
1232          0 69  0E  1       15 13E+04
1233          0 69100E 01     0 15418E+04
1234            692 0E  1       1 424E+04
1235          0 693  E+ 1       1 4 9E 04
1236          0 69400E 01     0 15435E+04
1237          0 695 0E  1     0 154 1E+0
1238          0 696  E 01       15446E+04
1239             9700E  1       1 4   +04
1240            698  E 01       15458E+04
1241          0 69900E 01     0 1 463E 04
1242     +    0 70  0E 01       1546 3E 04
1243          0 701 0E  1     0 1 473E+04
1244          0 70 00E 01     0 15478E 0
1245          0 70300E  1       1 4 3E+04
1246          0 704 0E 01       1 488E 0
1247            7 5 0E  1     0 1 493E+04
1248          0 706 0E  1     0 15498E 04
1249          0 70700E 01     0 15503E 04
1250     +    0 708 0E+01     0 15508E+ 4
1251     +    0 709  E  1       15513E+04
1252          0 71000E 01     0 15518E 0
1253            71100E  1       15524E+04
1254            71  0E 01       15 29E  4
1255     +      71300E  1     0 1 534E 04
1256          0 714 0E  1       15539E+04
1257          0 71500E 01     0 1 544E+04
1258          0 716  E  1       15549E+04
1259          0 717 0E  1     0 15554E+04
1260          0 71800E 01     0 1 560E 04
1261          0 719  E 01     0 15565E+04
126      +      720 0E  1       1 57 E 04
1263          0 72100E 01     0 1 575E 04
1264          0 722 0E  1     0 15580E+ 4
1265     +    0 72300E 01     0 15586E+04
1266          0 724 0E 01       15591E  4
1267            7250 E 01     0 15596E+04
1268     +    0 72600E 01     0 15601E+04
1269            727 0E  1       1 605E+ 4
1270            728  E 01       1561 E 04
1271          0 7 9  E 01       15615E+04
1272          0 73   E 01       1 620E+04
1273          0 73100E 01     0 156 5  04
1274     +    0 732 0E  1     0 1 630E+04
```

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1275          0 733 0E 01    0 1 634E 04
1276            734 0E 01    0 15639E 04
1277          0 73500E 01    0 15644E 04
1278          0 736 0E  1    0 15648E 04
1279          0 737 0E  1    0 1 6 3E 04
1280          0 73800E  1    0 15658E 04
1281          0 73900E+01    0 15662E 04
1282     +    0 74000E 01    0 1 667E+04
1283     +    0 74100E+01      15671E 04
1284     +      74200E+01    0 15676E+04
1285     +    0 74300E+01    0 15680E 04
1286          0 744 0E+01    0 15685E 04
1287     +    0 745 0E+01    0 15689E+ 4
1288          0 74600E 01    0 15694E 04
1289          0 74700E  1      15699E 04
1290     +    0 74800E 01    0 15703E 04
1291          0 749 0E 01      1 708E 04
1292          0 75  0E+ 1    0 15712E 04
1293          0 75100E 01    0 15717E 04
1294          0 75200E  1    0 15722E 04
1295          0 75300E 01    0 1 726E 04
1296          0 75400E  1    0 15731E 04
1297          0 75500E+ 1      1 736E 04
1298          0 75600E 01    0 15740E 04
1299          0 75700E 01    0 1 745E 04
1300          0 758 0E+ 1    0 1 749E+04
1301     +    0 75900E 01    0 15754E 04
1302          0 76  0E+01      15758E+04
1303     +    0 761 0E 01    0 1 762E 04
1304          0 7620 E 01    0 15767E+04
1305            763  E  1      15771E+04
1306          0 76400E+01    0 15776E 04
1307            76500E+ 1    0 15780E 04
1308            766 0E 01      1 784E 04
1309          0 76700E 01      15789E 04
1310          0 768 0E  1    0 15793E 04
1311     +    0 76900E+01    0 15797E+04
1312          0 77000E 01      15802E 04
1313          0 771 0E  1    0 1 806E 04
1314          0 77200E 01    0 15810E 04
1315            77300E 01    0 15814E+04
1316          0 77400E  1      1 819E 04
1317     +    0 775 0E+01      15823E 04
1318            77600E 01    0 15827E 04
1319          0 77700E 01    0 15832E 04
1320     +      778 0E 01      15836E  4
1321     +    0 7790 E 01    0 1 840E 04
1322          0 78000E 01    0 15844E 04
1323          0 78100E 01      15848E 04
1324     +      78200E 01      15853E 04
1325     +    0 783  E 01      158 7E 04
1326     +    0 784 0E  1      15861E 04
13 7          0 78500E 01    0 1586 E 04
1328     +      786 0E 01    0 15870E 04
1329     +    0 787  E  1    0 15874E 04
1330          0 78800E 01    0 15878E 04
1331          0 789 0E 01    0 15880E+04
1332     +    0 790 0E 01      1588 E 04
```

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1333          0 791      1     0 15892E 04
1334          0 79200   01     0 158 8E 04
1335          0 793 0E  01     0 1 903E 04
1336            794  E  1       1 900E  4
1337          0 79      01     0 1 913E  4
1338          0 796  E  1       1 917E  4
1339          0 797 0E  01     0 15921E 04
1340            798  E  1     0 15924E 04
1341          0 799 E  01       15927E 04
1342          0 80000E  01     0 15930E 04
1343          0 801     01       15933E 04
1344          0 8 2      1       1 936E  4
1345     +    0 803      1     0 15939E 04
1346            8 40 E  1       1 943E 04
1347          0 30500   01     0 1 946E 04
1348          0 80 0 E  1       15949E  4
1349            8070     1     0 159 2E  4
1350          0 80800E  01     0 159 6E 04
1351          0 809  E  1       159 9E 04
1352            81   E  1       15962E 04
1353          0 8110 E  01     0 159 6E 04
1354            81   E  01       1 9 9E 04
1355          0 81 00E  01     0 15972E 04
1356            814  E  01       15976E 04
1357          0 815  E  01       15979E 04
1358          0 81600E  01     0 1 982E 04
1359     +    0 817  E  01     0 1 98 E 04
136           0 819  E  01       15989E  4
1361            81900   01       15992E 04
1362          0 820 0E  1       15996E 04
1363          0 82100E  01     0 1 000E 04
1364          0 822 0E  1       16 03E 04
1365            823  E  01       16007E 04
1366          0 82400E  01     0 1 010E 04
1367          0 825 0   01       1 014E 04
1368          0 8260 E  01       16017E 04
1369          0 827 0   01       1 020E  4
1370          0 82800E  01       16024E  4
1371          0 82900   01     0 16027E 04
1372          0 830 0   01       16 30E 04
1373          0 83100E  01       16033E  4
1374          0 83200E  01     0 16037E 04
1375          0 8330 E  01       160 0E  4
1376            83   E  01       16043E  4
1377          0 83       1       16046E  4
1378          0 836 0E+01       16  0E 04
1379          0 83700   01       160 3E 04
1380     +    0 838 0E  01       16056E  4
1381            839  E  1       16060E 04
1382     +    0 84000E  01     0 16063E 04
1383          0  41  E  1     0 16066E 04
1384     +    0 842 0   01     0 16069E 04
1385     +    0 843 0    1       16 73E 04
1386          0 844 0   01       16076E 04
1387          0 84 00E  01     0 16079E 04
1388          0  46 0E  1     0 16 82E 04
1389     +    0 9470     1       16085E 04
1390          0 84800E  01     0 16089E 04
```

1391		0 84900E+01	0 16092E+04
1392	+	0 85000E 01	0 16095E 04
1393	+	0 85100E+01	16099E+04
1394		0 85200E 01	0 16102E+04
1395	+	0 85300E 01	16106E+04
1396	+	0 85400E 01	0 16109E+04
1397		0 85500E 01	0 16113E 04
1398	+	0 85600E+01	0 16116E+04
1399		0 85700E+01	0 16120E 04
140		0 85800E 01	0 16123E 04
1401		0 8590 E 01	0 16126E 04
1402		0 86000E 01	0 16130E+04
1403	+	0 86100E 01	16133E 04
1404		0 86200E+01	0 16137E 04
1405		0 86300E 01	16140E 04
1406	+	0 86400E+01	0 16143E 04
1407		0 86500E 01	0 16146E 04
1408		0 86600E+ 1	16150E 04
1409	+	0 867 0E+01	16153E+04
1410		0 86800E+01	0 16156E 04
1411		0 86900E+01	0 16160E 04
1412	+	0 87000E 01	0 16163E 04
1413		0 871 0E+ 1	0 16167E 04
1414	+	0 872 0E 1	0 16170E 04
1415	+	0 87300E 01	0 16174E 04
1416	+	0 874 0E 01	0 16177E+04
1417	+	0 8750 E 01	16180E 04
1418		0 87600E 1	0 16184E+04
1419	+	0 877 0E 1	0 16187E 04
1420		0 87800E+01	0 16191E+04
1421		0 879 0E+01	0 16194E 04
1422	+	0 88000E+01	0 16198E 04
1423	+	0 88100E 01	0 16201E 04
1424		0 88200E 1	0 16205E 04
1425	+	0 88300E 1	0 16208E 04
1426		0 884 0E+ 1	0 16212E+04
1427		0 8850 E 01	16 15E 04
1428	+	0 88600E 01	0 16219E 04
1429	+	0 8870 E+01	0 16222E 04
1430	+	0 88800E+01	0 162 6E+04
1431		0 88900E 01	0 16229E 04
1432	+	0 89000E+01	16233E 04
1433	+	0 89100E+01	16236E 04
1434		0 89200E+01	0 16240E+04
1435		0 8930 E 01	0 16243E+04
1436		0 89400E 01	0 16246E+04
1437		0 89500E 01	0 16250E+04
1438	+	0 896 0E 01	0 16253E+04
1439		0 89700E 01	0 16256E 04
1440	+	0 89800E 01	0 16259E 04
1441	+	899 0E+01	0 16263E 04
1442	+	0 900 0E 01	0 16266E 04
1443		0 9 1 0E 01	0 16269E+04
1444	+	0 90200E+01	0 16272E+04
1445		0 903 0E+ 1	0 16276E 04
1446		0 90400E 01	0 16279E+04
1447	+	0 90500E 01	0 16282E+04
1448		0 90600E 01	16286E 04

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1449          0 90700E 01    0 16289E+04
1450          0 908 0E 01    0 16292E+04
1451          0 90900E 01    0 16295E+04
1452     +    0 91 00E 01    0 16299E+04
1453          0 9110 E  1    0 1 302E+04
1454          0 91200E 01    0 16305E 04
1455            913  E 01      16308E+04
1456          0 91400E 01    0 16311E 04
1457     +    0 91500E 01    0 16315E+04
1458          0 9160 E 01    0 16319E+04
1459     +    0 91700E 01    0 163 2E+04
1460     +    0 91800E+01    0 16326E+04
1461     +    0 919 0E 01      16329E+ 4
1462          0 92000E  1    0 16333E+04
1463     +    0 92100E+01    0 16336E+04
1464          0 92200E 01    0 16340E+04
1465          0 923 0E  1    0 16343E+04
1466          0 924 0E+01    0 16347E+04
1467     +    0 92500E 01    0 16350E+04
1468     +    0 92600E  1    0 16354E+04
1469     +    0 927  E 01      163 7E 04
1470          0 92800E 01    0 16360E+04
1471          0 9290 E 01    0 16364E 04
1472          0 93000E 01    0 16367E+04
1473     +    0 931  E 01    0 16371E+04
1474     +    0 932 0E 01    0 16374E+04
1475     +    0 93300E 01    0 16377E+04
1476          0 9340 E+01    0 16381E 04
1477     +      935 0E 01      16384E+04
1478          0 936 0 +01    0 16388E+04
1479          0 9370 E 01    0 16391E+04
1480          0 93800E 01    0 16394E+04
1481     +    0 939  E 01    0 16398E+04
1482     +    0 94000E  1    0 16401E+04
1483          0 94100E 01    0 16404E 04
1484     +    0 942 0E 01      16408E+04
1485     +    0 943  E  1    0 1 411E+04
148           0 94400E 01    0 16414E+04
1487     +    0 945 0E+01    0 16418E+04
1488          0 94600E 01    0 164 1E+04
1489     +    0 94700E 01    0 16424E 04
1490     +    0 94800E 01    0 16427E 04
1491          0 94900E+01    0 16431E+04
1492            95000E 01    0 16434E+04
1493          0 95100E+01    0 16437E 04
1494          0 952 0E 01      16440E+04
1495          0 953  E 01    0 16444E 04
1496     +    0 95400E 01    0 16447E 04
1497     +    0 955  E  1    0 16450E+04
1498          0 9560 E 01    0 16 5 E+04
1499          0 95700E  1    0 16458E+04
1500            958 0E 01    0 16462E+04
1501     +    0 95900E 01    0 16465E+04
1502     +    0 96000E 01    0 16469E 04
1503          0 96100E 01    0 16472E+04
1504          0 96200E 01    0 16475E 04
1505     +      9630 E 01      16479E 04
1506          0 964 0E  1    0 16482E+04
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1507     +     0 965  E 01     0 16485E 04
1508     +     0 96600E+01     0 1648JE 04
1509     +       9670CE+01     0 16492E 04
151            0 96800E 01     0 1649 E 04
1511           0 969 0E 01     0 16499E+04
1512           0 9700 E  1     0 16502E+04
1513     +     0 97100E 01     0 16505E 04
1514     +     0 972 0E+01     0 1650JE+04
1515     +     0 973 0E+ 1     0 16512E 04
1516           0 97400E+01     0 16515E+04
1517     +     0 97500E 01       16519E+04
1518           0 97600E+01     0 16522E 04
1519     +     0 977C E 01     0 16 25E 04
1520     +     0 978  E+01     0 16528E 04
1521     +     0 97900E+01     0 16 32E 04
1522           0 980 E  1      0 1653 E 04
1523           0 9810 E  1       16 39E 04
1524     +     0 98200E 01     0 16542E 04
1525           0 983C E  1     0 16 4 E 04
1526     +     0 984CCE 01       16 49E+ 4
1527           0 985 0E 01       165 2E 04
1528           0 986  E  1     0 165 5E+04
1529           0 98700E 01     0 16 59E+04
153      +     0 98800E 01     0 16 62E+C4
1531           0 98900E 01     0 16 65E+04
1 32     +     0 99000E 01     0 16568E 04
1533           0 991 CE+01     0 16572E+04
1534     +     0 992  E 01       16 7 E C4
1535           0 993CCE 01     0 16578E 04
1536     +       9940 E  1     0 1658 E C4
1537     +     0 99500E 01     0 16535E 04
1538           0 996 CE  1     0 16538E 04
1539           0 997C E  1     0 16592E 04
1540     +     0 99800E 01     0 16595E 04
1541             999 CE  1     0 16598E 04
154              1C0  E 02       16601E 04
1543
1544      * *     *  *   ****** ***********  * *** * ** * *******     * * *
1545        REPLACEMENT CARDS
1546    *** * **  *  ** *** * * * ***   ***    **   * * ****   *** *** * ****
1547
1548
1549
1550
```

```
                    ----- DATA DECK DIAGNOSTICS - --

                    MINIMUM LENGTH OF TABLE ARRAY IN COMMON /SCRTCH/ IS   3288 WORDS

                    PROCESSING THE JOB CONTROL CARD

                    PROCESSING PROBLEM OPTIONS

                    PROCESSING PIN DATA

                    PROCESSING IDEAL SYSTEM DATA
+++++ ++ WARNING   CARD SERIES   600121 NO OF TABLE PAIRS SPECIFIED AT     400
         IS BEING RESET TO ACTUAL NO OF PAIRS FOUND IN INPUT =   207
++++ +++ WARNING   CARD SERIES   600141 NO OF TABLE PAIRS SPECIFIED AT     400
         IS BEING RESET TO ACTUAL NO OF PAIRS FOUND IN INPUT =  1001

                    INITIALIZING PIN PARAMETERS

                    PROCESSING EDIT OPTIONS

                    MINIMUM LENGTH OF DATA ARRAY IS      2424 WORDS

                    END OF INPUT DATA PROCESSING

                    NO FATAL DIAGNOSTICS
```

INITIALIZED INPUT DATA

----- GENERAL PROBLEM DATA -----

	SYSTEM FLAG
NUCLEAR	0
IDEAL ELECTRIC	-1
ACTUAL ELECTRIC	0

PROBLEM END TIME 1 000000D 01 SEC

TIME STEP CONTROL GROUPS

GROUP NO	BEGINNING TIME(SEC)	MINIMUM TIME STEP SIZE(SEC)	MAXIMUM TIME STEP SIZE(SEC)	STEP SIZE SEL FLAG
1	0 0	5 000000D-02	5 000000D-02	2
2	20 0000	5 00 0 D-02	5 00 00D-02	2

OUTPUT CONTROL

	ELAPSED NO OF TIME STEPS	ELPASED TIME	ROUTED TO DEVICE NO
MAJOR EDIT	0	0 100000D 01	6
MINOR EDIT	1	0 0	8
PLOT RECORD	C	C	I
RESTART RECORD	0	0 0	1

PROBLEM CONVERGENCE LIMITS

TYPE OF CALCULATION	MAX NO OF ITERATIONS	ALLOWED ERROR IN ENERGY BALANCE
STEADY-STATE CONDUCTION	499	0 100000D 00
TRANSIENT CONDUCTION	499	100000D 00
TRANSIENT BACK-CALCULATION CONDUCTION	499	0 100000D 00

IDEAL ELECTRIC SYSTEM INPUT DATA

----- IDEAL ELECTRIC SYSTEM DIMENSIONS -----

POWER CROSS REFERENCE FLAG	NUMBER OF FUEL PINS	NUMBER OF COOLANT CHANNELS
0	1	1

ORDERS OF INTERPOLATION

TABLE	ORDER
BACK-CALCULATION HEAT FLUX	2
BACK-CALCULATION TEMPERATURE	2

THE IDEAL ELECTRIC SYSTEM POWER IS BACK CALCULATED ON PIN NO 1 AT LEVEL NO 5

ELAPSED TIME BETWEEN SUCCESSIVE BACK-CALCULATION 0 000001-01 SEC

BACK-CALCULATION FILTER PARAMETERS

	LOW-PASS BREAKPOINT	HIGH-PASS BREAKPOINT	FILTER FLAG
HEAT FLUX	0	0 0	0
TEMPERATURE	0 0		
POWER		0 12 0D 03	4

SURFACE HEAT FLUX IS OBTAINED FROM THE FOLLOWING TABLE

----- SURFACE HEAT FLUX TABLE -----

TIME (SEC)	HEAT FLUX (BTU/HR-FT* 2)	TIME (SEC)	HEAT FLUX (BTU/HR-FT *2)	TIME (EC)	HEAT FLUX (BTU/HR-FT* 2)	TIME (SEC)	HEAT FLUX (BTU/HR-FT* 2)
0 0	0 976640D 02	0 500000D-01	0 914070D 02	0 100000D 00	0 7841 0D 02	0 1 00 CD 00	0 830070D 02
0 200000D 00	0 40385 D 02	0 250 00D 00	0 737160D 02	0 30 0 0D 00	84782CD 02	0 350 0 0D 00	989260D 02
0 400000D 00	92033 D 0	0 45 000D 00	0 922200D 02	0 00000D 00	0 928400D 02	0 55000CD 00	0 926540D 02
0 600000D 00	0 925390D 0	650000D 00	0 922 0 D 02	0 7 00 0D 0	0 92 65 D 02	0 750 D 00	0 916860D 02
0 800000D 00	0 384270D 02	0 850000D 00	0 904160D 02	0 900000D 00	0 216390D 01	0 9500 CD 0	0 700380D 0
0 100000D 01	0 12 290D 01	0 105000D 01	0 773030D 00	0 110 0D 1	0 128780D 01	0 11 00CD 01	0 196820D 01
0 12 000D 01	0 34710 D 01	125 0 D 01	0 766010D 01	0 1300 D 01	0 8885 0D 01	0 13 0 0D 01	1 7310D 02
0 140000D 01	0 984040D 01	0 145000D 01	0 191510D 02	0 150000D 01	0 226250D 02	0 1550 00 01	0 1 5050D 02
0 160000D 01	0 721770D 01	0 165000D 01	0 1 0550D 02	0 167000D 01	0 88727 D 01	0 172000D 1	0 170230D 02
0 177000D 01	0 168540D 02	0 182000D 01	0 196020D 02	0 187000D 01	0 1159 D 02	0 192000D 01	0 147310D 02
0 197000D 01	0 165610D 02	20200 D 01	0 160560D 02	0 207000D 01	0 174830D 02	0 21 00D 1	0 155560D 02
0 217000D 01	0 119490D 02	222000D 01	0 118580D 02	0 2270 0D 01	0 138790D 02	0 232 0D 01	165060D 02
0 237000D 01	0 192420D 02	0 242000D 01	0 172120D 02	0 247000D 01	0 149870D 02	0 252000D 01	0 158770D 02
0 254000D 01	0 132080D 0	0 2 9 00D 01	0 173850D 02	0 2640 0D 1	0 17655 D 02	0 269000D 01	0 135860D 0
0 274000D 01	0 125 90D 02	0 279000D 01	0 155430D 2	2840 0D 01	0 151910D 02	2890 D 01	0 179780D 02
0 294000D 01	0 176840D 02	0 299000D 01	0 137030D 02	0 304 0 D 1	0 150160D 02	0 3090 D 01	0 169740D 02
0 314000D 01	0 19021 D 02	319 00D 1	0 198930D 02	0 3240 0D 1	0 178240D 02	0 329 0D 01	172390D 0
0 334000D 01	0 185320D 02	0 339000D 01	0 164160D 02	0 341000D 01	0 157750D 02	0 34600 D 01	0 155250D 02
0 351000D 01	157120D 02	35600 D 01	0 158960D 02	0 361000D 01	0 16075 D 0	0 366 D 1	0 162490D 02
0 371000D 01	0 20336 D 01	0 376000D 01	0 106120D 02	0 3810 0D 01	0 129260D 0	0 386000D 01	0 132180D 02
0 391000D 01	0 121600D 02	0 396000D 01	0 741590D 01	0 401000D 01	0 668200D 01	0 40600CD 01	620920D 00
411 00D 01	0 22649 D 02	0 416000D 01	0 680810D 01	0 4210 0D 01	0 365470D 01	426000D 01	0 881030D 01
0 428000D 01	0 604790D 00	0 433000D 01	0 124810D 02	0 438 0D 01	0 114050D 02	0 44 00CD 01	0 970320D 01
0 448000D 01	0 12930 D 0	0 453000D 01	0 141300D 02	0 458 D 01	0 135410D 02	0 463000D 01	0 110600D 02
0 468000D 01	0 143450D 02	0 47300 D 01	0 122010D 02	0 478000D 01	0 1 6180D 02	0 483000D 01	0 104320D 02
0 488000D 01	0 104270D 02	0 493 00D 01	0 797850D 01	0 4980 D 1	0 899290D 01	0 0300CD 01	0 102800D 02
0 508000D 01	0 107890D 02	0 513000D 01	0 111900D 02	0 5150 0D 1	0 109710D 02	0 520000D 01	0 106810D 02
0 525000D 01	0 106740D 02	0 530000D 01	0 108900D 02	3500 D 01	0 104430D 02	0 40 00D 1	0 105890D 02
0 545000D 01	103930D 0	0 550000D 01	0 105040D 02	0 555000D 01	0 104130D 02	0 560000D 01	0 958020D 01
0 565000D 01	0 97406 D 01	0 570000D 01	0 934920D 01	0 575000D 01	0 918900D 01	0 580000D 01	0 978920D 01
0 585000D 01	0 984110D 01	0 590000D 01	0 9302 0D 01	0 5950 0D 01	0 912860D 01	0 6000 0D 01	0 868040D 01
0 602000D 01	0 821740D 1	0 607000D 01	0 725070D 01	612000D 01	0 794290D 01	0 617000D 01	0 864500D 01
0 622000D 01	0 799570D 01	0 627000D 01	0 813870D 01	0 63200 D 01	0 851500D 01	0 637000D 01	0 828040D 01
0 642000D 01	0 791550D 01	647000D 01	0 789600D 01	0 652 00D 01	0 759780D 01	0 657000D 01	821520D 01
0 662000D 01	0 814630D 01	0 667000D 01	0 795580D 01	0 672000D 01	0 839220D 01	0 677000D 1	0 802260D 01
0 682000D 01	0 827960D 01	0 687000D 01	0 857530D 01	0 692000D 01	0 904430D 01	0 69 0 0D 01	0 720690D 01
0 699000D 01	0 824540D 01	704000D 01	0 695750D 01	0 709000D 01	0 676960D 01	0 714000D 01	0 656550D 01
0 719000D 01	0 632490D 01	0 724000D 01	0 61998 D 01	0 729000D 01	0 653550D 01	0 734000D 01	0 685590D 01
0 739000D 01	0 715570D 01	0 744 00D 01	0 735910D 01	0 7490 0D 01	0 729390D 01	0 7540 0D 1	713820D 01
0 759000D 01	0 729710D 01	0 764000D 01	0 738560D 01	0 769000D 01	0 751530D 01	0 774000D 01	0 753400D 01

----- SURFACE HEAT FLUX TABLF -----

TIME (SEC)	HEAT FLUX (BTU/HR-FT _)	TIME (SEC)	HEAT FLUX (BTU/HR-FT**2)	TIME (SEC)	HEAT FLUX (BTU/HR-FT 2)	TIME (SEC)	HEAT FLUX (BTU/HR-FT* 2)
0 776000D 01	0 745280D 01	0 781000D 01	0 751700D 01	0 786 0D 1	0 7127 0D 1	0 791 0D 01	0 561450D 01
0 796000D 1	0 63710D 01	801000D 01	0 823650D 01	0 806000D 01	0 910410D 1	0 811000D 01	0 930210D 01
0 816000D 01	0 945720D 01	0 821000D 01	0 897390D 01	0 826000D 1	803230D 01	0 831 0 D 1	0 923910D 01
0 836000D 1	0 914410D 01	0 841000D 01	0 91316 D 01	0 846 0D 01	0 92102 D 01	851000D 01	0 885830D 01
0 856000D 01	0 832410D 1	0 8610 D 1	0 821260D 01	0 863000D 01	0 824600D 01	0 68000D 01	0 823960D 01
0 873000D 01	0 78543 D 01	8780D0D 01	0 7 0290D 01	0 883000D 01	0 729580D 01	0 888000D 01	0 700390D 01
0 893000D 01	0 710560D 01	0 89800 D 1	0 722770D 01	0 903 0D 01	0 725360D 01	0 908000D 01	0 7141 0D 01
0 913000D 01	0 729020D 01	0 918000D 01	0 63706 D 01	9 30 0D 01	0 616800D 1	0 280 D 01	607030D 01
0 933000D 01	0 59761 D 01	0 938000D 01	0 588700D 1	0 943 D 01	0 82540D 01	0 94800 D 01	0 586410D 01
0 950 00D 01	0 58825 D 01	0 955000D 01	0 576960D 01	0 960000D 01	0 488440D 01	0 965000D 01	0 499040D 01
0 970000D 01	0 502990D 01	0 97500 D 01	0 06280D 01	0 980 0D 01	0 493320D 01	985 0D 01	0 480040D 01
0 9900 0D 01	0 487780D 01	0 99 000D 01	481940D 01	0 1000000 02	0 484940D 01		

