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ORINC — A ONE-DIMENSIONAL IMPLICIT APPROACH TO THE INVERSE HEAT CONDUCTION PROBLEM

A Thesis

Presented for the

Master of Science

Degree

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ABSTRACT

This thesis develops an implicit solution technique to determine both the transient surface temperature and the transient surface heat flux of electrically heated rods given the power input and an "indicated" internal temperature. The analysis requires the solution of the classical inverse heat conduction problem which in the mathematical literature is usually referred to as a parabolic continuation problem.

This technique will be applied in the analytical determination of the surface conditions of indirect electrically heated nuclear fuel pin simulators, given the rod power input and the response from a thermocouple embedded in the simulator during a simulated loss-of-coolant accident transient.

A digital computer program ORINC (ORNL Inverse Code) is developed. The code solves a one-dimensional, transient, lumped parameter, implicit formulation of the inverse conduction problem at each bundle thermocouple position in the Thermal-Hydraulic Test Facility (THTF), at the Oak Ridge National Laboratory.

This work was motivated by potential nuclear fuel pin overheating during a postulated loss-of-coolant accident in pressurized water nuclear reactors and the lack of experimental and theoretical transient heat transfer data covering accidents of this type.

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LIST OF SYMBOLS

SYMBOL	DEFINITION
A	Area of integration, ft^2
A	Constant of proportionality [Eq. (II.15)]
$\overline{B}_F$	Column vector of knowns in the forward conduction model [Eq. (II.46)]
$\overline{B}_I$	Column vector of knowns in the inverse conduction model [Eq. (II.70)]
$b_{\_}$	Elements of $\overline{B}_{\_}$
Cp	Specific heat, $Btu/lb_m-°F$
f	Geometric view factor
$\overline{H}_F$	Tridiagonal coefficient matrix of the forward conduction model [Eq. (II.36)]
$\overline{H}_I$	Tridiagonal coefficient matrix of the inverse conduction model [Eq. (II.63)]
$h_{\_,\_}$	Elements of $\overline{H}_{\_}$
h_f	Surface convective heat transfer coefficient, $Btu/sec-ft^2-°F$
h_b	ORINC-calculated heat transfer coefficient based on T_b, $Btu/sec-ft^2-°F$
h_{sat}	ORINC-calculated heat transfer coefficient based on T_{sat}, $Btu/sec-ft^2-°F$
$h_{gap\_}$	Gap convective heat transfer coefficient, $Btu/sec-ft^2-°F$
$h_{r\_}$	Gap radiation heat transfer coefficient, $Btu/sec-ft^2-°F$
k	Thermal conductivity, $Btu/sec-°F-ft^2/ft$
$\overline{k}_{i,i+1}$	Average thermal conductivity (i.e., $k_i + k_{i+1}/2$), $Btu/sec-°F-ft^2/ft$
ℓ	Unit distance in the axial direction, ft
n	Number of nodes (subvolumes) in a substrate
$\overline{n}$	Unit vector normal to dA
$\dot{q}'''$	Volumetric heat generation rate, $Btu/sec-ft^3$
$\dot{q}$	Heat generation rate, Btu/sec
$q_{\_,\_}$	Heat flow between nodes, Btu/sec
r	Radial distance, ft

SYMBOL	DEFINITION
Δr^2	Nodal area, ft^2 [defined by Eq. (II.10) or (B-20)]
r_i	Node i interface radius, ft [defined by Eq. (II.11) or (B-18)]
$\bar{r}_i$	Node i center of mass, ft [defined by Eq. (II.12) or (B-19)]
r_I	Inside radius of heat source, ft
r_H	Outside radius of heat source, ft
r_S	Radius of rod surface, ft
Δr_{gap}	Radial gap at the substrata interface, ft
t	Time, sec
T	Temperature, °F
$\bar{T}_F$	Column vector of unknowns in the forward conduction model, [Eq. (II.45)] (nodal temperatures)
$\bar{T}_I$	Column vector of unknowns in the inverse conduction model, [Eq. (II.69)]
T_b	Average local fluid bulk temperature, °F
T_{sat}	Local fluid saturation temperature, °F
T_{surf}	Rod surface temperature, °F
Δv	Subvolume of a substrate, defined by Eq. (II.9) (nodal volume), ft^3
V	Volume of integration, ft^3
z	Axial distance, ft
θ	Azimuthal angle, radians
ρ	Density, lb_m/ft^3
σ	Stefan-Boltzmann constant
Φ	Time-averaged linear surface heat rate (divided by π), Btu/sec-ft
ψ	Time-averaged surface heat flux, Btu/sec-ft^2

SUBSCRIPTS	DEFINITION
NMGO	Number of nodes in magnesium oxide
MgO	Magnesium oxide substrate

SUBSCRIPTS	DEFINITION
NM	First node in Inconel substrate (NMGO + 1)
Heat (heater)	Inconel heater substrate
NHT	Number of nodes in Inconel substrate
NOD2	Last node in Inconel substrate (NMGO + NHT)
NH	First node in the Cupro Nickel substrate (NOD2 + 1)
Cu	Cupro Nickel substrate
NCU	Number of nodes in Cupro Nickel substrate
NOD3	Last node in the heater (NOD2 + NCU)
NC	First node in the boron nitride substrate (NOD3 + 1)
BN	Boron nitride substrate
NBN	Number of nodes in boron nitride substrate
NOD4	Last node in the boron nitride (NOD3 + NBN)
NB	First node in the inner stainless steel sheath substrate (NOD4 + 1)
SS1	Inner stainless steel sheath substrate
NSS1	Number of nodes in inner stainless steel sheath
NOD5	Last node in the inner stainless steel sheath (NOD4 + NSS1)
NS	First node in the outer stainless steel sheath (NOD5 + 1)
SS2	Outer stainless steel sheath substrate
NSS2	Number of nodes in outer stainless steel sheath
NOD6	Last node in the outer stainless steel sheath (NOD5 + NSS2)
SS	Stainless steel
gap_1	Radial gap at the magnesium oxide — Inconel interface
gap_2	Radial gap at the heater — boron nitride interface
gap_3	Radial gap at the boron nitride — inner stainless steel sheath interface
gap_4	Radial gap at the inner stainless steel sheath — outer stainless steel sheath interface
gap_0	Bias gap for gap_4

GLOSSARY

TERM	DEFINITION
ATWS	Anticipated transient without scram
BDHT	Blowdown heat transfer
CCDAS	Computer controlled digital data acquisition system
CHF	Critical heat flux
DNBR	Departure from nuclear boiling ratio
FCTF	Forced Convection Test Facility
LOCA	Loss of coolant accident
LWR	Light water reactor
NRC	Nuclear Regulatory Commission
ORINC	ORNL Inverse Code
ORNL	Oak Ridge National Labroatory
ORTCAL	ORNL Thermocouple Calibration Code
PWR	Pressurized water reactor
RELAP	Reactor Linearized Analysis Program
RSR	Reactor Safety Research
THTF	Thermal Hydraulic Test Facility

CHAPTER I

INTRODUCTION

Background[1]

The Oak Ridge National Laboratory (ORNL) Pressurized-Water-Reactor Blowdown Heat Transfer (PWR-BDHT) Separate-Effects Program is part of the overall light-water-reactor (LWR) safety research program of the Nuclear Regulatory Commission (NRC). Other parts of the program cover a wide range of experimental and analytical efforts from laboratory- to small-scale experimental nuclear plants; the separate-effects studies, which fall between these two, are designed to answer specific questions relevant to the hypothetical loss-of-coolant accident (LOCA).

Specific objectives of the ORNL PWR-BDHT Separate-Effects Program are to determine for a wide range of parameters time to CHF (critical heat flux) and the following variables for both pre- and post-CHF: heat fluxes, ΔT (temperature difference between pin surface and fluid), heat transfer coefficients, and local fluid properties. The program also seeks to test the ability of existing codes, such as RELAP, to predict the behavior of the single- and 49-rod loops under blowdown conditions.

The parameters to be studied include

1. single- and double-ended coolant line breaks of varying area ratios;
2. fast to slow depressurization rates;
3. combinations of system power and pressure to obtain different values of the departure from nuclear boiling ratio (DNBR);
4. a range of power cutoff delays;
5. a range of power decay rates;
6. a range of power-to-system volume ratios.

Secondary objectives are (1) to obtain CHF data under steady-state conditions over a range of coolant pressures, inlet and exit subcooling, and an inlet flow rate appropriate to PWR interests; (2) to evaluate the thermal-hydraulic behavior of the test loops during simulated operational upsets that include variations in local power, system pressure, or coolant

flow using the anticipated transient without scram (ATWS) as a guide;[2] and (3) to determine the effect of different spacer grids and power distribution profiles on both transient and steady-state CHF.

Test Facilities[1]

Primary test results are obtained from the Thermal-Hydraulic Test Facility (THTF), a large nonnuclear experimental loop with a test section that contains a 7 × 7 array of 12-ft stepped, chopped-cosine heater rods with an outside diameter of 0.422 in.

A schematic view of the THTF is shown in Fig. I-1. Fluid discharged from the pump flows through two control valves, where excess pump head is dissipated and flow adjusted to the desired level by diverting a portion through the bypass line. Heat generated in the fluid by the pump is removed in the small Graham "Heliflow" heat exchanger in the bypass line. The primary flow then passes through inlet instrumented spool pieces 1 and 2, where flow conditions are monitored by a combination of a drag disk, gamma densitometer, turbine meter, and temperature and pressure sensors in each spool piece. Flow enters the test section at the top of the rectangular shroud box, flows down its length, and enters the bottom of the rod bundle. The fluid exits the bundle through outlet spool pieces 1 and 2, which are identical to those on the inlet. The energy added by the test section heater rods is removed by Graham "Heliflow" heat exchangers A, B, and C. Finally, the fluid returns to the pump suction past the line from the pressurizer, which provides the primary pressure control for the loop and at the same time serves as a surge tank.

At the instant of blowdown, the contents of the primary loop may be discharged through either of two rupture disk assemblies and appropriately sized orifices into the pressure-suppression system. For approximately 15 sec before and approximately 300 sec after blowdown, over 500 sensors throughout the loop will be scanned by a computer-controlled digital-data-acquisition system (CCDAS) at a rate of 20 times per second. These sensors include approximately 320 thermocouples in the heater rods of the test section.

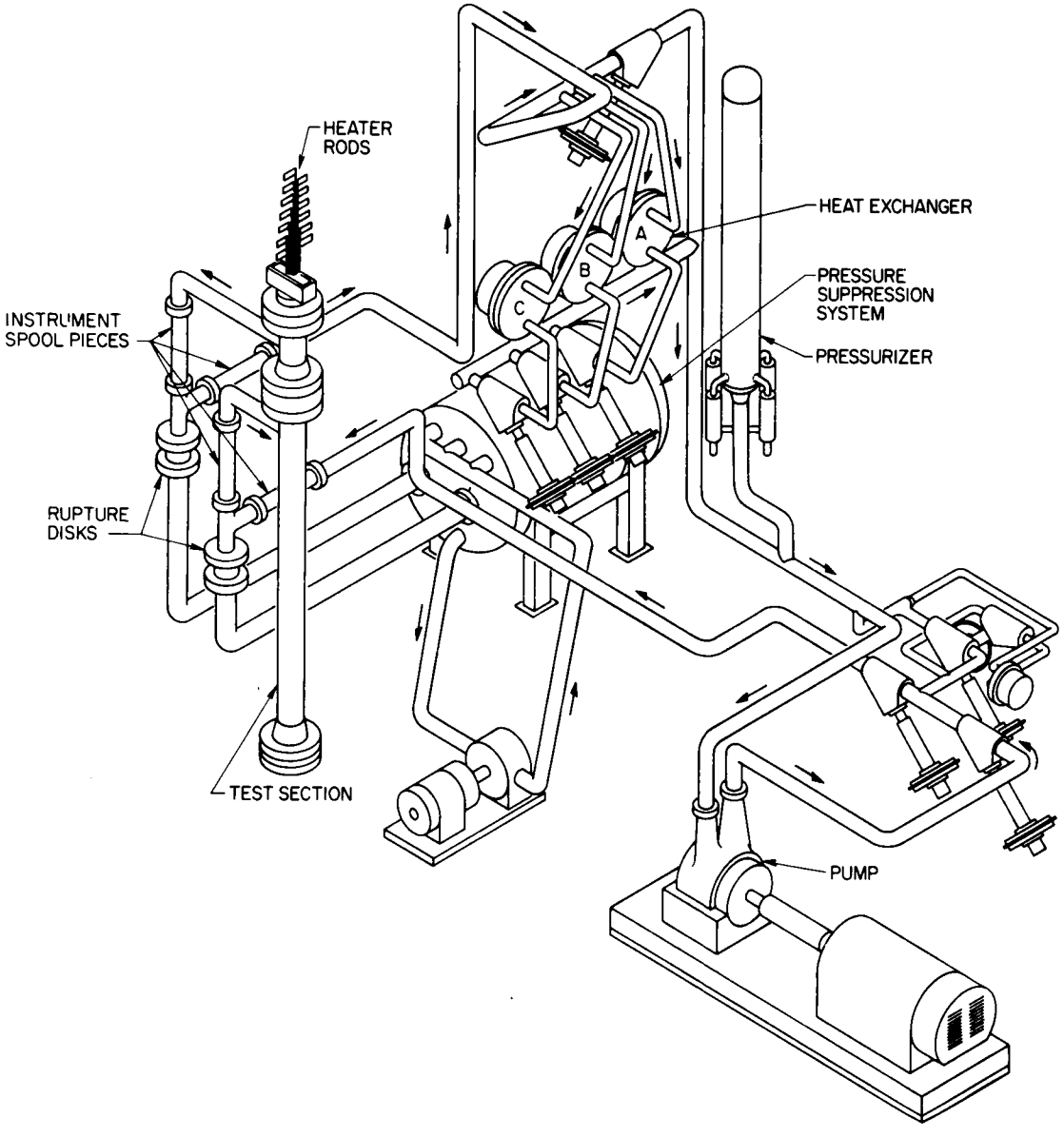


Fig. I-1. Thermal-Hydraulic Test Facility (ORNL-PWR Blowdown Heat Transfer Separate-Effects Program).

Supporting experiments are carried out in the Forced Convection Test Facility (FCTF). A schematic view of the principal FCTF loop components is illustrated in Fig. I-2. The primary purpose of the FCTF is to qualify prototype heaters for use in the THTF and to obtain blowdown heat transfer and steady-state CHF results for single rods in an annular geometry. In

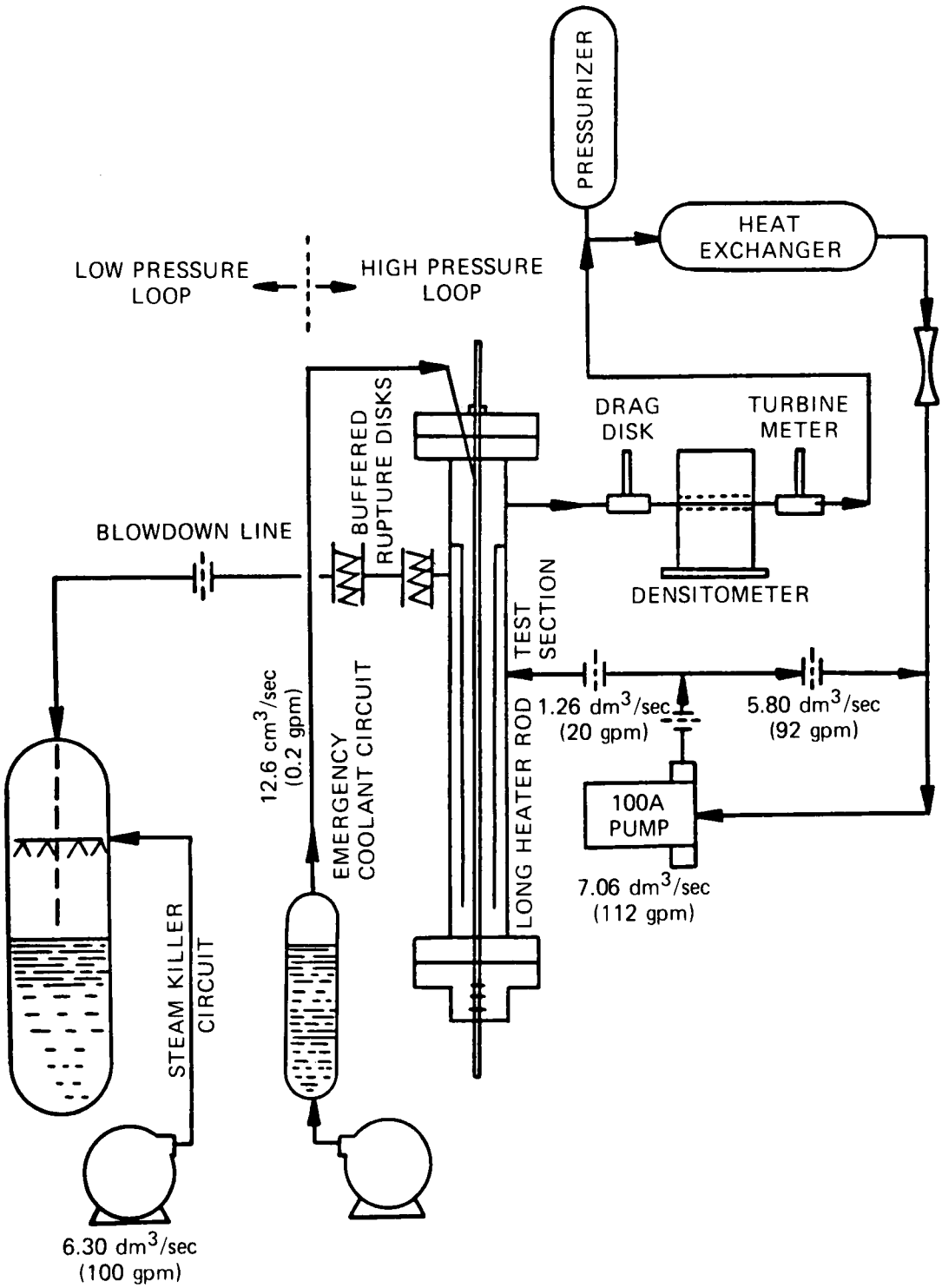


Fig. I-2. Forced convection depressurization loop.

its present configuration, the FCTF is capable of conducting only single-ended break tests.

Objectives

One of the primary objectives of the analysis is to determine the transient surface temperature and heat flux of the THTF heater rods from internal thermocouple signals obtained during a blowdown. This analysis requires the solution of the inverse heat conduction problem.

The first purpose of this thesis is to develop a method for calculating the surface heat flux and surface temperature given the power input and the "indicated" internal temperature. The second objective is to develop and present the inverse computer program ORINC (ORNL Inverse Code), which solves a one-dimensional, transient, lumped-parameter, implicit formulation of the conduction equation at each thermocouple position.

Literature Survey

An extensive review of the literature on the inverse heat conduction problem has been made by Muzzy, Avila, and Root.[3] The following draws heavily from that study.

The problem can be posed mathematically as follows: determine an unknown function b(t) which may be either the temperature or flux at the boundary $\overline{D}$ of a domain D if the temperature distribution T(x,t) satisfies

$$\overline{\nabla}\cdot k\overline{\nabla}T + \dot{q}''' = \rho Cp \frac{\partial T}{\partial t} \qquad \text{for } x \in D \tag{I.1}$$

and the conditions

$$T(x,0) = f(x) \qquad x \in D \tag{I.2}$$

$$T(x_0,t) = g(t) \qquad x_0 \in D,\ t \geq 0\ , \tag{I.3}$$

where ρ denotes density, Cp is specific heat, k is thermal conductivity, $\dot{q}'''$ is the heat generation rate, and f and g are known functions. Most numerical techniques for solving Eqs. (I.1) through (I.3) are inherently unstable since small changes in the data can cause large changes in the

solution. All numerical techniques that solve this problem successfully require an explicit or implicit reduction in the space of functions in which the solution will be sought.

There are four basic approaches to the numerical solution of the inverse heat conduction problem: integral equation techniques, transform techniques, series techniques, and techniques involving minimization over a multiparameter family of functions. All of these methods overlap considerably.

The integral equation approach exploits the fact that for linear problems (i.e., where the material properties are temperature and time invariant), the solution to Eqs. (I.1) through (I.3) employs an integral equation. For example, if b(t) denotes the surface heat flux on $\overline{D}$, then

$$g(t) = g(0) + \int_0^t G(S,t)\, b(S)\, dS \,, \tag{I.4}$$

where G(S,t) is an appropriate "kernel."

Stoltz[4] used Eq. (I.4) to obtain numerical solutions for b equal to the surface heat flux. By considering $t_i = i\,\Delta t$ (i = 0, 1, 2, ..., n), he approximated the integral using a simple integration scheme. By assuming b constant on each interval (t_i, t_{i+1}), he was able to solve for b recursively, starting from i = 0. Even when restricting the class of possible solutions to step functions, instabilities were observed if Δt became too small. Beck[5] also used Eq. (I.4), but improved on Stoltz's method by considering t_i ahead of the value for which b was presently sought. Applying a least-squares technique to obtain the optimum solution for Eq. (I.4) over several values of t_i simultaneously, Beck was able to solve b for a much smaller Δt. In a more recent work, Agee[6] also reduced the nonlinear problem to an equivalent linear problem via a relationship similar to Eq. (I.4) and then used an adjoint solution technique to solve the equivalent linear problem for either the surface temperature or heat flux. The integral equation approach is restricted to linear problems and can become difficult if the geometry is irregular.

The second approach is characterized by the use of Laplace or Fourier transforms to obtain transfer functions which relate the input data g(t) to

the output function b(t). Sparrow, Haji-Sheikh, and Lundgren,[7] Kendall,[8] and Imber[9] have used this approach. Again, the linearity assumption is crucial; if the domain is irregular or composed of many regions — each with different material properties — the application of these techniques may be difficult.

The third approach involves the use of infinite series with the values of g(t) and its derivatives to solve Eqs. (I.1) through (I.3). Burggraf[10] first developed this technique, and his results were later extended to other cases of interest by Makhin and Shmukin.[11] In more recent work, Plummer et al.[12] have employed this method numerically with apparent success. Linearity and a regular geometry are essential.

The fourth approach is that of minimization over a multiparameter family of functions. In this technique the solution is assumed to be of a certain form, for example, step or polynomial functions which depend on several parameters. These are chosen such that, with the resulting b(t) as input, a best match of the data g(t) in a least-squares sense is obtained. The major proponent of this method is Beck,[13] but others had considered it earlier (Frank[14] and Davies[15]). In this technique the process is an iterative one; for each proposed set of parameters the forward problem [Eqs. (I.1) and (I.2)] is solved, in addition to

$$-K \frac{\partial T}{\partial \bar{n}} = b(t) \qquad \text{for } x \in \bar{D} , \tag{I.5}$$

where b(t) represents the heat flux and $\bar{n}$ the direction normal to the surface. After the forward problem is solved, the adjustable parameters are altered by some strategy and the process is repeated. The best parameters are those for which Eq. (I.3) is most nearly satisfied.

Beck[13] considered b to be a low-order polynomial or constant over the analysis interval (several time steps in the discretized data). The coefficients in the polynomial expansion are adjusted to most nearly satisfy Eq. (I.3) in the least-squares sense over the analysis interval. The solution is taken as the accepted value of b over the next single time step only. The analysis interval is shifted by one step and the entire process is repeated.

In the mathematical literature inverse heat conduction is usually referred to as a parabolic continuation problem that is related to solving the heat equation backward in time. There are several approaches that may be taken to solve these problems. The first, described by Douglas,[16] is to solve an integral equation of the form of Eq. (I.4) subject to auxiliary conditions, such as requiring the solution to be bounded. Linear programming techniques are used to optimize the agreement in Eq. (I.3). Linearity is essential, but for regular geometries this approach may be easier to implement than those described above. As the complexity of the domain increases (such as multiple regions within the domain with varying thermal properties), it may not be possible to find the kernel function in Eq. (I.4), and the difficulties of this method increase.

A second approach, similar to the least-squares ideas described above, has been employed by Miller and Viano[17] and by Miller.[18] Assume that for any $b(t)$, $T(x_0,t)$ can be calculated by

$$A(b) = T(x_0,t) \ . \tag{I.6}$$

The following is then minimized

$$||A(b) - g|| \ , \tag{I.7}$$

(where $||.||$ denotes some convenient vector norm), subject to the condition

$$||B(b)|| \leq E \ , \tag{I.8}$$

where $B(b)$ expresses some operation on the function b. For example, $B(b)$ might be the derivative of b, and Eq. (I.8) would restrict the acceptable solutions to those functions whose derivatives remained bounded by E over the time step under consideration. This approach is applicable to nonlinear problems and offers the advantages of some theoretical background. So far, the applications in the literature have not included the problem given in Eqs. (I.1) through (I.3).

Muzzy, Avila, and Root[3] concluded that the most promising technique for solving the inverse heat conduction problem, as shown in the literature, is Beck's second method,[13] Miller's method,[18] or some combination of the

two. The other techniques are restricted by the linearity assumption and the requirements of simple geometries and/or simple domains.

The original algorithm for Beck's second method was implemented in the INVERS subroutine of the Aerojet Nuclear HEAT1A code.[19] This technique has also been incorporated in Energy Incorporated's LEPER code.[20] Muzzy, Avila, and Root[3] also used a variant of Beck's second method in General Electric's HCODE. Muzzy introduced several improvements and additions to this method: (1) the "trend" of the solution for b was anticipated in the formulation for $b(t_{i+1})$; (2) the formulation for $b(t_{i+1})$ allowed a one-parameter rather than a polynomial (multiparameter) minimization; (3) by restricting the maximum change in $b(t_{i+1})$ over the analysis interval, the possibility of oscillation in the heat flux for rapid transients was minimized; (4) the minimization algorithm was not entered until there was reasonable (within preset error criterion) agreement between the indicated and calculated temperatures; (5) HCODE used a weighted least-squares technique; and (6) HCODE forced the computed temperature to lie alternately on either side of the indicated temperature, reducing the accumulated error in b.

However, there are drawbacks in applying Beck's second method. The first is excessive computational time. Except for the improvements noted in HCODE, the least-squares error function may have local minima to which the iterative minimization process converges (these local minima may be relatively distant from the true minimum) and by applying the process recursively, the computed solution may "drift."

CHAPTER II

MODEL DERIVATION

Consider the governing differential equation for the conduction of heat in a solid with an internal heat source:

$$\bar{\nabla}\cdot k\bar{\nabla}T + \dot{q}''' = \rho Cp\,\frac{\partial T}{\partial t}\ . \tag{II.1}$$

Volume integration of Eq. (II.1) yields

$$\int_V (\bar{\nabla}\cdot k\bar{\nabla}T + \dot{q}''')dV = \int_V \rho Cp\,\frac{\partial T}{\partial t}\,dV\ . \tag{II.2}$$

With the assumption that $\rho Cp(\partial T/\partial t)$ is constant over V and with the application of the divergence theorem to the left side of Eq. (II.2), the result is

$$\int_A k\bar{\nabla}T\cdot\bar{n}dA + \int_V \dot{q}'''dV = \rho CpV\,\frac{\partial T}{\partial t}\ . \tag{II.3}$$

Restricting the model application to cylindrical coordinates allows expansion for the gradient of T,

$$\int_A k\left(\frac{\partial T}{\partial r}\,\bar{r} + \frac{1}{r}\,\frac{\partial T}{\partial \theta}\,\bar{\theta} + \frac{\partial T}{\partial Z}\,\bar{Z}\right)\cdot\bar{n}dA + \int_V \dot{q}'''dV = \rho CpV\,\frac{\partial T}{\partial t}\ . \tag{II.4}$$

Assuming there is no azimuthal temperature dependence and no axial conduction (i.e., $\partial T/\partial\theta = \partial T/\partial Z = 0$), Eq. (II.4) reduces to

$$\int_A k\,\frac{\partial T}{\partial r}\,(\bar{r}\cdot\bar{n})dA + \int_V \dot{q}'''dV = \rho CpV\,\frac{\partial T}{\partial t}\ . \tag{II.5}$$

With the further assumption that $k(\partial T/\partial r)$ is a function of r and t only, then

$$-2\pi k\ell\Big|_{r_i} r_i\,\frac{\partial T}{\partial r}\Big|_{r_i} + 2\pi k\ell\Big|_{r_0} r_0\,\frac{\partial T}{\partial r}\Big|_{r_0} + \int_V \dot{q}'''dV = \rho CpV\,\frac{\partial T}{\partial t} \tag{II.6}$$

for the radial interval (r_i, r_0).

Equation (II.6) can be further simplified with the assumptions that k is constant on the interval (r_i, r_0) and that $\dot{q}'''$ is constant for all regions:

$$\int_V \dot{q}''' dV = \dot{q} \ . \tag{II.7}$$

Therefore, Eq. (II.6) reduces to

$$-2\pi k \ell r_i \left.\frac{\partial T}{\partial r}\right|_{r_i} + 2\pi k \ell r_0 \left.\frac{\partial T}{\partial r}\right|_{r_0} + \dot{q} = \rho C p V \frac{\partial T}{\partial t} \ . \tag{II.8}$$

The next step in the derivation is dependent on the assumption of the nature of the heat flow between two radial positions. However, it is appropriate to first discuss the manner in which a continuous homogeneous domain (substrate) is replaced by a pattern of discrete points (nodes) within the domain. Given a substrate of domain (r_{i-1}, r_{i-1+n}), the substrate is divided into a finite number (n) of equal subvolumes where

$$\Delta v = \frac{\pi r_{i-1+n}^2 \ell - \pi r_{i-1}^2 \ell}{n} \ . \tag{II.9}$$

Replacing Δv with $\pi \ell \Delta r^2$ and eliminating $\pi \ell$ from both sides of Eq. (II.9) yields

$$\Delta r^2 = \frac{r_{i-1+n}^2 - r_{i-1}^2}{n} \ . \tag{II.10}$$

Therefore, the interface radius of each subvolume can be defined by

$$r_{i-1+j} = (r_{i-1}^2 + j \ \Delta r^2)^{1/2} \ , \tag{II.11}$$

where j = 0, n. Also, the center of mass of each subvolume is

$$\bar{r}_{i-1+j} = (r_{i-1+j}^2 - 0.5 \ \Delta r^2)^{1/2} \ , \tag{II.12}$$

where j = 1, n. The nodal points for a substrate over the domain (r_{i-1}, r_{i-1+n}) are defined by the centers of mass of the subvolumes; the temperature of a subvolume is associated with its center of mass. A better understanding of the element notation (node i, r_i, $\bar{r}_i$) can be gained by referring to Fig. II-1.

Given the cylinder depicted in Fig. II-2 with internal heat source over the radial domain of (r_I, r_H), heat flow between internal nodes [i.e., radial domain of (0, r_H)] is proportional to r^2 (or capacitance dominated); however, in the radial domain of (r_H, r_s) the heat flow between two nodes is constant at any r between the nodes, making it flux dominated. Derivation of the model, starting with Eq. (II.8), requires two branches which will be joined later.

Over the domain $0 < r < r_H$ (Figs. II-1 and II-2), assume that heat flow between the nodes is proportional to r^2, or

$$q \propto r^2 \ ; \tag{II.13}$$

also

$$q = -k2\pi r\ell \frac{\partial T}{\partial r} \ . \tag{II.14}$$

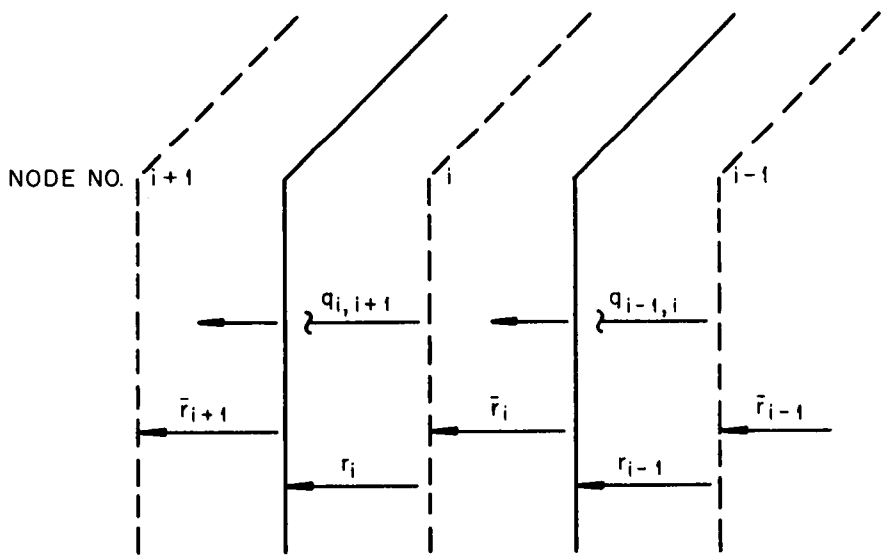


Fig. II-1. Schematic denoting element notation.

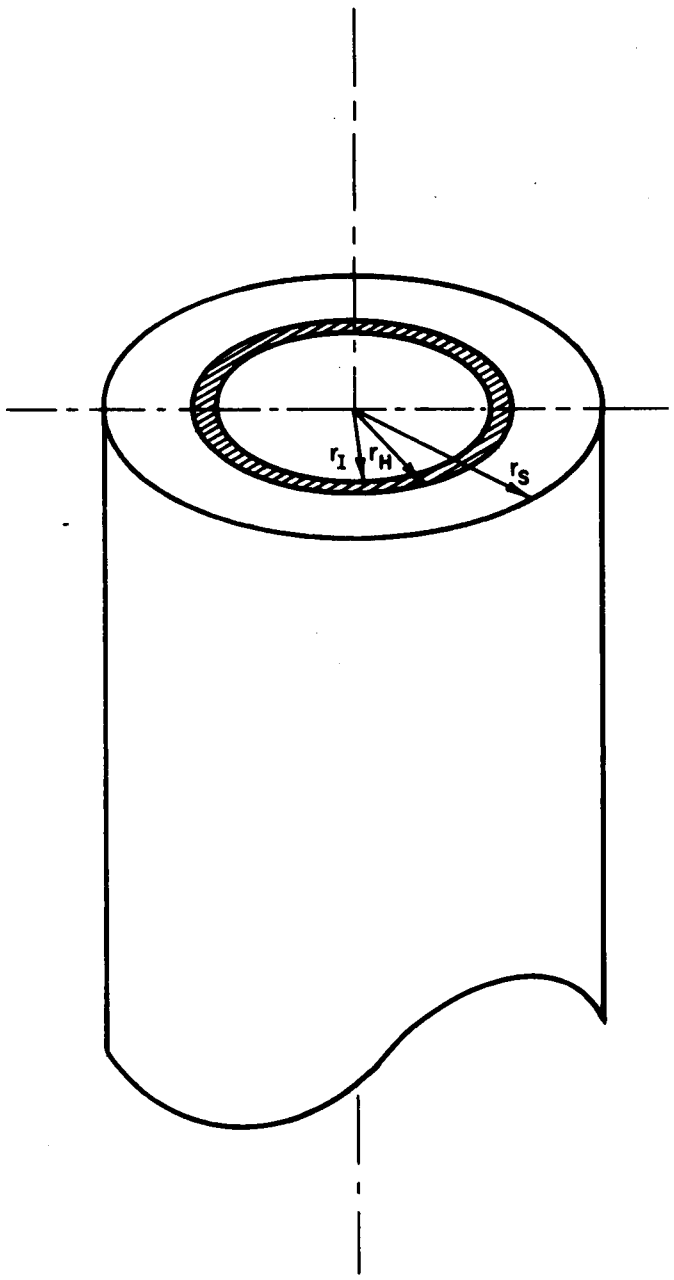


Fig. II-2. Schematic of a cylindrical rod with an internal heat source ($r_I < r < r_H$).

Combining Eqs. (II.13) and (II.14) with a constant of proportionality A yields

$$q = -k2\pi r\ell \frac{\partial T}{\partial r} = Ar^2 \quad . \tag{II.15}$$

With separation of variables,

$$-2k\pi\ell\partial T = Ar\partial r \quad , \tag{II.16}$$

and integration of Eq. (II.16) from $\bar{r}_{i-1}$ to $\bar{r}_i$, we have

$$-2k\pi\ell(T_i - T_{i-1}) = \frac{A}{2} (\bar{r}_i^2 - \bar{r}_{i-1}^2) \quad . \tag{II.17}$$

Therefore,

$$A = - \frac{4k\pi\ell(T_i - T_{i-1})}{(\bar{r}_i^2 - \bar{r}_{i-1}^2)} \quad . \tag{II.18}$$

Substituting Eq. (II.18) into Eq. (II.15) yields

$$q_{i-1,i} = - \frac{4k\pi\ell}{(\bar{r}_i^2 - \bar{r}_{i-1}^2)} (T_i - T_{i-1}) r_{i-1}^2 \quad . \tag{II.19}$$

Applying Eqs. (II.8) and (II.19) to the ith node (Fig. II-1) with ρ constant and Cp and k evaluated at the present nodal temperatures results in

$$- \frac{\bar{k}_{i-1,i} 4\pi\ell r_{i-1}^2}{(\bar{r}_i^2 - \bar{r}_{i-1}^2)} (T_i - T_{i-1}) + \frac{\bar{k}_{i,i+1} 4\pi\ell r_i^2}{(\bar{r}_{i+1}^2 - \bar{r}_i^2)} (T_{i+1} - T_i)$$

$$+ \dot{q}_i = \rho Cp_i V_i \frac{\partial T_i}{\partial t} \quad . \tag{II.20}$$

Expanding $\dot{q}_i$ and the right side of Eq. (II.20) yields

$$-\frac{\bar{k}_{i-1,i}4\pi\ell r_{i-1}^2}{(\bar{r}_i^2-\bar{r}_{i-1}^2)}(T_i-T_{i-1})+\frac{\bar{k}_{i,i+1}4\pi\ell r_i^2}{(\bar{r}_{i+1}^2-\bar{r}_i^2)}(T_{i+1}-T_i)$$

$$+\dot{q}_i'''\pi\ell(r_i^2-r_{i-1}^2)=\rho Cp_i\pi\ell(r_i^2-r_{i-1}^2)$$

$$\times\frac{T_i(t+\Delta t)-T_i(t)}{\Delta t}\,. \qquad \text{(II.21)}$$

Factoring out $\pi\ell$ and using an implicit formulation, Eq. (II.21) becomes

$$-\frac{4\bar{k}_{i-1,i}r_{i-1}^2}{(\bar{r}_i^2-\bar{r}_{i-1}^2)}[T_i(t+\Delta t)-T_{i-1}(t+\Delta t)]$$

$$+\frac{\bar{4}k_{i,i+1}r_i^2}{(\bar{r}_{i+1}^2-\bar{r}_i^2)}[T_{i+1}(t+\Delta t)-T_i(t+\Delta t)]+\dot{q}_i'''(r_i^2-r_{i-1}^2)$$

$$=\rho Cp_i(r_i^2-r_{i-1}^2)\frac{T_i(t+\Delta t)-T_i(t)}{\Delta t}\,. \qquad \text{(II.22)}$$