THE SURFACE HEAT TRANSFER COEFFICI NT OPTION IS IRRELEVANT

THE PIN SURFACE TEMPERATURE IS OBTAINED FROM THE FOLLOWING TABLF

----- TEMPERATURE TABLE -----

TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)
0 0	0 62133 D 0	0 1 0000D-01	0 621580D 03	2000 D 01	621960D 0	3 000D- 1	0 622430D 03
400 00D-01	0 2 96 D 3	500 00D-01	0 62355 D 03	0 00000D 01	0 6244 0D 03	0 700000D 01	0 62 560D 03
0 800000D-01	0 626870D 03	9 000D-01	0 62831 D 03	10 00 D	0 629920D 3	11 00 D 0	0 6 1690D 03
0 1200 0D 00	0 633 3 0 0	0 13 0 D 0	0 635750D 03	0 1 0000D 0	0 638070D 0	1 00 0D 0	0 6 0610D 03
0 160000D 00	0 643380D 03	0 170000D 00	0 646420D 03	0 180000D 00	0 649750D 03	0 190000 0	653430D 03
0 200000D 00	575 0D 3	0 21000 D 00	0 6582 D 03	22000 D 0	0 65858 D 03	0 23 0 0D	0 658850D 03
0 24 0 0D	0 65905 D 3	0 250000D 00	0 659290D 03	0 2 0000D 00	0 659410 0	0 27000 0 00	0 659500D 03
0 280000D 00	0 659590D 03	0 90 00D 00	659670D 03	3000 0D 0	0 6597 0D 03	0 310 0D 00	0 659850D 03
0 32 000D 00	0 65994 D 3	33 D 00	66 0 0D 03	340 D 00	0 6601 0D 3	35 0 D	660220D 03
0 360000D 00	0 660040D 03	0 370000D 00	0 660090D 03	0 380000D 00	0 660 80D 03	0 90 0D 0	660080D 03
0 400000D 00	0 66006 D 0	410 D 00	0 6601 D 03	00 0D 00	0 660150D 03	30 D	0 660190D 03
0 440 00D	0 66 240D 03	0 450000D 00	0 660270D 03	0 4 000 D 00	0 660100D 03	0 470000D 00	0 660120D 03
480000D 00	0 66 11 D 03	0 49000 D 00	0 6601 0D 03	0 500 D 00	0 660110D 3	1 00D	0 60130D 03
0 520000D 00	0 66017 D 03	0 30000D 00	0 660210D 03	0 40 D 00	66 32 D 3	0 550000D 00	0 660130D 03
0 560000D 00	0 660100D 03	0 570000D 00	0 660130D 03	580000D	0 66009 D 03	0 59 0 0D 0	0 660120D 03
0 600000D 00	0 66 110D 03	0 610000D 00	0 660120D 03	0 6 0 0D 00	0 6 990D 03	6300 0 0	0 659940D 03
0 640000D 00	0 659990D 03	0 6 0000D 00	0 6600 0D 03	0 660000D 00	0 660010D 03	0 67 0D 0	0 6600 0D 03
0 680000D 00	0 660090D 03	90000D 0	0 660120D 03	0 700 00D 00	0 659970D 03	71 0 D	0 659990D 03
0 720000D 0	0 660 20D 03	0 7300 0D 00	0 65998 D 03	740 0D 00	0 659960D 03	0 7 000D 00	0 659980D 03
0 760000D 00	0 660020D 03	770000D 0	0 660050D 03	0 7800 0D 00	0 659970D 03	0 7900 0D 0	0 660000D 03
0 800000D 00	0 660 0D 03	0 810000D 0	0 660720D 3	8 0000D	0 66068 D 03	0 830000D 00	0 660120D 03
0 840000D 00	0 659740D 03	0 850000D 00	0 660150D 03	0 8500 D 00	0 66 440D 03	0 8700 D	0 6606 D 03
0 880000D 00	0 660 4 D 03	8900 0D 0	0 674770D 03	0 900 0 D 0	0 676330D 3	910000D	0 677240D 03
0 920000D 00	0 67794 D 3	0 93000 D 0	0 67869 D 03	0 940000D 00	0 669360D 03	0 95000D 00	0 679 60D 03
0 960000D 00	0 679830D 03	0 970000D 00	0 680030D 03	0 980 D 00	0 680210D 03	99000D 0	680250D 03
0 100000D 01	0 68057 D 03	0 101000D 01	0 680860D 03	0 102 00D 01	0 6810 0D 03	0 103000D 01	0 681330D 03
0 104000D 01	0 681490D 03	105 00D 01	0 681 80D 03	0 1060 D 01	0 68164 D 03	107000D 01	681610D 03
0 108 00D 01	0 681600D 03	1 900 D 01	0 6820 0D 03	110 00D 01	0 682160D 03	0 111000D 01	68215 D 03
0 112 00D 01	0 68199 D 03	0 113000D 01	0 681940D 03	0 114000D 01	0 681930D 0	0 115000D 01	0 662010D 03
0 116000D 01	0 68455 D 0	0 117000D 01	689490D 03	118 D 01	0 6973 D 03	119 D 01	0 703550D 03
0 12 000D 01	0 708540D 3	0 121000D 01	0 713600D 03	0 1 2000D 01	0 718160D 03	0 123000D 01	0 722530D 03
0 124000D 01	0 726390D 0	0 1250 0 01	0 7299 D 03	0 1 0 D 1	0 733980D 03	0 127000D 1	0 738650D 03
0 1280 0D 01	0 74247 D 03	0 129000D 01	0 745880D 03	0 130 0 D 1	0 74936 D 03	1 10 0D 1	0 753480D 03
0 1320 0D 01	0 758080D 03	0 133000D 01	0 761750D 03	0 1340000 01	0 766070D 03	0 13 000D 01	0 768820D 03
0 136000D 01	0 771100D 3	1370000 01	0 773980D 3	1380 D 1	0 777180D 3	0 1390 0D 1	781020D 03
0 140000D 01	0 78490 D 3	141 0 D 01	0 788140D 03	0 14 000D 01	0 790690D 03	0 143000D 01	0 793050D 03
0 144000D 01	0 795630D 3	0 145000D 01	0 798570D 03	0 146 00D 1	0 8016 0D 03	1 7 0 0 01	0 8045 0D 03
0 148000D 01	0 80738 D 03	0 1400 D 01	0 809670D 03	0 1 000 D 01	0 81216 D 03	0 1 1 0 D 01	815610D 03
0 152000D 01	0 819100D 03	0 1 3000D 01	0 822430D 03	0 154000D 01	0 825970D 03	0 1 000D 01	0 829330D 03
0 156000D 01	0 832000D 03	0 157000D 01	0 836560D 03	0 1 80 D 01	0 840 1 D 03	0 1 900 D 01	0 843980D 03

----- TEMPERATURE TABLE -----

TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TI E (SEC)	TEMPERATURE (F)
0 160000D 0	0 947310D 3	0 161000D 01	0 850310D 03	0 162 0D 1	0 853070D 03	0 16 000D 01	0 855800D 03
0 1640 0D 01	0 858890D 03	0 165000D 01	0 862130D 03	0 166000D 01	0 8656 0D 03	0 167000D 01	0 868760D 03
0 168000D 01	0 871780D 03	169000D 01	0 874450D 03	0 170000D 01	0 876770D 03	0 17100 D 01	0 79190D 03
0 172000D 01	0 881 000 03	0 173 0 D 01	0 883980D 03	0 174000D 01	0 886410D 03	0 17500 D 1	0 888910D 03
0 176000D 01	0 891540D 03	0 177000D 01	0 894 0D 03	0 178000D 1	0 896930D 03	0 179000D 01	0 899530D 03
0 180000D 01	0 90194 D 03	0 181 0 D 01	0 904190D 03	182000D 01	0 906430D 03	0 183000D 01	0 908810D 03
0 184000D 01	0 911400D 03	0 185000D 01	0 914230D 03	0 18000 D 01	0 917240D 03	0 1870 0D 1	0 920430D 03
0 188000D 01	0 92299D 03	0 189000D 01	0 925490D 03	190000D 01	0 928430D 03	0 191 0D 1	0 930820D 03
0 192000D 01	0 933220D 03	19300 D 01	0 935250D 03	0 194000D 01	0 937880D 03	0 19 000D 01	0 940410D 03
0 196000D 01	0 942480D 03	0 197000D 01	0 944840D 03	0 198000D 01	0 947480D 3	0 1990 D 01	0 949670D 03
0 200000D 01	0 951880D 03	0 20100 D 01	0 954140D 03	0 202000D 01	0 956670D 03	0 203000D 01	0 958710D 03
0 204000D 01	0 961050D 03	0 05000D 01	0 963150D 03	0 206 0 D 01	0 965420D 3	0 2070 D 01	0 967660D 03
0 208000D 01	0 969950D 03	0 209000D 01	0 972300D 03	0 21000 D 1	0 974610D 03	0 21100 D 01	0 977010D 03
0 212000D 01	979430D 3	0 21300 D 01	0 981650D 03	0 14000D 01	0 984510D 03	0 215000D 01	0 987100D 03
0 216000D 01	0 989710D 3	0 217000D 01	0 992120D 03	0 218000D 01	99440 D 03	0 2190 0 1	0 996890D 03
0 220000D 01	0 99935 D 03	0 21000D 01	0 100180D 04	0 22000D 01	0 100410D 04	0 223000D 01	0 100630D 04
0 224000D 01	0 100830D 04	0 225000D 01	0 101040D 04	260 0D 01	0 101260D 04	0 227000D 1	0 101480D 04
0 228000D 01	0 10159 D 04	29 00D 01	0 101890D 04	0 230000D 01	0 102100D 04	0 2310 D 01	0 102270D 04
0 232 0D 01	102470D 4	0 233000D 01	0 102670D 04	0 234000D 01	0 102880D 04	0 35000D 01	0 103060D 04
0 236000D 01	0 103 30D 04	0 237000D 01	0 103400D 04	0 238 0 D 01	0 103600D 04	0 239000D 01	1 3800D 04
0 240000D 01	0 104 10D 04	0 241 0D 01	0 104200D 04	0 242000D 01	0 104300D 04	0 243 0D 01	0 104600D 04
0 244000D 1	0 104810D 04	0 245000D 1	0 105030D 04	0 246000D 01	0 105240D 04	0 24700 D 1	0 105430D 04
0 248000D 1	10 30D 0	249 0 D 01	0 105840D 04	2 0000D 01	0 106040D 0	0 251 0 D 01	0 106230D 04
0 252000D 01	0 106410D 04	0 3000D 01	0 106 80D 04	0 254000D 01	0 106810D 04	0 25 00D 01	0 106940D 04
0 256000D 01	0 107110D 4	0 57 00D 01	107270D 04	0 2 8000D 01	0 107470D 04	0 5900D 1	0 107640D 04
0 260000D 01	0 107800D 04	0 261000D 01	0 107940D 04	0 26 000D 01	0 108100D 04	0 263000D 01	0 108290D 04
0 264000D 01	0 108 7 D 04	0 265 0 D 01	0 108650D 04	0 2 6 00D 01	0 108820D 04	2670 0D 01	0 109020D 04
0 268 00D 01	0 109 20D 0	0 69000D 01	109440D 04	0 270000D 1	0 1 96 0D 04	0 271000D 01	0 109850D 04
0 272000D 01	0 110040D 04	0 73000D 01	0 110 40D 04	0 274 0D 01	0 110430D	0 750 0D 1	0 110610D 04
0 2760 0D 01	0 11 770D 0	0 277 00D 01	11092 D 04	27000 D 1	0 111 80D 04	0 2790 0D 01	0 111260D 04
0 280000D 01	0 111430D 04	0 81000D 01	0 111610D 04	0 282000D 01	0 111780D 04	0 283 00 1	0 1119 0D 04
0 284000D 01	0 11212 D 4	0 285000D 1	0 112290D 04	0 286000D 01	0 112440 04	0 870 0D 01	0 112590D 04
0 288000D 1	0 112740D 04	0 289000D 01	0 11286 0 04	290 D 01	0 113030D 04	0 291000D 01	0 113170D 04
0 292000D 01	0 113310D 04	0 293000D 1	0 113460D 04	0 294000D 01	0 1136 0D 04	0 29 00 D 01	0 113800D 0
0 296000D 01	0 114 0D 04	0 297000D 01	0 114190D 04	0 298000D 01	0 114370D 0	0 2990 D 01	0 114540D 04
0 300000D 01	0 114710D 0	0 301000D 01	0 114880D 04	0 302 00D 1	0 115040D 04	0 303000D 01	0 11 200D 04
0 304000D 01	0 11535 D 04	0 30500 D 01	0 1155 0D 04	0 30600 D 01	115660D 04	70 0D 1	0 115800D 04
0 308000D 01	0 115940D 04	0 309000D 01	0 116080D 04	0 310000D 01	0 116220D 04	0 311000D 01	0 116360D 04
0 312000D 01	0 116 90D 04	31300 D 01	0 116620D 04	0 3140 D 01	0 116750D 04	0 315000D 01	0 116870D 04
0 316000D 01	0 116990D 04	0 317 00D 1	0 117120D 04	0 318 0D 1	0 11724 D 04	0 319000D 1	0 117370D 04

----- TEMPERATURE TABLE -----

TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)
0 320000D 01	0 117510D 0	321 00D 01	117650D 04	0 3 2000D 01	0 117790D 04	0 323000D 01	0 117930D 04
0 324000D 01	0 118 7 D 0	325000D 01	0 118220D 04	0 326000D 01	0 118370D 04	0 3270 0D 01	118510D 04
0 328000D 01	1196 D 04	0 329000D 01	0 118700D 04	0 330 0D 1	0 118910D 04	0 3 100 D 01	0 119040D 04
0 33200 D 01	0 119160D 0	0 333000D 01	0 119280D 04	0 334000D 01	0 119410D 04	0 335 D 01	0 119540D 04
0 3360 0D 01	0 11968 D 0	3370 0D 01	0 119830D 04	0 338 D 01	0 119970D 0	0 339 0D 01	0 120110D 04
0 34 00D 01	0 120260D 04	0 341000D 01	0 120400D 04	0 342000D 01	0 120550D 04	0 34 0 0D 01	0 120600D 04
0 344000D 01	0 12083 D 04	0 345000D 01	0 120960D 04	0 346 00D 01	0 121100D 04	0 347000D 1	0 1 1240D 04
0 3480 0D 01	0 12137 D 04	0 349000D 01	0 121510D 04	0 3 0000D 01	0 121640D 04	0 351000D 01	0 121770D 04
0 35 000D 01	0 121910D 04	0 35 000D 01	0 122040D 04	0 3 4000D 1	0 122170D 04	355 0D 1	0 122300D 04
0 356 00D 01	12243 D 4	0 357000D 01	1225600D 04	0 358000D 01	0 122690 D 4	0 359000D 1	0 122820D 04
0 360000D 01	0 12 94 D 04	0 361000D 01	0 123070D 04	0 362000D 01	0 123200D 04	0 363000D 01	0 123320D 04
0 364000D 01	123450D 0	0 365000D 01	0 123570D 04	0 36600 D 01	0 123690D 04	0 3670 0D 01	0 123890D 04
0 368 00D 01	0 124050D 0	0 369000D 01	0 124180D 04	0 3700 0D 01	0 124320D 04	0 371000D 01	0 124510D 04
0 372000D 01	0 12 670D 04	0 373000D 01	0 124830D 04	0 374 00D 01	0 124990D 04	0 375000D 01	125130D 04
0 3760 0D 01	1252700D 04	377000D 01	0 125420D 04	0 378000D 01	125560D 04	0 3790 0D 01	0 125700D 04
0 380000D 01	0 125820D 04	0 381000D 01	0 125940D 04	0 382000D 01	0 126060D 04	0 3830 0D 01	0 126180D 04
384000D 01	0 1 630 D 04	385000D 01	0 12643 D 04	386000D 01	0 12656 D 04	0 38700 0 01	0 126690D 04
0 388000D 01	0 12681 D 0	0 389000D 01	0 126950D 4	390 D 01	0 127090D 04	0 391000D 01	0 127230D 04
0 392000D 01	0 1 7360D 04	0 39 00D 01	127510D 4	0 394 0 D 1	0 127640D 04	0 39 000D 01	0 127760D 04
0 396000D 01	0 127970D 04	397000D 01	0 128180D 04	0 3980 0D 01	0 128360D 4	0 399 00D 01	0 1 8490D 04
0 400000D 01	0 128680D 04	0 401000D 01	0 128820D 04	0 402000D 01	0 129020D 04	0 40 00 D 1	0 129210D 04
0 404 0D 01	0 129 0 D	405 00D 01	0 129 90D 04	0 40600 D 01	0 129780D 04	0 40700 D 01	0 129950D 04
0 408000D 01	0 13 090D 04	0 409 0 D 01	0 130250D 04	0 410000D 01	0 130390D 04	0 411000D 01	0 130230D 04
0 412000D 01	0 12998 D 0	41300 D 01	0 12998 D 04	0 14000D 1	0 130020D 04	0 41 00D 1	0 130320D 04
0 4160 0D 01	130640D	41700 D 01	0 130750D 4	4180 0D 01	0 130820D 04	0 419 00D 1	0 130840D 04
0 4 0000D 01	0 130970D 04	0 421000D 01	0 131260D 04	0 22000D 01	0 131420D 04	0 42 00D 01	0 131580D 04
0 424000D 01	131610D 04	0 4 00 D 01	131650D 04	0 426 00D 1	0 131840D 04	0 427000D 01	0 132060D 04
0 428000D 01	0 132290D	429 00D 01	0 132490D 04	0 430000D 01	0 132660D 04	0 431000D 01	0 13 790D 04
0 432000D 01	0 132670D 04	0 433000D 01	0 132910D 04	0 434 0D 01	132950D 04	0 435 0D 01	0 133030D 04
0 436000D 01	0 13315 D 0	0 437 00D 01	133290D 04	0 438000D 01	0 133410D 04	0 439000D 01	0 133510D 04
0 440000D 01	0 133630D 04	0 4410 0D 01	0 133750D 04	0 442000D 01	0 133880D 04	0 44 0 0D 1	0 134010D 04
0 44400 D 01	0 13413 D 04	0 445000D 01	134230D 4	0 446 00D 01	0 134320D 04	0 4470 0D 01	0 134420D 04
0 448000D 01	13451 D 04	0 449000D 01	0 134630D 04	0 450000D 01	0 134730D 04	0 451000D 01	0 134820D 04
0 452 0D 01	0 13491 D 0	453000D 01	13 00 D 04	0 454000D 01	0 135090D 4	0 455000D 01	0 135180D 04
0 456 0D 01	0 13528 D 04	4 700 D 01	0 135380D 04	0 4580 0D 01	0 13 480D 04	459000D 01	0 135590D 04
0 460000D 01	0 13570 D 04	0 4610 0D 01	0 13 830D 04	0 462000D 01	0 135950D 04	0 463 00D 01	0 136060D 04
0 464 00D 01	1 61600	465000D 01	0 136250D 04	0 466 00D 1	0 136320D 04	467 0D 01	0 136400D 04
0 468000D 01	0 136490D 04	0 469000D 01	0 136580D 04	0 470000D 01	0 136680D 04	0 471000D 01	0 136790D 04
0 472000D 01	0 136900D 04	0 73000D 01	0 137000D 04	0 474000D 01	0 137110D 04	0 475000D 01	0 137210D 04
0 476000D 01	0 1373 0D 04	477 00D 01	0 137400D 04	0 478000D 01	0 137490D 04	0 479000D 01	0 137590D 04

----- TEMPERATURE TABLE ----

TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATUR (F)	TIME (SEC)	TEMPERATURE (F)
0 480000D 01	0 137700D 04	0 481000D 01	0 137810D 04	0 43 0 D 1	0 137930D 4	0 4830 CD 1	0 138040D 04
0 484000D 1	0 1381 CD 04	485 000D 01	1382 0D 04	0 4860 D 01	0 1383 4	48700 D 01	0 1384 0D 04
0 488000D 01	0 138 60D 0	8900 D 01	0 138670D 04	0 490000D 01	0 138790D 04	0 491000D 01	0 138910D 04
0 492000D 01	0 139030D 04	0 493000D 01	0 139150D 04	0 4940 D 1	0 13927 D 04	495 000D 1	139380D 04
0 496000D 01	0 139490D 4	97000D 01	0 139 90D 04	0 498000D 01	0 139690D 04	499000D 01	0 139790D 04
0 500000D 01	0 139890D 0	0 01000D 01	0 13999 D 4	5020 0D 1	0 140090D 04	0 0 000D 01	0 140180D 04
0 504000D 01	0 140280D 04	0 050 0D 01	14 380D 04	0 5 6 000 1	0 14047 D 04	070 0D 01	0 140570D 04
0 508000D 01	1406 0D 04	0 509 000D 01	0 140750D 04	0 510000D 01	0 140840D 04	0 511000D 01	0 140930D 04
0 512000D 01	0 141 30D 04	0 513000D 01	0 141120D 4	0 514 000D 01	0 141210D 04	0 15 000D 01	0 141310D 04
0 516000D 01	0 141400D 04	0 17000D 01	141500D 04	0 18 000D 1	0 141590D 04	0 19 0D 01	0 141690D 04
0 520000D 01	0 141780D 04	21000D 01	0 14187 D 04	0 5 200 D 01	0 141970D 04	230 0D 01	0 142060D 04
0 524000D 01	0 14215 D 04	0 525000D 01	0 14224 D 04	0 2600 D 1	0 142330D 4	0 5270 0D 01	142420D 04
0 528 00D 01	0 142510D 04	0 529000D 01	0 142600D 04	0 530000D 01	0 142690D 0	0 5310000D 01	0 142780D 04
0 5320 0D 01	0 142870D 04	330 0D 01	0 142960D 4	0 534000D 01	0 14305 D 04	0 53 0 0D 01	0 143150D 04
536 00D 01	0 143240D 4	0 37000D 01	0 143330D 04	0 538 0D 01	0 14342 D 04	0 5 90 0D 01	0 143510D 04
0 540000D 01	0 143600D 04	0 5410000D 01	0 14368 D 04	0 42000D 01	0 143760D 04	0 43 000D 1	0 1438 0D 04
0 5440 D 01	0 143940D 04	54500 D 01	0 14403 D 04	0 6 D 1	14413 D 04	0 5470000D 01	0 144200D 04
0 548000D 01	0 144300D 04	0 549000D 01	0 144380D 04	0 5 0000D 01	0 14447 D 04	0 1000D 1	0 144550D 04
0 552000D 01	0 144630D 04	3000D 01	0 144720D 4	0 5 4 00D 01	0 14481 D 4	55 000D 01	0 14489 D 04
0 556000D 01	0 144900D 04	0 57000D 01	145 80D 04	80 0 1	0 145170D 04	0 5590000D 01	0 14 260D 04
0 560000D 01	0 14535 D 04	61000D 01	0 145440D 0	5 2000D 01	14553 D 04	6300 D 1	0 14 610D 04
0 564000D 1	0 14 700D 04	0 65000D 01	0 1 57 0D 0	66 0D 1	0 14587 D 04	5670 0D 01	0 145960D 04
0 568000D 01	0 146050D 04	0 569000D 01	0 146140D 04	570 D 1	0 146220D 04	0 710 0D 1	0 14 320D 04
0 572000D 01	0 14 410D 04	73000D 01	0 14649 D 0	0 5740 0D 01	146580D 04	0 575 000D 1	0 146670D 04
0 576000D 1	0 1467 D 04	0 57700 D 01	0 146840D 04	0 73000D 01	0 146920D 04	0 5790 0D 01	0 147000D 04
0 580000D 01	0 147 80D 4	58100 D 01	0 1471 0D 0	0 5820 0D 1	0 147240D 04	0 83 0D 01	0 147 20D 04
0 584000D 01	0 147 00D 0	0 58500 D 01	147490D 04	0 86 0 D 1	0 147 7 0 04	0 5870000D 01	0 147650D 04
0 588000D 01	0 147740D 04	0 589000D 01	0 14782 D 04	90 D 01	0 14791 D	0 910 0D 1	0 147990D 04
0 592000D 01	148380D 04	0 9 0 D 01	14816 D 04	0 594 D 1	0 148240D 04	59500D 01	0 148330D 04
0 596000D 01	148 10D 0	97000D 01	0 148490D 04	0 598000D 01	0 148580 04	0 5990000D 01	0 148660D 04
0 600000D 01	0 1487 D 04	0 60100 D 01	0 14883 0 04	0 0D 01	0 14892 D 4	6030 0D 01	149010D 0
0 6 4000D 01	0 1491 0D 04	6 5 00D 1	0 14919 D 04	0 6060000 01	0 149290D 0	0 607000D 01	0 149380D 04
0 608000D 01	0 149 7 D 04	60 00 D 01	0 14955 0 04	610 0D 1	0 149640D 04	0 611000D 01	149720D 04
0 612000D 01	0 14980 D 04	0 613000D 1	0 14988D 4	0 6140000 01	0 1499 0D 0	0 1500D 1	0 15002 D 04
0 6160 0D 1	0 150090D 04	0 617000D 01	0 150160D 04	0 618000D 01	0 150230D 04	0 619000D 01	0 150300D 04
0 620000D 01	0 150 0D 04	0 621 00D 01	0 150430D 04	0 62200 D 1	0 150490D 04	0 62300D 01	150560D 04
0 62 0 D 1	0 150620D 0	5000D 01	0 150680D 04	0 626000D 01	0 150740 0	0 627000D 01	0 150790D 04
0 628000D 01	0 1508 D 4	629 00D 01	0 15091 D 04	0 630 D 1	0 15096 0 04	0 6 10 0D 01	0 1 1020D 04
6320 D 01	151 8 D 04	633000D 01	0 1 113 0 04	0 634 0D 1	0 15119 D 04	6 0 D 1	0 1 1 30D 04
0 636000D 01	0 151300D 0	0 637000D 01	0 151360D 04	0 638000D 01	0 1514 0D 04	6 9 0D 1	151480D 04

----- TEMPERATURE TABLE ---

TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (C)	TEMPERATURE (F)	TIME (EC)	TEMPERATURE (F)
0 640 00D 01	151 4 D 04	641 CD 1	0 15159 D 04	0 64 D 1	151650D 04	64300CD 01	151710D 04
0 6440 CD 1	0 1517 D	0 64 C D 01	0 1 182 D 0	0 4 D 1	0 15188 L C	6 7 00D 1	0 151940D 04
0 648000D 01	0 151 90D 04	0 649000D 01	0 1 050D 04	6 000 D 1	152110D 0	0 1 00 1	1 21600 04
0 652 0D 01	15222 D	65300 D 1	15 28 0 04	0 6 4 D 1	0 15 3 D 4	6 50 D 01	0 152380D 04
0 656 00D 01	0 152 300	657 0 D 1	0 15249 0 04	0 6 000D 01	0 152 400 04	0 65900CD 01	0 152 90D 04
0 660000D 1	152 40D 04	661 D 1	0 15269 D 04	6 2 D 01	0 15 7 D 4	0 6630 0D 1	0 1 2800D 04
0 66400 D 01	0 1 235 D 04	0 6 5 0D 1	0 15291 0 4	66 0 0 1	1 96 D	667000D 01	0 153010D 04
0 668000D 01	0 153060D 04	0 69000D 01	0 1 311CD 4	67 D 1	0 15316 D 04	671 CD 1	153210D 04
0 672000D 01	1532 D	673 00D 1	1 331 D 0	674 0D 1	153360D	0 6750 0D 1	0 153410D 04
0 676 0D 1	0 1534 0	0 677000D 1	0 153510 04	0 79000D 01	0 1 3 70D 0	0 67000D 01	0 153620D 04
0 680000D 1	0 153 70D 0	0 8100 0 01	0 153710D 0	8 0 D 1	0 1537 0D 04	68300CD 01	1 3810D 04
0 684000D 1	0 153960D 0	85 00D 01	0 1 3 0 04	8 000D 01	0 153 0D 04	0 687000D 01	0 153990D 04
0 688000D 01	0 154040D 0	0 639 0 D 1	1 4080D 04	0 690 D 01	0 154130D 04	0 9100CD 1	154180D 04
0 69200 D 01	0 15424 D 0	693 0 D 1	0 154270D 04	691000D 1	0 154350D 4	695 0D 1	0 154410D 04
0 696000D 01	0 1 446 0 04	0 697000D 01	0 154520D 04	0 698000D 01	0 1 4580D 04	0 699000D 01	0 154630D 04
0 700000D 01	0 15468 D 0	701 00D 1	1 4730D 4	70 0 D 01	1 4 80D 04	703 CD 1	154830D 04
0 704 0 D 1	15498 0 0	705000D 01	0 154900 04	0 706000D 01	0 1 4980L 04	0 707000D 01	0 15 030D 04
0 708 0D 01	0 155 80D 04	70900 D 01	0 15513 D 0	71 0 D 01	0 1551 D 4	0 7110 0D 1	1 5240D 04
0 712000 D 1	0 1 0 D 4	1300 D 01	155340D 04	0 71 000D 01	0 15539 D 04	71 D 1	0 155440D 04
0 716000D 01	0 155490D 04	0 717000D 01	0 15 540D 04	0 718000D 1	0 1 00D 04	0 71900 D 1	0 155650D 04
0 720000D 1	0 1557 D 0	72100 D 01	0 1557 00 4	0 7 D 01	0 1553 0D 04	72 00 D 1	0 15 860D 04
0 724 0D 01	15 91 D	7 5000D 01	0 1559600 04	0 7 6000D 01	0 1 6010D 04	0 727000D 01	0 1 6050D 04
0 7230 0D 01	0 15610 D 0	7290 D 1	1561 D 04	73000 D 01	0 15620 D 4	0 731 0 D 1	1562 0D 04
0 732 D 01	0 1 630 D 04	7 300 D 01	1 634 D 04	73 D 1	0 1 639 0 4	0 735000D 01	0 156440D 04
0 736000D 01	0 156480D 0	0 737000D 01	0 1565300 04	0 738 D 1	0 15 80D	0 7 90 0D 01	0 156620D 04
0 740000 D 01	0 15667 0 0	0 741000D 01	15671 D 04	0 742 00D 01	0 1 6760D 04	743 01	156800D 04
0 744000D 01	0 156850D 0	0 745000D 01	0 1568900 04	0 746000D 01	0 156 400 04	0 747000D 1	0 156990D 04
0 748 0D 01	0 157 3 D	749 0 D 01	0 15708 D	75 0 D 1	0 1571 0D 4	7 10 0D 01	0 157170D 04
0 752 00D 01	1 7 0 0	0 7 30 D 01	0 157260D 04	0 7 4 00D 1	1 731 D 4	0 7 5000D 01	0 157360D 04
0 756000D 01	0 157 00D 04	0 7 7000D 01	0 1574 0 04	7 80 D 01	0 1 74 00 04	0 7 9 00D 01	0 157540D 04
0 76 00 D 01	0 15758 D	76100 D 1	0 1 76200 04	76 0 D 1	0 1 767 D 0	763 D 01	0 157710D 04
0 764000D 01	0 1 7760D 0	0 765000D 01	0 1578000 04	0 76 000D 1	0 1 7840D 4	0 767000D 1	0 157890D 04
0 768 00D 01	0 1579300 4	769000D 01	15797 D 04	0 770 D 1	0 158020D 04	0 771 0 D 1	0 158 60D 04
0 772 0D 01	0 1 810 D 04	0 773000D 01	0 1 8140D 4	0 774 D 01	0 158190D 04	0 775000D 01	0 158230D 04
0 776000D 01	0 158 70D 0	77700 D 01	0 15832 0 04	0 77800 D 1	0 158360D 04	7790 CD 01	0 158400D 04
0 780000D 01	0 158440D 0	0 781000D 01	0 158480D 04	782 D 01	0 158 0D 4	78300 1	0 158570D 04
0 784000D 01	0 158610D 04	0 785000D 01	0 158600D 04	0 786 00D 01	0 158700D 04	0 78700 D 01	158740D 04
788 00D 01	0 158780D 04	78900 D 01	0 15 80 D 04	0 790 D 1	0 1588 0D 4	7910 D 01	0 158920D 04
0 7920 CD 01	158 8 D	79300 D 1	0 159030D 04	0 794000D 01	0 159060D 04	0 79 000D 01	0 159130D 04
0 796000D 01	0 159170D 04	0 797000D 01	0 159210D 04	0 798 CD 1	1 924 D 04	0 799 CD 1	0 159270D 04