Collecting terms in Eq. (II.22) yields

$$\left[\frac{4\bar{k}_{i-1,i}r_{i-1}^2}{(\bar{r}_i^2-\bar{r}_{i-1}^2)}\right]T_{i-1}(t+\Delta t)+\left[-\frac{4\bar{k}_{i-1,i}r_{i-1}^2}{(\bar{r}_i^2-\bar{r}_{i-1}^2)}-\frac{\rho Cp_i(r_i^2-r_{i-1}^2)}{\Delta t}\right.$$

$$\left.-\frac{4\bar{k}_{i,i+1}^2r_i^2}{(\bar{r}_{i+1}^2-\bar{r}_i^2)}\right]T_i(t+\Delta t)+\left[\frac{4\bar{k}_{i,i+1}r_i^2}{(\bar{r}_{i+1}^2-\bar{r}_i^2)}\right]T_{i+1}(t+\Delta t)$$

$$=-\dot{q}_i'''(r_i^2-r_{i-1}^2)-\left[\frac{\rho Cp_i(r_i^2-r_{i-1}^2)}{\Delta t}\right]T_i(t)\,. \qquad \text{(II.23)}$$

Over the domain of $r_H < r < r_S$ (Figs. II-1 and II-2) assume that the heat flow between nodes is constant at any r between the nodes; therefore, in Eq. (II.14) the variables can be separated to yield

$$\frac{\partial r}{r}=-\frac{k2\pi\ell}{q}\,\partial T\,. \qquad \text{(II.24)}$$

Upon integration of Eq. (II.24) from $\bar{r}_{i-1}$ to $\bar{r}_i$

$$\ln\left(\frac{\bar{r}_i}{\bar{r}_{i-1}}\right) = -\frac{k2\pi\ell}{q_{i-1,i}}\,(T_i - T_{i-1})\ ; \tag{II.25}$$

rearranging Eq. (II.25) gives

$$q_{i-1,i} = -\frac{k2\pi\ell\ (T_i - T_{i-1})}{\ln\ (\bar{r}_i/\bar{r}_{i-1})}\ . \tag{II.26}$$

Applying Eqs. (II.8) and (II.26) to the ith node (Fig. II.1), with ρ constant, Cp and k evaluated at the present nodal temperatures, and with expansion of $\dot{q}_i$ and the right side of Eq. (II.8) yields

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

$$+ \dot{q}'''\pi\ell(r_i^2 - r_{i-1}^2) = \rho Cp_i\pi\ell(r_i^2 - r_{i-1}^2)\ \frac{T_i\ (t + \Delta t) - T_i\ (t)}{\Delta t}\ . \tag{II.27}$$

Factoring out $\pi\ell$ and using an implicit formulation, Eq. (II.27) becomes

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

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

$$= \rho Cp_i(r_i^2 - r_{i-1}^2)\ \frac{T_i(t + \Delta t) - T_i(t)}{\Delta t}\ . \tag{II.28}$$

Collecting terms in Eq. (II.28) yields

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

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

$$=-\dot{q}_i'''(r_i^2-r_{i-1}^2)-\left[\frac{\rho Cp_i(r_i^2-r_{i-1}^2)}{\Delta t}\right]T_i(t)\ . \qquad \text{(II.29)}$$

The inverse conduction model is basically a manipulation of the forward conduction model where the boundary conditions are specified and the rod temperature profile is desired. The forward conduction model will be set up using the equations developed previously, and the inverse conduction model will be derived from the forward conduction model.

Given the cylindrical rod in Fig. II-2 with a known internal heat source over the radial domain (r_I, r_H) of

$$\begin{aligned}&\dot{q}'''(t) \qquad r_I < r < r_H \text{ and } t \geq 0\\ &\dot{q}'''(t) = 0 \qquad 0 < r < r_I \text{ and } r_H < r < r_S\ ,\end{aligned} \qquad \text{(II.30)}$$

a known convective heat transfer coefficient at $r = r_S$ of

$$h_f(t) \qquad t \geq 0\ , \qquad \text{(II.31)}$$

a known sink temperature of

$$T_b(t) \qquad t \geq 0\ , \qquad \text{(II.32)}$$

and a known steady-state temperature profile of

$$T(r,0) \qquad 0 < r < r_S \text{ and } t = 0\ , \qquad \text{(II.33)}$$

solve for

$$T(r,t) \qquad 0 < r < r_S \text{ and } t > 0 \ . \tag{II.34}$$

Using n nodes and applying Eq. (II.23) over $(0,r_H)$ and Eq. (II.29) over (r_H,r_S), the matrix formulation of the forward conduction model is

$$\overline{H}_F \ \overline{T}_F = \overline{B}_F \ , \tag{II.35}$$

where $\overline{H}_F$ is the tridiagonal coefficient matrix of the system:

$$\overline{H}_F = \begin{bmatrix}
h_{1,1} & h_{1,2} & 0 & 0 & \cdots & 0 & 0 & 0 & 0 & 0 \\
h_{2,1} & h_{2,2} & h_{2,3} & 0 & \cdots & 0 & 0 & 0 & 0 & 0 \\
0 & h_{3,2} & h_{3,3} & h_{3,4} & \cdots & 0 & 0 & 0 & 0 & 0 \\
\cdot & \cdot & \cdot & \cdot & \cdots & \cdot & \cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot & \cdots & \cdot & \cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot & \cdots & \cdot & \cdot & \cdot & \cdot & \cdot \\
0 & 0 & 0 & 0 & \cdots & h_{n-3,n-4} & h_{n-3,n-3} & h_{n-3,n-2} & 0 & 0 \\
0 & 0 & 0 & 0 & \cdots & 0 & h_{n-2,n-3} & h_{n-2,n-2} & h_{n-2,n-1} & 0 \\
0 & 0 & 0 & 0 & \cdots & 0 & 0 & h_{n-1,n-2} & h_{n-1,n-1} & h_{n-1,n} \\
0 & 0 & 0 & 0 & \cdots & 0 & 0 & 0 & h_{n,n-1} & h_{n,n}
\end{bmatrix} \tag{II.36}$$

with interior nodes [i.e., within domain $(0, r_H)$]

$$h_{1,1} = -\frac{\rho Cp_1(r_1^2 - 0)}{\Delta t} - \frac{4\overline{k}_{1,2}r_1^2}{(\overline{r}_2^2 - \overline{r}_1^2)} \ , \tag{II.37}$$

$$h_{i,i} = -\frac{4\overline{k}_{i-1,i}r_{i-1}^2}{(\overline{r}_i^2 - \overline{r}_{i-1}^2)} - \frac{\rho Cp_i(r_i^2 - r_{i-1}^2)}{\Delta t} - \frac{4\overline{k}_{i,i+1}r_i^2}{(\overline{r}_{i+1}^2 - \overline{r}_i^2)} \ , \tag{II.38}$$

$$h_{i,i+1} = \frac{4\overline{k}_{i,i+1}r_i^2}{(\overline{r}_{i+1}^2 - \overline{r}_i^2)} \ , \tag{II.39}$$

$$h_{i,i-1} = \frac{4\bar{k}_{i-1,i} r_{i-1}^2}{(\bar{r}_i^2 - \bar{r}_{i-1}^2)} ; \tag{II.40}$$

and with exterior nodes [i.e., within domain (r_H, r_S)]

$$h_{i,i} = -\frac{2\bar{k}_{i-1,i}}{\ln (\bar{r}_i/\bar{r}_{i-1})} - \frac{\rho Cp_i (r_i^2 - r_{i-1}^2)}{\Delta t} - \frac{2\bar{k}_{i,i+1}}{\ln (\bar{r}_{i+1}/\bar{r}_i)} , \tag{II.41}$$

$$h_{i,i+1} = \frac{2\bar{k}_{i,i+1}}{\ln (\bar{r}_{i+1}/\bar{r}_i)} , \tag{II.42}$$

$$h_{i,i-1} = \frac{2\bar{k}_{i-1,i}}{\ln (\bar{r}_i/\bar{r}_{i-1})} , \tag{II.43}$$

$$h_{n,n} = -\frac{2\bar{k}_{n-1,n}}{\ln (\bar{r}_n/\bar{r}_{n-1})} - \frac{\rho Cp_n (r_n^2 - r_{n-1}^2)}{\Delta t} - \frac{2}{\frac{1}{r_n h_f (t + \Delta t)} + \frac{\ln (r_n/\bar{r}_n)}{k_n}} \tag{II.44}$$

(see Appendix B for explicit derivation of $h_{n,n}$). $\bar{T}_F$ is a column vector of unknowns (nodal temperatures at time $t + \Delta t$):

$$\bar{T}_F = \begin{bmatrix} T_1 \\ T_2 \\ \cdot \\ \cdot \\ \cdot \\ T_i \\ \cdot \\ \cdot \\ \cdot \\ T_{n-2} \\ T_{n-1} \\ T_n \end{bmatrix} . \tag{II.45}$$

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

$$\overline{B}_F = \begin{bmatrix} b_1 \\ b_2 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ b_{n-3} \\ b_{n-2} \\ b_{n-1} \\ b_n \end{bmatrix} . \tag{II.46}$$

For interior nodes within $(0,r_I)$,

$$b_i = -\cancelto{0}{\dot{q}_i''' (r_i^2 - r_{i-1}^2)} - \left[\frac{\rho Cp_i (r_i^2 - r_{i-1}^2)}{\Delta t}\right] T_i(t) . \tag{II.47}$$

For interior nodes within (r_I,r_H),

$$b_i = -\dot{q}_i''' (r_i^2 - r_{i-1}^2) - \left[\frac{\rho Cp_i (r_i^2 - r_{i-1}^2)}{\Delta t}\right] T_i(t) , \tag{II.48}$$

For exterior nodes within (r_H,r_S), except for b_n,

$$b_i = -\cancelto{0}{\dot{q}_i''' (r_i^2 - r_{i-1}^2)} - \left[\frac{\rho Cp_i (r_i^2 - r_{i-1}^2)}{\Delta t}\right] T_i(t) . \tag{II.49}$$

For the last node, b_n,

$$b_n = -\cancelto{0}{\dot{q}_n''' (r_n^2 - r_{n-1}^2)} - \left[\frac{2}{\dfrac{1}{r_n h_f(t + \Delta t)} + \dfrac{\ln (r_n/\overline{r}_n)}{k_n}}\right] T_b(t + \Delta t)$$

$$- \left[\frac{\rho Cp_n (r_n^2 - r_{n-1}^2)}{\Delta t}\right] T_n(t) . \tag{II.50}$$

Equation (II.35) can be solved by many techniques. ORINC simply inverts $\bar{H}_F$ to obtain $\bar{H}_F^{-1}$ by the Gauss-Jordan method with full pivoting. Each member of the unknown vector $\bar{T}_F$ is then determined by

$$T_i = \sum_{j=1,n} h_{i,j}^{-1} b_j \qquad i = 1,n \ . \tag{II.51}$$

The inverse conduction problem is then posed. If an internal heat source over (r_I, r_H) is known:

$$\begin{aligned} &\dot{q}'''(t) \qquad r_I < r < r_H \text{ and } t \geq 0 \ , \\ &\dot{q}'''(t) = 0 \qquad 0 < r < r_I \text{ and } r_H < r < r_S \ ; \end{aligned} \tag{II.52}$$

an internal temperature is known:

$$T(\bar{r}_{n-2}, t) \qquad r = \bar{r}_{n-2} \text{ and } t \geq 0 \ , \tag{II.53}$$

with a known steady-state temperature profile of

$$T(r,0) \qquad 0 < r < r_S \text{ and } t = 0 \ ; \tag{II.54}$$

solve for the boundary function,

$$\Phi(t) \qquad t > 0 \ , \tag{II.55}$$

and the temperature distribution,

$$T(r,t) \qquad t > 0 \ . \tag{II.56}$$

In essence, the inverse conduction model corresponding to Eq. (II.35) requires the modification of four members of $\bar{B}_F$, one column of $\bar{H}_F$, one row of $\bar{H}_F$, and two members of $\bar{T}_F$. First, inspection of the nth equation of the

forward conduction model shows

$$\left[\frac{2\bar{k}_{n-1,n}}{\ln\left(\bar{r}_n/\bar{r}_{n-1}\right)}\right] T_{n-1}(t+\Delta t) + \left[-\frac{2\bar{k}_{n-1,n}}{\ln\left(\bar{r}_n/\bar{r}_{n-1}\right)} - \frac{\rho Cp_n(r_n^2 - r_{n-1}^2)}{\Delta t} - \frac{2}{\frac{1}{r_n h_f} + \frac{\ln\left(r_n/\bar{r}_n\right)}{k_n}}\right] T_n(t+\Delta t) = -\left[\frac{2}{\frac{1}{r_n h_f} + \frac{\ln\left(r_n/\bar{r}_n\right)}{k_n}}\right] T_b(t+\Delta t) - \left[\frac{\rho Cp_n(r_n^2 - r_{n-1}^2)}{\Delta t}\right] T_n(t) . \qquad \text{(II.57)}$$

where h_f and T_b are functions of time. Equation (II.57) can be restructured to

$$\left[\frac{2\bar{k}_{n-1,n}}{\ln\left(\bar{r}_n/\bar{r}_{n-1}\right)}\right] T_{n-1}(t+\Delta t) + \left[-\frac{2\bar{k}_{n-1,n}}{\ln\left(\bar{r}_n/\bar{r}_{n-1}\right)} - \frac{\rho Cp_n(r_n^2 - r_{n-1}^2)}{\Delta t}\right] T_n(t+\Delta t) = \Phi(t+\Delta t) - \left[\frac{\rho Cp_n(r_n^2 - r_{n-1}^2)}{\Delta t}\right] T_n(t) , \qquad \text{(II.58)}$$

where the boundary condition

$$\Phi(t) \qquad t > 0 \qquad \text{(II.59)}$$

replaces Eqs. (II.31) and (II.32). Using the assumption that the heat flow between nodes is constant at any r between the nodes [the basis for Eqs. (II.26) and (II.19)] over the domain (r_H, r_S), then

$$\Phi = \left[\frac{2}{\frac{1}{r_n h_f} + \frac{\ln\left(r_n/\bar{r}_n\right)}{k_n}}\right] (T_n - T_b) = \left[\frac{2k_n}{\ln\left(r_n/\bar{r}_n\right)}\right] (T_n - T_{surf}) = 2r_n h_f (T_{surf} - T_b) . \qquad \text{(II.60)}$$

In the inverse conduction problem, Φ is unknown and Eq. (II.58) must be written as

$$\left[\frac{2\bar{k}_{n-1,n}}{\ln\left(\bar{r}_n/\bar{r}_{n-1}\right)}\right] T_{n-1}(t+\Delta t) + \left[-\frac{2\bar{k}_{n-1,n}}{\ln\left(\bar{r}_n/\bar{r}_{n-1}\right)} - \frac{\rho Cp_n(r_n^2 - r_{n-1}^2)}{\Delta t}\right]$$

$$\times T_n(t+\Delta t) - \Phi(t+\Delta t) = -\left[\frac{\rho Cp_n(r_n^2 - r_{n-1}^2)}{\Delta t}\right] T_n(t) \ . \qquad \text{(II.61)}$$

Since $T(\bar{r}_{n-2},t)$ from Eq. (II.53) is known, there are still n unknowns where Φ replaces T_{n-2} in $\bar{T}_F$. Also, column n-2 of $\bar{H}_F$ must be set equal to zero with $h_{n,n-2}$ set equal to -1 [the coefficient of Φ in the nth equation (II.61)] and the corresponding members of $\bar{B}_F$ modified. The matrix formulation of the inverse conduction model is

$$\bar{H}_I \, \bar{T}_I = \bar{B}_I \ , \qquad \text{(II.62)}$$

where $\bar{H}_I$ is the tridiagonal coefficient matrix of the system with

$$\bar{H}_I = \begin{bmatrix}
h_{1,1} & h_{1,2} & 0 & 0 & \cdots & 0 & 0 & 0 & 0 & 0 \\
h_{2,1} & h_{2,2} & h_{2,3} & 0 & \cdots & 0 & 0 & 0 & 0 & 0 \\
0 & h_{3,2} & h_{3,3} & h_{3,4} & \cdots & 0 & 0 & 0 & 0 & 0 \\
\cdot & \cdot & \cdot & \cdot & \cdots & \cdot & \cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot & \cdots & \cdot & \cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot & \cdots & \cdot & \cdot & \cdot & \cdot & \cdot \\
0 & 0 & 0 & 0 & \cdots & h_{n-3,n-4} & h_{n-3,n-3} & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & \cdots & 0 & h_{n-2,n-3} & 0 & h_{n-2,n-1} & 0 \\
0 & 0 & 0 & 0 & \cdots & 0 & 0 & 0 & h_{n-1,n-1} & h_{n-1,n} \\
0 & 0 & 0 & 0 & \cdots & 0 & 0 & -1 & h_{n,n-1} & h_{n,n}
\end{bmatrix} \qquad \text{(II.63)}$$

and with the coefficient terms for the interior nodes and exterior nodes the same as Eqs. (II.37) to (II.43) except for the following:

$$h_{n-3,n-2} = 0 \ , \tag{II.64}$$

$$h_{n-2,n-2} = 0 \ , \tag{II.65}$$

$$h_{n-1,n-2} = 0 \ , \tag{II.66}$$

$$h_{n,n-2} = -1 \ , \tag{II.67}$$

$$h_{n,n} = -\frac{2\bar{k}_{n-1,n}}{\ln\left(\bar{r}_n/\bar{r}_{n-1}\right)} - \frac{\rho Cp_n\left(r_n^2 - r_{n-1}^2\right)}{\Delta t} \ . \tag{II.68}$$

$\bar{T}_I$ is a column vector of unknowns where

$$\bar{T}_I = \begin{bmatrix} T_1 \\ T_2 \\ \cdot \\ \cdot \\ \cdot \\ T_i \\ \cdot \\ \cdot \\ \cdot \\ \Phi \\ T_{n-1} \\ T_n \end{bmatrix} \tag{II.69}$$

(note that T_{n-2} is replaced by Φ). $\bar{B}_I$ is a column vector of knowns where

$$\bar{B}_I = \begin{bmatrix} b_1 \\ b_2 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ b_{n-3} \\ b_{n-2} \\ b_{n-1} \\ b_n \end{bmatrix} . \qquad \text{(II.70)}$$

Modifications required for the b's are

$$b_{n-3} = -\left[\frac{\rho Cp_{n-3}(r^2_{n-3} - r^2_{n-4})}{\Delta t}\right] T_{n-3}(t) - \left[\frac{2\bar{k}_{n-3,n-2}}{\ln\,(\bar{r}_{n-2}/\bar{r}_{n-3})}\right] T_{n-2}(t + \Delta t) , \qquad \text{(II.71)}$$

$$b_{n-2} = -\left[\frac{\rho Cp_{n-2}(r^2_{n-2} - r^2_{n-3})}{\Delta t}\right] T_{n-2}(t) - \left[-\frac{2\bar{k}_{n-3,n-2}}{\ln\,(\bar{r}_{n-2}/\bar{r}_{n-3})} - \frac{\rho Cp_{n-2}(r^2_{n-2} - r^2_{n-3})}{\Delta t} - \frac{2\bar{k}_{n-2,n-1}}{\ln\,(\bar{r}_{n-1}/\bar{r}_{n-2})}\right] \times T_{n-2}(t + \Delta t) , \qquad \text{(II.72)}$$

$$b_{n-1} = -\left[\frac{\rho Cp_{n-1}(r^2_{n-1} - r^2_{n-2})}{\Delta t}\right] T_{n-1}(t)$$

$$-\left[\frac{2\bar{k}_{n-2,n-1}}{\ln\ (\bar{r}_{n-1}/\bar{r}_{n-2})}\right] T_{n-2}(t + \Delta t)\ , \qquad \text{(II.73)}$$

$$b_n = -\left[\frac{\rho Cp_n(r^2_n - r^2_{n-1})}{\Delta t}\right] T_n(t)\ . \qquad \text{(II.74)}$$

Equation (II.62) is solved similarly to Eq. (II.35),

$$T_i = \sum_{j=1,n} h^{-1}_{i,j}\ b_j \qquad \text{(II.75)}$$

$i = 1,n\ i \neq n-2$, and

$$\Phi = \sum_{j=1,n} h^{-1}_{n-2,j}\ b_j\ . \qquad \text{(II.76)}$$

The surface temperature is then calculated from Φ by

$$T_{surf}(t + \Delta t) = T_n(t + \Delta t) - \Phi(t + \Delta t)\Big/\left(\frac{2k_n}{\ln\ (r_n/\bar{r}_n)}\right). \qquad \text{(II.77)}$$

The model development in this section was made for the "general" rod with an internal heat source shown in Fig. II-2 (page 13). The development of the inverse model specifically for the THTF heaters is given in Appendix B. A description of the THTF heaters is presented in Appendix A.

The boundary condition calculated in Eq. (II.76) is the time-averaged linear surface heat rate divided by π for the time interval Δt,

$$\Phi = \frac{\int_{t}^{t+\Delta t} \phi \, dt}{\int_{t}^{t+\Delta t} dt} , \qquad \text{(II.78)}$$

where ϕ is the instantaneous linear surface heat rate divided by π. The time-averaged surface heat flux (Ψ) is calculated from Φ by

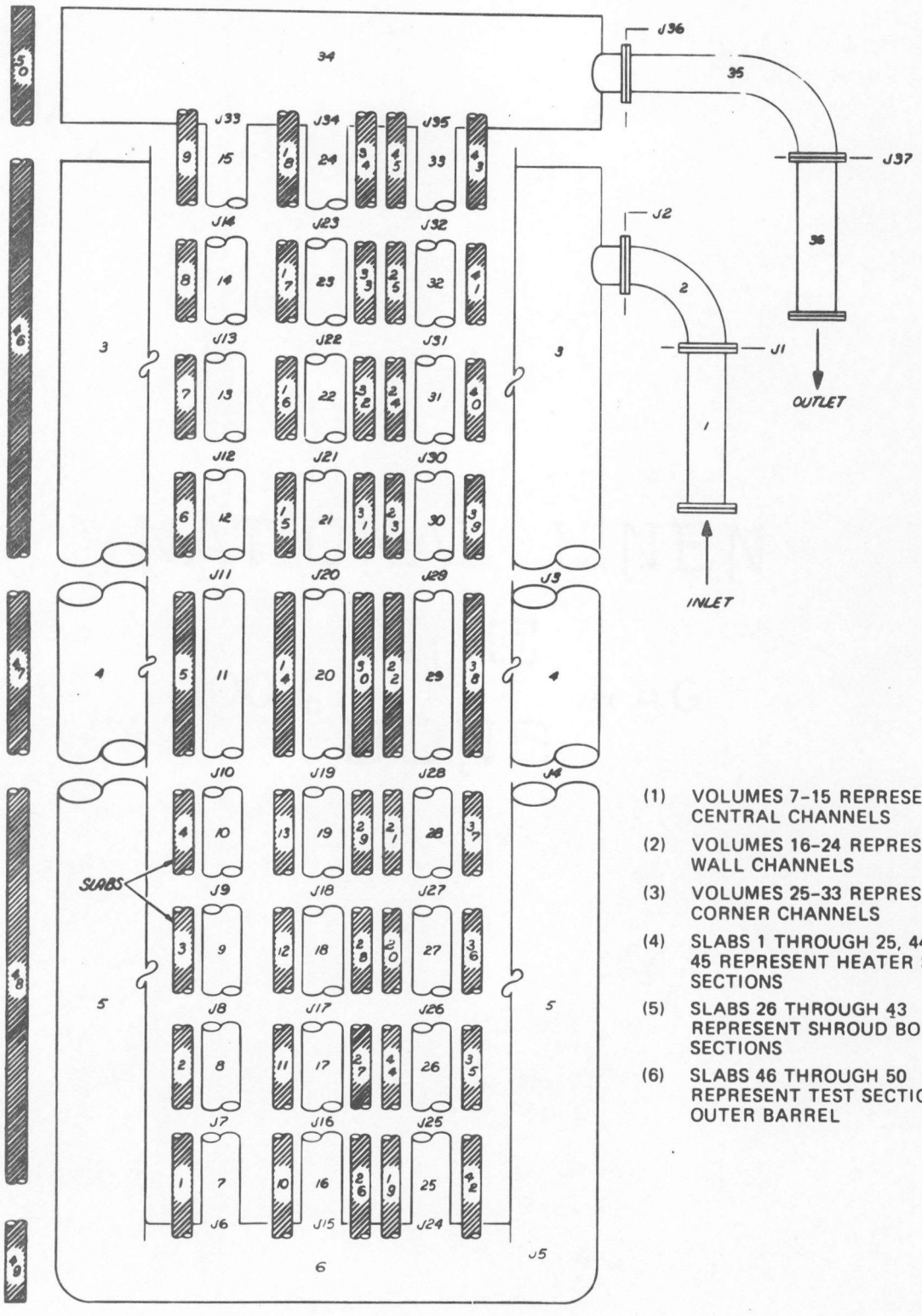
$$\Psi = \frac{\Phi}{(2r_n)} . \qquad \text{(II.79)}$$

One of the specific objectives of the ORNL-PWR-BDHT separate-effects program is the calculation of the local heat transfer coefficient and the local fluid properties during the blowdown transient; since ORINC cannot do the calculation independently, it is necessary that it be coupled or interfaced with a thermal-hydraulics code which calculates these properties and the local fluid bulk temperature (or local saturation temperature). Consequently, ORINC is presently interfaced[21] with a RELAP[22] model of the THTF core (Fig. II-3)[23] which is driven by a similar model of the THTF loop (Fig. II-4).[23] A 'heat transfer coefficient' can be calculated from Φ [Eq. (II.76)], T_{surf} [Eq. (II.77)] from ORINC, and T_b (average local fluid bulk temperature) or T_{sat} (local saturation temperature) from RELAP by

$$h_b = \frac{\Psi}{(T_{surf} - T_b)} \qquad \text{(II.80)}$$

$$h_{sat} = \frac{\Psi}{(T_{surf} - T_{sat})} . \qquad \text{(II.81)}$$

There is no a priori method at present for deciding which calculation is correct, so both are made. It must be noted that h_b and h_{sat} are calculated from the time-averaged heat flux (Ψ) and the end of the time-step temperatures (T_{surf}, and T_b or T_{sat}).



(1) VOLUMES 7-15 REPRESENT CENTRAL CHANNELS

(2) VOLUMES 16-24 REPRESENT WALL CHANNELS

(3) VOLUMES 25-33 REPRESENT CORNER CHANNELS

(4) SLABS 1 THROUGH 25, 44, AND 45 REPRESENT HEATER SLAB SECTIONS

(5) SLABS 26 THROUGH 43 REPRESENT SHROUD BOX SECTIONS

(6) SLABS 46 THROUGH 50 REPRESENT TEST SECTION OUTER BARREL

Fig. II-3. RELAP test section model.

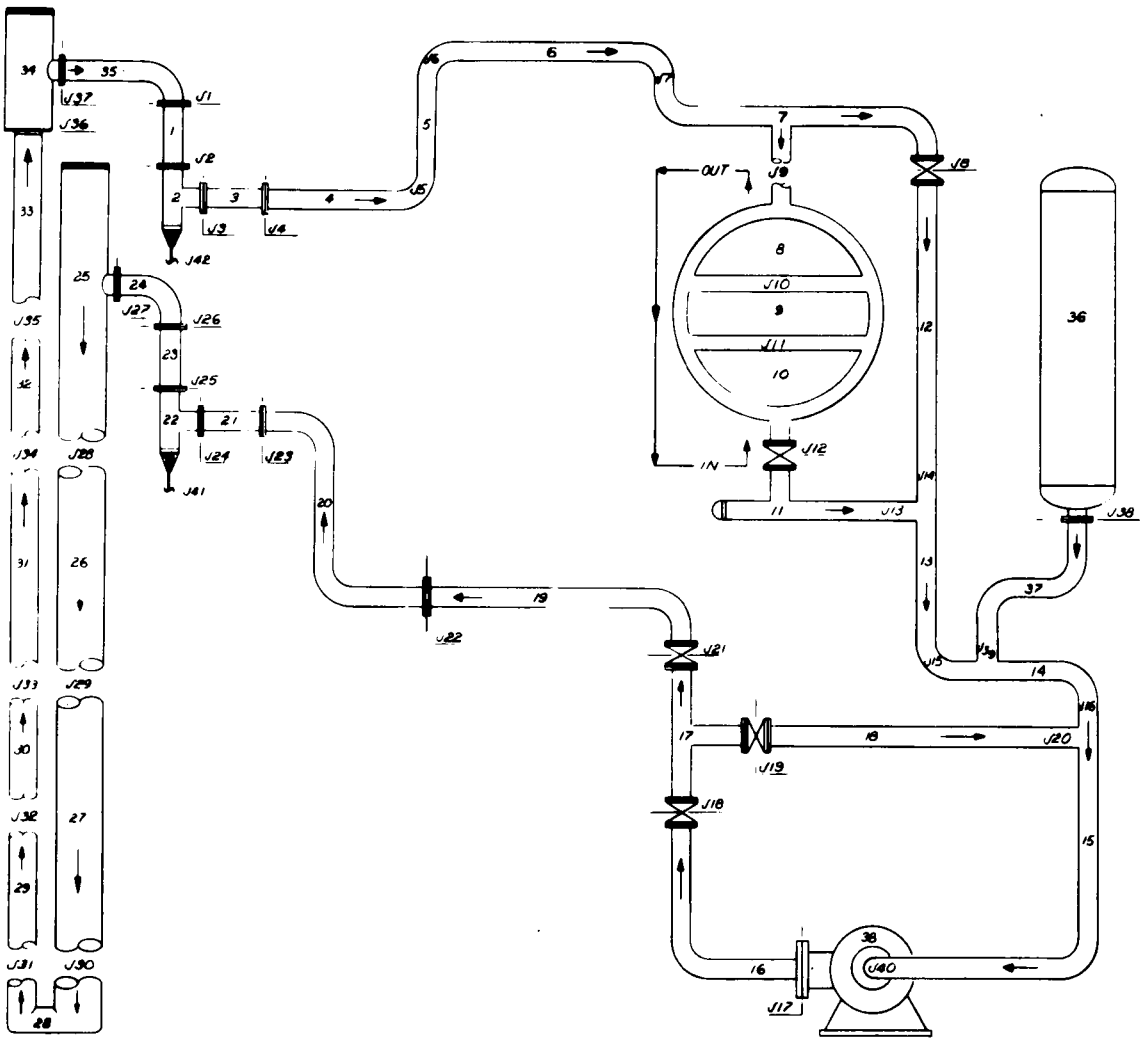


Fig. II-4. RELAP model for THTF.

CHAPTER III

INVERSE COMPUTER PROGRAM

Code Description

ORINC is an inverse computer program which solves a one-dimensional, transient, lumped-parameter, implicit formulation of the conduction equation at each thermocouple position. The code uses the techniques and equations presented in Section II and, more specifically, those presented in Appendix B for the THTF heaters discussed in Appendix A.

The program is currently operational on the ORNL IBM 360/91 and 360/195 computers. It consists of approximately 3200 lines of coding, including a main driving routine, 26 subroutines and subprograms, and a block data section. The programming language is FORTRAN IV.

A complete listing of ORINC is presented in Appendix C. Table D-1 of Appendix D contains a list of all subroutines, subprograms, and multiple subroutine entry points in ORINC along with a brief description of their functions in the code. A flowchart (with clarifying comments) of the logic in the main driving routine is presented in Fig. D-1 of Appendix D.

Code Verification

The method for testing ORNL's ability to determine the local heat transfer coefficient as a function of calculated local conditions and, in effect, serve as an instrument for verifying ORINC was agreed upon by NRC[24] and ORNL,[25] and is briefly outlined in the following paragraph.

Upon receipt of RELAP-4, Version 5 from Reactor Safety Research (RSR), the loop and core of the THTF were modeled by the analysis group of the BDHT program. After the models were reviewed by RSR, a heated bundle blowdown case was to be selected from the THTF test matrix[1] and a RELAP4 run performed at ORNL. The results and input decks for the dry run were supplied to RSR. The local fluid conditions and pin radial temperatures (at the internal thermocouple locations) generated by the RELAP4 dry run were used as forcing functions in ORINC for calculation of the sheath surface

temperature, surface flux, and local heat transfer coefficient. The ORINC generated values were then compared with those in the RELAP4 dry run.

Blowdown test 104 was selected from the test matrix for the transient specified by NRC. ORINC runs were made for the "hot spot" and "average" nodes[26] based on the RELAP4 ORNL-THTF core model results.[27] Figures III-1 to III-6[28] are overlays of ORINC predictions with RELAP generated values. As shown by these figures, the ORINC dry run results compare favorably with the RELAP4 dry run predictions.

At the time the dry run was conducted, the automatic interfaces and plotting routines for ORINC did not exist; thus, the overalys in Figs. III-1 to III-6 are hand-plotted.

Application of ORINC for THTF Blowdown 104

The fully interfaced version of ORINC has been used to analyze the data from THTF blowdown 104.[29] The coefficient data tape contained the final calibration and regression data (Appendix A) for the 100 series tests with gap bias data for test 104. The RELAP-ORINC interface[21] tape was generated by the best estimate THTF RELAP core model[23] which was driven by the THTF RELAP loop model.[23]

Four examples (at thermocouples TE-322AE, TE-318BG, TE-304CH, and TE-301DJ) of ORINC unit 6 output for this test case are presented in Appendix E. Figures III-7 to III-22 are four sets of graphs for these thermocouples. Each set consists of the following: (1) overlay of the ORINC and RELAP4 predicted surface heat fluxes, (2) overlay of the ORINC and RELAP4 predicted surface temperatures, (3) overlay of ORINC and RELAP4 predicted heat transfer coefficients, and (4) the corresponding RELAP4 core volume pressure, bulk averaged temperature, and saturation temperature.

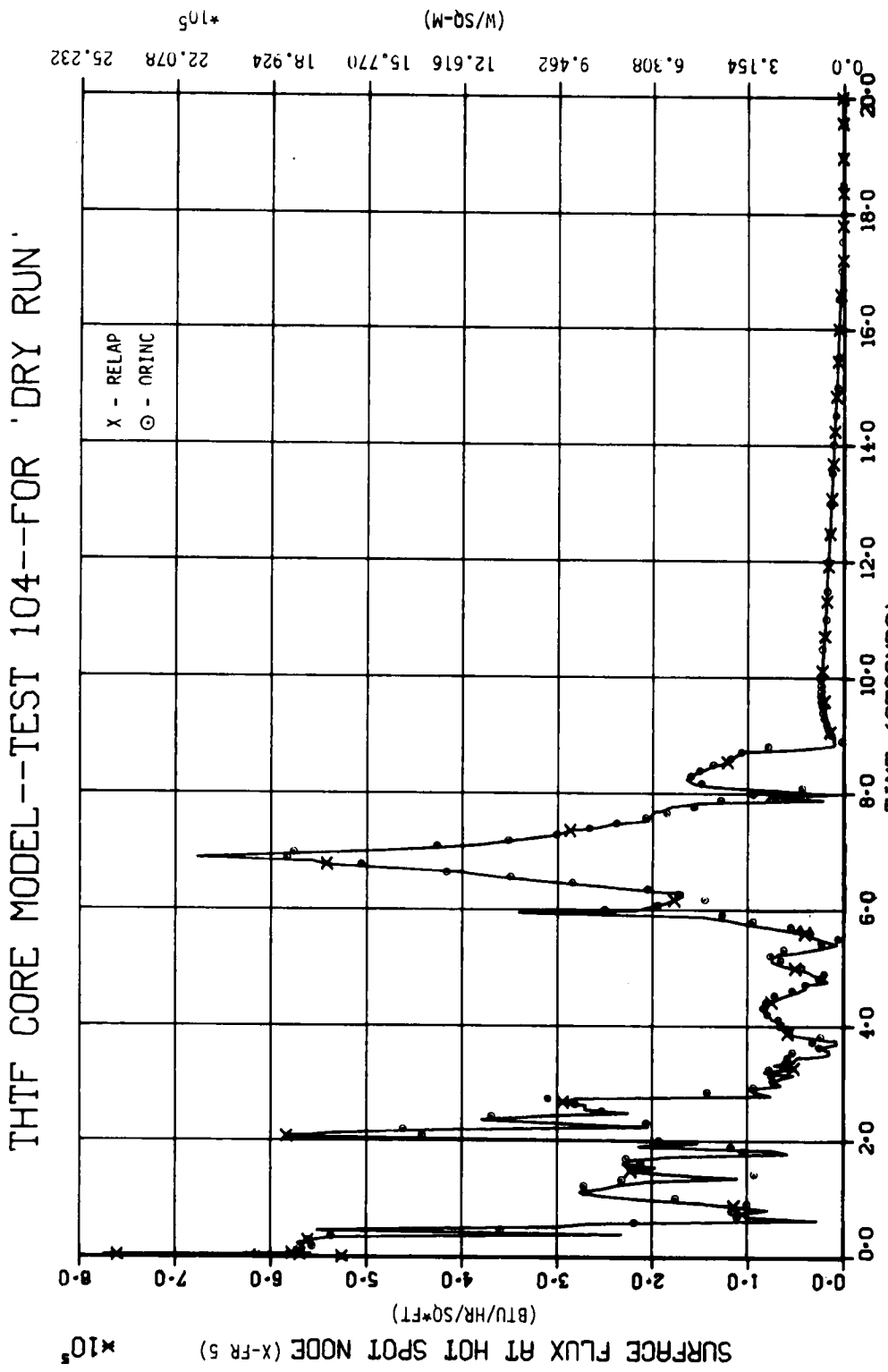


Fig. III-1. Overlay of ORINC and RELAP predicted surface heat fluxes for core hot node (dry run 104).