----- TEMPERATURE TABLE -----

TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)
0.800000D 01	0.159300D 04	0.801000D 01	0.159330D 04	0.802000D 01	0.159360D 04	0.803000D 01	0.159390D 04
0.804000D 01	0.159430D 04	0.805000D 01	0.159460D 04	0.806000D 01	0.159490D 04	0.807000D 01	0.159520D 04
0.808000D 01	0.159560D 04	0.809000D 01	0.159590D 04	0.810000D 01	0.159620D 04	0.811000D 01	0.159660D 04
0.812000D 01	0.159690D 04	0.813000D 01	0.159720D 04	0.814000D 01	0.159760D 04	0.815000D 01	0.159790D 04
0.816000D 01	0.159820D 04	0.817000D 01	0.159860D 04	0.818000D 01	0.159890D 04	0.819000D 01	0.159920D 04
0.820000D 01	0.159960D 04	0.821000D 01	0.160000D 04	0.822000D 01	0.160030D 04	0.823000D 01	0.160070D 04
0.824000D 01	0.160100D 04	0.825000D 01	0.160140D 04	0.826000D 01	0.160170D 04	0.827000D 01	0.160200D 04
0.828000D 01	0.160240D 04	0.829000D 01	0.160270D 04	0.830000D 01	0.160300D 04	0.831000D 01	0.160330D 04
0.832000D 01	0.160370D 04	0.833000D 01	0.160400D 04	0.834000D 01	0.160430D 04	0.835000D 01	0.160460D 04
0.836000D 01	0.160500D 04	0.837000D 01	0.160530D 04	0.838000D 01	0.160560D 04	0.839000D 01	0.160600D 04
0.840000D 01	0.160630D 04	0.841000D 01	0.160660D 04	0.842000D 01	0.160690D 04	0.843000D 01	0.160730D 04
0.844000D 01	0.160760D 04	0.845000D 01	0.160790D 04	0.846000D 01	0.160820D 04	0.847000D 01	0.160850D 04
0.848000D 01	0.160890D 04	0.849000D 01	0.160920D 04	0.850000D 01	0.160950D 04	0.851000D 01	0.160990D 04
0.852000D 01	0.161020D 04	0.853000D 01	0.161060D 04	0.854000D 01	0.161090D 04	0.855000D 01	0.161130D 04
0.856000D 01	0.161160D 04	0.857000D 01	0.161200D 04	0.858000D 01	0.161230D 04	0.859000D 01	0.161260D 04
0.860000D 01	0.161300D 04	0.861000D 01	0.161330D 04	0.862000D 01	0.161370D 04	0.863000D 01	0.161400D 04
0.864000D 01	0.161430D 04	0.865000D 01	0.161460D 04	0.866000D 01	0.161500D 04	0.867000D 01	0.161530D 04
0.868000D 01	0.161560D 04	0.869000D 01	0.161600D 04	0.870000D 01	0.161630D 04	0.871000D 01	0.161670D 04
0.872000D 01	0.161700D 04	0.873000D 01	0.161740D 04	0.874000D 01	0.161770D 04	0.875000D 01	0.161800D 04
0.876000D 01	0.161840D 04	0.877000D 01	0.161870D 04	0.878000D 01	0.161910D 04	0.879000D 01	0.161940D 04
0.880000D 01	0.161980D 04	0.881000D 01	0.162010D 04	0.882000D 01	0.162050D 04	0.883000D 01	0.162080D 04
0.884000D 01	0.162120D 04	0.885000D 01	0.162150D 04	0.886000D 01	0.162190D 04	0.887000D 01	0.162220D 04
0.888000D 01	0.162260D 04	0.889000D 01	0.162290D 04	0.890000D 01	0.162330D 04	0.891000D 01	0.162360D 04
0.892000D 01	0.162400D 04	0.893000D 01	0.162430D 04	0.894000D 01	0.162460D 04	0.895000D 01	0.162500D 04
0.896000D 01	0.162530D 04	0.897000D 01	0.162560D 04	0.898000D 01	0.162590D 04	0.899000D 01	0.162630D 04
0.900000D 01	0.162660D 04	0.901000D 01	0.162690D 04	0.902000D 01	0.162720D 04	0.903000D 01	0.162760D 04
0.904000D 01	0.162790D 04	0.905000D 01	0.162820D 04	0.906000D 01	0.162860D 04	0.907000D 01	0.162890D 04
0.908000D 01	0.162920D 04	0.909000D 01	0.162950D 04	0.910000D 01	0.162990D 04	0.911000D 01	0.163020D 04
0.912000D 01	0.163050D 04	0.913000D 01	0.163080D 04	0.914000D 01	0.163110D 04	0.915000D 01	0.163150D 04
0.916000D 01	0.163190D 04	0.917000D 01	0.163220D 04	0.918000D 01	0.163260D 04	0.919000D 01	0.163290D 04
0.920000D 01	0.163330D 04	0.921000D 01	0.163360D 04	0.922000D 01	0.163400D 04	0.923000D 01	0.163430D 04
0.924000D 01	0.163470D 04	0.925000D 01	0.163500D 04	0.926000D 01	0.163540D 04	0.927000D 01	0.163570D 04
0.928000D 01	0.163600D 04	0.929000D 01	0.163640D 04	0.930000D 01	0.163670D 04	0.931000D 01	0.163710D 04
0.932000D 01	0.163740D 04	0.933000D 01	0.163770D 04	0.934000D 01	0.163810D 04	0.935000D 01	0.163840D 04
0.936000D 01	0.163880D 04	0.937000D 01	0.163910D 04	0.938000D 01	0.163940D 04	0.939000D 01	0.163980D 04
0.940000D 01	0.164010D 04	0.941000D 01	0.164040D 04	0.942000D 01	0.164080D 04	0.943000D 01	0.164110D 04
0.944000D 01	0.164140D 04	0.945000D 01	0.164180D 04	0.946000D 01	0.164210D 04	0.947000D 01	0.164240D 04
0.948000D 01	0.164270D 04	0.949000D 01	0.164310D 04	0.950000D 01	0.164340D 04	0.951000D 01	0.164370D 04
0.952000D 01	0.164400D 04	0.953000D 01	0.164440D 04	0.954000D 01	0.164470D 04	0.955000D 01	0.164500D 04
0.956000D 01	0.164550D 04	0.957000D 01	0.164580D 04	0.958000D 01	0.164620D 04	0.959000D 01	0.164660D 04

---- TEMPERATU E TABLE -----

TIME (SEC)	TE P RATUR (F)	TIME (SEC)	TEMPERATURE (F)	TIME (SEC)	TEMPERATURE (F)	TI E (SEC)	TEMPERATURE (F)
0 96 0 0D 01	0 164 0 04	9 1 0 D 01	16 20D	0 9620 D 1	0 16475 D 4	0 9630 D 1	0 164790D 04
0 964 00D 01	0 164 0D 0	0 965000D 01	0 1648 0D 04	0 0 6000D 01	0 164890D 04	0 670 D 01	0 164920D 04
0 968 0CD 01	0 1649 0 0	0 0 9 D 1	1649 0D 04	0 970 D 1	0 16502 D 0	0 71 D 01	0 165050D 04
0 9720 0D 01	0 1 0C0 4	973 0 D 1	0 163120D 4	0 97 0 1	0 1 51 D 4	97500CD 01	0 165190D 04
0 976000D 01	0 165 20D 0	0 977000D 01	0 1652 0D 04	0 978 0 1	0 16 280D 4	0 9790 D 01	0 165320D 04
0 980 0D 1	16 35 0 04	98100 D 1	1653 0 04	0 0D 1	0 16 42 0 04	0 98300 D 1	0 165450D 04
0 984000D 01	0 16 490D 04	0 985000D 01	0 165 0D 0	0 986000D 01	0 165 0D 4	0 987 D 01	0 165 90D 04
988000D 01	16 2 0	9890 0D 1	0 1 50D 0	990 D 1	16 68 0 4	0 991 0CD 1	16 720D 04
0 992 0 D 1	0 16575 0 0	993100D 1	0 16570 D 04	994 D 01	0 16 320D 04	0 950000D 01	0 165850D 04
0 996000D 01	0 165980D 0	0 997 0 1	165920D 4	9 8 0 1	0 16 90 0 4	9990 0 1	0 165980D 04
0 10 0 D 2	1 6 1 D 0						

FOLLOWING ARE DESCRIPTIONS OF TH IDEAL ELECTRIC YSTE1 PIN(S)

----- PIN DATA -----
(PIN NO 1)

POWER SYSTEM	POWER FLAG	PIN TO AVG POW PEAK FAC	TOTAL PIN LENGTH FT	NUMBER OF AXIAL LEVELS	NUMBER OF MATERIALS
2	1	1000D 01	12 0	11	6

GAP CALCULATION FLAG	INTERNAL DATA FLAG	CHANNEL ORIFICING FACTOR	PIN DEFORMATION FLAG	
0	0	0 10 000D 01		0

HEATER BAND RESISTANCE

IS IRRELEVANT TO THIS PROBLEM

----- LEVEL DATA -----
(PIN NO 1)

LEVEL NO	SURFACE HEAT TRANSFER AREA (FT *2)	AXIAL LENGTH (FT)	AXIAL PIN POWER FRACTION	ASSOCIATED WATER NODE	NO OF RADIAL REGIONS	NO OF RADIAL NODES
1	0 166 8D 00	1 50	0 03 2	0	7	19
2	124881D 00	1 125	0 0497	0	7	19
3	0 971294D 01	0 87	0 0888		7	19
4	0 111035D 00	1	1071	0	7	1
5	0 111 0 D 00	1 000	0 1392	0	7	19
6	0 111 5D 00	1 000	0 1392	0	7	19
7	0 1110 5D 00	1 000	0 1392		7	19
8	0 111035D 00	1 000	0 1071	0	7	19
9	0 971294D-01	87	0 0888	0	7	19
10	1 4881D 00	1 125	0 0497	0	7	19
11	0 1665 8D 00	1 500	0 0352	0	7	19

----- REGION DATA -- -
(PIN NO 1)

LEVEL NO	REGION NO	REGION INNER RADIUS FT	REGION OUTER RADIUS FT	RADIAL POWER PEAK FACTOR	NO OF NODES	MATERIAL I D NO
1	1	0 0	0 7467D-02	0 0	4	1
1	2	0 7467D-02	0 942 D 02	0 4023D 00	4	2
1	3	9 25D-02	0 1017D-01	0 5977D 0	1	3
1	4	0 1017D-01	0 1433D 01	0 0	3	4
1	5	0 1433D-01	0 1683D- 1	0 0	3	5
1	6	0 1683D-01	0 1684D-01	0 0	1	6
1	7	0 1684D-01	0 1767D-01		3	5
2	1	0	0 7925D- 2		4	1
	2	0 79 5D-02	0 9708D-	0 738D 00	4	2
	3	0 9708D-02	1017D-01	0 262D 00	1	3
2	4	0 1017D-01	0 1433D 01	0 0	3	4
2	5	0 1433D-01	0 1683D- 1	0 0	3	5
2	6	0 1683D-01	0 1684D-01	0 0	1	
2	7	0 1684D-01	0 1767D-01	0 0	3	5
3	1	0	0 3408D- 2	0	4	1
3	2	0 3408D-02	0 1017D-01	0 1000D 01	4	2
3	3	1017D-01	0 1 17D 01	0	1	3
3	4	0 1017D-01	0 1433D 01	0	3	4
3	5	0 1433D-01	0 1683D-01	0 0	3	
3	6	1683D-01	1 84D- 1		1	
3	7	0 1 84D-01	0 1767D- 1	0 0		
4	1	0	0 872 D- 2	0	4	1
	2	0 3725D-02	1 17D-01	0 1000D 01		2
4	3	0 1 17D-01	0 1 17D-01	0	1	3
4	4	0 1 17D-01	0 1433D- 1		3	
4	5	0 1433D-01	0 1683D-01	0 0		5
4	6	0 1683D- 1	0 1684D- 1	0 0	1	6
4	7	0 1684D-01	0 1767D 01	0	3	5
5	1	0	0 9067D- 2	0 0	4	1
	2	0 9067D-02	1017D 1	1000D 01	4	2
5	3	0 1017D-01	0 1017D-01	0 0	1	3
5	4	1 17D- 1	0 1433D 1	0	3	4
5	5	0 1433D-01	0 1683D-01		3	
5	6	0 1683D-01	0 1684D-01	0 0	1	6
5	7	1684D- 1	0 1767D 1	0	3	5
6	1	0 0	0 9067D 02	0 0	4	1
6	2	0 9067D-0	1 17D- 1	0 1000D 01	4	2
	3	1017D 01	0 1017D-01	0	1	3
6	4	0 1017D-01	0 1433D 01		3	4
6	5	1433D-01	0 1683D- 1		3	5
	6	1 83D-01	0 1684D-01	0 0	1	6
	7	0 1 84D-01	0 17 7D- 1	0	3	5
7	1	0 0	0 9 7D-0		4	1

----- RE ION DATA --
(PI NO 1)

LEV L NO	REGION NO	REGION INNER RADIUS FT	REGION OUT P RADIU FT	RADIAL POWER PEAK FACTOR	NO OF RODLS	MATERIAL I D NO
7	2	0 9067D-02	0 1017D- 1	0 1000D 01	4	2
7	3	0 1017D-01	0 1017D-01		1	3
7	4	0 1017D-01	0 1433D- 1		3	4
7		0 1433D-01	0 1683D-01	0 0	3	
7	6	0 1683D-01	1684D 01	0 0	1	6
7	7	0 1684D-01	1767D- 1	0	3	5
8	1	0 0	0 8725D-02	0	4	1
8	2	0 8725D-02	1 17D 1	0 10 D 1	4	2
8	3	1017D-01	0 1017D 01	0 0	1	3
8	4	1017D-01	0 1433D- 1		3	4
	5	0 1433D-01	0 1683D-01		3	
8	6	0 1683D-01	0 1684D-01	0 0	1	6
8	7	0 1 84D- 1	1767D-01	0	3	5
	1	0 0	0 8408D-0	0 0	4	1
	2	0 8408D- 2	1017D-01	1 00D 01	4	2
	3	0 1017D-01	0 1017D- 1	0	1	3
9	4	0 1017D-01	0 1433D-01	0 0	3	4
9		0 1433D- 1	0 1683D- 1	0	3	5
		0 1683D-01	1 84D-01	0	1	6
9	7	0 1684D-01	1767D-01	0 0	3	5
10	1	0 0	0 7325D- 2	0 0	4	1
10		0 79 5D-02	0 9708D-02	0 57 8D 00		
1	3	9708D-02	0 1017D-01	0 4262D 00	1	3
10		0 1017D-01	0 1433D-01	0	3	4
10		0 1433D-01	0 1683D-01	0 0	3	5
10		0 1683D-01	0 1684D-01	0	1	6
10	7	0 1684D-01	0 1767D-01	0 0	3	
11	1	0 0	0 7467D-02	0	4	1
11		0 74 7D-02	0 9 50D-0	4 23D 0	4	2
11	3	0 9 0D- 2	0 1017D-01	0 5977D 00	1	3
11	4	0 1017D-01	0 1433D-01	0	3	
11	5	0 1433D-01	0 1683D 01	0 0	3	5
11	6	0 1683D-01	0 1684D- 1	0	1	
11	7	0 1684D-01	0 1767D-01	0 0	3	5

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
1	1	0	0 263998D-02	0 373350D-02	0 656861D-04	0 0	1
1	2	0 3733 0D-02	0 457258D- 2	0 27997D-02	0 656861D-04		1
1	3	0 527997D-02	0 590318D- 2	0 646661D-02	656861D-04	0 0	1
1	4	646661D-0	0 698474D-02	0 746700D-0_	0 656861D-04	0 0	1
1	5	0 746700D-02	773889D-02	0 800155D-02	0 389650D- 4	0 100571D 0	2
1	6	0 80 15 D-0	0 825585D-02	0 850255D-02	0 38965 D-04	0 1 0571D 00	2
1	7	0 850255D-02	0 8742_9D-02	0 897563D-02	0 38965 D-04	0 100571D 00	2
1	8	897563D- 2	0 920306D- 2	0 942500D-02	0 38965 D-04	0 1 571D 00	2
1	9	0 94 5 0D-02	0 9803 2D-02	0 101670D-01	0 685052D-04	0 597717D 00	3
1	10	0 101670D-01	109717D-01	0 117214D-01	0 160326D-03	0 0	4
1	11	0 11721 D-01	124258D-01	0 130925D-01	0 16 326D- 3	0 0	
1	12	0 1309 5D-01	0 137268D-01	0 143330D-01	0 160326D-03	0 0	4
1	13	0 143330D-01	0 147791D-01	0 1521 1D-01	0 122389D-03	0 0	5
1	14	0 1 2121D-01	0 156331D-01	0 160430D- 1	0 12238 D-03	0 0	5
1	1	0 160430D-01	0 164428D-01	0 168330D-01	0 122380D-03	0 0	5
1	16	0 168330D-01	168348D-01	0 168366D-01	0 571191D-06	0	6
1	17	168366D-01	0 169778D-01	0 171179D-01	0 450061D-04	0 0	
1	18	0 171179D-01	0 1725 8D-01	0 173946D- 1	0 450061D-04	0 0	5
1	19	173946D-01	175313D-01	0 176670D-01	0 450061D-04	0 0	5
2	1	0 0	280191D-02	0 396250D-02	0 554934D-04	0 0	1
2	2	0 396250D-02	0 485305D-02	0 560382D- _	0 4934D-04	0 0	1
2	3	0 56038 0-0	0 626526D-02	0 686325D-02	0 554934D-04	0 0	1
2	4	0 68632 D-02	741316D- 2	0 792500D- 2	0 554934D-04	0 0	1
2	5	792500D-	0 816918D-02	0 840628D- 2	27779 D-04	0 143 39D 0	2
2	6	0 840628D-02	0 863687D-02	0 886146D-02	0 77792D-04	0 143439D 0	2
2	7	0 886146D- 2	0 908050D-02	0 92943 D-02	0 277792D-04	0 143439D 0	
2	8	929437D-02	950344D-02	0 970300D-02	0 277792D-04	0 143439D 00	2
2	9	0 97 800D-02	994015D-02	0 1 1670D-01	0 32242 D-04	0 426246D 00	3
2	10	101670D-01	109717D-01	0 117214D-01	120 4 D-03	0 0	4
2	11	0 117214D-01	0 124258D-01	0 130925D-01	0 120245D-03	0 0	4
2	12	13 92 D-01	0 137268D- 1	0 143330D-01	0 12 245D-03	0 0	4
2	13	0 143330D-01	0 147791D-01	0 152121D-01	0 917914D-04	0 0	5
2	14	0 1521 1D-01	0 156331D-01	0 16 430D-01	0 917914D-04	0 0	5
2	15	160430D-01	164428D-01	0 16833 D-01	917914D-04	0	
2	16	16833 D-01	0 168352D-01	0 168374D-01	0 525985D-06	0 0	6
2	17	0 168374D-01	0 169785D-01	0 171184D- 1	0 337221D-04	0 0	5
2	18	0 1 1184D- 1	0 172572D-01	0 173949D-01	0 337221D-04	0 0	
2	19	0 173949D-01	0 175315D-01	0 176670D-01	0 337221D-04	0 0	5
3	1	0	0 297268D-02	0 420400D-02	48 829D-04	0 0	1
3	2	420400D-0	0 514893D-02	0 594 35D-02	0 485829D-04	0 0	1
3	3	0 59453 D-	0 664711D 2	0 728154D-02	0 485829D-04	0 0	1
3	4	7281 4D-02	0 786496D-02	0 840800D-02	0 485829D-04	0	1
3	5	0 840800D-0	0 864746D-02	0 888047D-02	0 24539D-04	0 5000 D 00	2
3	6	888047D-02	0 9107 2D-02	0 932905D-02	0 2 4539D-04	0 25 0 00 00	2
3	7	93 90 D-02	954544D- 2	0 97570_D-02	0 224539D-04	0 0000D 00	2
3	8	0 97 7 2D-0	0 996412D-02	0 101670D-01	0 224539D-04	0 20 00 D 00	2
3	9	101670D-01	0 101670D-01	0 101670D-01	0 558960D-09	0 0	3

----- NODE DATA -- --
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
3	10	0 101670D-01	0 109717D-01	0 117214D- 1	0 93 236D-04	0 0	4
3	11	0 117214D-01	0 124258D-01	0 130925D-01	0 93 236D-04	0 0	4
3	12	0 13 925D-01	0 137268D-01	0 143330D-01	93 236D-04	0 0	4
3	13	0 143330D-01	147791D-01	0 152121D-01	0 713933D-04	0 0	5
3	14	0 152121D-01	0 156331D-01	0 16 430D-01	0 713933D-04	0 0	5
3	15	0 16 430D-01	0 164428D-01	0 168330D-01	0 713933D-04	0 0	5
3	16	0 169330D-01	0 168356D-01	0 168382D-01	0 478527D-06	0 0	6
3	17	0 168382D- 1	0 169791D-01	0 171189D-01	0 262051D-04	0 0	5
3	18	0 171189D-01	0 172576D-01	0 173951D-01	0 262051D-04	0 0	5
3	19	0 1739 1D-01	0 175316D-01	0 176670D-01	0 262 51D-04	0 0	5
4	1	0 0	0 308475D-02	0 436250D-02	0 597889D-04	0 0	1
4	2	0 436250D-02	0 534295D-02	0 616951D-02	0 597889D-04	0 0	1
4	3	0 616951D-02	0 689772D-02	0 755607D-02	0 597889D-04	0 0	1
4	4	0 755607D-02	0 816149D-02	0 87 500D-02	0 597889D-04	0 0	1
4	5	0 8725 0D-02	0 891801D-02	0 910693D-02	0 213960D-04	0 250000D 00	2
4	6	91 693D-02	929201D-02	0 947348D-02	0 213960D-04	0 2500 0D 0	2
4	7	0 947348D-02	0 965153D-02	0 982636D-02	0 213960D-04	0 250000D 00	2
4	8	98263 D-02	0 999813D-02	0 101670D-01	0 213960D-04	0 250000D 00	2
4	9	101670D-01	0 101670D-01	0 101670D-01	0 638812D-09	0 0	3
4	10	0 101670D-01	0 109717D-01	0 117214D-01	0 106884D-03	0 0	4
4	11	117214D-01	0 124258D-01	0 130925D-01	0 106884D-03	0 0	4
4	12	0 1309 5D-01	0 137268D-01	0 143330D-01	0 106884D-03	0 0	4
4	13	143330D-01	0 147791D-01	0 152121D-01	0 815924D-04	0 0	5
4	14	152121D-01	0 156331D-01	0 160430D-01	0 815924D-04	0 0	5
4	15	0 160430D-01	0 164428D-01	0 168330D-01	0 815924D-04	0 0	5
4	16	0 16833 D 01	0 168361D-01	0 168392D-01	0 654805D-06		6
4	17	0 168392D-01	0 169800D-01	171196D-01	0 299127D-04	0 0	5
4	18	0 171196D-01	0 172581D-01	0 173954D-01	99127D-04	0 0	5
4	19	0 173954D-01	0 175317D-01	0 176670D-01	0 299127D-04	0 0	5
5	1	0 0	0 320567D-02	0 453350D-02	0 645680D-04	0 0	1
5	2	0 4 3350D-02	0 555238D-02	0 641134D-02	0 645680D-04	0	1
5	3	0 641134D-02	0 716809D-02	0 785225D-02	0 645680D-04	0 0	1
5	4	0 78 225D- 2	0 848140D-02	0 906700D-02	0 645680D-04	0 0	1
5	5	906700D-02	0 921169D- 2	0 935413D-02	0 166170D-04	0 250000D 0	2
5	6	0 935413D-0	0 949445D-02	0 963271D-02	0 166170D-04	0 250000D 00	2
5	7	0 9 3271D-02	0 976903D-02	0 990346D-02	0 166170D-04	0 500 0D 00	2
5	8	0 990346D-02	0 100361D-01	0 101670D-01	0 166170D-04	0 250000D 00	2
5	9	0 101670D-01	0 101670D-01	0 101670D-01	0 638812D-09	0	3
5	10	0 101670D-01	0 109717D-01	0 117214D-01	0 106884D-03	0 0	4
5	11	0 117214D-01	0 124258D-01	0 130925D-01	0 106884D-03	0 0	4
5	12	0 130925D-01	0 137268D-01	0 143330D-01	106884D-03	0 0	4
5	13	143330D-01	0 147791D-01	0 152121D-01	81 924D-04	0 0	5
5	14	0 152121D-01	0 156331D-01	0 160430D-01	0 815924D-04	0 0	5
5	15	0 16043 D-01	0 164428D-01	0 168330D-01	0 815924D-04	0 0	5
5	16	0 16833 D-01	0 168364D-01	0 168398D-01	0 723579D-06	0 0	6
5	17	0 168398D-01	0 169805D-01	0 171200D-01	0 298898D-04	0 0	5
5	18	0 171200D-01	0 172584D- 1	0 173957D-01	0 298898D-04	0 0	5

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NOD INNER RADIU FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
5	19	1739 7D- 1	0 175319D-01	0 176670D-01	298898D-04	0 0	5
6	1	0 0	0 320567D-02	0 4533 0D- 2	645680D-04	0 0	1
6	2	4 33 0D-02	0 5 238D-02	0 641134D-	0 645680D 4	0	1
6	3	0 641134D-0	0 716879D-02	0 785225D-02	0 64568 D-04	0	1
6	4	78522 D-02	0 84814 D-02	9 6700D- 2	0 645680D-04	0 0	1
6		0 9067 0D-02	0 921169D-02	0 93 413D- 2	0 166170D-04	0 25000CD 00	2
6	6	0 93 413D- 2	949445D-02	963271D-0	0 16617 D- 4	0 2500 D 00	2
6	7	0 963271D-02	976903D-02	990346D-02	0 16 170D-04	0 25 000CD 00	2
6	8	0 990346D-0	0 1003 1D-01	0 101670D-01	0 166170D-04	0 25000CD 00	2
6	9	0 101670D-01	0 101670D- 1	0 101 70D-01	39812D-09	0	3
6	10	0 101670D-01	109717D-01	0 117214D- 1	106884D-03	0 0	4
6	11	0 117214D-01	0 124258D-01	0 130925D-01	106884D-03	0 0	4
6	12	0 1309 D- 1	0 137268D-01	0 143330D-01	10698 D- 3	0	4
6	13	0 14333 D-01	0 147791D-01	0 152121D-01	0 815924D-04	0 0	5
6	14	0 1 2121D-01	0 15631D-01	0 160430D- 1	0 815924D-04		5
6	15	16 430D-01	0 164428D-01	0 168330D-01	615924D-04	0	5
6	16	0 168330D-01	0 169363D-01	0 168396D-01	0 701359D-06	0 0	
6	17	1683 6D-01	0 169803D-01	0 171199D-01	298972D-04	0 0	
6	18	0 171199D-01	0 172583D-01	1739 6D-01	298972D-04	0 0	5
6	19	0 173956D-01	0 175318D-01	0 176670D-01	298972D-04	0 0	5
7	1	0 0	3205 7D-02	0 4533 0D-02	0 645680D-04	0 0	1
7	2	0 453350D-0	0 55523 D-02	0 641134D-02	0 645680D-04	0 0	1
7	3	0 41134D-02	0 7169 9D-02	0 78 2 5D-02	0 64568 D-04	0 0	1
7	4	79522 D-02	84914 D-02	0 906700D-0	0 64 680D-04	0 0	1
7	5	0 90 700D-	921169D-0	0 93 413D-02	0 16617 D-04	0 2 00 CD 0	2
7	6	0 93 413D-0	949445D-02	0 963271L 02	16617 0-0	0 000CD 0	2
7	7	0 963271L-02	0 976903D-02	0 990346D-0	0 166170D-04	0 25000CD 00	
7	8	99 34 0-0	1 361D- 1	0 101670D-01	16 17 D-04	0 25 000D 00	2
7	9	0 101 70D- 1	0 101670D- 1	1 1670D-01	638812D-09	0	3
7	10	0 101670D-01	0 109717D 01	0 117214D- 1	106884D-03	0	4
7	11	117214D 1	0 124258D-01	0 13 925D- 1	106884D- 3	0	
7	12	0 13 9 5D- 1	0 137268D- 1	0 143330D-01	0 106884D-03	0 0	4
7	13	0 143330D- 1	0 147791D-01	0 1 2121D- 1	81 924D-04	0	5
7	1	0 15 121D-01	0 15 331L- 1	0 16043 0-01	0 815924D-04	0 0	5
7	15	0 1 0430D-01	0 164428D-01	0 168330D-01	0 815924D-04	0 0	
7	16	0 1 833 0- 1	0 1 8362D-01	0 163394D- 1	0 681256D-0	0	6
7	17	0 1 839 0-01	0 169802D-01	0 171197D-01	299 39D-04	0 0	5
7	18	0 171197D-01	0 172582D-01	0 1739 5D- 1	299 39D-04	0	5
7	19	1739 D- 1	175318D- 1	176670D- 1	299 39D-04	0 0	5
8	1	0 0	0 308475D-02	0 4362 0D-02	0 597889D-04	0 0	1
8		43 2 D-0	534 95D-02	0 1 9 1D-	597889D-04		1
8	3	1 9 1D-02	689772D-0	0 7 607D- 2	0 597889D-04	0 0	1
8		0 7 607D-0	816149D-02	0 87 00D- 2	97889D-04	0	1
8	5	8725 0D-	0 891801D-0	0 91 693D 2	21396 D-0	0 5 0 D	
8	6	91 693D-0	0 929201D-02	0 9473 8D-02	0 13960D-04	0 25000CD 00	2
8	7	0 947340D-0	0 965153D- 2	0 98 36D-0	0 1396 D-04	0 25 0D 0	2