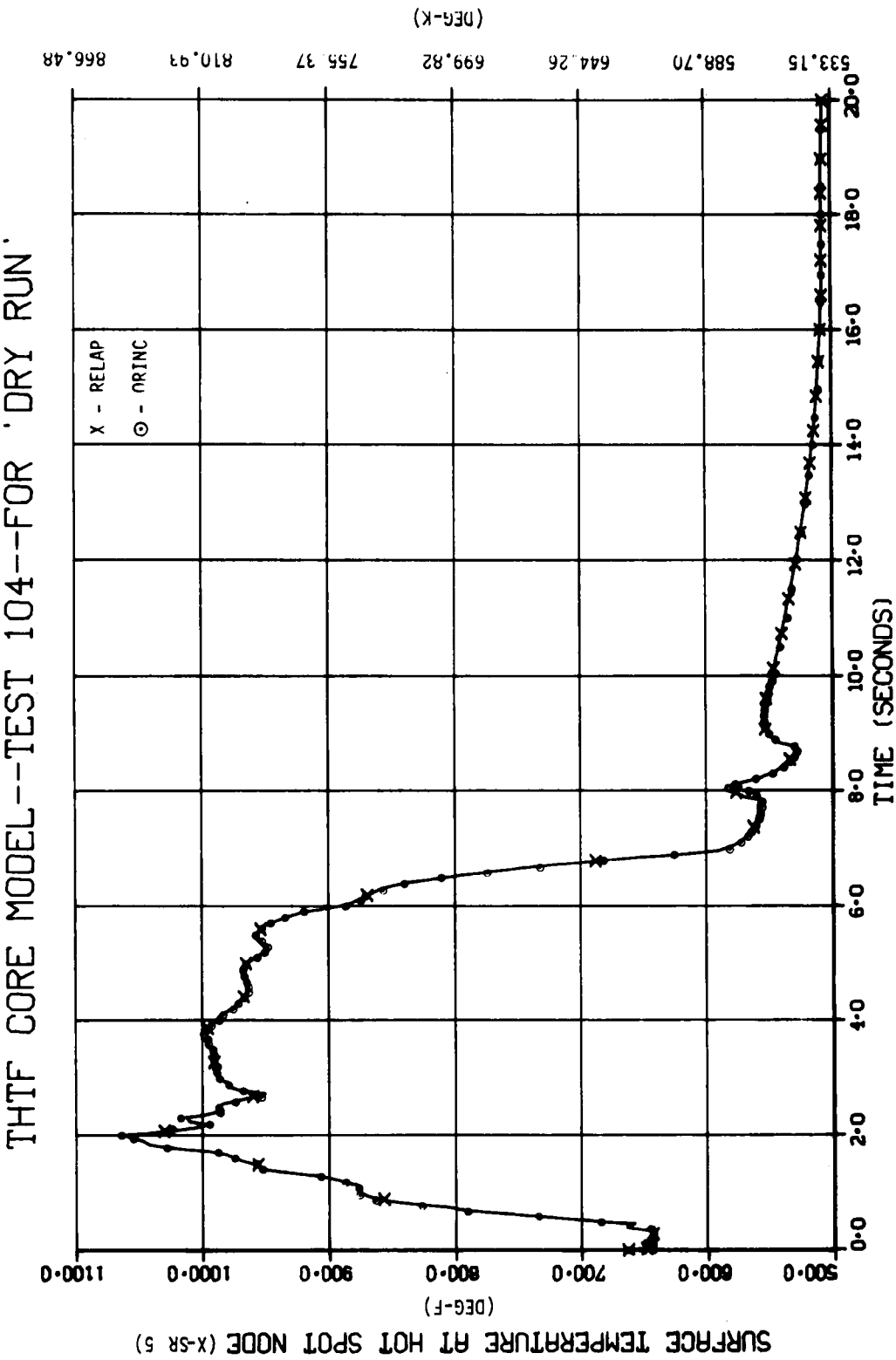


Fig. III-2. Overlay of ORINC and RELAP predicted surface temperatures for core hot node (dry run 104).

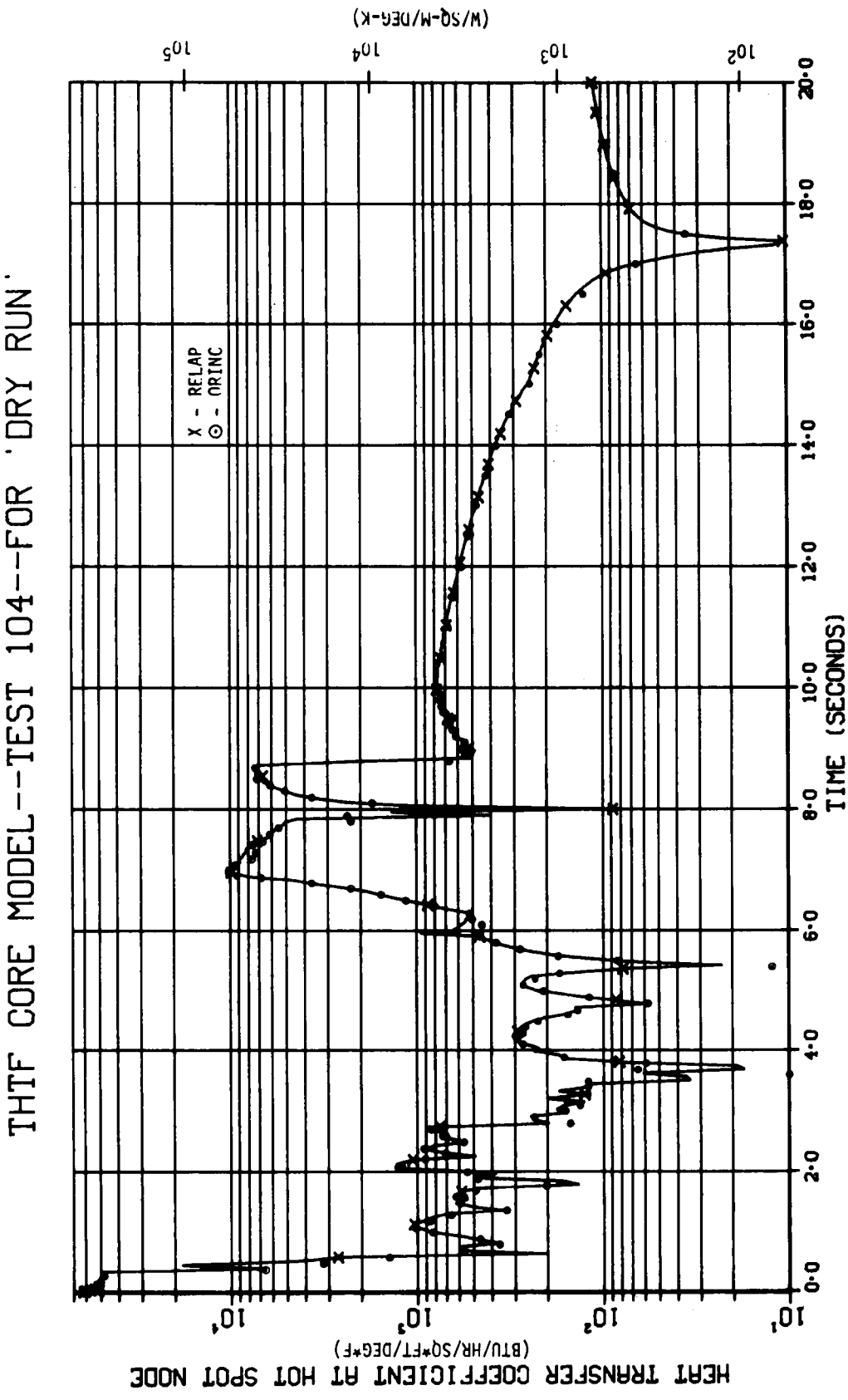


Fig. III-3. Overlay of ORINC and RELAP predicted heat transfer coefficients for core hot node (dry run 104).

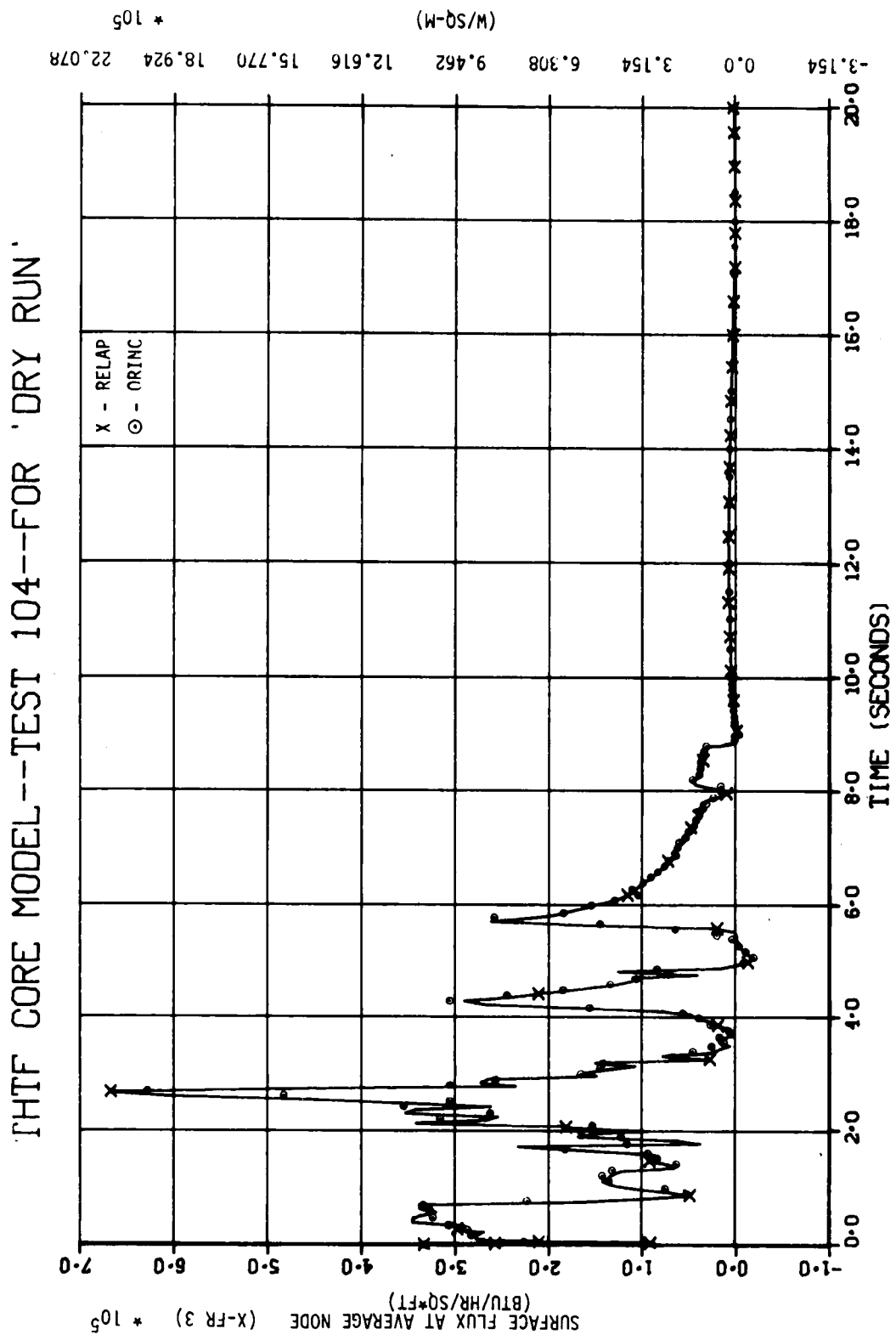


Fig. III-4. Overlay of ORINC and RELAP predicted surface heat fluxes for core average node (dry run 104).

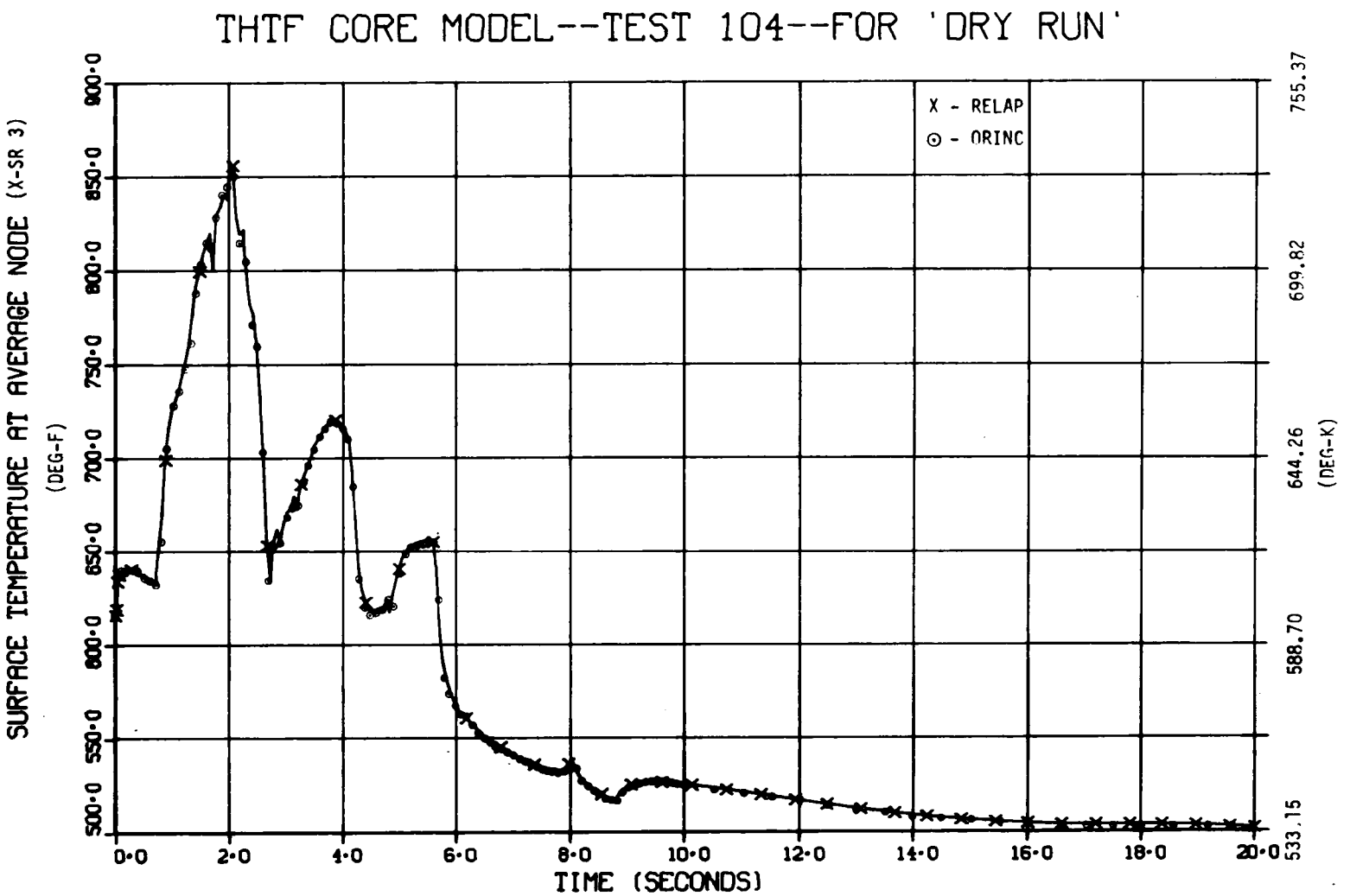


Fig. III-5. Overlay of ORINC and RELAP predicted surface temperatures for core average node (dry run 104).

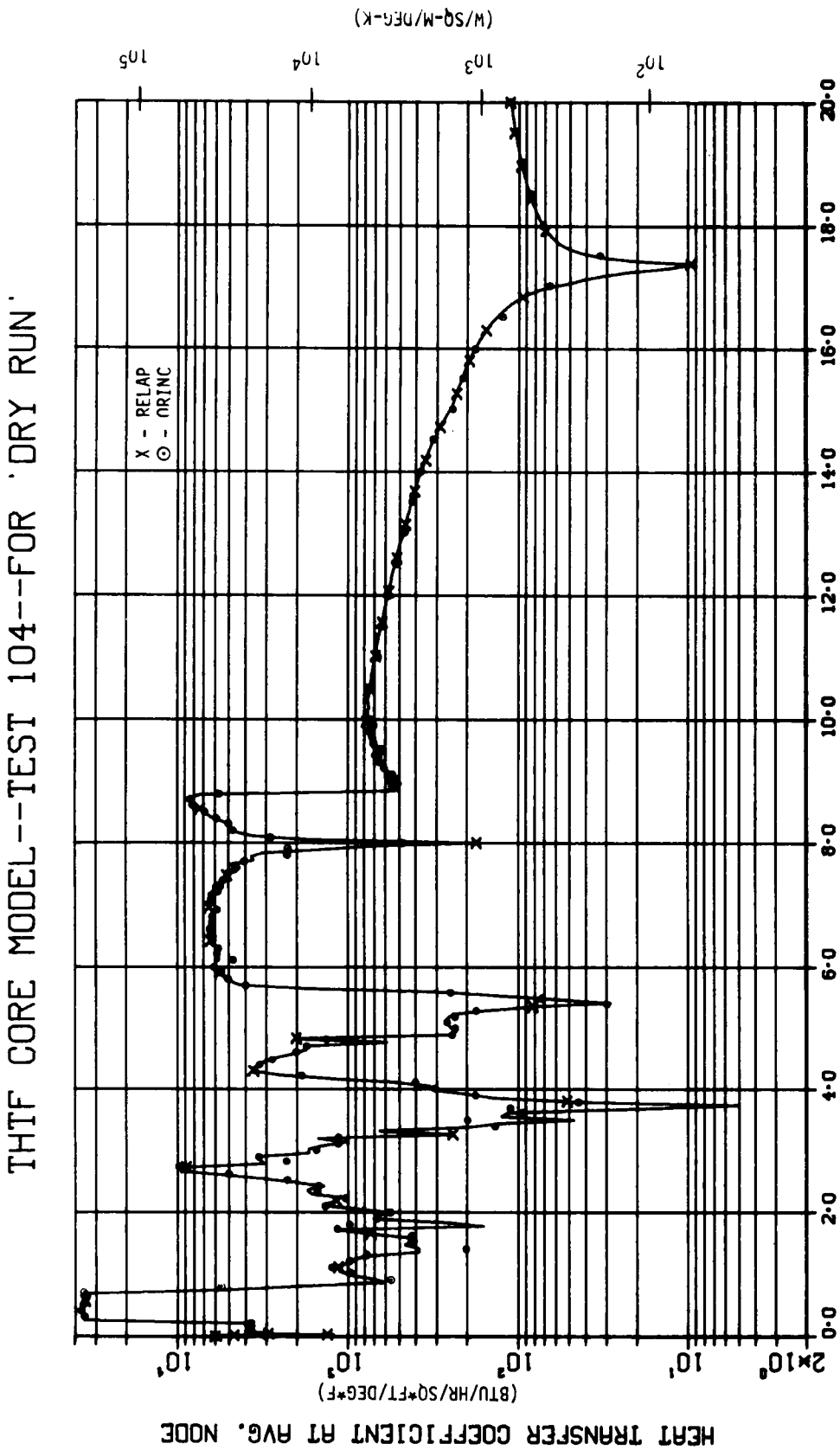


Fig. III-6. Overlay of ORINC and RELAP predicted heat transfer coefficients for core average node (dry run 104).

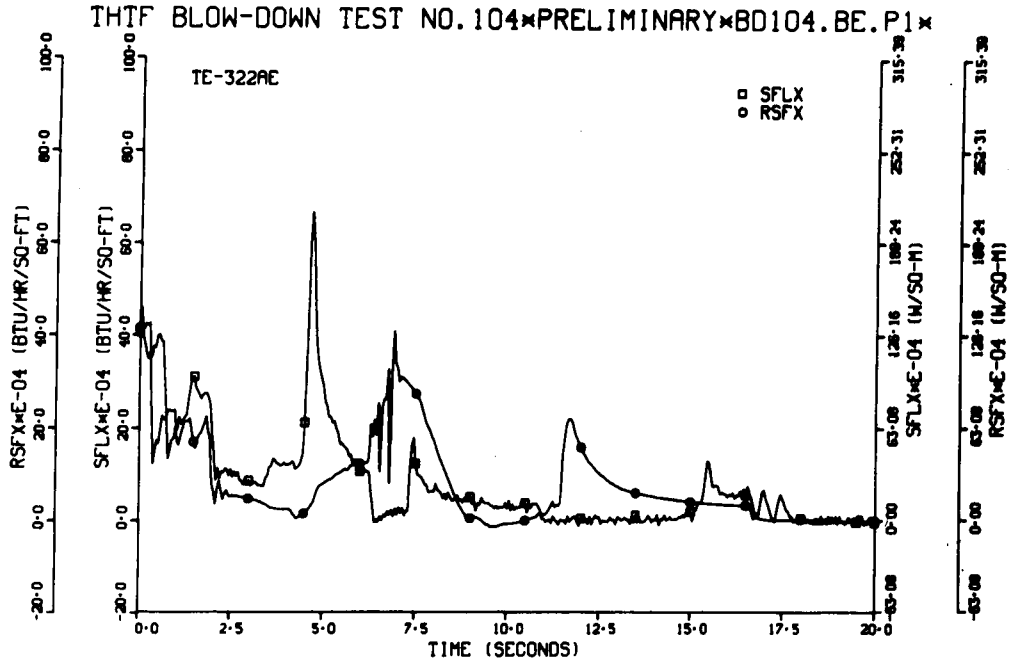


Fig. III-7. Overlay of ORINC and RELAP predicted surface heat fluxes (THTF test 104, TE-322AE).

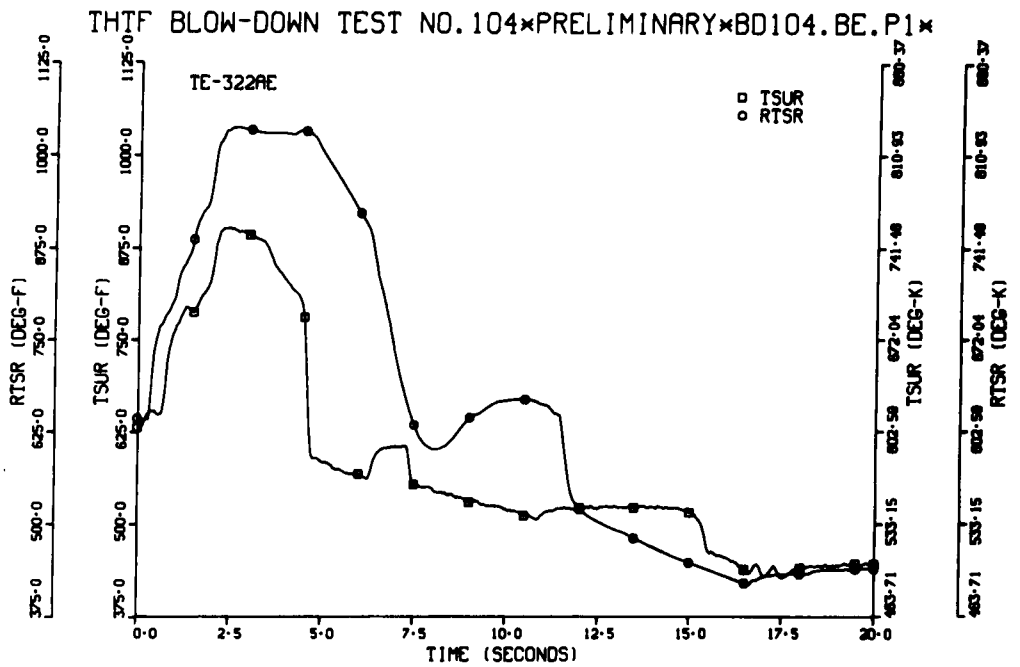


Fig. III-8. Overlay of ORINC and RELAP predicted surface temperatures (THTF test 104, TE-322AE).

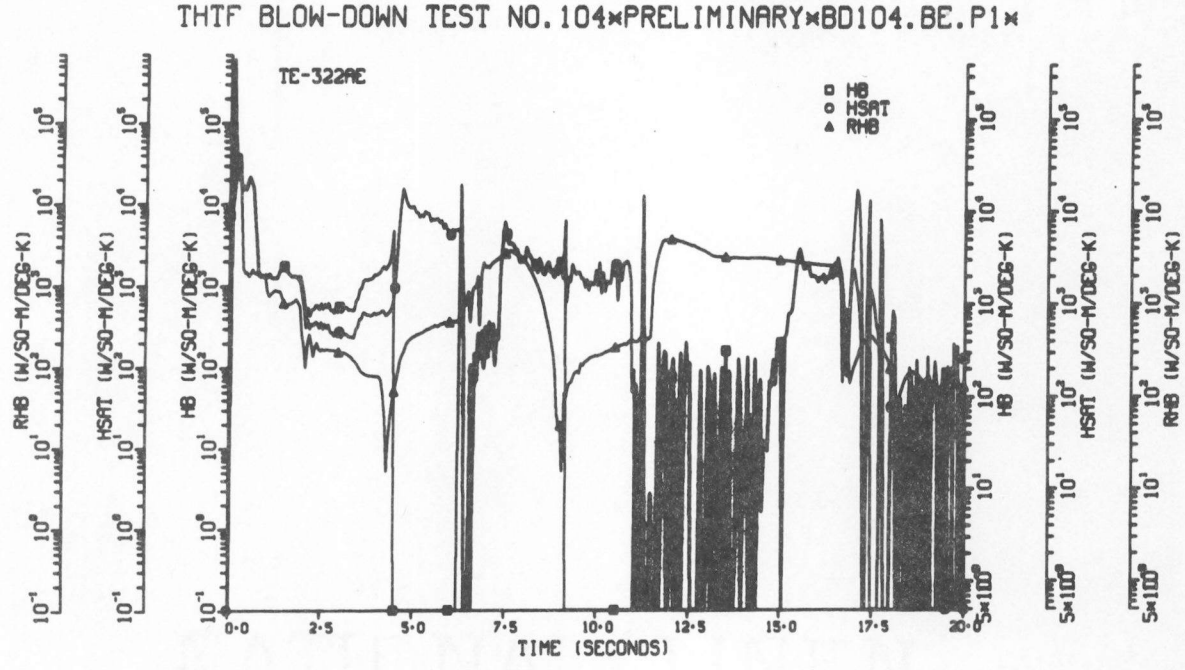


Fig. III-9. Overlay of ORINC and RELAP predicted heat transfer coefficients (THTF test 104, TE-322AE).

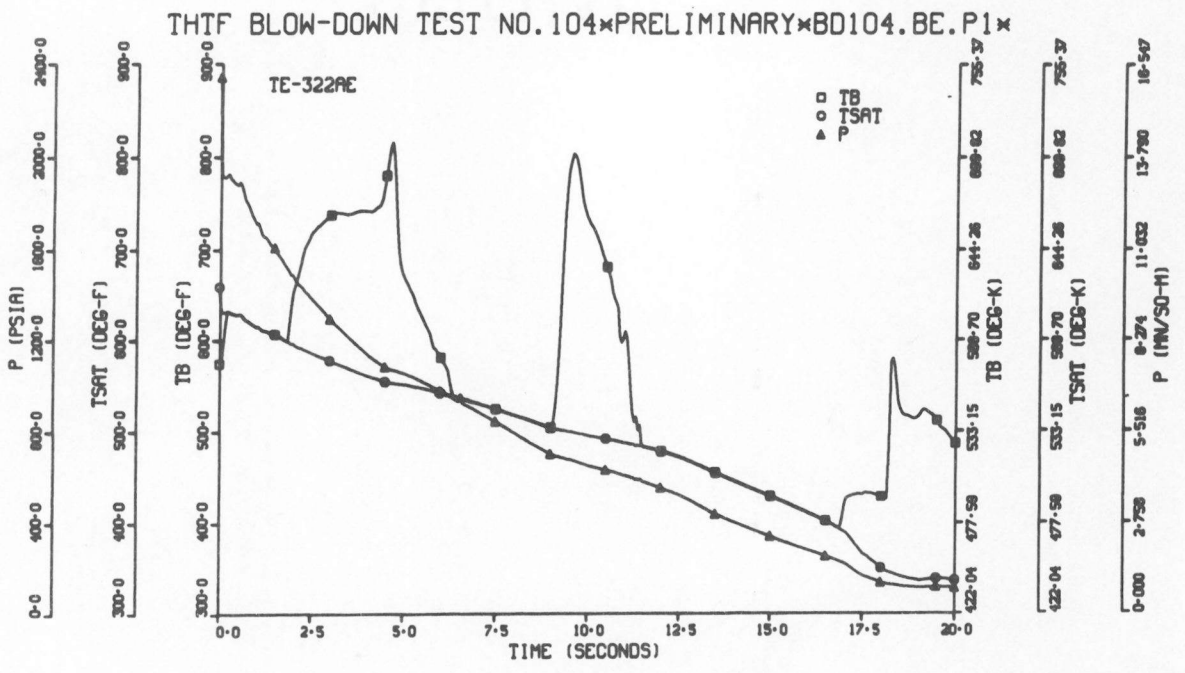


Fig. III-10. RELAP predicted core volume pressure, bulk temperature, and saturation temperature (for heat slab relative to TE-322AE).

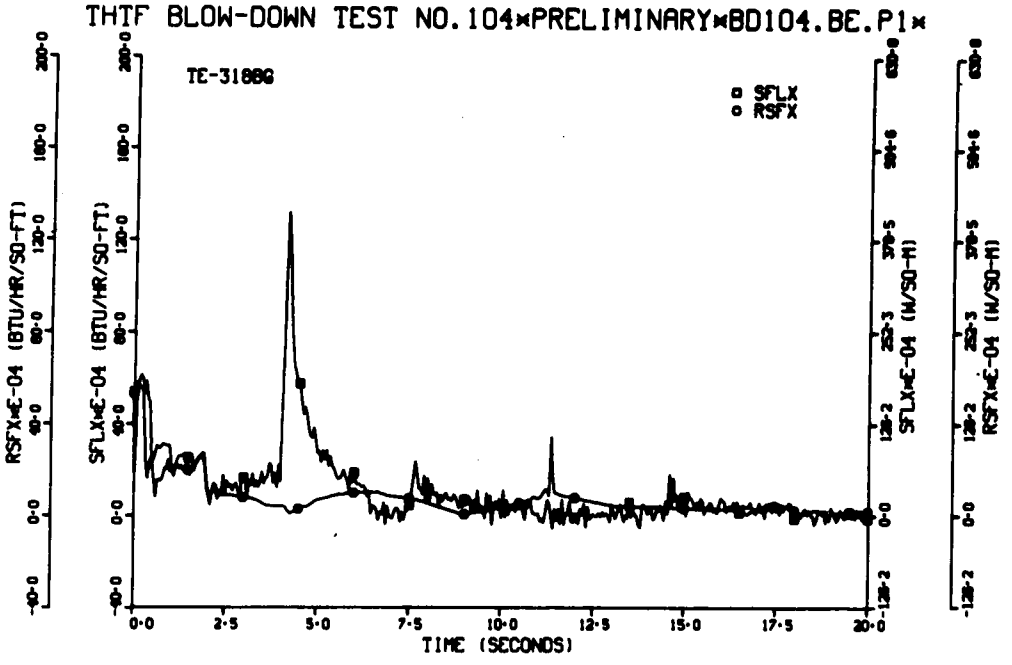


Fig. III-11. Overlay of ORINC and RELAP predicted surface heat fluxes (THTF test 104, TE-318BG).

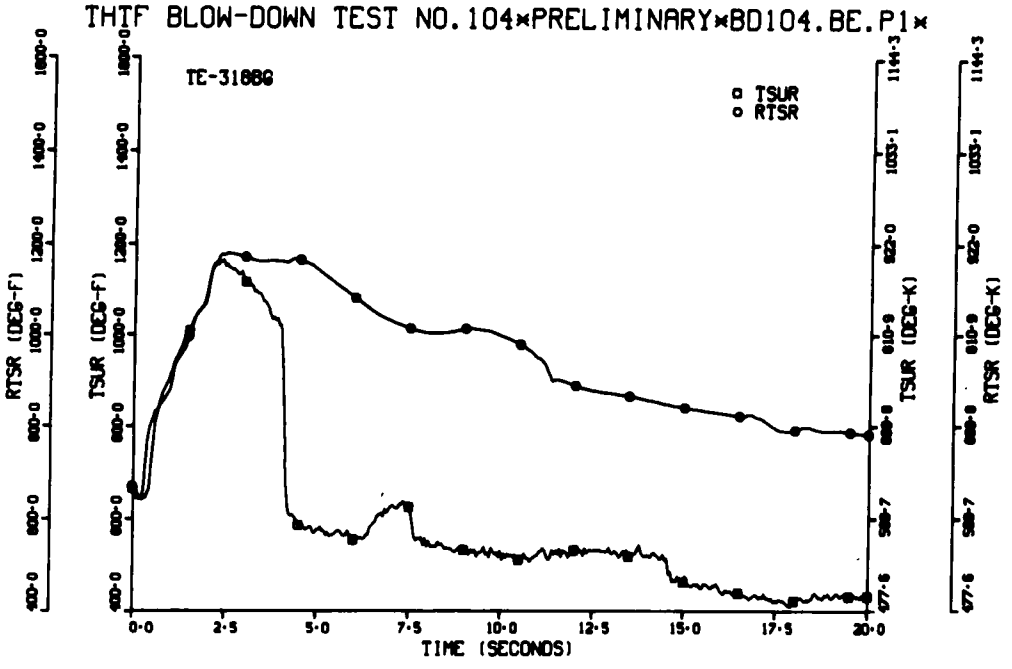


Fig. III-12. Overlay of ORINC and RELAP predicted surface temperatures (THTF test 104, TE-318BG).

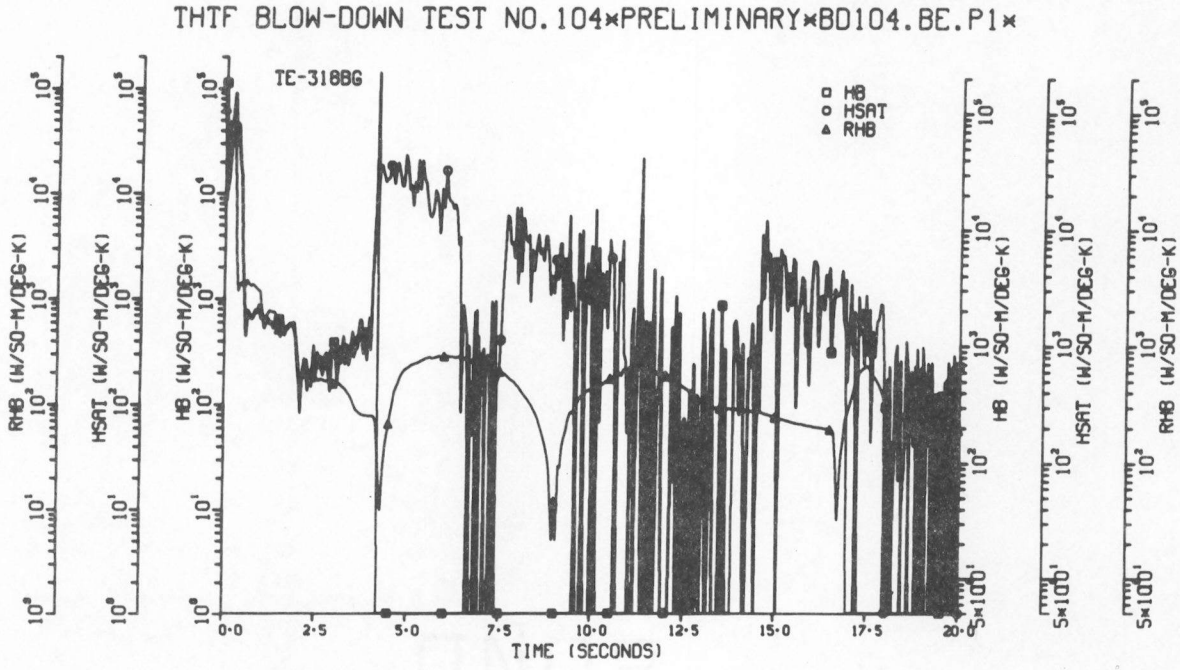


Fig. III-13. Overlay of ORINC and RELAP predicted heat transfer coefficients (THTF test 104, TE-318BG).

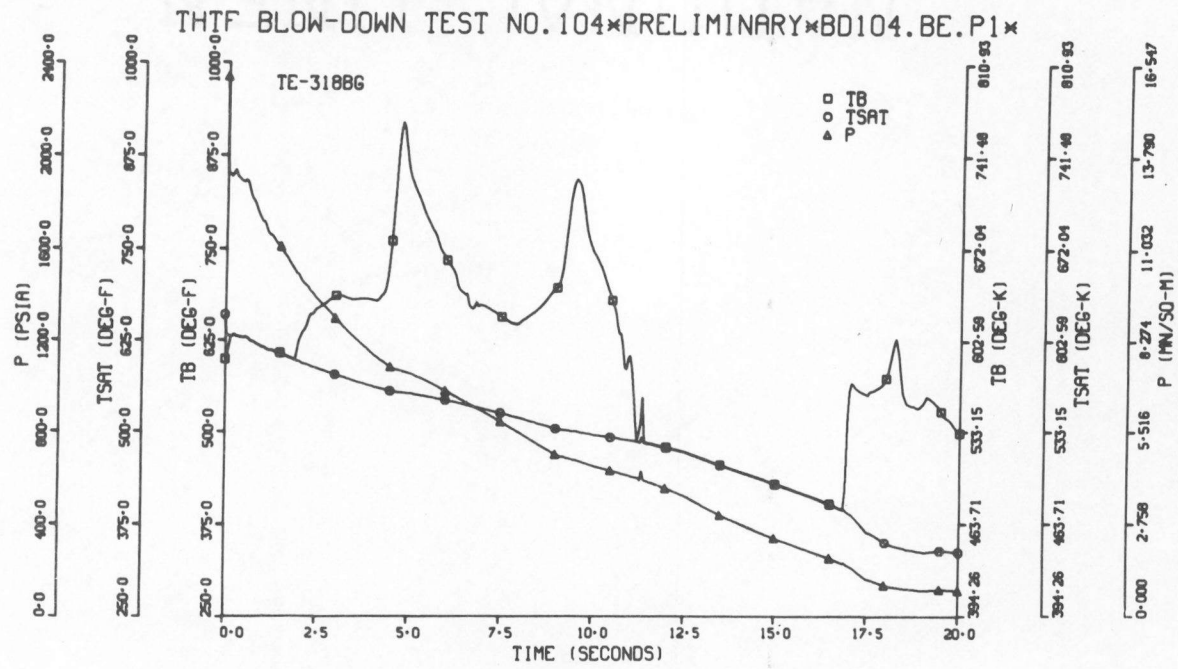


Fig. III-14. RELAP predicted core volume pressure, bulk temperature, and saturation temperature (for heat slab relative to TE-318BG).

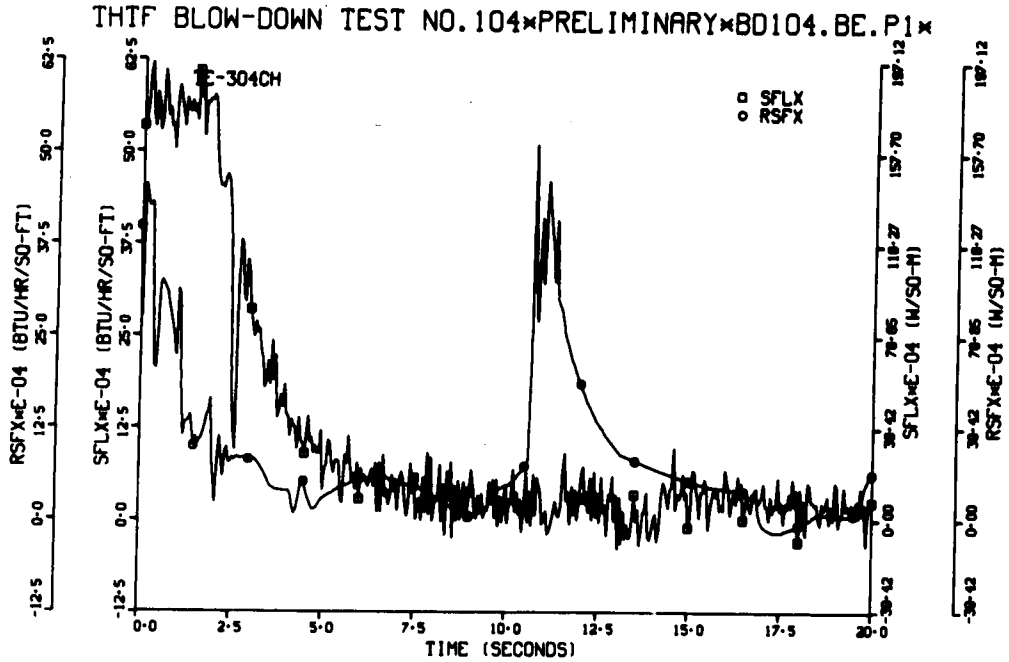


Fig. III-15. Overlay of ORINC and RELAP predicted surface heat fluxes (THTF test 104, TE-304CH).