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIUS FT	NODE CENTER RADIUS FT	NODE OUTER RADIUS FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
8	8	0 98263 D-02	999813D- 2	101670D-01	0 21396 D-04	0 5000 E 00	2
8	9	101670D-01	0 101670D-01	0 101670D-01	0 638812D-09	0 0	3
8	10	0 101 70D-01	0 109717D-01	0 117214D-01	0 106884D-03	0 0	4
8	11	0 117 14D 01	0 1242 8D-01	13092 D-01	0 106884D-03	0	4
8	12	0 1309 5D-01	0 137268D-01	0 143330D-01	0 106884D-03	0 0	4
8	13	0 143330D-01	0 147791D-01	0 152121D-01	0 815924D-04	0 0	5
8	14	0 1521 1D-01	0 156331D- 1	0 160430D-01	0 815924D-04	0 0	5
8	15	0 160430D-01	0 164428D-01	0 168330D-01	0 815924D-04	0	5
8	16	0 16833 D-01	0 168364D-01	0 168398D-01	0 717230D-06	0 0	6
8	17	0 168398D-01	0 169804D-01	0 171200D-01	0 298919D-04	0 0	5
8	18	171200D-01	0 172583D-01	0 173956D-01	0 298919D-04	0 0	5
8	19	173956D-01	0 175318D-01	0 176670D-01	298919D-04	0 0	5
9	1	0 0	0 297268D-02	0 4204 0D-02	0 485829D-04	0 0	1
9	2	0 4204 0D- 2	0 514883D-02	0 594535D-02	0 485829D-04	0 0	1
9	3	0 5945 5D-0	0 664711D-02	0 728154D-02	0 48582 D-04	0 0	1
9	4	0 728154D-	0 786496D-02	0 840800D-02	0 485829D-04	0 0	1
9	5	0 840800D-02	0 864746D-02	0 888047D-02	0 224539D-04	0 250000D 00	
9	6	0 888047D-02	0 910752D-02	0 932905D-02	224539D-04	0 2 0000D 0	2
9	7	0 93290 D-02	0 954544D-02	0 975702D-02	0 224539D-04	0 2 0000D 00	2
9	8	0 975702D-0	0 996412D-02	0 101670D-01	0 224539D-04	0 250000D 00	2
9	9	0 101670D-01	0 101670D-01	0 101670D-01	0 558960D-09	0 0	3
9	10	0 101670D-01	0 109717D-01	0 117214D-01	0 935236D-04	0 0	4
9	11	0 117214D 01	0 124258D-01	0 130925D-01	0 935236D-04	0 0	4
9	12	1309 5D-01	0 137268D-01	0 143330D-01	0 935236D-04	0 0	4
9	13	0 143330D-01	0 147791D-01	0 152121D-01	713933D-04	0 0	5
9	14	0 1521 1D-01	0 156331D-01	0 160430D-01	0 713933D-04	0	5
9	15	0 160430D-01	0 164428D-01	0 168330D-01	0 713933D-04	0 0	
9	16	0 168330D-01	0 168364D-01	0 168398D-01	0 631280D-06	0 0	6
9	17	0 168398D-01	0 169805D-01	0 171200D-01	0 261542D-04	0 0	5
9	18	0 171200D-01	0 172584D-01	0 173956D-01	0 261542D-04	0 0	5
9	19	0 1739 6D-01	0 175318D-01	0 176670D-01	0 261542D-04	0 0	5
10	1	0 0	0 280191D-02	0 396250D-02	0 554934D-04	0 0	1
10	2	0 396250D-0	0 485305D-02	0 60382D-02	0 554934D-04	0 0	1
10	3	0 56 382D-02	0 626526D-02	0 686325D-02	0 554934D-04	0 0	1
10	4	0 686325D-02	741316D-02	0 792500D-02	554934D-04	0 0	1
10	5	0 792500D-0	0 816918D-02	0 840628D-0	0 277792D-04	0 143439D 0	2
10	6	0 8406 8D-02	0 863687D-02	0 88 146D-02	277792D-04	0 143439D 00	2
10	7	0 886146D-02	0 908050D-02	0 929437D-02	0 277792D-04	0 143439D 00	2
10	8	0 929437D-02	950344D-02	0 970800D-02	0 277792D-04	0 143439D 00	2
10	9	0 970800D-02	0 994015D-02	0 101670D-01	0 322420D-04	0 426246D 00	3
10	10	0 101670D-01	0 109717D-01	0 117214D-01	0 120 45D-03	0 0	4
10	11	0 117214D-01	0 1242 8D-01	0 130925D-01	0 12 245D-03	0 0	4
1	12	0 13 925D-01	0 137268D-01	0 1 3330D-01	0 120245D-03	0 0	4
10	13	0 143330D-01	0 147791D-01	0 152121D-01	0 917914D-04	0 0	5
10	14	0 152121D-01	0 156331D-01	0 160430D-01	0 917914D-04	0 0	
10	15	0 160430D-01	0 164428D-01	0 168330D-01	0 917914D-04	0 0	5
10	16	0 168330D-01	0 168355D-01	0 168381D-01	0 604537D-06	0 0	6

----- NODE DATA -----
(PIN NO 1)

LEVEL NO	NODE NO	NODE INNER RADIU FT	NODE CENTER RADIUS FT	NODE OUTER RADIU FT	NODE VOLUME FT3	RADIAL POWER PEAKING FACTOR	MATERIAL I D NO
10	17	168391D-01	169790D-01	0 171188D-01	0 36959D-04	0 0	5
10	18	171188D-01	0 172 7 D-01	0 1739 1D-01	3369 9D-04	0	5
10	19	0 173951D-01	0 17 316D-01	0 17 670D-01	0 336959D-04	0 0	
11	1	0 0	0 263998D 02	0 3733 0D-02	0 656861D-04	0 0	1
11	2	0 373350D-02	0 457258D-02	0 279970D-02	0 656861D 04	0 0	1
11	3	0 527997D-02	0 590318D-02	0 646661D-02	65 861D- 4	0	1
11	4	0 646661D-02	0 698474D-02	0 74 700D-02	656861D-04		1
11		0 746700D-02	0 771245D-02	0 795033D 02	351149D-04	0 1 0571D 0	2
11	6	0 795 33D-02	81812 D-02	0 840 91D-02	351149D-04	0 1 571D 0	2
11	7	840591D- 2	862468D 02	883804D-0	0 351149D-04	0 100571D 00	2
11	8	0 883804D-02	904636D-02	0 92 0 D-0	0 351149D 04	1 0571D 00	2
11	9	0 9 5 00D- 2	0 971932D 02	101670D-01	0 8390 9D-04	977170 00	3
11	10	10167 D-01	0 109717D-01	0 117214D-01	0 160326D-03	0 0	4
11	11	117214D-01	0 124258D- 1	0 130925D-01	0 16 32 D-0	0	4
11	12	130925D-01	0 137268D 1	0 143330D- 1	0 1 0326D- 3	0	4
11	13	0 1 333 0D-01	0 147791D-01	0 1 21 1D- 1	122389D-03	0	5
11	14	152121D-01	0 15 331D 01	0 16 430D- 1	12 389D-03	0	
11	15	0 160430D- 1	0 164428D- 1	0 168330D-01	0 12 389D-03	0 0	
11	16	16333 D-01	0 163362D-01	0 1 8395D- 1	102347D- 5	0	6
11	17	0 168395D- 1	0 169302D-01	0 171197D-01	448554D-04		
11	18	0 171197D-01	0 17253 D-01	0 173955D-01	0 448554D-04	0 0	
11	19	0 173955D-01	0 175318D- 1	0 176670D-01	0 4495 4D- 4	0 0	5

---- MATERIAL DATA -----
(PIN NO I)

IDENTIFIED MATE IALS

ATERIAL NO I I MAG ESIUM OXIDE

MATE IAL NO 2 IS IN CONEL

MATERIAL NO 3 IS COPRO-NIC EL

MATERI L NO 4 IS CCR N NITRIDE

MATERIAL NO IS STAI LESS STEEL 316

FOLLOWING ARE DESCRIPTIONS OF THE OTHER MATERIALS

----- MATERIAL DATA -----
(PIN NO 1)

MATERIAL NO 6

MELTING TEMPERATURE (F)
500 00

THERMAL CONDUCTIVITY
(BTU/HR-FT-F)

ALLOWED TEMPERATURE RANGE

HIGH	LOW
2300 00	0 0

TEMPERATURE (F)	CONDUCTIVITY (BTU/HR-FT-F)	TEMPERATURE (F)	CONDUCTIVITY (BTU/HR-FT-F)	TEMPERATURE (F)	CONDUCTIVITY (BTU/HR-FT-F)	TEMPERATURE (F)	CONDUCTIVITY (BTU/HR-FT-F)
200 00	0 173196D-01	1000 00	0 34 996D-01	1600 00	475560D-01		

SPECIFIC HEAT CAPACITY
(BTU/LBM-F)
0 0

DENSITY
(LBM/FT #3)
0 0

END OF INPUT DATA PROCESSING

TEADY-STATE OUTPUT

---- YSTEM PO ER DATA -- -

SYSTEM	STEADY-STATE POWER	
NUCLEAR	0	MW
IDEAL ELECTRIC	0 8217630 02	KW
ACTUAL ELECTRIC	0 0	KW

++++ NOTE THE IDEAL SYSTEM SURFACE HEAT FLUX TABLE IS BEING NORMALIZ D

TEADY-STATE PO ER (PIDL) - 0 8 17 30 02

STEADY-STATE FLUX (PHIIDL) 0 9766 00 02

RATIO - 0 1 0000 01

TALULATED STEADY-STATE FLUX - 0 976640D 02

STEADY- TATE IDEAL
ELECTRIC YST OUTPUT

BOUNDARY CONDITION FOR POWER BACK CALCULATION

(BACK-CALCULATED ON PIN NO 1 AT LEVEL NO 5)

SURFACE HEAT FLUX (BTU/SEC-FT 2)	SURFACE TEMPERATURE (F)
0 9766400 02	621 3

----- NORMALIZED HEAT FLUX TABLE -----

TIME (SEC)	HEAT FLUX (BTU/SEC-FT* 2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT*)	TIME (EC)	HEAT FLUX (BTU/SEC-FT *2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT 2)
0 0	0 976640D 02	0 500 0 D-01	0 91407 D 02	1 0 0D 00	0 78412 D 2	0 1 00 00 00	0 630070D 02
0 20 000D 00	4 3850D 02	0 2 000 D 0	0 737160D 02	30000 D 0	847820D 02	0 5000 0D 00	0 889260D 02
0 400000D 00	0 920330D 02	0 450000D 00	0 922200D 02	0 5000 D	0 9 8400D 02	0 5 0 0D 00	0 9 6540D 02
0 600 00D 00	0 9 5390D 02	0 650 000 00	0 92 0 D 2	700000D 0	9 5650D 2	0 750 0D 00	0 916860D 02
0 80 000D 00	0 88427OD 02	0 8 000 0 0	0 904160D 02	0 9000000 00	0 216390D 01	0 95000D 00	0 700380D 00
0 10000OD 01	125290D 01	0 10500 D 01	0 773030D 00	110 D 1	0 12878 D 01	11 000 01	196820D 01
0 120000D 01	0 347100D 01	0 12500 D 01	766010D 01	130 00D 01	0 888 00D 01	0 135000D 01	0 107310D 02
0 140000D 01	0 984040D 01	0 145000D 01	0 19151 D 02	150000D 01	0 2262 0D 2	1 0 0D 1	125050D 02
0 160000D 1	0 721770D 01	1650 0D 01	0 100550D 02	0 167000D 01	0 887270D 01	0 17200 D 01	0 170230D 02
0 1770 0D 01	0 168540D 02	0 182000D 01	0 196020D 02	0 187000D 01	0 115960D 02	0 192000D 01	147310D 02
0 197000D 01	0 16561 D 02	0 20200 D 01	0 160560D 02	0 07 0D 01	0 174830D 0	0 212 0 01	0 150560D 02
0 217000D 01	0 119490D 0	0 2 2 000D 1	0 118580D 0	0 27000D 01	0 138700D 02	0 32000D 01	0 165060D 0
0 237000D 01	19242 D 02	0 242000D 01	0 172120D 02	247 0D 1	0 143870D 0	2 200 01	0 158770D 0
0 254000D 1	0 13208OD 02	2 900 D 01	0 173850D 02	0 264000D 01	0 176 0D 02	0 269 D 01	1358 D 02
0 274000D 01	0 125590D 02	0 790000D 01	0 155480D 02	0 284000D 01	0 15101 D 02	0 285000D 01	0 179780D 02
0 29400 D 01	0 176940D 02	0 0900 D 01	0 137030D 02	3040 0 01	0 15 160D 0	0 3 900 1	0 167740D 02
0 314 00D 01	0 190210D 02	0 319000D 01	0 198930D 02	0 324000D 01	0 178240D 02	0 329000D 01	0 172390D 02
0 334 00D 01	0 18 32 D 0	0 339000D 01	0 164160D 02	0 341 0D 01	0 1577 01 02	0 346000D 01	0 1 5250D 02
0 35100 D 01	0 157120D 2	356000D 01	0 158 0 D 2	0 35100 D 01	160750D 0	0 3 60 D 1	16 490D 0
0 371000D 01	0 903 60D 01	0 376000D 01	0 106120D 02	0 3810 0D 01	0 1292 D 02	0 8 0 0D 01	0 132180D 02
0 391000D 01	0 12166 D 02	0 396 00D 01	0 741 9 0 01	401 0 D 01	0 682 0D 01	0 40600 1	0 620920D 00
0 411000D 01	0 226490D 02	0 416000D 01	0 680810D 01	0 421000D 01	0 36 470D 01	0 4260 D 01	881030D 01
0 428000D 01	0 60479 D 00	0 433000D 01	0 1 4810D 02	0 438 D 1	0 114050D 02	0 443 00D 1	970320D 01
0 448000D 01	0 129300D 02	0 453 00D 01	141300D 02	0 4 8 D 1	135410D 02	0 463000D 01	0 110660D 02
0 468000D 01	0 143450D 02	0 473000D 01	122010D 02	0 78 00D 01	0 126180D 02	0 48 00D 01	104320D 02
0 488000D 01	0 104270D 0	0 493000D 01	0 7978 D 1	0 4980 0D 01	0 899_90D 1	0 50 0D 01	0 10 800D 02
0 508000D 01	0 107890D 02	0 513000D 01	0 111900D 02	0 150 0D 01	0 109710D 2	52 000D 1	0 106810D 02
0 525000D 01	0 106740D 02	0 530 0D 01	1 8300D 02	0 535 0 D 1	0 1 4430D 0	0 540000D 1	10 890D 02
0 54 00D 01	0 10393 D 02	0 550000D 1	1 5 400D 02	0 5 5000D 01	0 104130D 0	0 5600 0D 01	0 958020D 01
0 565000D 01	0 974060D 01	0 57 000D 01	0 934920D 01	0 5750 0D 01	0 918900D 01	0 5800 0D 1	0 978920D 01
0 5850 0D 01	0 98411 D 01	0 59000 D 1	0 9302 0D 01	0 5950 0D 01	0 12860D 01	0 600000D 01	0 868040D 01
0 602000D 01	0 821740D 01	0 607000D 01	0 725070D 01	12000D 01	0 794290D 01	0 617000D 1	864500D 01
0 622000D 01	799 70D 01	0 627000D 1	0 813870D 01	6320 0D 1	0 8515 0D 01	0 637 00D 01	0 828040D 01
0 642000D 01	0 791550D 01	0 647000D 01	0 789600D 01	0 652000D 01	0 759780D 01	0 657000D 01	0 821520D 01
0 66 000D 01	0 814030D 01	667000D 01	0 795580D 01	0 672000D 1	0 8392 0D 01	0 677000D 01	0 80 260D 01
682000D 01	0 82796OD 01	0 687000D 01	857530D 01	0 690000D 01	0 904430D 01	0 694000D 01	0 720690D 01
0 699000D 01	0 624540D 1	0 704000D 01	695750D 01	0 709000D 01	0 6769 0D 01	0 714 00D 1	656550D 01
0 719000D 01	0 63249 0 01	724000D 01	619980D 01	0 729000D 01	0 653550D 01	0 7 4 0D 01	0 68 590D 01
739000D 01	0 715370D 01	0 744000D 01	0 735910D 01	0 749000D 01	0 72 390D 01	0 754000D 01	0 713820D 01
0 759000D 01	0 729710D 01	764000D 01	0 73856 0 01	0 769000D 01	751530D 01	0 774000D 1	7 3400D 01

-- -- NORMALIZED HEAT FLUX TABLE - ---

TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)	TIME (SEC)	HEAT FLUX (BTU/SEC-FT**2)
0.776000D 01	0.74528D 01	7910D 01	7.17 0 01	736 0D 1	0.7127 0D 01	0.7910 D 01	14 0D 01
0.796000D 01	0.5 37100 01	0.801000D 01	0.8 36500 01	0 0 000D 01	0.010410D 01	0.8110 0 01	93 210D 01
0.810 D 1	0.9 572 D 1	821 D 1	0.99739 D 01	0 00 D 1	0.3932 0D 01	8 1 0D 1	3910D 01
0.8360 0D 1	14 10 1	841 0 D 1	91316 0 1	4 0D 1	92102 D 1	0.8 100 D 01	0.885830D 01
0.856000D 01	0 100 01	0.861000D 01	0.82126 0 01	0.8 3 00D 1	8_46 D 01	0 6800 D 01	0.8239 D 01
0.8730 0D 1	0.7 43 0 1	0.87 0 D 01	76 200D 01	833 0D 1	0.729580D 1	0.888 0D 1	0.70 390D 01
0.893000D 01	0.71 0D 01	0.898000D 01	0.7 770D 01	0.000000D 1	7 1	0.9 8 D 01	0.714160D 01
913 0 D 1	729 D 1	918 D 1	0.6379 0D 01	9230 0D 1	516 0 1	28 0D 1	0 07 30D 01
0.933000D 1	0 9761 1	0.938 D 01	08 7 0 1	0.943000 01	0.5 2540D 01	0.948000D 01	0 86410D 01
0.950000D 01	0.5982 D 1	0.9 0 00D 1	5769 0D 01	0.9 0 D 1	0.884 0D 1	65 0D 01	499040D 01
970 00D 1	0 99 D 01	0.975 D 01	5 8 D 01	980 1	0 933 0D 1	0.98 000D 01	0.485040D 01
0.990000D 01	0.427780D 01	0.99 000D 01	0.431940D 01	10 D 2	0.48 94 D 1		

FOLLOWING ARE SUMMARIES OF THE IDEAL ELECTRIC SYSTEM PIN(S) CONDITIONS

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

TAU (SEC)	DELT (SEC)
0 0	0 0

	BTU/SEC	K
PIN POWER	0 779008D 2	0 821763D 02
SYSTEM AVG PIN POWER	7790 80 02	821763D 02

LEVEL NO	LEVEL POWER (BTU/SEC)	SURF HEAT TRAN (BTU/SEC)	SURF HEAT FLUX (BTU/SEC-FT *2)	CENTERLINE TEMP (F)	HEATER NODE TEMP(F)	SURFACE TEMP (F)	ADJACENT COOL TEMP(F)	SURF HT TRANS COEFF(B/S-FT2-F)
1	0 273951D 01	0 0	0 0	0 0	0 0	0 0	0	0 0
2	0 387 57D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	0 691370D 01	0 0	0 0	0 0	0	0 0		0 0
4	0 834188D 01	0 0	0 0	0 0	0	0 0		0 0
5	0 108412D 02	0 108412D 02	0 976640D 02	100306D 04	0 983069D 03	0 6 1330D 03	0 0	0 0
6	0 108412D 02	0 0	0 0	0 0	0 0	0		0 0
7	0 108412D 02	0 0	0	0 0	0 0	0 0		0 0
8	0 834188D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 691370D 01	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	0 3875 7D 01	0 0	0 0	0 0	0	0 0	0 0	0 0
11	0 273951D 01	0 0	0 0	0 0	0	0 0	0	0 0

LEVEL	EQUIVALENT GAP CONDUCTIVITY (BTU/SEC-FT-F)	GAP CONDUCTANCE (BTU/SEC-FT *2-F)	GAP THICKNESS (FT)	STEADY STATE GAP THICKNESS (FT)	N OF ITERATIONS IN H T SOLUTION
1	0 0	0	0 0	0 0	
2	0	0	0 0	0	0
3	0 0	0	0	0 0	0
4	0 0	0	0 0	0 0	
5	0 0	0	0 0	0 0	14
6	0 0	0	0	0 0	0
7	0 0	0 0	0 0	0 0	
8	0 0	0 0	0 0	0 0	0
9	0	0 0	0	0 0	
10	0 0	0 0	0 0	0 0	
11	0 0	0 0	0 0	0 0	0

SUMMARY OF PIN CONDITION PIN NO 1 SYSTEM NO 2

PIN TEMPERATURE DISTRIBUTION

LEVEL NO	NODE 1	2	3	4	5	6	7	8	9	10
1	0 0	0 0		0 0	0 0	0 0			0 0	0 0
2	0 0			0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	0	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0
4	0	0	0 0	0 0	0 0	0 0	0 0		0 0	0
5	1003 06	1003 06	1003 06	1003 05	1003 05	990 47	992 71	983 07	976 88	944 41
6			0	0 0	0	0	0	0	0	0 0
7		0 0	0 0	0 0	0	0	0 0	0 0	0 0	0 0
8	0 0	0 0	0 0	0 0	0 0	0	0 0	0	0	0 0
9	0 0	0 0	0 0	0	0	0	0	0 0	0 0	0 0
1	0	0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	0 0		0 0	0 0	0	0 0	0	0 0	0 0	0 0

LEVEL NO	NODE 11	12	13	14	15	16	17	18	19
1	0 0	0 0	0	0 0	0 0	0 0	0 0	0	0
2	0 0	0	0	0 0	0 0	0 0	0 0	0 0	0 0
3	0 0	0 0	0	0	0	0	0	0	0 0
4	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0
5	891 90	850 71	815 59	783 49	754 28	695 60	645 51	63 62	626 00
6	0		0 0	0 0	0 0	0 0	0 0	0 0	
7	0 0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0
8	0 0	0 0	0 0	0 0	0 0	0	0	0	0 0
9	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0

SUMMARY OF PIN CONDITIONS PIN NO 1 YSTEM NO

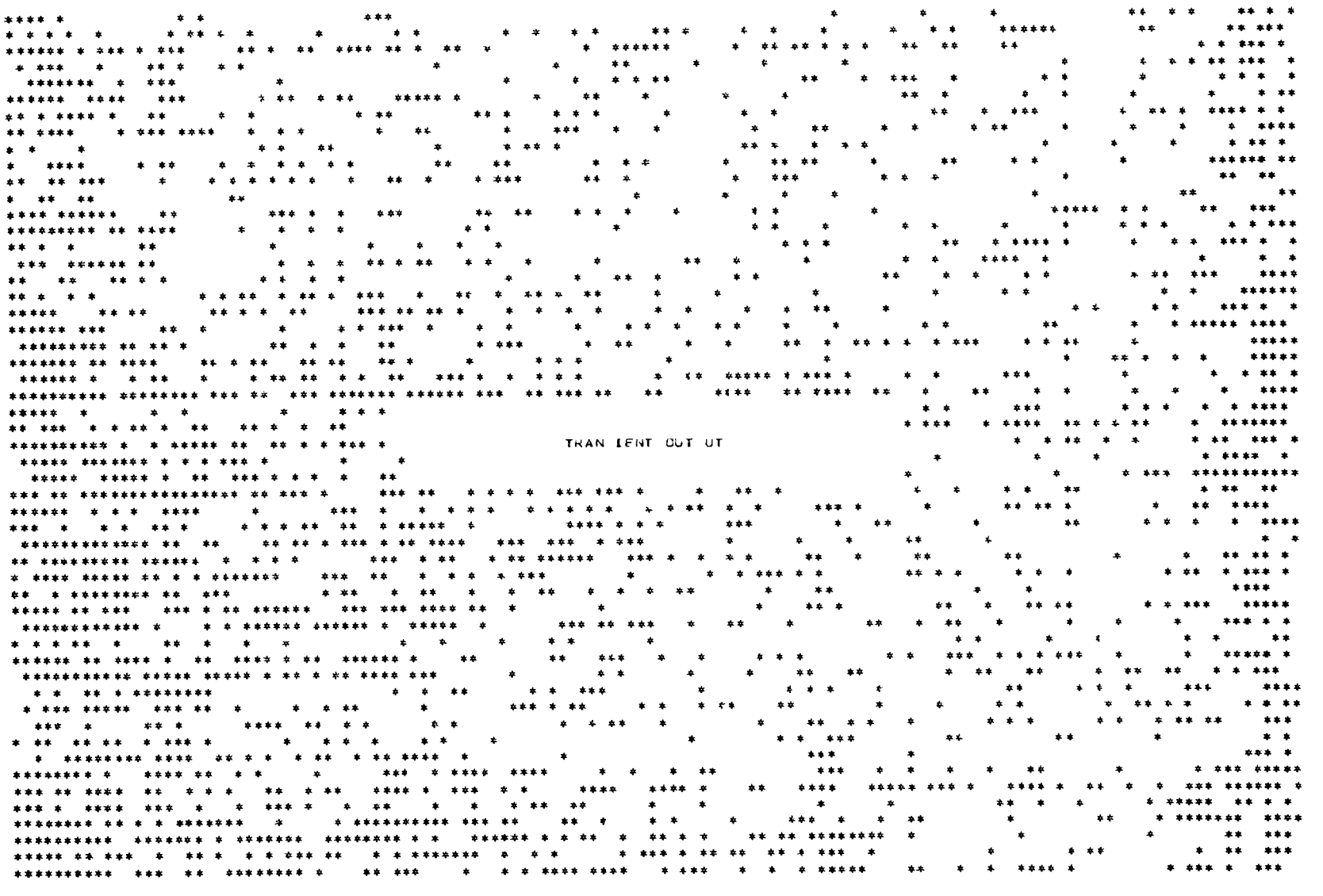
TOTAL TORED ENERGY PIN 1 - 0 489290D 02 BTU

LEVEL	TORED ENERGY PER LEVEL(BTU)
1	0 0
2	0
3	0
4	0 0
5	489 9 D 02
6	0
7	0 0
8	0 0
9	0
10	0 0
11	0 0

TOTAL NODAL STORED ENER Y (BTU)

LEVEL NO	NODE 1	2	3	4	5	6	7	8	9	10
1	0 0	0 0	0 0	0	0	0 0	0		0	0 0
2	0		0	0 0	0 0	0 0	0 0	0	0	0 0
3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	0	0 0
4	0 0		0		0	0	0 0	0	0 0	0
5	0 39 9D 1	0 39290 1	39290 01	0 39290 01	0 10 D 01	1 81D 01	0 1072D 01	0 1060D 01	0 3887D-04	0 4742D 01
6	0 0	0 0	0 0	0		0 0	0			0
7	0	0	0		0	0 0	0	0 0		0 0
8	0 0			0 0	0 0	0 0	0	0 0	0 0	0 0
9	0	0 0	0	0 0	0 0	0	0 0		0 0	0 0
10	0 0		0 0		0		0 0			0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0 0			0

LEVEL NO	NODE 11	12	13	1	15	16	17	18	19
1	0 0		0 0	0	0	0 0	0 0	0	0
2	0		0	0 0	0	0	0 0	0	0 0
3	0 0	0 0	0 0	0 0	0 0	0 0	0 0		0 0
4	0	0	0 0	0	0	0 0	0	0	0 0
5	4 39	12	4 2	4 0	3 88	0	1 18	1 16	1 14
6	0 0	0 0	0 0	0 0	0	0	0	0	0
7	0 0	0	0	0	0	0			0
8	0	0	0	0 0	0 0	0 0	0 0	0 0	0 0
9	0	0 0	0 0	0 0	0		0	0 0	0
1	0	0		0 0	0	0	0 0		0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0	0	0




```
** **     TAU =   0 9000000  0  WARN HAS BEEN CALLED  POSSIBLE PROBLEM ERROR *** * * *
 ***  *   TAU      950000D  0  WA N HAS BLEN CALLLD  POSSIBLE PROBLEM ERROR *    * *
***** *** TAU =   0 10000 D  1  WARN HAS BEEN CALLED  POSSIBLE PROBLEM ERROR *    **
```

```
******** ** ****   *** *       *****   ** * *        MAJOR EDIT NUMBER   1        *  **   ** ** ******     *   * *** ****** ** ***
**** ********** * **  ** *  ****  ***********       TIME ST P NUMBER    20        ***  **** ** *** *****  *     * * *******  ***
************************ ** *  **  ******** ****    TRANSIENT TIME     1 0000 SEC  * ** *** * * * ** **  *  *      * *    * *  **
```

TYPE OF OUTPUT	CURRENT NO OF RECORDS WRITTEN
MAJOR EDIT	1
MINOR EDIT	20
PLOT RECORD	
RESTART RECORD	0

----- YSTEM DATA --- -

SYSTEM	SYSTEM NO	SYSTEM POWER (KW)	AVERAGE PIN POWER (KW)	AVERAGE PIN POWER (BTU/SEC)
IDEAL E	2	0 0	0	0 0

MAJOR EDIT NUMBER 1
TIME STEP NUMBER 20
TRANSIENT TIME - 1 0000 SEC

IDEAL SYSTEM DATA

BOUNDARY CONDITION FOR POWER BACK-CALCULATION

(BACK-CALCULATED ON PIN NO 1 AT LEVEL NO 5)

SURFACE HEAT FLUX (BTU/SEC-FT**2)	SURFACE TEMPERATURE (F)
0 125290D 01	680 57

BACK-CALCULATED SYSTEM POWER - 0 0 KW

BACK-CALCULATION ENERGY BALANCE ERRORS CONVERGED TO WITHIN 0 10 000D 00 IN 4 ITERATIONS

EFFECT OF FILTERING IN BACK-CALCULATION

	UNFILTERED SIGNAL		FILTERED SIGNAL		FILTER
	LAST STEP	THIS STEP	LAST STEP	THIS STEP	FLAG
HEAT FLUX	0 125290D 01	0 125290D 01	0 125290D 01	0 125290D 01	0
TEMPERATURE	0 680570D 03	0 680570D 03	0 680570D 03	0 680570D 03	0
POWER	-0 376776D 04	-0 376776D 04	0 0	0 0	4

FOLLOWING ARE SUMMARIES OF THE IDEAL ELECTRIC SYSTEM PIN(S) CONDITIONS

SUMMARY OF PIN CONDITIONS PIN NO 1 SY TEM NO 2

TAU (SEC) D LT (SEC)
0 100D 01 0 500D-01

	BTU/SEC	KW
PIN POWER	0 0	0 0
SYSTEM AVG PIN POWER	0 0	

LEVEL NO	L VEL POWER (BTU/SEC)	SURF HEAT TRAN (BTU/S C)	SURF HEAT FLUX (BTU/SEC HT *2)	CENTERLINE TEMP (F)	HEATER NODE T P(F)	SURFACE TEMP (F)	ADJACENT COOL TE P(F)	URF HT TRANS COEFF(J/S-FT2-F)
1	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0
2	0 0		0 0	0	0 0	0	0 0	0 0
3	0	0	0 0	0	0		0	0 0
4	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0
5	0 0	0 799389D 1	0 720136D 02	0 99676 D 3	0 004731D 03	680 70D 03	0 0	0 0
6	0 0	0	0	0	0 0	0 0	0 0	0 0
7	0 0		0		0 0		0 0	0 0
8	0 0	0	0	0	0 0	0	0	0
9	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0
10	0	0 0	0	0	0	0	0 0	0 0
11	0 0	0	0 0	0 0	0 0	0	0	0 0

LEVEL	EQUIVALENT GAP CONDU TIVITY (BTU/SEC-FT-F)	GAP CONDUCTANCE (BTU/SEC-FT 2-F)	GAP THICKNE S (FT)	STEADY STATE AP THICKNESS (FT)	NO OF ITERATIONS IN H T SOLUTION
1	0 0	0 0	0 0	0 0	0
2	0				
3			0	0 0	0
4	0 0	0 0	0 0	0	
	0 0	0	0		4
6	0		0	0 0	0
7	0 0	0	0 0	0	
8		0	0	0	
	0 0	0 0	0 0	0 0	0
1			0	0	
11		0 0	0		

UMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

PIN TEMPERATURE DISTRIBUTION

NODE

LEVEL NO	1	2	3	4	5	6	7	8	9	10
1	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0	0 0
2	0 0		0 0	0	0 0	0 0	0	0 0	0	0 0
3	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	0 0	0	0 0	0	0 0	0 0	0	0	0 0	0 0
5	996 77	993 97	979 10	946 66	916 2	912 86	908 92	9 4 73	902 50	891 71
6	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	0
7	0 0	0 0	0 0	0	0 0	0	0	0 0	0 0	0 0
8	0 0	0	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 0	0	0 0	0 0	0 0	0	0 0	0	0 0	0 0
10	0	0	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0

NODE

LEVEL NO	11	12	13	14	15	16	17	18	19
1	0 0	0	0 0	0 0	0 0	0 0	0 0	0 0	0
2	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0	0 0
3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0
5	867 17	843 6	821 04	798 74	777 8	734 64	696 15	690 93	683 96
6	0 0	0 0	0 0	0 0	0 0	0 0	0	0 0	0 0
7	0	0 0	0 0	0 0	0 0	0	0 0	0 0	0 0
8	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	0 0	0 0	0 0	0	0 0	0	0 0	0	0 0
10	0	0	0	0	0 0	0 0	0		0 0
11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

SUMMARY OF PIN CONDITIONS PIN NO 1 SYSTEM NO 2

TOTAL STORED ENERGY PIN 1 0.481241D 02 BTU

LEVEL	STORED ENERGY PER LEVEL(BTU)
1	0
2	0.0
3	0.0
4	
5	481241D 02
6	0.0
7	0.0
8	
9	0.0
10	0
11	0

TOTAL NODAL STORED ENERGY (BTU)

NODE

LEVEL NO	1	2	3	4	5	6	7	9	10
1	0	0	0.0	0	0.0	0	0	0	0.0
2	0.0	0.0	0.0	0.0	0	0.0	0.0	0	0.0
3				0		0	0	0.0	0.0
4	0			0	0.0	0.0	0.0	0.0	0.0
5	0.3901D 01	3838D 1	3821D 01	3.7 D 01	9765D 0	0720D	967 D 00	0.9 22D 0	0.3 3 D-04 4380D 01
6	0.0	0	0	0.0			0	0	0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
8	0	0.0	0.0			0	0.0	0	0.0
9		0	0.0	0		0	0.0	0.0	0.0
10	0.0	0.0	0.0	0	0	0.0	0.0		0.0
11	0	0	0.0		0	0	0.0	0	0.0

NODE

LEVEL NO	11	12	13	14	15	16	17	18	19
1	0.0	0	0	0.0	0	0.0	0	0	0.0
2	0.0	0.0	0.0	0	0	0		0.0	
3	0	0.0	0.0	0.0	0		0	0	0
4	0.0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
5	4.22	7	4.28	4.1	4.0	0	1.30	1.28	1.27
6	0	0.0	0.0	0	0		0	0	0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0
8	0	0	0.0	0.0			0		0
9	0	0	0.0	0	0.0	0	0	0.0	0.0
10	0.0	0.0	0	0.0	0	0.0		0.0	0.0
11			0		0	0.0	0	0.0	0

```
* * * *** TAU -   0.105000D 01  WARN HAS BEEN CALLED  POSSIBLE PROBLEM ERRO   ** **
* **  * * TAU      1100 0D 1  WARN HA BEEN C LL E  OS IBL PROBL M PPOR     *   *
* * * *   TAU    0.1150 D 01  WARN HAS BEEN CALLED  POSSIBLE PROBLE ERROR       **
*  *    * TAU -   0.1200000 01  WARN HAS BEEN CALLED  POSSIBLE PROBLEM ERROR  *  **
```

```
*** ** **      **** *   * *  *      *       **            AJOR  DIT NUMBER   2          * **  *                *  ****    *  * **  *  ***
************ *    *  ** **** *  **  **       **  *      TIME STEP NUMBER      0            *    *           *   *            **   * * *  *
**** * ** ****  *  **  * *   **** * ******** **      TRANSIENT TIME      2        EC          ** *     * * * *        *          ****** *
```

TYPE OF OUTPUT	CURRENT NO. OF RECORD WRITTEN
MAJOR EDIT	2
MINOR EDIT	40
PLOT RECORD	
RESTART RECORD	0

- - - SYSTEM DATA - ---

SYSTEM	SYSTEM NO	SYSTEM POWER	AVERAGE PIN POWER (KW)	AVERAGE PIN POWER (BTU/SEC)
IDEAL E	2	125000D 03(KW)	0 1 5 00D 0	0 1164 7D 03

MAJOR DIT NUMBER 2
TIME STEP NUMBER 40
TR NSIENT TIME = 0000 SEC

IDEAL SY TEM DATA

BOUNDARY CONDITIONS FOR POWER BACK-CALCULATION

(BACK-CALCULATED ON PIN NO 1 AT LEVEL NO)

SURFACE HEAT FLUX (BTU/SEC-FT**2)	SURFACE TEMPERATURE (F)
0 1625800 02	951 88

BACK CALCULATED YSTEM POWER - 0 1 50 D 03 KW

BACK-CALCULATION NERGY BALANCE ERRORS CONVERGED TO WITHIN 0 1 0 0D 00 IN 3 ITERATIONS

EFFECT OF FILTERING IN BA K-CALCULATION

	UNFILTERED SIGNAL		FILTERED IGNAL		FILTER
	LAST STEP	THIS STEP	L ST STEP	THIS STEP	FLAG
HEAT FLUX	0 162580D 02	0 162580D 0	0 162580D 02	0 162580D 02	0
TEMPERATURE	0 95188 D 03	0 951890D 03	95188 D 03	95189 D 3	
POWER	0 336406D 03	0 336406D 03	1L5000D 03	0 12 000D 03	4

OLLOWING ARE SUMMARIES OF THE IDEAL EL CTRIC SYSTEM PIN(S) CONDITIONS

UMMARY OF PIN CONDITION PIN NO 1 YSTEM NO 2

TAU (SEC)	DELT (SEC)
0 200D 01	0 00D-01

	BTU/ EC	KW
PIN POWER	0 118497D 03	0 12 000D 03
SYSTE AVG PIN POWER	0 118497D 03	0 125000D 03

LEVEL NO	LEVEL POWER (BTU/SEC)	SU F HEAT TRAN (BTU/SEC)	URF HEAT FLUX (BTU/SEC-FT 2)	CENTERLINE TEM (F)	HEATER NODE TEMP(F)	URFACE TE P (F)	DJACENT COOL TE P( )	U URF FT TRAN COEFF(B/ -FT2-F)
1	0 416713D 01	0	0 0	0 0	0 0	0 0	0 0	0
2	0 589 20D 01	0 0	0 0	0 0	0	0 0	0	0 0
3	0 10516 D 2	0 0	0 0	0	0 0			0 0
4	0 126830D 02	0 0	0 0	0 0	0	0	0 0	0
5	0 164908D 02	0 1 7328D 01	0 141730D 02	0 9172 D 3	0 1171 80 04	0 1880D 3		0
6	0 164 8D 02	0 0	0	0 0	0 0	0 0	0 0	0 0
7	0 164908D 02		0			0 0	0	
8	12689 D 02	0 0	0	0	0 0	0	0	0
9	0 10516 D 02	0 0	0 0	0 0	0 0	0 0	0	0
10	0 5895 D 01	0	0	0 0	0	0		
11	0 416713D 01	0 0	0	0 0	0	0 0	0 0	0 0

LEVEL	EQUIVALENT GAP CONDUCTIVITY (BTU/SEC-FT-F)	GAP CONDUCTANCE (BTU/ EC-FT 2-F)	GAP THICKNES (FT)	STEADY STATE GAP THICKNESS (FT)	NO OF ITERATIONS IN H T SOLUTION
1	0 0	0 0	0 0	0 0	0
2	0	0	0 0	0 0	
3		0	0 0	0	0
4	0 0	0 0	0 0	0 0	0
	0	0 0	0 0	0	3
6	0	0	0 0	0 0	0
7	0 0	0 0	0	0	
8		0 0	0	0 0	
9	0 0	0 0	0 0	0 0	
10	0	0	0 0	0 0	0
11	0 0	0	0 0	0 0	0

RESTART TIME(SEC)	NODAL SYS POWER(KW)	BC 1 REHFLX B/S-FT# 2	SURF HT FLUX B/S-F #2 (1 5)	NODAL TEMP (DEG F) (1 5 1)	NODAL TEMP (DEG F) (1 5)	NODAL TEMP (DEG F) (1 10)	BC 1 SNK TEMP (DEG F)	BC 1 SHFLTRN B/S-FT 2-DF	PIN SUR TEMP DEG F (1 5)
0 0	82 176	97 66	97 664	1003 1	1003 1	944 41	21	0 0	6 1 33
0 500000D-01	0 0	91 4 7	93 796	1003	9 7 8	92 7	3 5		623 55
0 10 D	0	78 412	8 074	1002 7	93 71	900 0	629 92	0	29 92
0 150000	0	63 007	73 128	1002 1	911 3	883 04	640 61	0 0	640 61
0 2 0 00	0	40 38	6 243	1001 1	89 63	8 8 94	7 50	0 0	657 0
0 25000	12 0	73 716	66 692	99 84	0 1 7	892 36	9 29	0 0	659 29
0 300000	12 0	4 782	69 511	998 40	930 12	914 03	59 7	0	6 9 75
35 00	125 0	88 926	71 60	996 9	909 71	931 00	60		60 22
0 400000	12 00	92 033	75 165	99 73	1015 3	94 19	0 6		60 06
0 450 0	125 0	92 220	78 112	994 72	1028 4	957 5	66 7	0	60 27
0 500 0	12 0	9 840	81 936	994 04	1040 1	9 8 2	60 11	0 0	6 0 11
0 5 00	125	92 6 4	8 220	993 72	10 0	979 28	6 0 13		60 13
0 6 00	12 0	92 539	88 3	993 73	10 0	987 33	6 11	0 0	660 11
0 650000	125 00	92 240	91 813	994 2	10 8 8	99 6	6 0		66
0 700 0	0 0	92 565	93 5 0	994 0	100 8	9 7 58	6 9 7		9 97
0 750000	0	91 636	93 163	995 6	973 94	942 87	659 98	0	59 98
0 8 0000		8 4 7	90 11	996 27	950 93	922 00	66 50	0	60 50
0 85 00	125	90 416	89 682	99 76	100 2	9 2 1	6 1		60 15
	* * **	TAU -	0 900000D 00	WARN HAS BEEN CALLED POSSIBLE PROBLEM ERRO			****		
9 0000	0 0	2 1630	6 613	997 0	9 7 5	923 82	676 3	0	676 33
	** * **	TAU	0 95 000D 0	WARN HAS BEEN CALLED POS IBLE PROBLEM ERROR			* **		
0 95000	0	70038	72 46	997 08	933 38	90 23	70 26	0	79 26
	** * *	TAU -	10000 D 01	WARN HAS BEEN CALLED POSSIBLE PROBLE ERROR			* *		
1 00000	0 0	1 2529	72 014	996 77	916 52	891 71	63 7	0	680 57
	* * *	TAU	0 1050000 1	WARN HA BEEN CALLED POSSIBLE PROBLEM ERROR			*		
1 5000	0	77303	69 477	96 05	90 82	879 44	691 58	0 0	81 58
	****	TAU	110000D 01	WARN HAS BEEN CALLED POSSIBLE PROBLEM ERROR			**		
1 10000	0	1 2378	66 304	994 90	891 02	863 7	682 16	0	682 16
	* *** *	TAU	0 1150000 01	WARN HAS BEEN CALLED PO SIBLE PROBLEM ERROR			* ***		
1 15 00	0 0	1 9682	64 629	993 3	880 56	859 12	682 01		682 01
	*** *****	TAU -	0 120 0 D 1	WARN HAS BEEN CALLED PO SIBLE PROBLEM ERROR			*		
1 20000	0 0	3 4710	25 198	991 26	871 37	850 71	7 8 4	0	708 54
1 25000	0 0	7 601	14 649	988 31	863 23	843 81	7 9 00	0 0	729 90
1 30000	125 00	8 38 0	7 0196	986 10	92 90	874 02	749 36		749 36
1 3500	125 00	1 731	0 43058	983 38	9 0 36	901 30	768 82	0	768 82
1 4000	1 5	5 840	0 64760	980 85	8 92	924 61	784 90	0 0	784 90
1 45000	12 00	15 151	2 9624	978 7	1007 6	94 38	798 57	0	798 57
1 500 0	125 00	22 6 3	3 9198	97 98	1027 1	964 51	812 16	0 0	812 16
1 5000	125 00	12 05	-0 2370	975 84	104 3	982 63	829 3		829 3
1 6000	12	7 2177	-2 46 0	975 20	1062	1 00 1	8 7 31	0	847 31
1 65000	125 0	10 0 5	0 99432	97 35	1079 3	1017 0	86 13	0 0	862 13
1 70000	125 0	13 763	2 2517	976 03	109 6	1033	876 77	0	876 77
1 750 0	125	16 922	6 7 17	977 30	1111 5	1049	888 91	0 0	888 91
1 80000	125 00	18 03	7 55 7	979 14	1127 1	1 65	901 04		901 94
1 8500	125 0	14 738	3 8175	981 34	11 2 3	1081 0	914 23	0	914 23
1 900	1 0	13 477	8 4939	984 45	11 7 3	1096 1	928 3	0 0	928
1 950 0	125 0	15 929	11 7	987 86	1172	1111 0	9 41	0	940 41

R F T A R T TI E(SEC)	IC L Y P(F( )	C I RFHFLX SU F / FT*	T FLU F/ 2 (1)	N DAL T M ( ) (1 1)	N DAL T (DE) (1)	NODAL TE (D C F) (1 1)	C I SN T P (DEC)	C I RFHT N / FT 2 DF	IN UR TEMP D G F (1 5)
2 0	125	1 8	1 173	9 1 73	11 6	11	9 1		9 1 88
2 5 0	125	16 91	16 00	996 0	1200	1133	9 3 1		3 15
2 1	2 4	16 7	16 1	10	11	11	974 1		974 51
2 15	28	13 1 2	13 2	10	11 3	111 9	987 10	0 0	987 10
2 0000	125 00	11 80	11 8	101	11 6	11 6 1	0	0	999 35
2 2 0	125	1 071	11 42	101	1 1 0	11 6 3	101		1010 4
2 30000	12 00	15 4	1 477	1020	1 31 7	11 4 4	10 1	0	10 1 0
2 3 0	1	18 148	14 777	102 1	1 4	11 1	1 6		1030 6
2 40	12	18 0	1 09	1031	1 6 0	1 06	1040 1	0 0	1040 1
2 5000	0 0	1 377	1	1 37	1 1	118 5	1 5 3		1 0 3
2 5 0	119	1 21	1 41	1 3	1 3	1 2	106	0 0	1060 4
2 55000	0 0	14 043	1 77	10 9 3	1 6	11 6 4	10 9		1069 4
2 60 0	12	17 39	15 0	10	1 5	1	1 78		1078 0
2 6 0	1	1 041	15 486	10 1	1 1 5	12 7	1086	0 0	1086 5
2 70000	1 1 2	13 381	13 47	1 7 2	127	1 34	10		1096 5
2 750	71 0	13 1 7	13 2	1073 2	1 7 0	12 7	1106 1	0 0	1106 1
2 8 000	12 00	1 477	1	1079 3	13 1	1256	1114 3		1114 3
2 85000	11	1 7 8	15 76	1085	13	1 71 6	1122 9		112 9
2 9 000	2	17 010	17 991	10 1	129 3	1 6	1130 3		1130 3
2 950	0	1 933	17 36	1 0 1	12	124 2	11	0	1139 0
3	3 5	13 3 6	14 20	10 4	123 9	1 7	11 7 1	0 0	1147 1
3 05000	12 00	1 4 8	14 31	111 6	133 7	1 81 1	11		11 0
3 1 0	125	17 383	1 73	111 8	13 2	13 1	11 2 2		1162 2
3 15	1 0	10 195	16 33	1123 1	1375 0	1 1 6	11 8 7	0	1168 7
3 0		1 79	19 7 6	1129	1 22	1301	1175 1		1175 1
3 2500		17 707	18 0	11 5	1 97 6	1 8	11 2	0 0	1182 2
3 30 00	12 0	17 98	17 47	114 0	13 1 9	1 7 4	11 9 1		1189 1
3 3 0	108 5	18 10	18 1 2	1148 3	1 72 4	1 2 1	119		119 4
3 4	0 0	1 09	16 480	11 4	13 3	1 10	1 02		1 2 6
3	77 7	1 7	1 621	116	13 0 7	1318	1		1209 6
30 00	1	1 67	15 56	1166	13 9	1 40 4	121	0 0	1216 4
3 5	7 02	1 359	1 9	117 7	1376 4	1342	12 3		1223 0
3 0	4 7	16 04	16 0 7	1178 7	1 7	1 0	12 4		1229 4
3 65000	96 0	16 1	16 250	113 7	1393 3	13 3 3	12 5 7		123 7
3 7 0		1 477	13	119	1	134	1 3	0	1243 2
7 0	4 6	1 9	10 33	1196 4	1339	1 9 2	1 1 3	0 0	1251 3
3 8 0	12	12 4 3	9 933	1 0 1	13 7	13 4	1 8		12 8 2
3 85 00	1 5 0	13 10	11 61	1207 3	1 2 6	1373 3	12 4		1264 3
3 90000	125 00	12 370	11 776	1213	14 2 4	1399 3	127		1270 9
3 05		3 3	1 318	121	1 7	138	12 7 0		1277 6

RESTART TIME(SEC)	IDEAL SYSTEM POWER (KW)	FHFLX SURF /S-FT 2	HT FLUX B/S-F* 2 (1 5)	NODAL TEMP (DEG F) (1 1)	NODAL TEMP (DEG F) (1 5 5)	NODAL TEMP (DEG F) (1 1 1)	BULK TMP (DEG F)	SFHTRN B/S-FT 2 DF	PIN SURF TEMP DEG F (1 5)
4 000 0	0	6 8288	7 6102	1224 9	1379 8	1369 1	1 86 8	0 0	1286 8
4 05000	0 0	1 8331	4 0861	1 30	1365 8	13 8 3	129 9	0	129 9
	* ***	TAU -	41000 0 01	WARN HAS	EN CALL	D POS	ITLE P	OBLEM ER	OR * * *
4 10000	125	18 243	2 94 1	12 6 0	1 5 7	1384 6	1303 9	0 0	1303 9
4 15 00	0	9 3763	15 163	1241 3	1399 6	137 9	1303 2		1303 2
4 2000	0	854	6 8 84	1246 6	1373 6	1366 4	1 09 7	0	1309 7
4 2 000	125 0	7 779	4 1390	1251 7	1433 6	1393	1316 5	0	1316 5
4 30 00	125	5 3553	-1 70 4	12 6 7	1 67 7	1 1 2	132 6	0	1326 6
4 35 0	125 00	1 051	7 56 5	1261 9	1 93 1	1 41 6	1330 3		1330 3
4 4 000	12	1 724	8 4386	1267 1	1 14 6	1461 3	1 3 3	0	1336 3
4 45 0	77 916	10 994	11 028	1272 6	1507 6	1466 5	1 2 3	0 0	1342 3
4 5 0	0 0	13 410	14 110	1278 2	1 66 3	14 0 0	1347 3	0	1347 3
4 55 0		13 8 4	15 382	1283 8	14 4	143 8	1 1		1351 8
4 60000	0 0	12 5 1	13 40	1 89 3	143 2	14 5	13 7		1357 0
4 650 0	125 0	1 379	11 2	1294 3	14 1 0	1 51	13	0	1362 5
4 7 000	111 99	13 87	13 490	1300 3	1 18 2	1472 7	136 8	0 0	1365 8
4 7 00	0	1 368	12 11	130 3	1 76	14 8	1372 1	0	1372 1
4 8 0		11 7 4	12 160	1311	1 7	1 4	1 77 0	0 0	1377 0
4 95000	89 170	10 430	10 448	131	1 85 2	1 63	136	0	1382 5
4 900	32 317	476	9 46 2	1321 7	1434 5	1 64 1	138 0		1387 9
9 0	119 20	9 38 3	8 367	132 9	1	1 36	139 8	0 0	1393 8
5 0 0	6 146	9 077	0 29	1332 1	1 1 7	1 0	139		1398 9
5 05 0	72 62	10 43	10	1337 3	1 2	1 7 0	1403 8	0 0	1403 8
5 10000	0 0	10 949	11 11	134	1 09	1 6 3	14 8 4		1408 4
5 1500	75 86	10 71	10 99	13 7	1 4 6	1 0	1 13 1		1413 1
5 20 0	33	10 6 1	1 70	1352 7	1 1 1	1405 7	1417	0 0	1417 8
5 250	71 827	1 74	10 92	13 7 9	1 34 8	15	142 4		1422 4
5 30 0	79	10 390	1 910	136 8	1 37 9	1 11 0	1 6 9	0	1426 9
5 35000	9 2067	10 43	1 463	13 7 8	151 7	15 3	1431 5		1431 5
5 40 00	108 13	10 93	1 592	1372 7	1 9	1 23 2	143 0	0 0	143 0
5 45 0		10 393	10 741	1377 6	1 9	1 13 9	1440 3	0 0	1440 3
5 000	73 47	10 04	10 20	1382	1 1 9	1 25 9	1444 7		1444 7
55 00	15 03	1 13	1 4 1	1387 3	1 3 0	1519 1	1 48 9	0 0	1448 9
5 60000	75 7	9 8 2	9 9	1392 0	1 9	1 0	1453		1453 5
5 65 0	61 07	9 74 6	7 65	139 3	1 6 6	1	1 7 9	0	1 57 9
5 7 0		9 3492	820	1401	1 3 7	1 0	1 2	0 0	1462 2
5 750	98 246	1390	9 19 7	1406 1	15 6	1 48	1 6 7	0	1466 7
5 8 0	36 0	0 739	9 80 6	1410 7	1 7 1	1547 8	1 70 8	0 0	1470 8
5 8 0	31 121	9 3411	9 8 81	141 3	1 8	1	1 7 9		147 9
5 90 00	4 571	392	9 31 5	1419 8	1 9 4	1 4 3	1 7 1		1479 1
5 95000	33 927	1 86	1390	14 4 3	1 9	1 0 1	1 33 3		1483 3

RESTART

TIME(SEC)	IDEAL SYSTEM POWER(KW)	BC I SRFHFLX B/S-FT**2	SURF HT FLUX B/S-FT 2 (1 5)	NODAL TEMP (DEG F) (1 5 1)	NODAL TEMP (DEG F) (1 5)	NODAL TEMP (DEG F) (1 5 10)	BC I NK TMP (DEG F)	C I SRFHTRN B/S-FT 2-DEG	PIN SUR TEMP DEG F (1 5)
6 0000	0 0	8 6804	8 7631	1428 3	1 63 3	1 1 0	1487 5	0 0	1487 5
6 05000	23 651	7 6374	7 6510	1433 2	1 62 7	1549 7	1491 9	0 0	1491 9
6 10000	125 00	7 6660	7 2617	1437 5	1617 0	1575 0	1496 4	0	1496 4
6 15 00	10 09	8 364	8 3772	1441 9	1 87 1	1570 6	1 0 2	0 0	1500 2
6 20000	0 0	8 554	8 9662	1446 2	1 68 8	1561 1	1 03 6	0	1503 6
6 25000	0	8 091	8 6431	1450 4	15 8	15 3 5	15 6 8	0	1506 8
6 30000	9 399	8 3645	8 3727	14 4 4	1567 8	1555 7	1509		1509 6
6 35000	118 51	8 3742	8 3737	1458	1621 0	1582 3	1512 5		1512 5
6 40000	0 0	3 0615	8 6683	1462 4	1587 8	1 75	1515 4	0 0	1515 4
6 45000	0 0	7 0038	8 6747	1466 3	1573 5	1567 4	1 18 2	0 0	1518 2
6 50 00	0 0	7 7171	7 7527	1470 1	1 65 1	15 1 0	1521 1	0 0	1521 1
6 55000	124 3	7 9682	7 9671	1473 3	1627 5	1589	15 3 8	0	1523 8
6 6 0 0	0 0	8 1739	8 4192	1477 5	1 95 3	1583 3	152 4		1526 4
6 65000	0	8 320	8 1709	1481 1	1581 5	1575 7	1 29 1	0 0	1529 1
6 70000	47 963	8 2176	8 2 42	1484 6	1 99 9	1582 4	1531 6	0 0	1531 6
6 75000	36 373	8 1704	8 1775	1488 1	16 3 7	1586 7	1534 1	0 0	1 34 1
6 80000	49 031	8 1768	8 1836	1491	1614 3	1593 7	1536 7	0	1536 7
6 85000	0	8 4570	8 5899	1494 9	159 0	1 87 3	1 39 0		1539 0
6 90000	47 889	8 67 8	8 68 3	1498 3	1611 8	1593 8	1541 3	0 0	1541 3
6 95000	0 0	7 0146	7 5945	1501 6	1594 9	1588 1	1544 1	0	1544 1
7 00000	0 0	6 3878	6 7163	1504 3	1 8 3	1582	1546 8	0 0	1546 8
7 05000	117 48	6 9199	6 9186	1 07 9	164 5	1609 3	1549 3	0	1549 3
7 10000	0	6 7288	7 2161	1 11 1	1615 2	1604 0	1551 8	0 0	1551 8
7 15000		6 5174	6 9564	1514 1	1602 4	1590 9	1554 4	0 0	1554 4
7 20000	7 7813	6 2999	6 306	1517 2	1599 3	1593 5	1 57 0	0	1 57 0
7 2 000	103 29	2669	2663	1520 2	1649 2	1616 0	1559 6	0 0	1 59 6
7 30000	0 0	6 996	6 7 92	1523 1	16 1 6	1 11 3	1562 0		1562 0
7 35000	24 23	6 915	6 9222	1526 1	1623 1	1611 0	1564 4	0	1564 4
7 4000	38 703	7 1948	7 2006	1529 0	1 32 1	1615 7	1 66 7	0 0	1566 7
7 45000	10 791	7 3 1	7 3524	1531 9	1 22 5	1 13 0	1568 9	0 0	1568 9
7 50000	46 10	7 628	7 2678	1534 8	1637 8	1620 0	1571	0 0	1571 2
7 55000	30 260	7 1700	7 1760	1537 6	1638 1	1 22 7	1573 6	0 0	1573 6
7 60000	5 1357	7 3148	7 3211	1540	1626 1	1618 4	1 7 8	0 0	157 8
7 65 00	56 533	7 115	7 4156	1543 3	1648 3	1628 0	1578 0	0 0	1 78 0
7 70000	19 148	7 5190	7 5252	1546 1	164 7	1627 0	1 80 2	0 0	1580 2
7 75000	1 3 19	7 4934	7 4994	1 48 8	162 6	1622 6	1 82 3	0 0	1582 3
7 80000	8 844	7 042	7 5 76	1551 5	1 3 5	1 33 1	1584 4	0	1584 4
7 85000	0 0	7 05	7 3865	1554 2	1 3	1628 3	1 86 5	0 0	1 86 5
7 90000		5 9171	7 0630	1556 9	16 7 0	1623 0	1588 5	0 0	1588 5
7 95000	79 058	5 6326	5 6327	1559 5	1 6	1640 0	1 91 3	0	1591 3