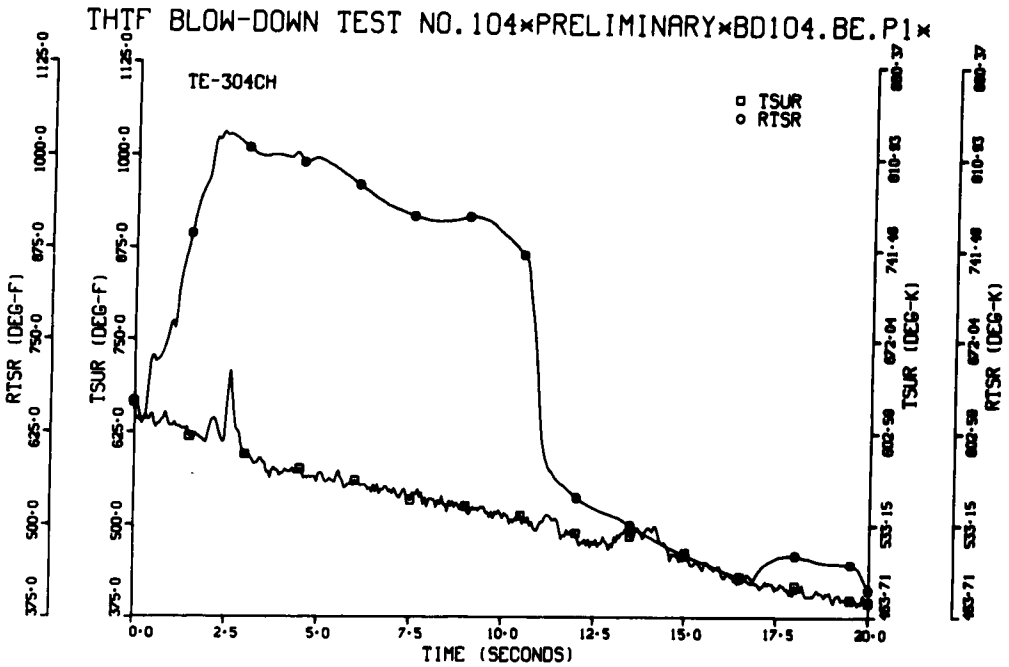


Fig. III-16. Overlay of ORINC and RELAP predicted surface temperatures (THTF test 104, TE-304CH).

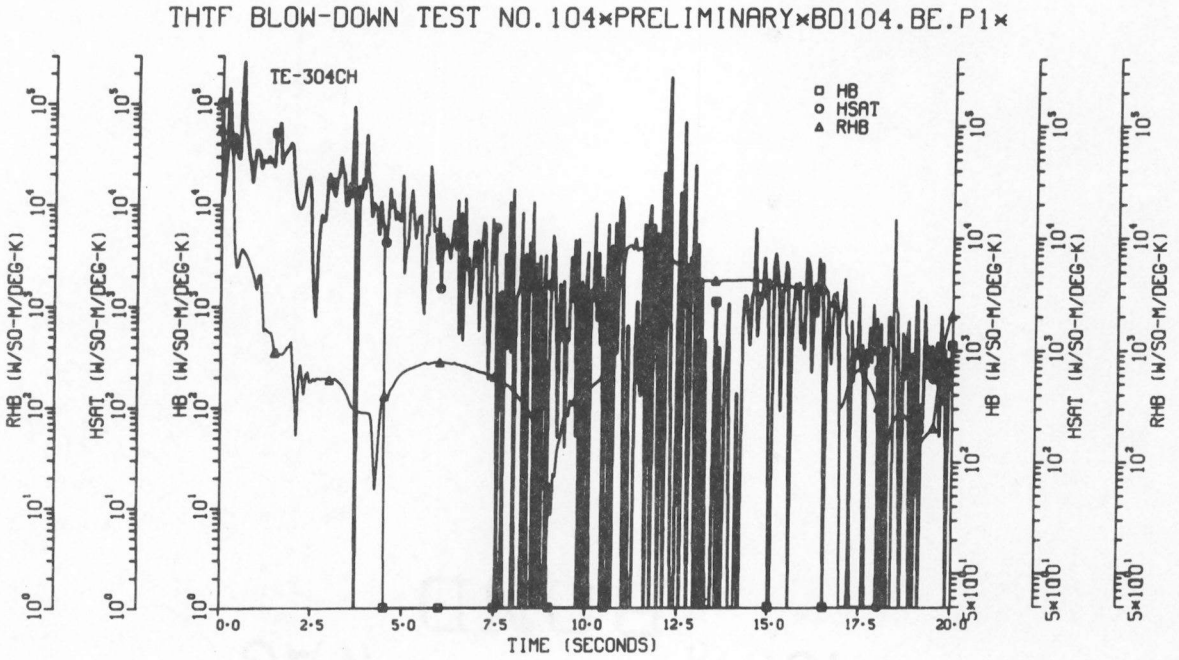


Fig. III-17. Overlay of ORINC and RELAP predicted heat transfer coefficients (THTF test 104, TE-304CH).

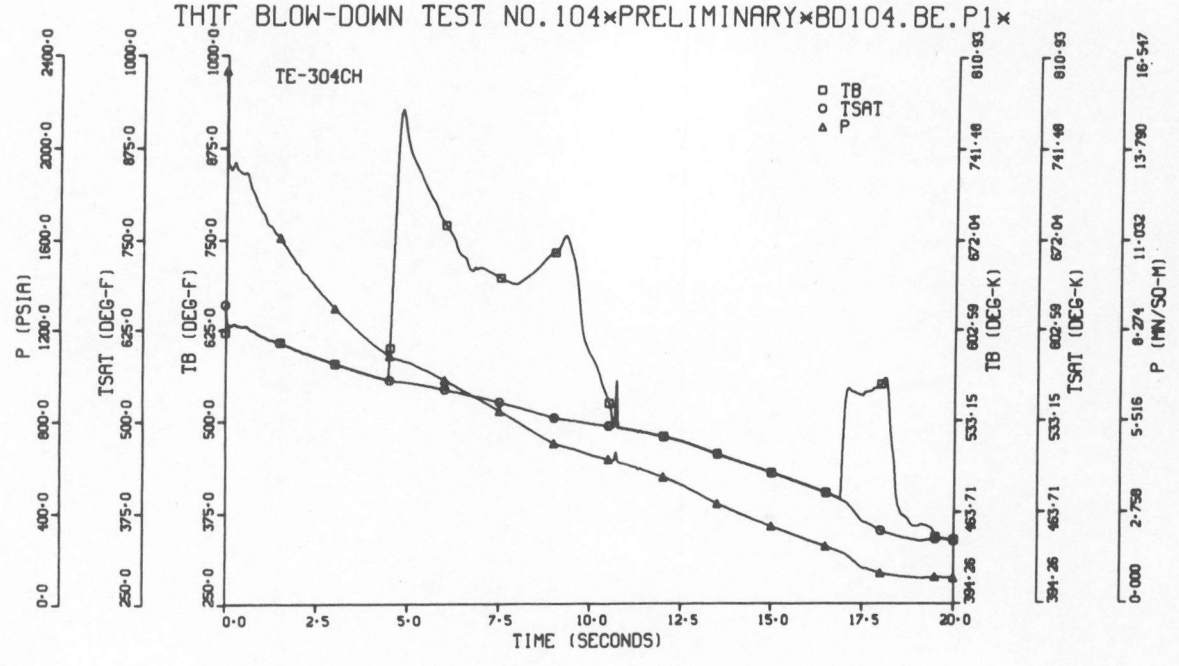


Fig. III-18. RELAP predicted core volume pressure, bulk temperature, and saturation temperature (for heat slab relative to TE-304CH).

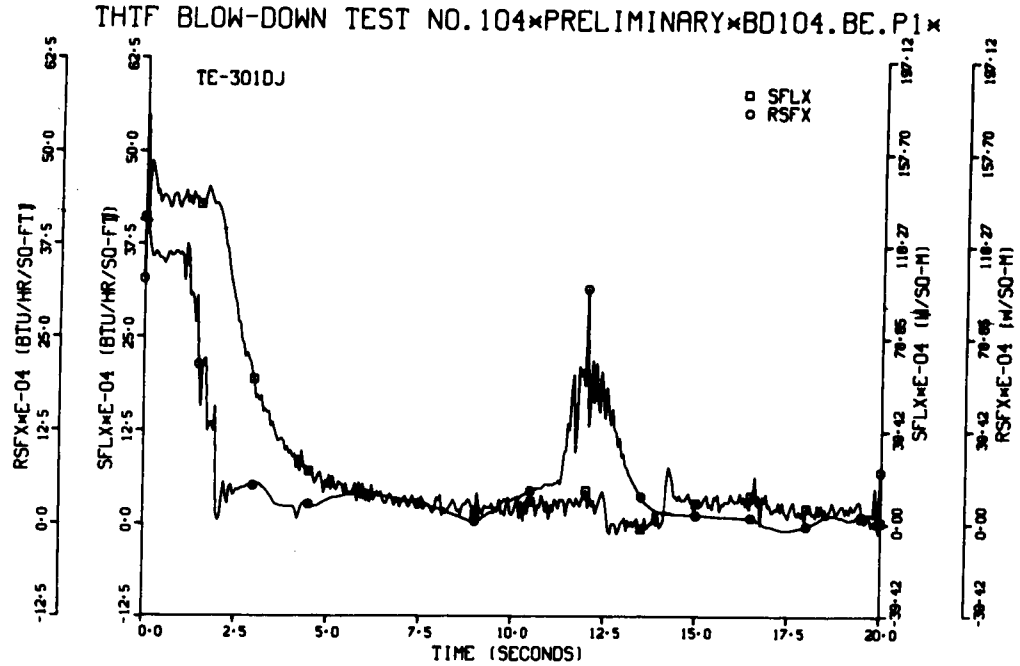


Fig. III-19. Overlay of ORINC and RELAP predicted surface heat fluxes (THTF test 104, TE-301DJ).

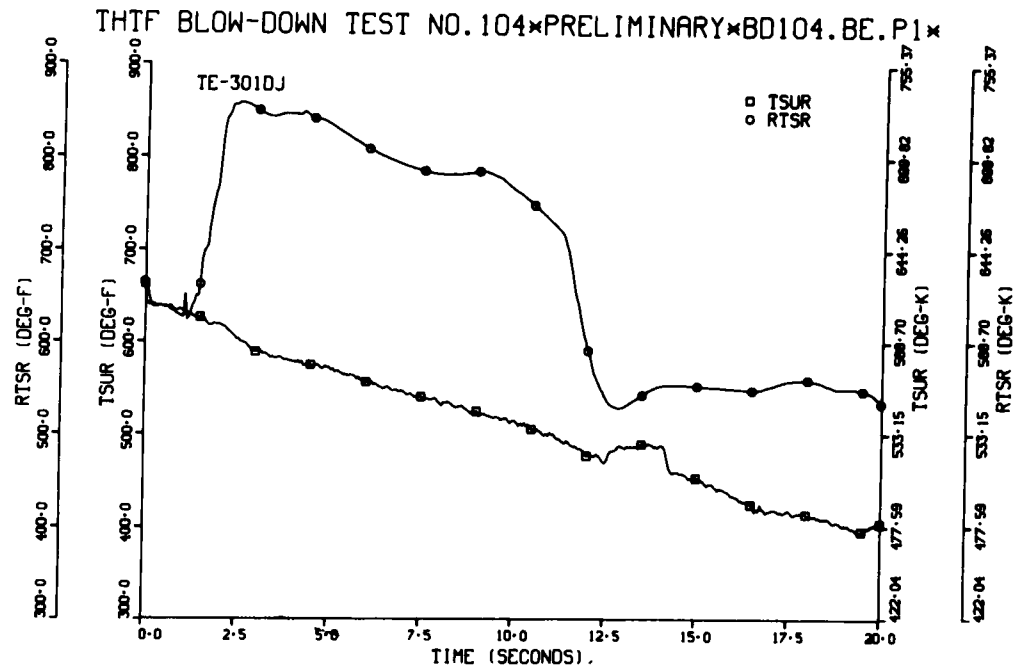


Fig. III-20. Overlay of ORINC and RELAP predicted surface temperatures (THTF test 104, TE-301DJ).

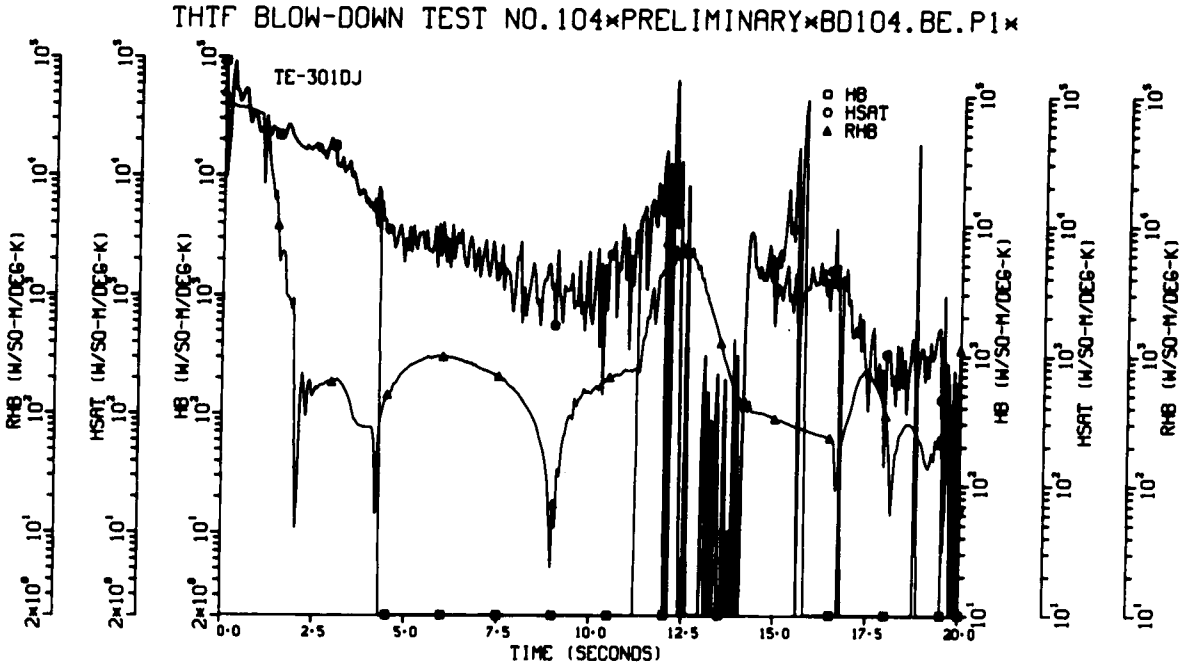


Fig. III-21. Overlay of ORINC and RELAP predicted heat transfer coefficients (THTF test 104, TE-301DJ).

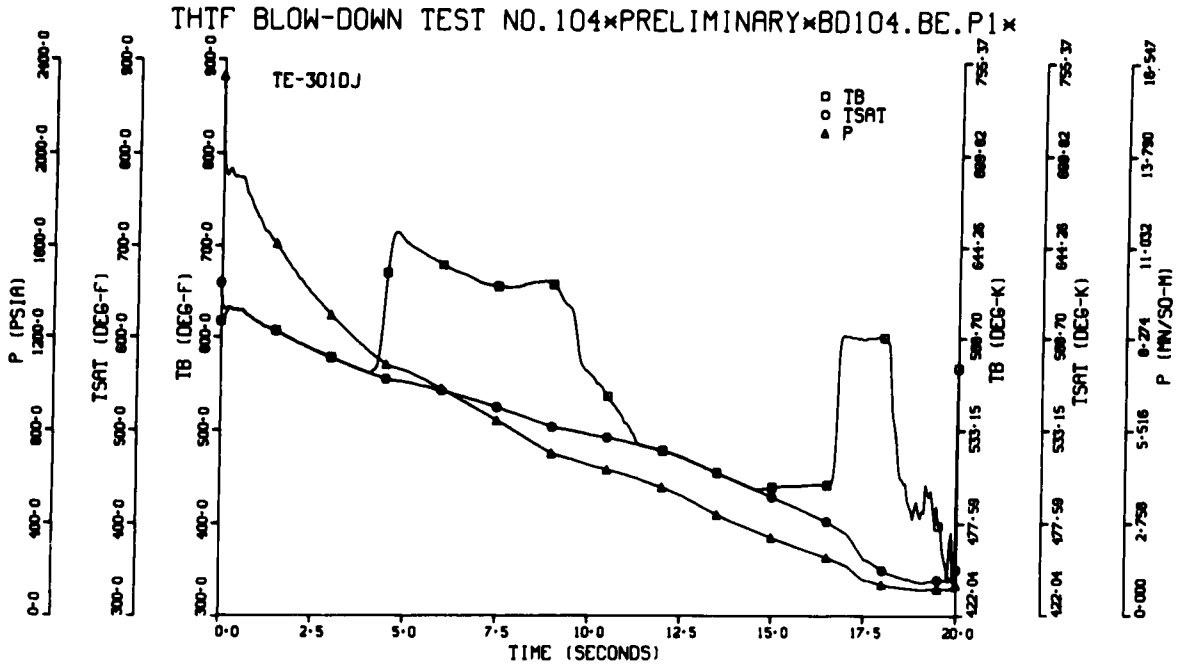


Fig. III-22. RELAP predicted core volume pressure, bulk temperature, and saturation temperature (for heat slab relative to TE-301DJ).

CHAPTER IV

CONCLUSIONS

An implicit technique has been developed to determine both the transient surface temperature and the transient surface heat flux of electrically heated rods during a simulated loss-of-coolant accident. A computer code (ORINC) has been developed using this technique; the code will be used in subsequent analysis of THTF-BDHT test data.

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LIST OF REFERENCES

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45. R. A. Hedrick, personal communication, 1976.

APPENDICES

APPENDIX A

THTF HEATERS

Heater Rod Description[1]

The indirect electric heater rods used in THTF bundle 1 are 1.0719 cm diam (0.422 in.) with a stepped, chopped-cosine power profile length of 365.76 cm (12 ft) (Fig. A-1). The overall rod length is 548.64 to 640.08 cm (18 to 21 ft), depending on its location in the bundle. The rod is double-ended, with the sheath and ground-lead extension welded together at the lower end and the power lead insulated from the sheath at the upper end.

The heater rods have a dual-sheath design (see rod cross section in Fig. A-2). The outer sheath is 0.0254-cm-thick (0.010-in.) stainless steel; the inner sheath is 0.0762-cm-thick (0.030-in.) stainless steel and is grooved to accept the 0.0508-cm (0.020-in.) chromel vs alumel thermocouples. The next inner layer is boron nitride, which electrically insulates the heating element from the stainless steel sheaths. The heater element consists of a series of oversleeves swaged over a central base tube to provide the heat-generation zones. The central "hot zone" consists of only the base Inconel 600 heater tube; this zone has the highest electrical resistance and maximum heat generation rate. Successive oversleeves of Inconel 600 or Cupro Nickel are swaged over the heater element with each succeeding oversleeve extending to the end. As oversleeves are added between the central zone and the ends, the resistance and heat generation rates of that particular zone decrease so that the step-changes approximate the desired chopped-cosine power profile shown in Fig. A-3. The lengths of the steps for different power levels were chosen to match the integrated chopped-cosine power profile (Fig. A-4). Nominal heated zone lengths, power ratios, and local powers for THTF heaters are given in Table A-1. The core of the heater element is filled with MgO, which is both a filler and insulator between the heating element and the central rod thermocouple sheaths.