RESTART

TIME(SEC)	IDEAL SYS POW R(KW)	(C I SRFHFLX B/S FT 2	SURF HT FLUX B/S-F (1 5)	NODAL TEMP (D G F) (1 1)	NODAL TEMP (DE F) (1 5 5)	NODAL TEMP (DEG F) (1 5 10)	BC I SNK T P (C F)	C I SRFHTRN B/S FT *2 DF	PIN SUR TEMP DEG F (1)
8 000	70 8 8	7 7166	7 7183	1562 1	168 8	1654 2	1 93 0	0 0	1593 0
8 05000	0 0	8 9306	9 0203	1564 7	16 7 5	1647 3	1534 6	0	1594 6
8 10000		9 262	9 40	1567 4	16 5 9	1 40	1 96 2	0	1596 2
8 15000	22 305	9 4262	9 4319	1570 0	16 1 4	1641 1	1597	0 0	1597 9
8 20000	9 7031	9 0706	9 0757	1572	1 46 7	1 39 1	1599 6	0	1 99 6
8 25 00	72 319	8 9406	8 9421	1575 1	1678 4	1653 9	1601 4	0 0	1601 4
8 30000	0 0	9 1777	9 3163	1577 6	1 7 5	16 9 0	16 3	0	1603 0
8 35000	0 17934E-01	9 1631	9 1684	1580 1	1648 0	1 3 4	160 6		1604 6
8 40000	74 709	9 13 1	9 135_	1 8 6	1683 1	16 8	160 3		1606 3
8 45000	0 0	9 1945	9 3878	1585 0	1 62 3	1653 8	1 07 9		1607 9
8 5000	0 0	8 9 87	9 2106	1537 4	1652 9	1648 2	1609	0 0	1609 5
8 5 00	19 60	8 4309	8 4356	1589 8	1657 9	1 48 9	1611 3	0 0	1611 3
8 60000	4 66	8 349	8 2381	1592 1	1673 8	16 6 9	1613 0	0	1613 0
8 65000	12 96	2434	8 2 79	1594 3	1 6	1656 1	1614 6		161 6
8 70000	31 526	3 0355	8 0898	1596 6	1 73 5	1659 7	1616 3	0	1616 3
8 75000	0 0	7 7537	7 846	1 98 8	1660 9	1655 2	1 18 0	0 0	1618 0
8 80 00	38 349	7 4831	7 837	16 0 9	1 7 4	1660 9	1 19 9	0	1619 8
8 85000	0	7 1790	7 2696	1 03 0	165	1 5 9	1621 5	0 0	1621 5
8 90000	54 063	7 0446	7 0468	1605 1	1 3 8	1667 0	1623 3	0	1623 3
8 95000	8 71 6	7 1544	7 1 87	1607 2	1 74 5	166 1	162 0	0 0	1625 0
9 00000	13 545	7 2381	7 2424	1609 2	1 72 5	1 64 0	1626 6	0	162 6
9 05 00	29 133	7 2 38	7 2125	1611 2	1 8 0	16 7	16 8 2		1623 2
9 10000	40 346	7 2010	7 044	1613 2	1690 8	1674 0	1629 9	0 0	1629 9
9 15000	0 0	9260	7 3583	1615 2	1 76	1 69 5	1631 5	0	1631 5
9 2000		29	6 7159	1617 2	16 8 8	1664 9	1633 3		1633 3
9 25000	5 5845	6 1 83	6 132_	1619 0	1 7 3	1 62 8	1 3 0	0	163 0
9 30000	80 2 0	6 0326	6 0305	1620 9	1706 5	1 80 9	1636 7	0	1636 7
9 35000		5 9405	6 1469	1622 8	1 85 7	1677 3	1638	0 0	1638 4
9 4000	0	5 8624	6 0317	1624 6	1676 8	1 72 4	1640 1	0	1640 1
9 45000	30 6 5	8409	5 8438	1626 4	1 88 4	1 76 3	1641 8		1641 8
9 50000	22 616	5 882	5 88 6	1628 2	1 90 3	1673 0	1643 4	0 0	1643 4
9 55000	10 066	5 7696	5 7729	1630 0	1685 5	1677 9	1 4	0	164 0
9 60000	0 9308_	4 884	4 8875	1631 7	1 7 5	1674 4	1646 9	0 0	1646 9
9 6 00	43 18	4 99 4	4 9918	1633 4	1697 6	1682 5	1641 5	0	1648 5
9 70000	39 38	5 0 99	5 0316	1635 1	1706 3	1683 7	1650 2	0 0	16 0 2
9 7 0 0	0 0	5 0628	1195	1636 8	1 91 8	1685 5	16 1 9		1651 9
9 80000	0 0	4 9332	5 0715	1638 3	1684 9	1681 3	16 3		1653 5
9 8 000	47 069	4 8504	4 8 16	1640 2	1706	1 90 3	165 2	0	16 5 2
9 9 00	2 9311	4 8778	4 8805	1641 8	1694 5	1 87 8	16		1656 8
9 9 000	41 837	4 8194	4 8211	1643 5	1710 4	1695 0	16 8	0 0	1658 5

Appendix G

LISTING OF MAJOR SUBROUTINES

Included in this Appendix are listings of PINSIM's main program and the three major program control subroutines INPUT, SSTATE, and TRAN These listings are included here as an indication of the structure of the code and the style of the programming

```
C                                                                       PNSM0001
C     PINSIM MAIN                                                       PNSM0002
C                                                                       PNSM0003
      IMPLICIT REAL*8 (A-H O-Z)                                         PNSM0004
C
      COMMON/JOBCON/RSTRTM DELRST DELPLT                                PNSM0005
     1              IDJOB   NRST   NPLT   RESTRT                       PNSM0006
      LOGICAL RESTRT                                                    PNSM0007
C                                                                       PNSM0008
C     RSTRTM   TIME AT WHICH PROBLEM IS TO BE RESTARTED                 PNSM0009
C     IDJOB    JOB TYPE IDENTIFICATION FLAG                             PNSM0010
C     DELRST   ELAPSED TIME BETWEEN RESTART RECORD OUTPUT               PNSM0011
C     NRST     NUMBER OF TIME STEPS BETWEEN RESTART RECORD OUTPUT       PNSM0012
C     DELPLT   ELAPSED TIME BETWEEN PLOT RECORD OUTPUT                  PNSM0013
C     NPLT     NUMBER OF TIME STEPS BETWEEN PLOT RECORD OUTPUT          PNSM0014
C     RESTRT   =  TRUE  INDICATES A RESTART JOB                         PNSM0015
C                                                                       PNSM0016
C                                                                       PNSM0017
      COMMON/SCRTCH/NCASE NOTY IERROR MAXTMP TEMP(5500) TABLE(100 0)
C
C     NOTY  = DIMENSION OF THE TABLE ARRAY (INITIALLY)
C             (NOTY IS INITIALIZED BELOW)
C     MAXTMP = DIMENSION OF TEMP ARRAY
C     TEMP  = SCRATCH SPACE FOR SUBROUTINE INP2
C     TABLE = SCRATCH SPACE FOR SUBROUTINE INP
C                                                                       PNSM0021
      COMMON / STATUS / WARNED NOGO                                     PNSM0022
      LOGICAL NOGO WARNED                                               PNSM0023
C                                                                       PNSM0024
C     WARNED  =  TRUE  MEANS POSSIBLE PROBLEM ERROR                     PNSM0025
C     NOGO    =  TRUE  MEANS PROBLEM FAILURE                            PNSM0026
C                                                                       PNSM0027
C                                                                       PNSM0028
      COMMON /TABLES/ MARK  MAXDAT   XY( 5000)                          PNSM0029
C                                                                       PNSM0030
C     MARK   = DATA(I) POINTER FOR NEXT AVAILABLE SPACE                 PNSM0031
C     MAXDAT = DIMENSION OF DATA (I) ARRAY                              PNSM0032
C                                                                       PNSM0033
C                                                                       PNSM0034
C     (IGNORE UNDERFLOWS)                                               PNSM0035
      CALL ERRSET(208 256 -1 1)                                         PNSM0036
C                                                                       PNSM0037
C     * INITIALIZE VARIABLE COMMON BLOCK SIZES *                        PNSM0038
C                                                                       PNSM0039
C     /SCRTCH
      MAXTMP = 5500                                                     PNSM0041
      NOTY = 1 000
C                                                                       PNSM0042
C     /TABLES/                                                          PNSM0043
      MARK = 1                                                          PNSM0044
      MAXDAT = 5000                                                     PNSM0045
C                                                                       PNSM0046
C     /STATUS/                                                          PNSM0047
      NOGO= FALSE                                                       PNSM0048
      WARNED= FALSE                                                     PNSM0049
C                                                                       PNSM0050
C     * DO INPUT AND INITIALIZATION *                                   PNSM0051
C                                                                       PNSM0052
      CALL INPUT                                                        PNSM0053
      IF (NOGO) GO TO 99                                                PNSM0054
      IF (RESTRT) GO TO 10                                              PNSM0055
C                                                                       PNSM0056
C     * CALCULATE STEADY STATE DISTRIBUTIONS *                          PNSM0057
C                                                                       PNSM0058
      CALL SSTATE                                                       PNSM0059
      IF(IDJOB EQ 0)STOP                                                PNSM0060
      IF(NOGO)GO TO 99                                                  PNSM0061
C                                                                       PNSM0062
C     * PERFORM TRANSIENT CALCULATIONS *                                PNSM0063
C                                                                       PNSM0064
```

```
   10 CALL TRAN                                                         PNSM0065
C                                                                       PNSM0066
      STOP                                                              PNSM0067
C                                                                       PNSM0068
C                                                                       PNSM0069
   90 WRITE(6 9999)                                                     PNSM0070
      TOP                                                               PNSM0071
 9999 FORMAT(1H1 24(130( * )/) 2(50( * ) 29X 50( * )/)                  PNSM0072
     1 50( * )      JOB TERMINATED IN MAIN       50( * )/               PNSM0073
     2 50( * )        NOGO HAD BEEN SET          50( * )/               PNSM0074
     3 2(50( * ) 29X 50( * )/) 24(13)( * )/))                           PNSM0075
C                                                                       PNSM0076
C                                                                       PNSM0077
      END                                                               PNSM0078
```

```
      SUBROUTINE INPUT                                                  INPT0001
C                  *****************                                    INPT0002
C                 ******************                                    INPT0003
C                *****            *****                                INPT0004
C               ****** I N P U T ******                                 INPT0005
C                *****            *****                                INPT0006
C                 ******************                                    INPT0007
C                  *****************                                    INPT0008
C                                                                       INPT0009
C PROGRAMMER  E D  DRENNEN                                              INPT0010
C             UNION CARBIDE CORP  NUCLEAR DIVISION                      INPT0011
C             COMPUTING APPLICATIONS DEPARTMENT                         INPT0012
C             ENGINEERING MECHANICS SECTION                             INPT0013
C                                                                       INPT0014
C FIRST VERSION   DECEMBER 1976                                         INPT0015
C                                                                       INPT0016
C ABSTRACT   THIS ROUTINE HANDLES THE CONTROL OF ALL DATA INPUT TO      INPT0017
C             THE NUCLEAR-ELECTRIC PIN ANALYSIS PROGRAM P I N S I M     INPT0018
C             INPUT USES THE FREE FORMAT AND DATA ERROR HANDLING PACKAGEINPT0019
C             INP (CONVERTED FROM BETTIS  INPF CDC 6600 PROGRAMS TO     INPT0020
C             IBM 360-370 USE BY R J  WAGNER)                           INPT0021
C                                                                       INPT0022
C CALLING ROUTINE   MAIN OF P I N S I M                                 INPT0023
C ROUTINES CALLED   ACTIN  BUFOUT  EDOP  ENDIT  HEADER                  INPT0024
C                   HYDRIN  IDLIN  INAOUT  INIOUT  INNOUT  INTPRT       INPT0025
C                   INP  INP8  INRKEN  INTOUT  INTPRT  NUCIN            INPT0026
C                   PINNIT  PROBOP                                      INPT0027
C                                                                       INPT0028
C                                                                       INPT0029
      IMPLICIT REAL*8 (A-H O-Z)                                         INPT0030
      REAL*4 XMINP XMAXP XLENP YMINP YMAXP YLENP                        INPT0031
      LOGICAL GROEN LSUPHT PHINEG                                       INPT0032
      INTEGER*4 TUBIN TUBOUT                                            INPT0033
C                                                                       INPT0034
      COMMON /CONTRL/ NPINS NNUCPN NIDLPN NACTPN                        INPT0035
     1                NCHAN INUCFL IIDLFL IACTFL                        INPT0036
     2                NTRPS INPOWX IIPOWX IAPOWX                        INPT0037
     3                IDUM1 NNPINS NIPINS NAPINS                        INPT0038
     4                IDUM2 NNCHAN NICHAN NACHAN                        INPT0039
C                                                                       INPT0040
C     NPINS - NUMBER OF PINS IN THE PROBLEM                             INPT0041
C     NCHAN - NUMBER OF COOLANT CHANNELS IN THE PROBLEM                 INPT0042
C     NNUCPN - I D  NO  OF AVG  NUCLEAR PIN                             INPT0043
C     NIDLPN - I D  NO  OF REPRESENTATUVE IDEAL ELEC  PIN               INPT0044
```

```
C     NACTPN - I D  NO  OF REPRES NTATUVE ACTUAL ELEC  PIN                INPT0045
C     INUCFL - NUC SYSTEM CONTROL FLAG                                   INPT0046
C     IIDLFL - IDL SYSTEM CONTROL FLAG                                   INPT0047
C     IACTFL - ACT SYSTEM CONTROL FLAG                                   INPT0048
C     INPOWX - NUC POWER CROSS-REFERENCE FLAG                            INPT0049
C     IIPOWX - IDL POWER CROSS-REFERENCE FLAG                            INPT0050
C     IAPOWX - ACT POWER CROSS-REFERENCE FLAG                            INPT0051
C     NNPIN  - NO  OF PINS IN THE  NUCLEAR SYSTEM                        INPT0052
C     NIPINS - NO  OF PINS IN THE  IDEAL SYSTEM                          INPT0053
C     NAPINS - NO  OF PINS IN THE  ACTUAL SYSTEM                         INPT0054
C     NNCHAN - NO  OF COOLANT CHANNELS IN THE NUCLEAR SYSTEM             INPT0055
C     NICHAN - NO  OF COOLANT CHANNELS IN THE IDEAL SYSTEM               INPT0056
C     NACHAN - NO  OF COOLANT CHANNELS IN THE ACTUAL SYSTEM              INPT0057
C                                                                        INPT0058
      COMMON/CNSTNT/ BPKWHR INFET KWPMW PI SECPHR                        INPT0059
C                                                                        INPT0060
C     BPKWHR - 3412.7 BTU/KW-HR                                          INPT0061
C     INPFT  - 12 IN/FT                                                  INPT0062
C     KWPMW  - 1000 KW/MW                                                INPT0063
C      PI - 3.1415926                                                    INPT0064
C      SECPHR - 3600 SEC/HR                                              INPT0065
C                                                                        INPT0066
      COMMON/DEBUG/IGDBUG    ICDBUG    IHDBUG    IKDBUG                  INPT0067
     1             IPDBUG    IADBUG    IIDBUG    ISDBUG   NDBUG          INPT0068
C                                                                        INPT0069
C     IGDBUG - GENERAL  PROBLEM CONTROL                                  INPT0070
C     ICDBUG - HYDRAULIC  CHANNEL CALCULATIONS                           INPT0071
C     IHDBUG - HEAT TRANSFER                                             INPT0072
C     IKDBUG - REACTOR KINETICS                                          INPT0073
C     IPDBUG - PIN DEFORMATION                                           INPT0074
C     IADBUG - ACTUAL ELECTRIC POWER SYSTEM RESPONSE                     INPT0075
C     IIDBUG - IDEAL ELECTRIC POWER SYSTEM BACK-CALCULATION              INPT0076
C     ISDBUG - FLAG TO CONTROL FREQUENCY OF DEBUG OUTPUT                 INPT0077
C     NDBUG  - DEVICE TO WHICH DEBUG OUTPUT IS ROUTED                    INPT0078
C                                                                        INPT0079
C                                                                        INPT0080
      COMMON/JOBCON/RSTRTM DELRST DELPLT                                 INPT0081
     1             IDJOB   NRST   NPLT  RESTRT                           INPT0082
      LOGICAL RESTRT                                                     INPT0083
C                                                                        INPT0084
C     RSTRTM   TIME AT WHICH PROBLEM IS TO BE RESTARTED                  INPT0085
C     IDJOB    JOB TYPE IDENTIFICATION FLAG                              INPT0086
C     DELRST   ELAPSED TIME BETWEEN RESTART RECORD OUTPUT                INPT0087
C     NRST     NUMBER OF TIME STEP  BETWEEN RESTART RECORD OUTPUT        INPT0088
C     DELPLT   ELAPSED TIME BETWEEN PLOT RECORD OUTPUT                   INPT0089
C     NPLT     NUMBER OF TIME STEPS BETWEEN PLOT RECORD OUTPUT           INPT0090
C     RESTRT   =  TRUE  INDICATES A RESTART JOB                          INPT0091
C                                                                        INPT0092
      COMMON/MINOR/DELMIN FMTMIN(12) MINLOC(9) MINHED(6,9)               INPT0093
     1             INDX(3,9) NMNOUT NMIN NUMMIN                          INPT0094
C                                                                        INPT0095
C     DELMIN - ELAPSED TIME BETWEEN MINOR EDITS                          INPT0096
C     FMTMIN - ARRAY USED TO DEFINE MINOR EDIT FORMAT                    INPT0097
C     MINLOC - ARRAY THAT HOLDS CORE ADDRESSES OF MINOR EDIT VARIABLES   INPT0098
C     MINHED - ARRAY THAT HOLDS MINOR EDIT COLUMN HEADERS                INPT0099
C     INDX - MINOR EDIT VARIABLE INDICES                                 INPT0100
C     NMNOUT - DEVICE TO WHICH MINOR EDITS ARE ROUTED                    INPT0101
C     NMIN - NUMBER OF TIME STEPS ELAPSED BETWEEN MINOR EDITS            INPT0102
C     NUMMIN - NUMBER OF MINOR EDIT VARIABLES                            INPT0103
C                                                                        INPT0104
      COMMON/PINHED/HEAD1(15) TITLE(15) HEAD3(15) IUNIT MAXLIN           INPT0105
     1             LINE1 LINE2 LINE3 LONG1 LONG2 LONG3                   INPT0106
C                                                                        INPT0107
      COMMON/SCRTCH/NCASE NOTY IERROR MAXTMP TEMP(5500) TABLE(1)
C                                                                        INPT0109
      COMMON / STATUS / WARNED NOGO                                      INPT0110
      LOGICAL NOGO WARNED                                                INPT0111
C                                                                        INPT0112
C     TIMEX    = ELAPSED PROBLEM TIME                                    INPT0113
C     NOGO     =  TRUE  MEANS PROBLEM FAILURE                            INPT0114
```

```
C                                                                       INPT0115
C                                                                       INPT0116
      COMMON/TIMER/TIME(10) DTMIN(10) DTMAX(10) ENDT NTIM ITIMFL(10)    INPT0117
C                                                                       INPT0118
C     TIME - TIME AT BEGINNING OF TIME STEP GROUP SEC                   INPT0119
C     DTMIN - MINIMUM STEP SIZE   SEC                                   INPT0120
C     DTMAX - MAXIMUM STEP SIZE   SEC                                   INPT0121
C     ENDT - END-OF-PROBLEM TIME  SEC                                   INPT0122
C     NTIM - NO  OF TIME STEP GROUPS                                    INPT0123
C     ITIMFL - STEP SIZE CALCULATION FLAG                               INPT0124
C                                                                       INPT0125
C                                                                       INPT0126
      DIMENSION /TABLES/ MARK  MAXDAT   XY( 1)                          INPT0127
C                                                                       INPT0128
C     MARK = DATA(I) POINTER FOR NEXT AVAILABLE SPACE                   INPT0129
C     MAXDAT = DIMENSION OF DATA (I) ARRAY                              INPT0130
C                                                                       INPT0131
C                                                                       INPT0132
      COMMON /WHERE/ NPIN                                               INPT0133
      DIMENSION ITEMP(2 20)  MODE1(10)                                  INPT0134
      EQUIVALENCE (ITEMP(1 1)  TEMP(1))                                 INPT0135
C                                                                       INPT0136
      CALL COMZER                                                       INPT0137
C                                                                       INPT0138
C                                                                       INPT0139
C                                                                       INPT0140
C          ++++++++++++++++++++                                         INPT0141
C          + SET UP PAGE HEADER +                                       INPT0142
C          ++++++++++++++++++++                                         INPT0143
C                                                                       INPT0144
C                                                                       INPT0145
      CALL HEADER (LINE1  LONG1  HEAD1  IUNIT  MAXLIN)                  INPT0146
C                                                                       INPT0147
C                                                                       INPT0148
C          ++++++++++++++++++++++++++++++++                             INPT0149
C          + DEFINE MISCELLANEOUS CONSTANTS +                           INPT0150
C          ++++++++++++++++++++++++++++++++                             INPT0151
C                                                                       INPT0152
       BPKWHR = 3412 7D0                                                INPT0153
       INPFT = 12                                                       INPT0154
       KWPMW = 1 0D+3                                                   INPT0155
       PI   2 0D0 * DARSIN(1  D0)                                       INPT0156
       SECPHR = 3 6D+3                                                  INPT0157
C                                                                       INPT0158
C                                                                       INPT0159
C                                                                       INPT0160
C          ++++++++++++++++++++++++++++++                               INPT0161
C          + READ AND SORT ALL INPUT CARDS +                            INPT0162
C          ++++++++++++++++++++++++++++++                               INPT0163
C                                                                       INPT0164
C INITIALIZE LENGTH OF TABLE ARRAY
      LONG = NOTY
C
C FIRST CASE  SET NCASE TO ZERO                                         INPT0165
      NCASE = 0                                                         INPT0166
C                                                                       INPT0167
C TABLE = DOUBLE PRECISION ARRAY USED FOR STORING CARD IMAGES  DATA     INPT0168
C         AND SCRATCH TABLE SPACE                                       INPT0169
C  LONG = LENGTH OF TABLE ARRAY                                         INPT0170
C NOTY      ON ENTRY TO INP  DIMENSION OF TABLE ARRAY
C           ON EXIT FROM INP  NECESSARY LENGTH OF TABLE ARRAY
C                                                                       INPT0176
C   IOK = FLAG FOR RETURN STATUS FROM INP                               INPT0178
C       = 0  NORMAL RETURN                                              INPT0179
C       = 1  END OF DATA SET FOUND                                      INPT0180
C       = 2  NORMAL RETURN WITH CARD FORMAT ERRORS                      INPT0181
C       = 3  TABLE NOT LARGE ENOUGH                                     INPT0182
C                                                                       INPT0183
      IF (NCASE  EQ  0) NOTY = -1                                       INPT0185
   10 CONTINUE                                                          INPT0186
```

```
      NFLU  =  CASE + 1                                                 INPT0187
       RITE(6 9000)                                                     INPT0188
C                                                                       INPT0189
C                                                                       INPT0190
      CALL INP (TABLE LONG NCA E NOTY IOK)                              INPT0191
C                                                                       INPT0192
C                                                                       INPT0193
C++++OUTPUT  INIMUM LENGTH OF TA LE ARRAY IN COMMON /SC TCH/            INPT0194
       RITE(    1  )                                                    INPT0195
      WRIT (6 1 00) NOTY LEN                                            INPT0196
                                                                        INPT0197
C                                                                       INPT0198
      IF (IOK  EQ  0) GO TO  0                                          INPT0199
      IF (IOK  NE  1) GO TO 1                                           INPT0200
      WRIT  (6 93 0)                                                    INPT0201
      STOP 777                                                          INPT0202
   1C IF (I K  GT  1) CALL FAIL                                         INPT0203
C                                                                       INPT0204
C-------------------------------                                        INPT0205
C CARD 1  0   - JOB CONTROL CARD                                        INPT0206
C                                                                       INPT0207
      DATA  CDE1 /10 0     0     4  0  1  0  1  1  0/                   INPT0208
       CDE1(C) = 1                                                      INPT0209
       RITE(6 9710)                                                     INPT0210
C                                                                       INPT 211
      CALL IN 2 (TABLE  TEM    CDE1)                                    INPT0212
      IF (MODE1( )  EQ  -1) CALL FAIL                                   INPT0213
C                                                                       INPT0214
      IDJO   = ITEMP(2 1)                                               INPT0215
      RSTRTM - TE P   (2)                                               INPT0216
      TNOT     T_MP   ( )                                               INPT0217
      NTIM   - ITEMP(  4)                                               INPT0218
C    *  ERROR? IDJOB OUT OF RANGE                                       INPT 219
       IF (((IDJOB  LE  0)  AND  (IDJOB  LE  0))  OR                    INPT0220
            (IDJOB  EQ  -3)) GO TO 21                                   INPT0221
       WRITE (6 9400) IDJOB                                             INPT0222
       CALL FAIL                                                        INPT0223
C  *** ERROR? NTIM OUT OF RANGE                                         INPT0224
   21  IF ((NTIM  GT  0)  AND  (NTIM  LE  10)) GO TO 22                 INPT0225
       WRITE (6 9500) NTIM                                              INPT0226
       CALL FAIL                                                        INPT0227
C                                                                       INPT0228
C++++W ITE F1  T PLOT-RE TA T RECORD ON UNIT 1     PROGRAM HEADER       INPT0229
C     AND JOB TITLE                                                     INPT0230
   2  IF (IDJOB  GT  1) CALL BUFOUT (1  HEAD1   60  IMDONE  ICOUNT)     INPT0231
C                                                                       INPT0232
C++++  START JOB                                                        INPT0233
      RE TRT -  FALSE                                                   INPT0234
      IF (IAB  (IDJOB)  EQ  3) RESTRT =  TRUE                           INPT0235
      IF (  IOT  RESTRT) GO TO  3                                       INPT0236
C      ALL OLDJOB TO INPUT RESTART DATA                                 INPT0237
       RITE(  972 )                                                     INPT0238
      CALL OLDJOB                                                       INPT0239
       RITE(6 9820)                                                     INPT0240
      RETURN                                                            INPT0241
C                                                                       INPT0242
C                                                                       INPT0243
C                                                                       INPT0244
C          ++++++++++++++++++++++++++++++++                              INPT0245
C          + LOAD DATA INTO PROPER ARRAYS +                             INPT0246
C          ++++++++++++++++++++++++++++++++                              INPT0247
C                                                                       INPT0248
C++++CALL PROBOP TO LOAD ALL PROBLEM OPTIONS                            INPT0249
   23 CONTINUE                                                          INPT0250
      WRITE(6 9730)                                                     INPT0251
      CALL PROBOP                                                       INPT0252
C++++CALL HYDRIN TO RELAY ALL HYDRAULICS PARAMETERS                     INPT0253
C                                                                       INPT0254
C     IF NCHAN=0 NO HYDRAULICS DATA                                     INPT0255
```

```
C
      IF (NCHAN  EQ  0) GO TO 25                                        INPT0256
      WRITE(6 9750)                                                     INPT0257
      CALL HYDRIN                                                       INPT0258
C                                                                       INPT0259
C                                                                       INPT0260
C++++CALL PINIT TO STORE ALL PIN DATA                                   INPT0261
   25 WRITE(  9760)                                                     INPT0262
      CALL PINIT                                                        INPT0263
C                                                                       INPT0264
C++++INPUT NUCLEAR SYSTEM DATA                                          INPT0265
      IF (INUCFL  EQ  0) GO TO 26                                       INPT0266
      WRITE(6 9770)                                                     INPT0267
      CALL NUCIN                                                        INPT0268
      IF(INUCFL EQ -1)CALL TWIGIN                                       INPT0269
C                                                                       INPT0270
C++++INPUT IDEAL SYSTEM DATA                                            INPT0271
   26 IF (IIDLFL  EQ  0) GO TO 27                                       INPT0272
      WRITE(6 9780)                                                     INPT0273
      CALL IDLIN                                                        INPT0274
C                                                                       INPT 275
C++++INPUT ACTUAL SYSTEM DATA                                           INPT0276
   27 IF (IACTFL  EQ  0) GO TO 28                                       INPT0277
      WRITE(6 9790)                                                     INPT0278
      CALL ACTIN                                                        INPT0279
C                                                                       INPT0280
C++++CALL PINNIT TO INITIALIZE PIN INPUT PARAMETERS                     INPT0281
   28 WRITE(6 9800)                                                     INPT0282
      DO 30 I=1 NPINS                                                   INPT0283
         NPIN = I                                                       INPT0284
         CALL PINNIT                                                    INPT0285
   30    CONTINUE                                                       INPT0286
C                                                                       INPT0287
C++++CALL EDOP TO ENTER ALL OUTPUT EDIT OPTIONS                         INPT0288
      WRITE(6 9740)                                                     INPT0289
      CALL EDOP                                                         INPT0290
C                                                                       INPT0291
C                                                                       INPT0292
C++++CALL INRKEN TO LOAD REACTOR KINETICS PARAMETERS                    INPT0293
      IF(INUCFL EQ -1)WRITE(6 9810)                                     INPT0294
      IF(INUCFL EQ -1)CALL INRKEN                                       INPT0295
C                                                                       INPT0296
C                                                                       INPT0297
C+++ OUTPUT MINIMUM LENGTH OF /TABLES/ DATA ARRAY                       INPT0298
      MARKIT=MARK-1                                                     INPT0299
      WRITE(6 1001)MARKIT MAXDAT                                        INPT0300
C                                                                       INPT0302
C                                                                       INPT0303
C          ++++++++++++++++++++++++++++++++++++++++                     INPT0304
C          + CHECK FOR UNUSED CARDS IN INPUT CASE +                     INPT0305
C          ++++++++++++++++++++++++++++++++++++++++                     INPT0306
C                                                                       INPT0307
C++++FUNCTION INP8 FOR ANY CARDS UNREFERENCED BY LOADING ROUTINES       INPT0308
      NPRINT = 1                                                        INPT0309
      NOUSE = INP8 (NPRINT TABLE)                                       INPT0310
C THE RETURNED VALUE WILL TELL HOW MANY CARDS WERE UNUSED               INPT0311
      IF (NOUSE  GT  0) CALL WARN                                       INPT0312
      WRITE(6 9820)                                                     INPT0313
      IF( NOT NOGO)WRITE(6 9200)                                        INPT0314
C                                                                       INPT0315
C++++PRINT PAGE HEADER AND JOB TITLE ON DEBUG UNIT AND UNIT NMNOUT+1    INPT0316
      WRITE(NDBUG 9600)(HEAD1(I) I=1 14)                                INPT0317
C      WRITE(NDBUG 9600)(TITLE(I) I=1 9)                                INPT0318
      NOUT = NMNOUT + 1                                                 INPT0319
      WRITE(NOUT 9600)(HEAD1(I) I=1 14)                                 INPT0320
C      WRITE(NOUT 9600)(TITLE(I) I=1 9)                                 INPT0321
C                                                                       INPT0322
C          ++++++++++++++++++++++++++++++++++++++++                     INPT0323
C          + WRITE OUT INPUT DATA IN LEGIBLE FORM +                     INPT0324
C          ++++++++++++++++++++++++++++++++++++++++                     INPT0325
```

```
C                                                                       INPT0326
      CALL INTOUT                                                       INPT0327
      IF(INUCFL NE 0)CALL INNOUT                                        INPT0328
      IF(IIDLFL NE 0)CALL INIOUT                                        INPT0329
      IF(IACTFL NE 0)CALL INAOUT                                        INPT0330
      IF(NCHAN EQ 0)GO TO 99                                            INPT0331
      CALL SETUP                                                        INPT0332
      CALL INTPRT                                                       INPT0333
   99 CONTINUE                                                          INPT0334
C                                                                       INPT0335
C                                                                       INPT0336
C                                                                       INPT0337
C                                                                       INPT0338
C                                                                       INPT0339
      IF ( NOT  NOGO)WRITE(6 982 )                                      INPT0340
      RETURN                                                            INPT0341
C                                                                       INPT0342
C                                                                       INPT0343
C                                                                       INPT0344
 100  FORMAT (X /// 36X  MINIMUM LENGTH OF TABLE ARRAY                  INPT0345
     *          IN COMMON /SCRTCH/ IS  I7   WORDS //
     1           47X  (LENGTH OF THE ARRAY IS NOW   I7  WORDS) //)
 101  FORMAT(////44X  MINIMUM LENGTH OF DATA ARRAY IS   I9   WORDS  //  INPT0347
     1           47X  (LENGTH OF THE ARRAY IS NOW   I7  WORDS) //)
C                                                                       INPT0348
 9000 FORMAT (1H1/26(1H  130(1H*)/) 2(1H  40(1H*) 50X 40(1H*)/)         INPT0349
     *         1H  40(1H*) 18X  INPUT DATA   22X 40(1H*)/               INPT0350
     *         2(1H  40(1H*) 50X 40(1H*)/) 26(1H  130(1H*)/))           INPT0352
C                                                                       INPT0353
 9100 FORMAT(1H1 X//50X 5( - )   DATA DECK DIAGNOSTICS   5( - ))         INPT0354
C                                                                       INPT0355
 9200 FORMAT(X//56X  NO FATAL DIAGNOSTICS )                             INPT0356
C                                                                       INPT0357
 9300 FORMAT (5(/) 50X  --- END OF DATA --- )                           INPT0358
 9400 FORMAT ( 0++++++++ CARD 100000  IDJOB =  I5   MUST BE  GE  0      INPT0359
     *            AND   LE  3  OR   EQ  -3 )                            INPT0360
 9500 FORMAT ( 0++++++++ CARD 1 0000  NTIM =  I5   MUST BE              INPT0361
     *          BETWEEN 1 & 10 INCLUSIVE  )                             INPT0362
 9600 FORMAT( X  14A8)                                                  INPT0363
 9710 FORMAT(/51X  PROCESSING THE JOB CONTROL CARD )                    INPT0364
 9720 FORMAT(/54X  PROCESSING RESTART DATA )                            INPT0365
 9730 FORMAT(/53X  PROCESSING PROBLEM OPTIONS )                         INPT0366
 9740 FORMAT(/54X  PROCESSING EDIT OPTIONS )                            INPT0367
 9750 FORMAT(/53X  PROCESSING HYDRAULICS DATA )                         INPT0368
 9760 FORMAT(/56X  PROCESSING PIN DATA )                                INPT0369
 9770 FORMAT(/51X  PROCESSING NUCLEAR SYSTEM DATA )                     INPT0370
 9780 FORMAT(/52X  PROCESSING IDEAL SYSTEM DATA )                       INPT0371
 9790 FORMAT(/52X  PROCESSING ACTUAL SYSTEM DATA )                      INPT0372
 9800 FORMAT(/53X  INITIALIZING PIN PARAMETERS )                        INPT0373
 9810 FORMAT(/50X  PROCESSING REACTOR KINETICS DATA )                   INPT0374
 9820 FORMAT(/52X  END OF INPUT DATA PROCESSING  )                      INPT0375
      END                                                               INPT0376
```

```
      SUBROUTINE SSTATE                                                 STAT0001
C                                                                       STAT0002
C     (CALLED BY PINSIM)                                                STAT0003
C     ******************************************************************STAT0004
C     * SSTATE IS THE DRIVER ROUTINE FOR STEADY-STATE CALCULATIONS     *STAT0005
C     ******************************************************************STAT0006
```

```
C
      IMPLICIT REAL*8 (A-H O-Z)
C
      COMMON/ACTSYS/ OMEGA     XI    RESIDL RESACT
     1               VZERO   EZERO   ESUBI      E    EACT
     2              IFOLFL    IIPN    IAPN    INI     INA
C
C                  OMEGA     NATURAL FREQUENCY OF SYSTEM
C                          XI        SYSTEM DAMPING RATIO
C                  RESIDL    CURRENT HEATER RESISTANCE OF IDEAL PIN
C                  RESACT    CURRENT HEATER RESISTANCE OF ACTUAL PIN
C                  VZERO     INITIAL RATE OF CHANGE OF EACT (THIS TIME ST
C                  EZERO     INITIAL VALUE OF EACT (THIS TIME STEP)
C                  ESUBI     DEMAND VOLTAGE FOR FORWARD CALCULATION
C                  E         DEMAND VOLTAGE FOR BACK CALCULATION
C                  EACT      RESPONSE VOLTAGE
C                  IFOLFL    ACTUAL  YSTEM  FOLLOWING  FLAG
C                  IIPN      PIN FROM WHICH IDEAL HTR  RESIST  IS DETERMI
C                  IAPN      PIN FROM WHICH ACTUAL HTR  RESIST  IS DETERM
C
      COMMON/CNSTNT/BPKWHR  INPFT  KWPMW     PI  SECPHR
C
C     BPKWHR - 3412.7 BTU/KW-HR
C     INPFT  - 12 IN/FT
C     KWPMW  - 1000 KW/MW
C     PI - 3.1415926
C     SECPHR - 3600 SEC/HR
C
      COMMON/CONTRL/ NPINS NNUCPN NIDLPN NACTPN
     1               NCHAN INUCFL IIDLFL IACTFL
     2              NTRIPS INPOWX IIPOWX IAPOWX
     3               IDBUG NNPINS NIPINS NAPINS
     4              IDUMM2 NNCHAN NICHAN NACHAN
C
C     NPIN  - NUMBER OF PINS IN THE PROBLEM
C     NCHAN - NUMBER OF COOLANT CHANNELS IN THE PROBLEM
C     NNUCPN - I.D.  NO.  OF AVG.  NUCLEAR PIN
C     NIDLPN - I.D.  NO.  OF REPRESENTATIVE IDEAL ELEC.  PIN
C     NACTPN - I.D.  NO.  OF REPRESENTATIVE ACTUAL ELEC.  PIN
C     INUCFL - NUC SYSTEM CONTROL FLAG
C     IIDLFL - IDL SYSTEM CONTROL FLAG
C     IACTFL - ACT SYSTEM CONTROL FLAG
C     INPOWX - NUC POWER CROSS-REFERENCE FLAG
C     IIPOWX - IDL POWER CROSS-REFERENCE FLAG
C     IAPOWX - ACT POWER CROSS-REFERENCE FLAG
C     NNPINS - NO.  OF PINS IN THE NUCLEAR SYSTEM
C     NIPINS - NO.  OF PINS IN THE IDEAL SYSTEM
C     NAPINS - NO.  OF PINS IN THE ACTUAL SYSTEM
C     NNCHAN - NO.  OF COOLANT CHANNELS IN THE NUCLEAR SYSTEM
C     NICHAN - NO.  OF COOLANT CHANNELS IN THE IDEAL SYSTEM
C     NACHAN - NO.  OF COOLANT CHANNELS IN THE ACTUAL SYSTEM
C
      COMMON /EVERY/          DELT            TAU         HRTOSC
     1                      LASTUB         NTIMST            NIN
     2                        NOUT
C
C     DELT - TIME STEP - SEC
C     TAU --TIME - SEC
C     HRTOSC - 1/3600
C     LASTUB - LAST NODE NUMBER
C     NTIMST - TIME STEP NUMBER
C     NIN - INPUT LOGICAL UNIT NUMBER
C     NOUT - OUTPUT LOGICAL UNIT NUMBER
C
      COMMON/IDLCON/ DTIDL NPBACK NLBACK NNBACK
     1               IQFLAG IHFLAG ITFLAG IBCKFL
C
C     IBKCFL - BACK-CALCULATION CONTROL FLAG
C     NPBACK - BACK-CALCULATION PIN
C     NLBACK - BACK-CALCULATION LEVEL
```

```
C     NNBACK - BACK-CALCULATION NODE                                    STAT0077
C     IQFLA  - SURFACE HEAT FLUX CONTROL FLAG                           STAT0078
C     IHFLAG - SURFACE HEAT TRANSFER COEFFICIENT CONTROL FLAG           STAT0079
C     ITFLAG - COOLANT/SURFACE TEMPERATURE CONTROL FLAG                 STAT0080
C      DTIDL - ELAPSED TIME BETWEEN BACK-CALCULATIONS                   STAT0081
C                                                                       STAT0082
C                                                                       STAT0083
      COMMON /IDLLNK/ NPQ  NLQ  NPH  NLH  NPT                           STAT0084
     1                NLT  NNT  NQ  NH  NT                              STAT0085
C                                                                       STAT0086
C     NPQ -   PIN FROM WHICH  URFACE HEAT FLUX IS TAKEN                 STAT0087
C     NLQ - LEVEL FROM WHICH SURFACE HEAT FLUX IS TAKEN                 STAT0088
C     NPH -   PIN FROM WHICH SURFACE HEAT FLUX IS TAKEN                 STAT0089
C     NLH - LEVEL FROM WHICH SURFACE HEAT FLUX IS TAKEN                 STAT0090
C     NPT -   PIN FROM WHICH TEMPERATURE IS TAKEN                       STAT0091
C     NLT - LEVEL FROM WHICH TEMPERATURE IS TAKEN                       STAT0092
C     NNT -  NODE FROM WHICH TEMPERATURE IS TAKEN                       STAT0093
C     NQ - DATA(I) POINTER FOR TABULATED SURFACE FLUX                   STAT0094
C     NH - DATA(I) POINTER FOR TABULATED SURFACE H                      STAT0095
C     NT - DATA(I) POINTER FOR TABULATED TEMPERATURE                    STAT0096
C                                                                       STAT0097
      COMMON/JOBCON/RSTRTM DELRST DELPLT                                STAT0098
     1                IDJOB   NRST   NPLT  RESTRT                       STAT0099
      LOGICAL RESTRT                                                    STAT0100
C                                                                       STAT0101
C     RSTRTM   TIME AT WHICH PROBLEM IS TO BE RESTARTED                 STAT0102
C     IDJOB    JOB TYPE IDENTIFICATION FLAG                             STAT0103
C     DELRST   ELAPSED TIME BETWEEN RESTART RECORD OUTPUT               STAT0104
C     NRST     NUMBER OF TIME STEPS BETWEEN RESTART RECORD OUTPUT       STAT0105
C     DELPLT   ELAPSED TIME BETWEEN PLOT RECORD OUTPUT                  STAT0106
C     NPLT     NUMBER OF TIME STEPS BETWEEN PLOT RECORD OUTPUT          STAT0107
C     RESTRT   =  TRUE  INDICATES A RESTART JOB                         STAT0108
C                                                                       STAT0109
      COMMON/NUCCON/DTNUC NNPBCK NNLBCK NNNBCK                          STAT0110
     1               INQFL INHFL INTFL INBCK                            STAT0111
C                                                                       STAT0112
C                                                                       STAT0113
C     INBCK - BACK-CALCULATION CONTROL FLAG                             STAT0114
C     NNPBCK - BACK-CALCULATION PIN                                     STAT0115
C     NNLBCK - BACK-CALCULATION LEVEL                                   STAT0116
C     NNNBCK - BACK-CALCULATION NODE                                    STAT0117
C     INQFL - SURFACE HEAT FLUX CONTROL FLAG                            STAT0118
C     INHFL - SURFACE HEAT TRANSFER COEFFICIENT CONTROL FLAG            STAT0119
C     INTFL - COOLANT/SURFACE TEMPERATURE CONTROL FLAG                  STAT0120
C     DTNUC - ELAPSED TIME BETWEEN BACK-CALCULATIONS                    STAT0121
C                                                                       STAT0122
      COMMON /NUCLNK/ NPQN  NLQN  NPHN  NLHN  NPTN                      STAT0123
     1                NLTN  NNTN  NQN  NHN  NTN                         STAT0124
C                                                                       STAT0125
C     NPQN -   PIN FROM WHICH SURFACE HEAT FLUX IS TAKEN                STAT0126
C     NLQN - LEVEL FROM WHICH SURFACE HEAT FLUX IS TAKEN                STAT0127
C     NPHN -   PIN FROM WHICH SURFACE HEAT FLUX IS TAKEN                STAT0128
C     NLHN - LEVEL FROM WHICH SURFACE HEAT FLUX IS TAKEN                STAT0129
C     NPTN -   PIN FROM WHICH TEMPERATURE IS TAKEN                      STAT0130
C     NLTN - LEVEL FROM WHICH TEMPERATURE IS TAKEN                      STAT0131
C     NNTN -  NODE FROM WHICH TEMPERATURE IS TAKEN                      STAT0132
C     NQN - DATA(I) POINTER FOR TABULATED SURFACE FLUX                  STAT0133
C     NHN - DATA(I) POINTER FOR TABULATED SURFACE H                     STAT0134
C     NTN - DATA(I) POINTER FOR TABULATED TEMPERATURE                   STAT0135
C                                                                       STAT0136
      COMMON/ PINFO/  PINLEN( 4) PINPOW( 4) POWFAC( 4) ORIFAC( 4)       STAT0137
     1                  IPOW( 4)   ISYS( 4)   NLVL( 4)   NMAT( 4)       STAT0138
     2                IGAPFL( 4) INFLAG( 4) NINBEG( 4) NINPOW( 4)       STAT0139
     3                NINGAP( 4)  IDFORM(4)                             STAT0140
C                                                                       STAT0141
C     PINLEN - AXIAL LENGTH OF PIN  FT                                  STAT0142
C     PINPOW - PIN POWER  BTU/SEC                                       STAT0143
C     POWFAC - PIN POWER PEAKING FACTOR                                 STAT0144
C     ORIFAC - ASSOCIATED COOLANT CHANNEL ORIFICING FACTOR              STAT0145
C     IPOW - PIN POWER CONTROL FLAG                                     STAT0146
```

```
C     ISYS - I D  NO  OF  YST M OF WHICH PIN IS A PART
C     NLVL - NO  OF AXIAL LEVELS
C     NMAT - NO  OF MATERIALS IN THE PIN
C     IGAPFL - GAP CONDUCTIVITY CALCULATIONAL FLAG
C     INFLAG - FLUX DEPRESSION/HEATER RESISTANCE FLAG
C     NINBEG - DATA(I) POINTER FOR  INFLAG  DATA
C     NINPOW - DATA(I) POINTER FOR PIN POWER TABLE
C     NINGAP - DATA(I) POINTER FOR GAP DATA
C     IDFORM - PIN DEFORMATION FLAG
C
      COMMON/PINHED/HEAD1(15) HEAD2(15) HEAD3(15) IUNIT MAXLIN
     1               LINE1 LINE2 LINE3 LONG1 LONG2 LONG3
C
      COMMON/PINLVL/HTTAW( 4 20) ZLNGTH( 4 20) POWLVL(4 20)
     1               POVPA( 4 20)  NNODT( 4 20) NODWAT( 4 20)
     2                 NREG( 4 20) NODHTR( 4 20)
C
C     HTTAW - SURFACE AREA  FT**2
C     ZLNGTH - AXIAL LENGTH  FT
C     POWLVL - POWER GENERATED ON THIS LEVEL  BTU/SEC
C     POVPA - AXIAL POWER FRACTION
C     NNODT - NO  OF RADIAL NODES
C     NODWAT - I D  NO  OF ASSOCIATED WATER NODE
C     NREG - NO  OF RADIAL REGIONS
C     NODHTR - I D  NO  OF HEATER NODE (IDL AND ACT ONLY )
C
      COMMON/POWERS/APNPOW(3) PNUC  PIDL  PACT
     1                        PNUCO PIDLO PACTO IPN IPI IPA IPT
C
C     APNPOW - SYSTEM AVERAGE PIN POWER  BTU/SEC
C     PNUC - NUCLEAR SYSTEM POWER  MW
C     PIDL - IDEAL E SYSTEM POWER  KW
C     PACT - ACTUAL E SYSTEM POWER  KW
C     PNUCO - PREVIOUS TIME STEP PNUC
C     PIDLO - PREVIOUS TIME STEP PIDL
C     PACTO - PREVIOUS TIME STEP PACT
C     IPN - DATA(I) POINTER FOR TABULATED PNUC
C     IPI - DATA(I) POINTER FOR TABULATED PIDL
C     IPA - DATA(I) POINTER FOR TABULATED PACT
C
      COMMON /TABLES/ MARK  MAXDAT DATA( 1)
C
C     MARK = DATA(I) POINTER FOR NEXT AVAILABLE SPACE
C     MAXDAT = DIMENSION OF DATA (I) ARRAY
C
      COMMON/WHERE/NPIN LVL NOD MAT IPROP
C
C     NPIN - PIN
C     LVL - LEVEL
C     NOD - NODE
C
C
C
C     ******************
C     * NUCLEAR SYSTEM *
C     ******************
C
 1000 CONTINUE
      IF(INUCFL EQ -3)GO TO 1002
      IF(INUCFL EQ -2 AND IIDLFL EQ 0)GO TO 1009
      IF(INUCFL EQ 0 OR INUCFL EQ -2)GO TO 2000
 1001 IF(INUCFL NE -2)GO TO 1009
      IF(INBCK NE 1)GO TO 1008
      IF(INQFL NE -1)GO TO 1009
      GO TO 1007
C
C     (TWIGLE-CALCULATED NUCLEAR POWER)
C
 1002 CALL NSTATE
      GO TO 2000
```

```
C                                                                       STAT0217
C     * BACK-CALCULATE NUCLEAR  YSTEM POWER *                           STAT0218
C                                                                       STAT0219
 1007 POVERH = POWLVL(NPGN NLGN)/HTTAW(NPGN NLGN)                       STAT 220
      PNUC = POVERH*HTTAW(NNPBCK NNLBCK)/POVPA(NNPBCK NNLBCK)           STAT0221
     1        /POWFAC(NNPBCK)* SECPHR/KWPMW/BPKWHR * NNPINS             STAT0222
      GO TO 1009                                                        STAT0223
 1008 CONTINUE                                                          STAT 224
      PNUC = PINPOW(-INFCK)/POWFAC(NNUCPN)*NNPINS                       STAT0225
 1009 CONTINU                                                           STAT0226
      IF(PNUC LT 1 0D-6 AND INQFL GT 0)                                 STAT0227
     1     NUC = DATA(NQN+1) * HTTAW(NNPBCK NNLBCK) * POWFAC(NNPBCK)    STAT0228
     2    * NNPINS * SECPHR / (BPKWHR * KWPMW * POVPA(NNPBCK NNLBCK))   STAT0229
C                                                                       STAT0230
C     * CALCULATE AVERAGE PIN POWER AND DISTRIBUTE POWER *              STAT0231
C                                                                       STAT0232
      APNPOW(1)=PNUC/NNPINS*KWPMW*BPKWHR/ ECPHR                         STAT0233
      DO 1019 NPIN=1 NPINS                                              STAT0234
      IF(I YS(NPIN) NE 1)GO TO 1019                                     STAT0235
      CALL NODPOW                                                       STAT0236
 1019 CONTINUE                                                          STAT0237
      IF(INUCFL EQ -2)GO TO    ^                                        STAT0238
C                                                                       STAT0239
C     ************************                                          STAT0240
C     * IDEAL ELECTRIC SYSTEM *                                         STAT0241
C     ************************                                          STAT0242
C                                                                       STAT0243
 2000 CONTINUE                                                          STAT0244
      IF(IIDLFL EQ 0)GO TO 3000                                         STAT0245
      IF(IIDLFL NE -1)GO TO 2009                                        STAT0246
      IF(IPCKFL NE 1)GO TO 2008                                         STAT0247
      IF(IQFLAG NE -1)GO TO 2009                                        STAT0248
C                                                                       STAT0249
C     * BACK-CALCULATE IDEAL SYSTEM POWER *                             STAT0250
C                                                                       STAT0251
      POVERH = POWLVL(NPG NLG)/HTTAW(NPG NLG)                           STAT0252
      PIDL = POVERH*HTTAW(NPBACK NLBACK)/POVPA(NPBACK NLBACK)           STAT0253
     1        /POWFAC(NPBACK)* SECPHR/BPKWHR * NIPINS                   STAT0254
      GO TO 2009                                                        STAT0255
 2008 CONTINUE                                                          STAT0256
      PIDL = PINPOW(-IBCKFL)/POWFAC(NIDLPN)*NIPINS                      STAT0257
 2009 CONTINUE                                                          STAT0258
      IF(PIDL LT 1 0D-6 AND IQFLAG GT 0)                                STAT0259
     1   PIDL = DATA(NQ+1) * HTTAW(NPBACK NLBACK) * POWFAC(NPBACK)      STAT0260
     2            * NIPINS * SECPHR / (BPKWHR * POVPA(NPBACK NLBACK))   STAT0261
C                                                                       STAT0262
C     * CALCULATE AVERAGE PIN POWER AND DISTRIBUTE POWER *              STAT0263
C                                                                       STAT0264
      APNPOW(2) = PIDL/NIPINS * BPKWHR/SECPHR                           STAT0265
      DO 2019 NPIN=1 NPINS                                              STAT0266
      IF(ISY (NPIN) NE 2)GO TO 2019                                     STAT0267
      CALL NODPOW                                                       STAT0268
 2019 CONTINUE                                                          STAT0269
      IF(INUCFL EQ -2)GO TO 1001                                        STAT0270
C                                                                       STAT0271
C     ************************                                          STAT0272
C     * ACTUAL ELECTRIC SYSTEM *                                        STAT0273
C     ************************                                          STAT0274
C                                                                       STAT0275
 3000 CONTINUE                                                          STAT0276
      IF(IACTFL EQ 0)GO TO 4000                                         STAT0277
C                                                                       STAT0278
C     * DETERMINE ACTUAL SYSTEM POWER *                                 STAT0279
C                                                                       STAT0280
      IF(IAPOWX LT -1)                                                  STAT0281
     1  PACT=PIDL*DFLOAT(NAPINS/NIPINS)                                 STAT0282
      IF(IAPOWX EQ -1)PACT=PNUC*DFLOAT(NAPINS/NNPINS)*KWPMW             STAT0283
C                                                                       STAT0284
C     * CALCULATE AVERAGE PIN POWER AND DISTRIBUTE POWER *              STAT0285
C                                                                       STAT0286
```

```
      APNPOW(3)= ACT/NAPIN *BPKWHR/SECPHR                               STAT0287
      DO 3019 NPIN=1 NPINS                                              STAT0288
      IF(I YS(NPIN) NE 3)GO TO 3019                                     STAT0289
      CALL NODPOW                                                       STAT0290
 3019 CONTINUE                                                          STAT0291
C                                                                       STAT0292
C                                                                       STAT0293
 4000 CONTINUE                                                          STAT0294
      TAU = 0 0D0                                                       STAT0295
      DELT = 0 0D0                                                      STAT0296
      NTIM T = 0                                                        STAT0297
C                                                                       STAT0298
C     * THE CALL TO STEADY INITIALIZES CHANNEL *                        STAT0299
C     * PROPERTIES AND PIN TEMPERATURES        *                       STAT0300
C                                                                       STAT0301
      IF(NCHAN NE 0)CALL STEADY                                         STAT0302
 5000  ONTINUE                                                          STAT0303
      CALL TAVER                                                        STAT0304
C                                                                       STAT0305
C     ****************************                                      STAT0306
C     * INITIALIZE POWER SYSTEMS *                                      STAT0307
C     ****************************                                      STAT0308
C                                                                       STAT0309
      CALL SSTOUT                                                       STAT0310
C                                                                       STAT0311
      IF(IIDLFL EQ 0)GO TO 6000                                         STAT0312
      IF(INUCFL EQ -2 OR INJCFL EQ 0)GO TO 7000                         STAT0313
 6000 IF(INUC L NE 0)CALL NUCNIT                                        STAT0314
      IF(INJCFL EQ -2)GO TO 8000                                        STAT0315
 7000 IF(IIDLFL NE 0)CALL IDLNIT                                        STAT0316
      IF(INUCFL EQ -2)GO TO 6 00                                        STAT0317
 8000 IF(IACTFL NE 0)CALL ACTNIT                                        STAT0318
C                                                                       STAT0319
C     * OUTPUT SSTATE CHANNEL RESULTS *                                 STAT0320
C                                                                       STAT0321
      IF(NCHAN NE 0)CALL  SPRT                                          STAT0322
C                                                                       STAT0323
C     * OUTPUT SSTATE RESTART RECORD *                                  STAT0324
C                                                                       STAT0325
      IF(IDJOB GE 2)CALL SSDUMP                                         STAT0326
C                                                                       STAT0327
C                                                                       STAT0328
      RETURN                                                            STAT0329
      END                                                               STAT0330
```

```
      SUBROUTINE TRAN                                                   TRAN0001
C                                                                       TRAN0002
C     (CALLED BY PINSIM)                                                TRAN0003
C     ******************************************************************TRAN0004
C     * TRAN IS THE TRAN IENT DRIVER ROUTINE                           *TRAN0005
C     ******************************************************************TRAN0006
C     (CALLS  NEXTEP NUCPOW IDLPOW ACTPOW NODPOW LINKIT  SSH2O          TRAN0007
C      MOMH2O  HTH2O ENTHLW MATRIX EXPLCT MINOUT MAJOUT PLOTIT TRNDMP)  TRAN0008
C                                                                       TRAN0009
      IMPLICIT REAL*8(A-H O-Z)                                          TRAN0010
      REAL*4 TITLE DEL THT EPSSS                                        TRAN0011
C                                                                       TRAN0012
C                                                                       TRAN0013
      COMMON/CNSTNT/BPKWHR  INPFT  KWPMW     PI  SECPHR                 TRAN0014
```

```
C
C     BTUKWHR - 3412.7 BTU/KW-HR
C     INPFT   - 12 IN/FT
C     KWPMW   - 1000 KW/MW
C     PI - 3.1415926
C     SECPHR - 3600 SEC/HR
C
      COMMON/CONTRL/ NPINS NNUCPN NIDLPN NACTPN
     1               NCHAN INUCFL IIDLFL IACTFL
     2              NTRIPS INPOWX IIPOWX IAPOWX
     3              IDUMM1 NNPINS NIPINS NAPINS
     4              IDUMM2 NNCHAN NICHAN NACHAN
C
C     NPIN   - NUMBER OF PINS IN THE PROBLEM
C     NCHAN  - NUMBER OF COOLANT CHANNELS IN THE PROBLEM
C     NNUCPN - I.D. NO. OF AVG. NUCLEAR PIN
C     NIDLPN - I.D. NO. OF REPRESENTATIVE IDEAL ELEC. PIN
C     NACTPN - I.D. NO. OF REPRESENTATIVE ACTUAL ELEC. PIN
C     INUCFL - NUC SYSTEM CONTROL FLAG
C     IIDLFL - IDL SYSTEM CONTROL FLAG
C     IACTFL - ACT SYSTEM CONTROL FLAG
C     INPOWX - NUC POWER CROSS-REFERENCE FLAG
C     IIPOWX - IDL POWER CROSS-REFERENCE FLAG
C     IAPOWX - ACT POWER CROSS-REFERENCE FLAG
C     NNPINS - NO. OF PINS IN THE NUCLEAR SYSTEM
C     NIPINS - NO. OF PINS IN THE IDEAL SYSTEM
C     NAPINS - NO. OF PINS IN THE ACTUAL SYSTEM
C     NNCHAN - NO. OF COOLANT CHANNELS IN THE NUCLEAR SYSTEM
C     NICHAN - NO. OF COOLANT CHANNELS IN THE IDEAL SYSTEM
C     NACHAN - NO. OF COOLANT CHANNEL IN THE ACTUAL SYSTEM
C
      COMMON /EVERY/          DELT          TAU        HRTOSC
     1                     LASTUB        NTIMST           NIN
     2                       NOUT
C
C     DELT - TIME STEP - SEC
C     TAU --TIME - SEC
C     HRTOSC - 1/3600
C     LASTUB - LAST NODE NUMBER
C     NTIMST - TIME STEP NUMBER
C     NIN - INPUT LOGICAL UNIT NUMBER
C     NOUT - OUTPUT LOGICAL UNIT NUMBER
C
      COMMON/JOBCON/PSTRTM DELRST DELPLT
     1                IDJOB   NRST   NPLT  RESTRT
      LOGICAL RESTRT
C
C     RSTRTM   TIME AT WHICH PROBLEM IS TO BE RESTARTED
C     IDJOB    JOB TYPE IDENTIFICATION FLAG
C     DELRST   ELAPSED TIME BETWEEN RESTART RECORD OUTPUT
C     NRST     NUMBER OF TIME STEPS BETWEEN RESTART RECORD OUTPUT
C     DELPLT   ELAPSED TIME BETWEEN PLOT RECORD OUTPUT
C     NPLT     NUMBER OF TIME STEPS BETWEEN PLOT RECORD OUTPUT
C     RESTRT   =  TRUE  INDICATES A RESTART JOB
C
      COMMON/OUTCNT/NOUTMJ NOUTMN NOUTPL NOUTRS
     *              NMNSTP NMJSTP NRSSTP NPLSTP
     *              DMIN   DMAJ   DRST   DPLT
C
C       NOUTMJ - NUMBER OF MAJOR EDITS OUTPUT
C       NOUTMN - NUMBER OF MINOR EDITS OUTPUT
C       NOUTPL - NUMBER OF PLOT RECORDS OUTPUT
C       NOUTRS - NUMBER OF RESTART RECORDS OUTPUT
C       NMNSTP - NO. TIME STEPS SINCE LAST MINOR EDIT
C       NMJSTP - NO. TIME STEPS SINCE LAST MAJOR EDIT
C       NRSSTP - NO. TIME STEPS SINCE LAST RESTART RECORDS WRITTEN
C       NPLSTP - NO. TIME STEPS SINCE LAST PLOT RECORD WRITTEN
C       DMIN   - ELAPSED TIME SINCE LAST MINOR EDIT
C       DMAJ   - ELAPSED TIME SINCE LAST MAJOR EDIT
C       DRST   - ELAPSED TIME SINCE LAST RESTART RECORDS WRITTEN
```

```
C       DPLT    - ELAPSED TIME  SINCE LAST PLOT RECORD WRITTEN
C
      COMMON/ PINFO/  PINLEN( 4) PINPOW( 4) POWFAC( 4) ORIFAC( 4)
     1                  IPOW( 4)   ISYS( 4)   NLVL( 4)   NMAT( 4)
                      ICAPFL( 4) INFLAG( 4) NINBEG( 4) NINPOW( 4)
     3                NINGAP( 4)  IDFORM(4)
C
      PINLEN - AXIAL LENGTH OF PIN  FT
C     PINPOW - PIN POWER  BTU/SEC
C     POWFAC - PIN POWER PEAKING FACTOR
C     ORIFAC - ASSOCIATED COOLANT CHANNEL ORIFICING FACTOR
C     IPOW - PIN POWER CONTROL FLAG
C     ISYS - I D  NO  OF SYSTEM OF WHICH PIN IS A PART
C     NLVL - NO  OF AXIAL LEVELS
C     NMAT - NO  OF MATERIALS IN THE PIN
C     ICAPFL - GAP CONDUCTIVITY CALCULATIONAL FLAG
C     INFLAG - FLUX DEPRESSION/FILATER RESISTANCE FLAG
C     NINBEG - DATA(I) POINTER FOR  INFLAG  DATA
C     NINPOW - DATA(I) POINTER FOR PIN POWER TABLE
C     NINGAP - DATA(I) POINTER FOR GAP DATA
C     IDFORM - PIN DEFORMATION FLAG
C
      COMMON/PINHED/HEAD1(15) HEAD2(15) HEAD3(15) IUNIT MAXLIN
     1                LINE1 LINE2 LINE3 LONG1 LONG2 LONG3
C
      COMMON/PINLVL/HTTAW( 4 20) ZLNGTH( 4 20) POWLVL(4 20)
     1                POVPA( 4 20)  NNODT( 4 20) NODWAT( 4 20)
     2                  NREG( 4 20) NODHTR( 4 20)
C
      HTTAW - SURFACE AREA  FT**2
C     ZLNGTH - AXIAL LENGTH  FT
C     POWLVL - POWER GENERATED ON THIS LEVEL  BTU/SEC
C     POVPA - AXIAL POWER FRACTION
C     NNODT - NO  OF RADIAL NODE
C     NODWAT - I D  NO  OF ASSOCIATED WATER NODE
C     NREG - NO  OF RADIAL REGIONS
C     NODHTR - I D  NO  OF HEATER NODE (IDL AND ACT ONLY )
C
      COMMON/PINNOD/RINNOD( 4 20 20)   RNOD( 4 20 20) ROTNOD( 4 20 20)
     1                TNOD( 4 20 20)  TNODO( 4 20 20)   QOVP( 4 20 20)
     2               QDOTV( 4 20 20) VOLNOD( 4 20 20) NODMAT( 4 20 20)
C
      RINNOD - NODE INNER RADIUS  FT
C     RNOD - NODE CENTER-OF-MASS RADIUS  FT
C     ROTNOD - NODE OUTER RADIUS  FT
C     TNOD - NODE TEMPERATURE  F
C     TNODO - PREVIOUS TIME STEP TNOD
C     QOVP - RADIAL POWER FRACTION
C     QDOTV - HEAT GENERATION RATE  BTU/SEC
C     VOLNOD - NODE VOLUME  FT**3
C     NODMAT - I D  NO  OF NODE MATERIAL
C
      COMMON /MAJOR/ DELMAJ  NMJOUT  NMAJ
C
      DELMAJ - ELAPSED TIME BETWEEN MAJOR EDITS
C     NMJOUT - DEVICE TO WHICH MAJOR EDITS ARE ROUTED
C     NMAJ - NUMER OF TIME STEPS BETWEEN MAJOR EDITS
C
      COMMON /MINOR/ DELMIN  FMTMIN(12)  MINLOC(9)  MINHED(6 9)
     *               INDX(3 9)  NMNOUT  NMIN
C
      DELMIN - ELAPSED TIME BETWEEN MINOR EDITS
C     FMTMIN - ARRAY USED TO DEFINE MINOR EDIT FORMAT
C     MINLOC - ARRAY THAT HOLDS CORE ADDRESSES OF MINOR EDIT VARIABLES
C     MINHED - ARRAY THAT HOLDS MINOR EDIT COLUMN HEADERS
C     INDX - MINOR EDIT VARIABLE INDICES
C     NMNOUT - DEVICE TO WHICH MINOR EDITS ARE ROUTED
C     NMIN - NUMBER OF TIME STEPS ELAPSED BETWEEN MINOR EDITS
C     NUMMIN - NUMBER OF MINOR EDIT VARIABLES
C
```

```
C
      COMMON/POINTR/ DELTBC NUMSAV NDMSAV
C
C     DELTBC = HYDRAULICS TIME-AVERAGING PERIOD
C     NUMSAV = DIMENSION OF HYDRAULICS TIME-AVG ARRAYS
C     NDMSAV = DIMENSION OF POWER BACK-CALC  TIME-AVG ARRAYS
C
      COMMON/POWERS/APNPOW(3) PNUC  PIDL  PACT
     1                        PNUCO PIDLO PACTO IPN IPI IPA IPT
C
C     APNPOW - SYSTEM AVERAGE FIN POWER  BTU/SEC
C     PNUC - NUCLEAR SYSTEM POWER  MW
C     PIDL - IDEAL F SYSTEM POWER  KW
C     PACT - ACTUAL E SYSTEM POWER  KW
C     PNUCO - PREVIOUS TIME STEP PNUC
C     PIDLO - PREVIOUS TIME STEP PIDL
C     PACTO - PREVIOUS TIME STEP PACT
C     IPN - DATA(I) POINTER FOR TABULATED PNUC
C     IPI - DATA(I) POINTER FOR TABULATED PIDL
C     IPA - DATA(I) POINTER FOR TABULATED PACT
C
C
      COMMON/PROBID/TITLE(1 ) DEL THT EPSSS NSS IFEED INPTF
C
C      TITLE - PROBLEM TITLE
C      DEL   - CONVERGENCE LIMITS
C      THT   - TIME DIFFERENCING PARAMETER
C      NSS   - STEADY SEARCH FLAG
C      IFEED - TEMPERATURE/POWER FEEDBACK FLAG
C      INPTF - INITIAL FLUX INPUT FLAG
C
      COMMON / STATUS / WARNED NOGO
      LOGICAL NOGO  WARNED
C
C     TIMEX   = ELAPSED PROBLEM TIME
C     NOGO    =  TRUE  MEANS PROBLEM FAILURE
C
      COMMON /TABLES/ MARK  MAXCAT DATA( 1)
C
C
      COMMON/TIMER/TIME(10) DTMIN(10) DTMAX(10) ENDT NTIM ITIMFL(10)
C
C     TIME - TIME AT BEGINNING OF TIME STEP GROUP SEC
C     DTMIN - MINIMUM STEP SIZE  SEC
C     DTMAX - MAXIMUM STEP SIZE  SEC
C     ENDT - END-OF-PROBLEM TIME  SEC
C     NTIM - NO  OF TIME STEP GROUPS
C     ITIMFL - STEP SIZE CALCUATION FLAG
C
      COMMON/WHERE/NPIN LVL NOD MAT IPROP
C
C     NPIN - PIN
C     LVL - LEVEL
C     NOD - NODE
C
      COMMON /WHICH/  BREAKE              METHOD
C
      COMMON/WHICHN/NFRST NLAST
C
C
C
C     * INITIALIZE OUTPUT COUNTERS *
C
      IF (RESTRT) GO TO 10
      NMNSTP=1
      NMJSTP=1
      NRSSTP=1
      NPLSTP=1
      IT = ITIMFL(I)
      IF(IT EQ 1 OR IT EQ 2)DTSIZE=DTMIN(1)
```

```
      IF(IT EQ 3)DTSIZE=DTMAX(1)
      DMIN=DTSIZE
      DMAJ=DTSIZ
      DPST=DT IZE
      DPLT=DT IZE
    1 WRITE(6 90 0)
C
C     *  RITE OUT PLOT RECORD *
C
      IF(NMIN NE 0 OR DELMIN NE 0 0D0)CALL MINOUT
      IF(NPLT NE 0 OR DELPLT NE 0 0D0)CALL PLOTIT
C
C
C     ***********************
C     * BEGIN ITERATION LOOP *
C     ************************
C
  100 CONTINUE
C
C     * DETERMINE TIME STEP SIZE AND UPDATE PROBLEM TIME *
C
      CALL NEXTEP
      IF(TAU GE ENDT)GO TO 8999
C
C     ****************************************
C     * UPDATE CHANNEL BOUNDARY CONDITIONS AND *
C     * WATER PROPERTIES  AND  ET UP MOMENTUM  *
C     * EQUATION TERMS                         *
C     ****************************************
C
      IF(NCHAN EQ 0)GO TO 1000
      IF(DELTBC GT 0 0D0)CALL LINKIT
      IF(DELTBC LE 0 0D0)CALL INLNK
      CALL SSH20
      CALL MOMH20
C
C
C
C     ******************
C     * NUCLEAR SYSTEM *
C     ******************
C
 1000 CONTINUE
      IF(INUCFL EQ -3)GO TO 1002
      IF(INUCFL EQ -2 AND IIDLFL EQ 0)GO TO 1001
      IF(INUCFL EQ 0 OR INUCFL EQ -2)GO TO 2000
 1001 CONTINUE
      GO TO 1003
C
C     (TWICE-CALCULATED NUCLEAR POWER)
C
 1002 CONTINUE
      IF(NTIMST EQ 1 AND NSS EQ 0) CALL KSERCH
      CALL JTRAN
      GO TO 2000
 1003 CONTINUE
C
      CALL NUCPOW
C
C     * CALCULATE AVERAGE PIN POWER  DISTRIBUTE POWER  *
C     * AND DETERMINE PIN TEMPERATURE DISTRIBUTIONS    *
C
      APNPOW(1)=PNUC/NNPINS*KWPMW*BPKWHR/SECPHR
      DO 1019 NPIN=1 NPINS
      IF(ISYS(NPIN) NE 1)GO TO 1019
      CALL NODPOW
      NFRST = NPIN
      NLAST = NPIN
      CALL PINTEN
```

```
 1019 CONTINUE                                                          TRAN0294
      IF(INJCFL EQ - )GO TO 7   0                                       TRAN0295
C                                                                       TRAN0296
C                                                                       TRAN0297
C                                                                       TRAN0298
C     ************************                                          TRAN0299
C     * IDEAL ELECTRIC SYSTEM *                                         TRAN0300
C     ************************                                          TRAN0301
C                                                                       TRAN0302
 2000 CONTINUE                                                          TRAN0303
      IF(IIDLFL EQ 0)GO TO 3   0                                        TRAN0304
C                                                                       TRAN0305
      CALL IDLPOW                                                       TRAN0306
C                                                                       TRAN0307
C     * CALCULATE AV EA E PIN POWER  DISTRIBUTE POWER  *                TRAN0308
C     * AND DETERMIN  PIN TEMPERATURE DISTRIBUTIONS    *                TRAN0309
C                                                                       TRAN0310
      APNPOW(2)=PIDL/NIPINS*BPKWHR/SECPHR                               TRAN0311
      DO   19 NPIN=1 NPINS                                              TRAN0312
      IF(ISYS(NPIN) NE 2)GO TO  019                                     TRAN0313
      CALL NODPOW                                                       TRAN0314
      NFR T = NPIN                                                      TRAN0315
      NLA T - NPIN                                                      TRAN0316
      CALL PINTEN                                                       TRAN0317
 2019 CONTINUE                                                          TRAN0318
      IF(INUCFL EQ -2)GO TO 1001                                        TRAN0319
C                                                                       TRAN0320
C                                                                       TRAN0321
C                                                                       TRAN0322
C     ************************                                          TRAN0323
C       ACTUAL ELECTRIC SYSTEM *                                        TRAN0324
C     ************************                                          TRAN0325
C                                                                       TRAN0326
 3000 CONTINUE                                                          TRAN0327
      IF(IACTFL EQ 0)GO TO 40 0                                         TRAN0328
C                                                                       TRAN0329
      CALL ACTPOW                                                       TRAN0330
C                                                                       TRAN0331
C     * CALCULATE AVERAGE PIN POWER  DISTRIBUTE POWER  *                TRAN0332
C     * AND DETERMINE PIN TEMPERATURE DISTRIBUTIONS    *                TRAN0333
C                                                                       TRAN0334
      APNPOW(3)=PACT/NAPINS*BPKWHR/SECPHR                               TRAN0335
      DO 3019 NPIN=1 NPINS                                              TRAN0336
      IF(I Y (NPIN) NE 3)GO TO  019                                     TRAN0337
      CALL NODPOW                                                       TRAN0338
      NFRST = NPIN                                                      TRAN0339
      NLAST =  NPIN                                                     TRAN0340
      CALL PINTEN                                                       TRAN0341
 3019 CONTINUE                                                          TRAN0342
C                                                                       TRAN0343
C                                                                       TRAN0344
C                                                                       TRAN0345
C                                                                       TRAN0346
C     * UPDATE PREVIOUS-TIME-STEP TEMPERATURES *                       TRAN0347
C                                                                       TRAN0348
 4000 CONTINUE                                                          TRAN0349
      DO 99 N=1 NPINS                                                   TRAN0350
      NL=NLVL(N)                                                        TRAN0351
      DO 99 L=1 NL                                                      TRAN0352
      NN=NNODT(N L)                                                     TRAN0353
      DO 99 M=1 NN                                                      TRAN0354
   99 TNODO(N L M)=TNOD(N L M)                                          TRAN0355
C                                                                       TRAN0356
C                                                                       TRAN0357
C     ****************************                                      TRAN0358
C     * UPDATE CHANNEL CONDITIONS *                                     TRAN0359
C     * AND SOLVE EQUATIONS       *                                     TRAN0360
C     ****************************                                      TRAN0361
C                                                                       TRAN0362
      IF(NCHAN EQ 0)GO TO 5000                                          TRAN0363
```

```
      CALL ENTHLW                                                       TRAN0364
      IF(METHOD EQ 0)CALL MATRIX                                        TRAN0365
      IF(METHOD EQ 1)CALL EXPLCT                                        TRAN0366
 5000 CONTINUE                                                          TRAN0367
C                                                                       TRAN0368
C     * COMPUTE AVERAGE REGION TEMPERATURES *                           TRAN0369
C                                                                       TRAN0370
      CALL TAVER                                                        TRAN0371
C                                                                       TRAN0372
C     ******************                                                TRAN0373
C     * OUTPUT RESULTS *                                                TRAN0374
C     ******************                                                TRAN0375
C                                                                       TRAN0376
      NMNSTP=NMNSTP+1                                                   TRAN0377
      NMJSTP=NMJSTP+1                                                   TRAN0378
      NRSSTP=NRSSTP+1                                                   TRAN0379
      NPLSTP=NPLSTP+1                                                   TRAN0380
      DMIN = DMIN + DELT                                                TRAN0381
      DMAJ = DMAJ + DELT                                                TRAN0382
      DRST = DRST + DELT                                                TRAN0383
      DPLT = DPLT + DELT                                                TRAN0384
C                                                                       TRAN0385
C     * MINOR EDIT *                                                   TRAN0386
C                                                                       TRAN0387
      IF(NMNSTP LT NMIN)GO TO 6000                                      TRAN0388
      IF(DMIN LT DELMIN)GO TO 6000                                      TRAN0389
      IF(NMIN EQ 0 AND DELMIN EQ 0.0D0)GO TO 6000                       TRAN0390
      NOUTMN = NOUTMN + 1                                               TRAN0391
      CALL MINOUT                                                       TRAN0392
      NMNSTP = 1                                                        TRAN0393
      DMIN = DELT                                                       TRAN0394
C                                                                       TRAN0395
C     * MAJOR EDIT *                                                   TRAN0396
C                                                                       TRAN0397
 6000 IF(NMJSTP LT NMAJ)GO TO 7000                                      TRAN0398
      IF(DMAJ LT DELMAJ)GO TO 7000                                      TRAN0399
      IF(NMAJ EQ 0 AND DELMAJ EQ 0.0D0)GO TO 7000                       TRAN0400
      NOUTMJ = NOUTMJ + 1                                               TRAN0401
      CALL MAJOUT                                                       TRAN0402
      NMJSTP = 1                                                        TRAN0403
      DMAJ = DELT                                                       TRAN0404
C                                                                       TRAN0405
C                                                                       TRAN0406
C     * PLOT RECORD *                                                  TRAN0407
C                                                                       TRAN0408
 7000 CONTINUE                                                          TRAN0409
      IF(NPLSTP LT NPLT)GO TO 8000                                      TRAN0410
      IF(DPLT LT DELPLT)GO TO 8000                                      TRAN0411
      IF(NPLT EQ 0 AND DELPLT EQ 0.0D0)GO TO 8000                       TRAN0412
      NOUTPL = NOUTPL + 1                                               TRAN0413
      CALL PLOTIT                                                       TRAN0414
      NPLSTP = 1                                                        TRAN0415
      DPLT = DELT                                                       TRAN0416
C                                                                       TRAN0417
C     * RESTART RECORD *                                               TRAN0418
C                                                                       TRAN0419
 8000 CONTINUE                                                          TRAN0420
      IF(NRSSTP LT NRST)GO TO 8999                                      TRAN0421
      IF(DRST LT DELRST)GO TO 8999                                      TRAN0422
      IF(NRST EQ 0 AND DELRST EQ 0.0D0)GO TO 8999                       TRAN0423
      NOUTRS = NOUTRS + 1                                               TRAN0424
      CALL TRNDMP                                                       TRAN0425
      NRSSTP = 1                                                        TRAN0426
      DRST = DELT                                                       TRAN0427
C                                                                       TRAN0428
 8999 CONTINUE                                                          TRAN0429
      IF(NCGO)GO TO 999                                                 TRAN0430
C                                                                       TRAN0431
C                                                                       TRAN0432
      IF(TAU LE ENDT)GO TO 100                                          TRAN0433
```

```
C                                                                       TRAN0434
C                                                                       TRAN0435
C                                                                       TRAN0436
      RITE(6  090)                                                      TRAN0437
 9000 FORMAT(1H1 9(/) 24(131( * )/) 2(41( * ) 50X 40( * )/)             TRAN0438
     1 41( * ) 16X  TRAN IENT OUTPUT  18X 40( * )/                      TRAN0439
     2 2(41( * ) 50X 40( * )/) 24(131( * )/))                           TRAN0440
 9090  ORMAT(1H1 9(/) 24(131( * )/) 2(41( * ) 50X 40( * )/)             TRAN0441
     1 41( * ) 16X  END CF TRANSIENT  18X 40( * )/                      TRAN0442
     2 2(41( * ) 50X 40( * )/) 24(131( * )/))                           TRAN0443
C                                                                       TRAN0444
C     MAKE SURF LAST PLOT CR RESTART RECORD HAS BEEN WRITTEN            TRAN0445
C     AND PUT AN END OF FILE MARK ON FILE 1                             TRAN0446
      IF (IDJO   LT  2) RETURN                                          TRAN0447
      CALL BUFWEF (1  IDUM1  IDUM2  IMDONE  ICOUNT)                     TRAN0448
      CALL BUFDLY (1  IDUM1  IDUM2  IMDONE  ICOUNT)                     TRAN0449
      RETURN                                                            TRAN0450
C                                                                       TRAN0451
  999 W RITE(6 9999)                                                    TRAN0452
      STOP                                                              TRAN0453
 9999 FORMAT(1H1 24(130( * )/) 2(50( * ) 29X 50( * )/)                  TRAN0454
     1 50( * )      JOB TERMINATED IN TRAN       50( * )/               TRAN0455
     2 50( * )        NOGO HAD BEEN SET           0( * )/               TRAN0456
     3 2(50( * ) 29X 50( * )/) 24(130( * )/))                           TRAN0457
C                                                                       TRAN0458
      END                                                               TRAN0459
```

```
C                                                                       PNSM0001
C     PINSIM MAIN                                                       PNSM0002
C                                                                       PNSM0003
      IMPLICIT REAL*8 (A-H O-Z)                                         PNSM0004
C
      COMMCN/JOBCON/RSTRTM DELRST DELPLT                                PNSM0005
     1                IDJOB   NRST   NPLT  RESTRT                       PNSM0006
      LOGICAL RESTRT                                                    PNSM0007
C                                                                       PNSM0008
C     RSTRTM   TIME AT WHICH PROBLEM IS TO BE RESTARTED                 PNSM0009
C     IDJOB    JOB TYPE IDENTIFICATION FLAG                             PNSM0010
C     DELRST   ELAPSED TIME BETWEEN RESTART RECORD OUTPUT               PNSM0011
C     NRST     NUMBER OF TIME STEPS BETWEEN RESTART RECORD OUTPUT       PNSM0012
C     DELPLT   ELAPSED TIME BETWEEN PLOT RECORD OUTPUT                  PNSM0013
C     NPLT     NUMBER OF TIME STEPS BETWEEN PLOT RECORD OUTPUT          PNSM0014
C     RESTRT   =  TRUE  INDICATES A RESTART JOB                         PNSM0015
C                                                                       PNSM0016
C                                                                       PNSM0017
      COMMON/SCRTCH/NCASE NOTY IERROR MAXTMP TEMP(5500) TABLE(10000)
C
C     NOTY  = DIMENSION CF THE TABLE ARRAY (INITIALLY)
C             (NOTY IS INITIALIZED BELOW)
C     MAXTMP = DIMENSICN OF TEMP ARRAY
C     TEMP  = SCRATCH SPACE FOR SUBROUTINE INP2
C     TABLE = SCRATCH SPACE FCR SUBROUTINE INP
C                                                                       PNSM0021
      COMMON / STATUS / WARNED NOGO                                     PNSM0022
      LOGICAL NOGO WARNEC                                               PNSM0023
C                                                                       PNSM0024
C     WARNED  =  TRUE  MEANS POSSIBLE PROBLEM ERROR                     PNSM0025
C     NOGO    =  TRUE  MEANS PRCBLEM FAILURE                            PNSM0026
C                                                                       PNSM0027
C                                                                       PNSM0028
      COMMON /TABLES/ MARK  MAXCAT   XY( 5000)                          PNSM0029
C                                                                       PNSM0030
C     MARK   = DATA(I) POINTER FOR NEXT AVAILABLE SPACE                 PNSM0031
```

```
C     MAXDAT - DIMENSION OF DATA (I) ARRAY                              PNSM0032
C                                                                       PNSM0033
C                                                                       PNSM0034
C     (IGNORE UNDERFLOWS)                                               PNSM0035
      CALL ERRSET(208 256 -1 1)                                         PNSM0036
C                                                                       PNSM0037
C     * INITIALIZE VARIABLE COMMON BLOCK SIZE  *                        PNSM0038
C                                                                       PNSM0039
C     /SCRTCH
      MAXTM2 - 5500                                                     PNSM0041
      NOTY - 10000
C                                                                       PNSM0042
C     /TABLES/                                                          PNSM0043
      MARK = 1                                                          PNSM0044
      MAXDAT = 500                                                      PNSM0045
C                                                                       PNSM0046
C     /STATUS/                                                          PNSM0047
      NOGO- FALSE                                                       PNSM0048
      WARNED= FALSE                                                     PNSM0049
C                                                                       PNSM0050
C     * DO INPUT AND INITIALIZATION *                                   PNSM0051
C                                                                       PNSM0052
      CALL INPUT                                                        PNSM0053
      IF (NOGO) GO TO 99                                                PNSM0054
      IF (RESTRT) GO TO 10                                              PNSM0055
C                                                                       PNSM0056
C     * CALCULATE STEADY STATE DISTRIBUTIONS *                          PNSM0057
C                                                                       PNSM0058
      CALL SSTATE                                                       PNSM0059
      IF(IDJOB EQ 0)STOP                                                PNSM0060
      IF(NOGO)GO TO 99                                                  PNSM0061
C                                                                       PNSM0062
C     * PERFORM TRANSIENT CALCULATIONS *                                PNSM0063
C                                                                       PNSM0064
   10 CALL TRAN                                                         PNSM0065
C                                                                       PNSM0066
      STOP                                                              PNSM0067
C                                                                       PNSM0068
C                                                                       PNSM0069
   99  RITE(6 9999)                                                     PNSM0070
       TOP                                                              PNSM0071
 9999 FORMAT(1H1 24(130( * )/) 2(50( * ) 29X 50( * )/)                  PNSM0072
     1 50( * )      JOB TERMINATED IN MAIN       50( * )/               PNSM0073
     2 50( * )        NOGO HAD BEEN SET          50( * )/               PNSM0074
     3 2(50( * ) 29X 50( * )/) 24(130( * )/))                           PNSM0075
C                                                                       PNSM0076
C                                                                       PNSM0077
      END                                                               PNSM0078
```

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