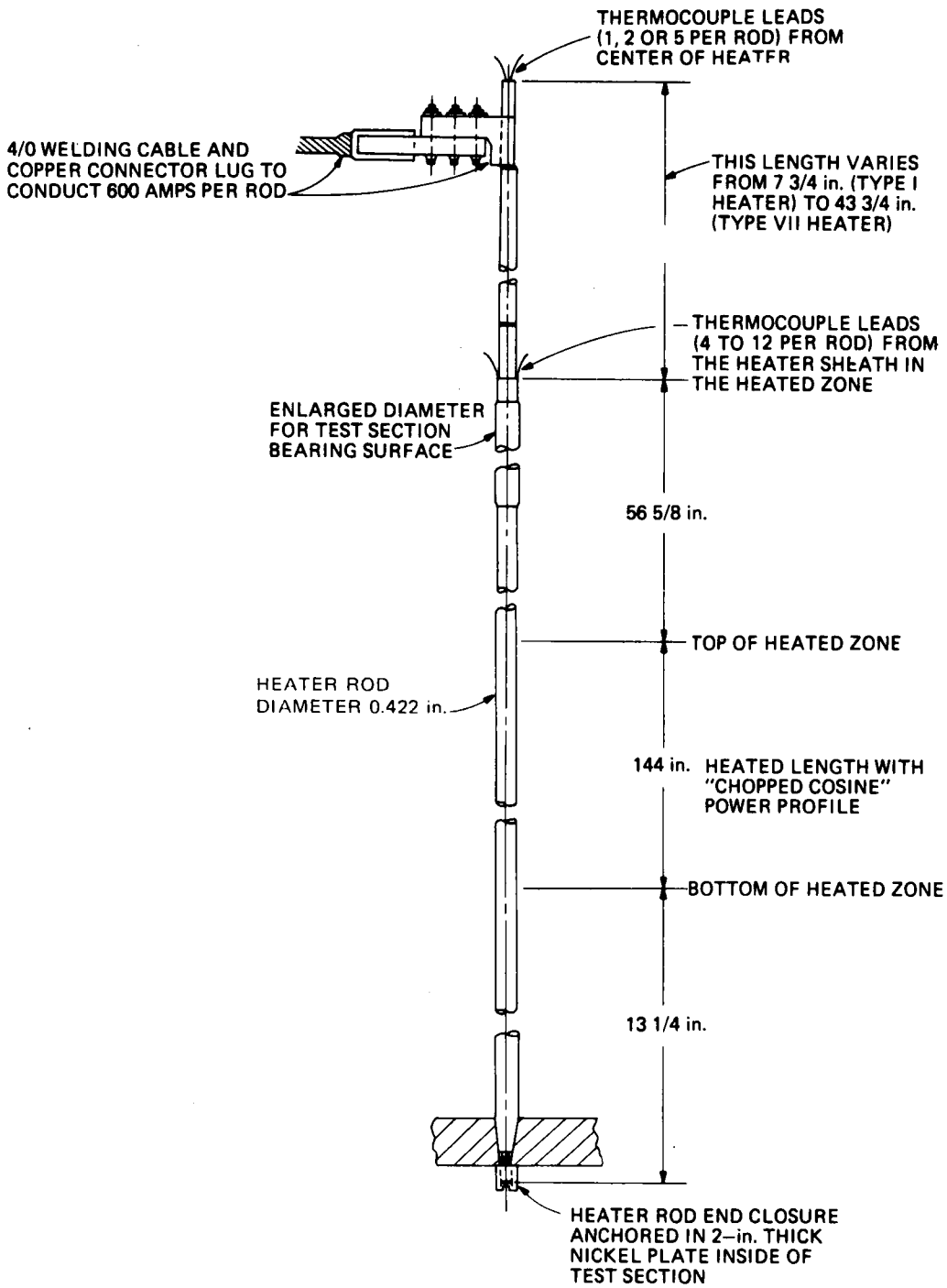

Fig. A-1. Indirect heater rod assembly. (1 in. = 2.54 cm)

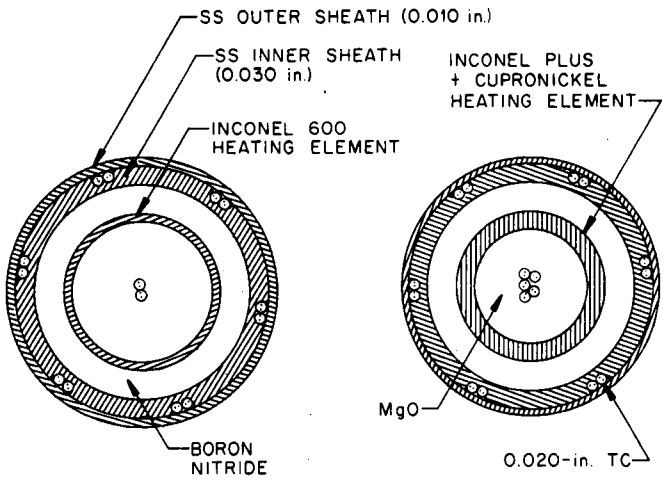

Fig. A-2. Heater rod cross section. (1 in. = 2.54 cm)

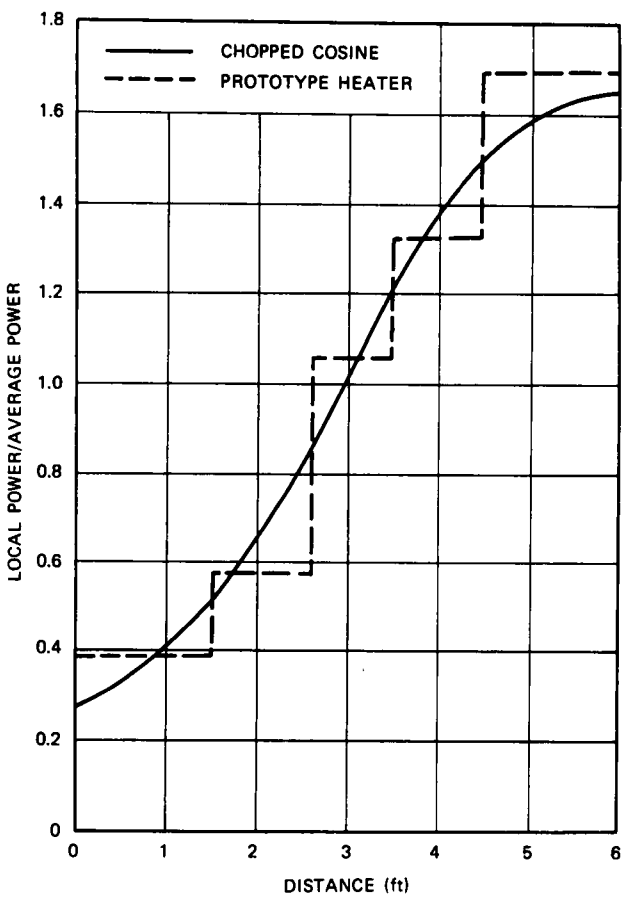

Fig. A-3. Power profile of prototype heater. (1 ft = 30.48 cm)

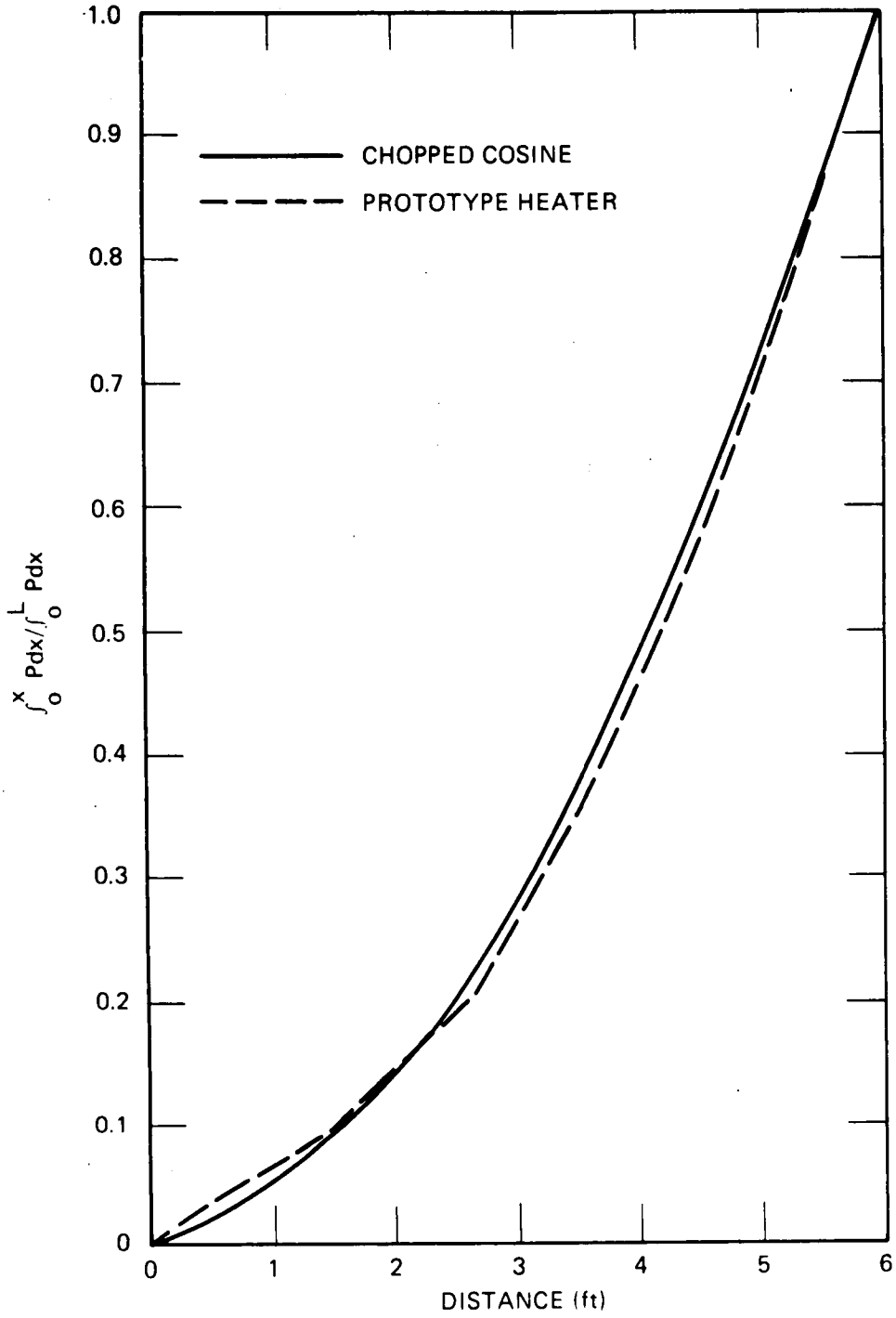

Fig. A-4. Integrated power profile of stepped, chopped-cosine heater rod compared to the integrated power profile of a smooth chopped-cosine curve. (1 ft = 30.48 cm)

Table A-1. Nominal power profile for the THTF indirect heater with average power of 12 kW/ft

(1 in. = 2.54 cm, 1 kW/ft = 3.28084 kW/m)

Length of heated zone from beginning (in.)	Local/average power ratio	Local power rate (kW/ft)
0–18	0.422	5.06
18–31.5	0.597	7.16
31.5–42	1.065	12.78
42–54	1.285	15.42
54–90	1.67	20.0
90–102	1.285	15.42
102–112.5	1.065	12.78
112.5–126	0.597	7.16
126–144	0.422	5.06

The sheath thermocouples are located in axial grooves (two per groove) machined in the inner sheath. After the tips of the thermocouple sheath are spot-welded at the proper location, a stainless steel filler rod is added to the remainder of the groove (Fig. A-5). The heater is then slipped into the 0.0254-cm-thick outer sheath and the whole assembly is swaged down to a 1.0719-cm OD.

BDHT heater 150-5 (originally S/N-5) was cross-sectioned and micro-photographed[30] by the Y-12 Development Division Metallurgical Department. A typical cross section (Fig. A-6) shows the peripheral location of sheath thermocouples and heater components. Blow-ups of the inner sheath groove area (Fig. A-7) reveal that the groove has been milled to a depth of 0.0394 cm (0.0155 in.), which is less than the original 0.0508-cm OD of the thermocouple. As a result, during swaging operations the thermocouple is crushed to a somewhat elliptical shape and the edge of the milled groove is pulled away from the outer sheath (Fig. A-7). A review of all photographs of cross sections at thermocouple bead junctions in heater 150-5 results in the composite drawing shown in Fig. A-8.

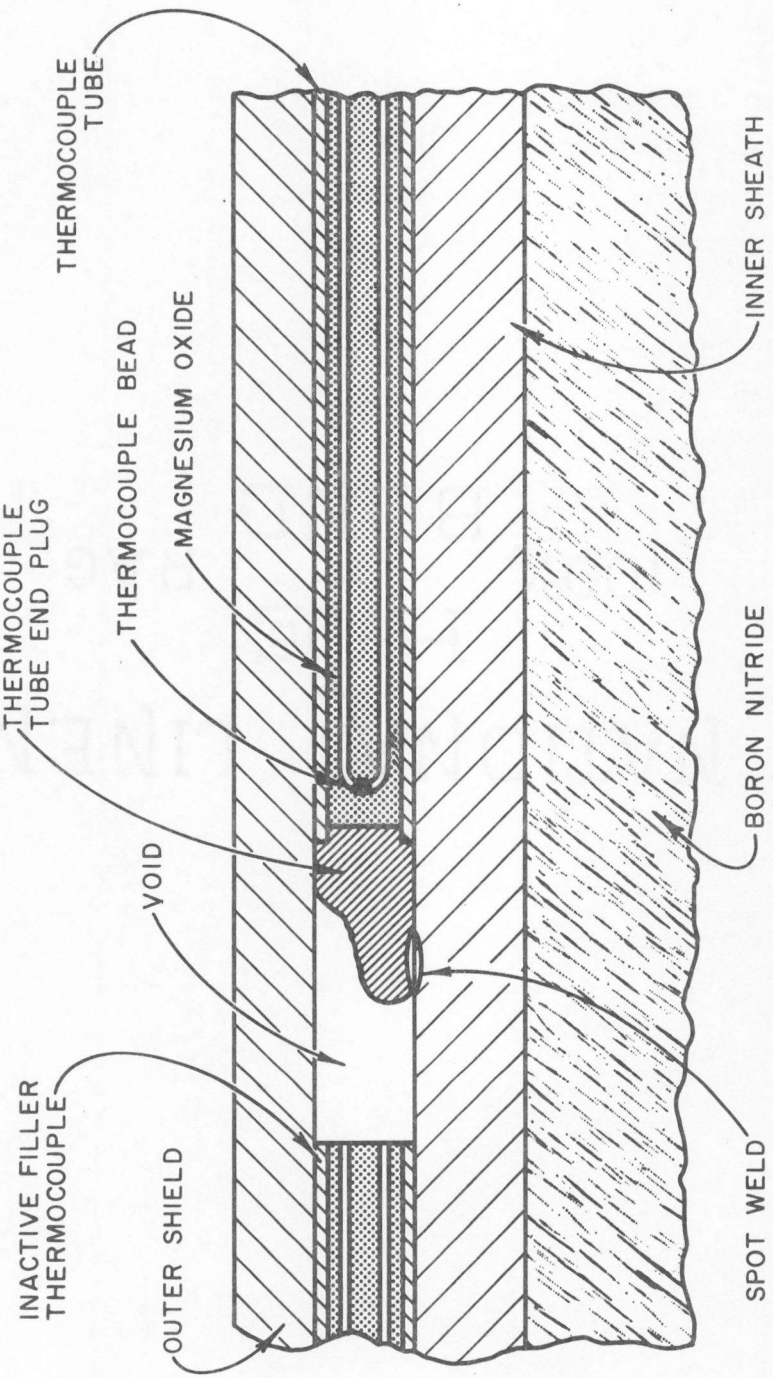

Fig. A-5. Typical thermocouple junction configuration.

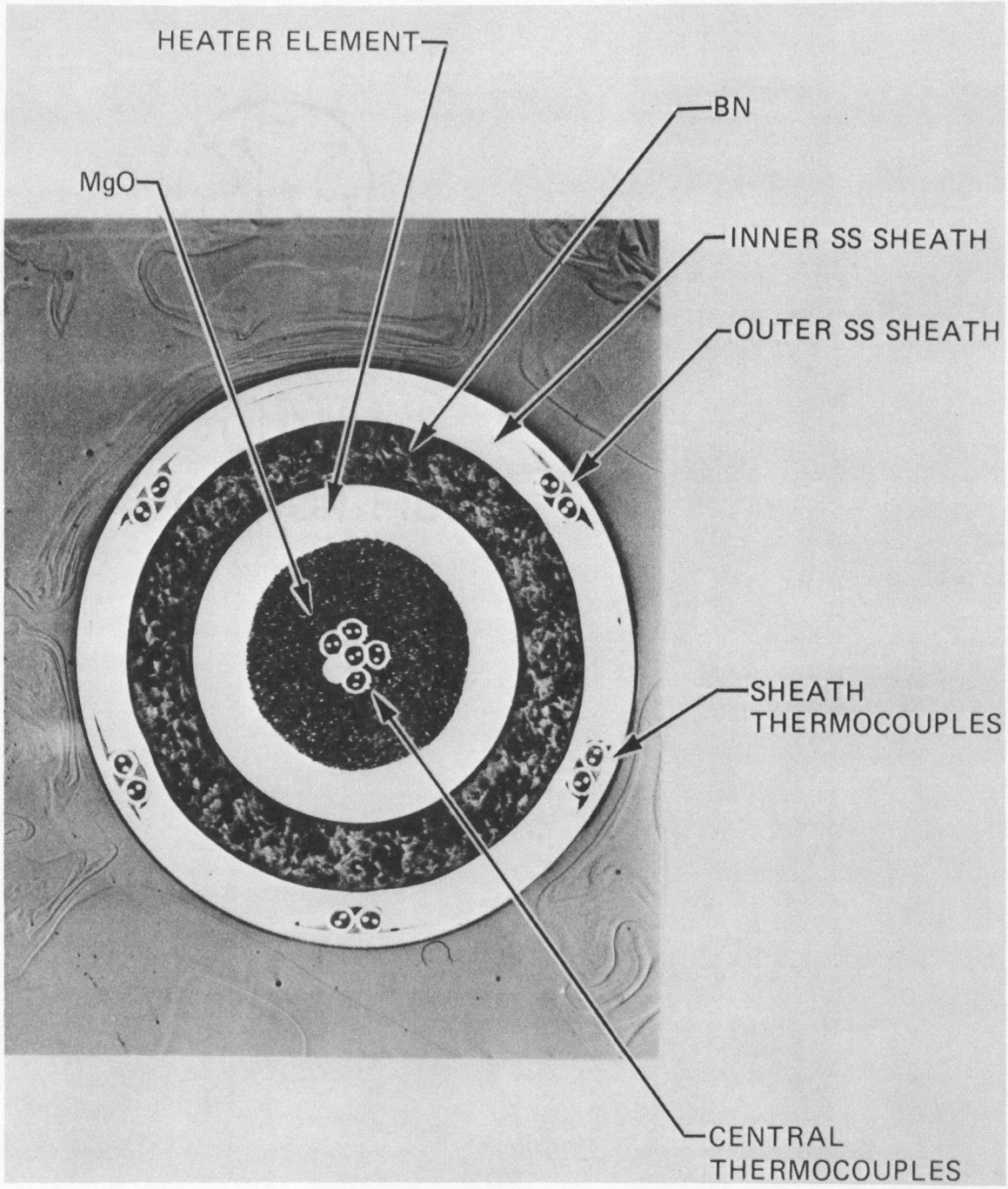

Fig. A-6. Cross section of BDHT heater 150-5.

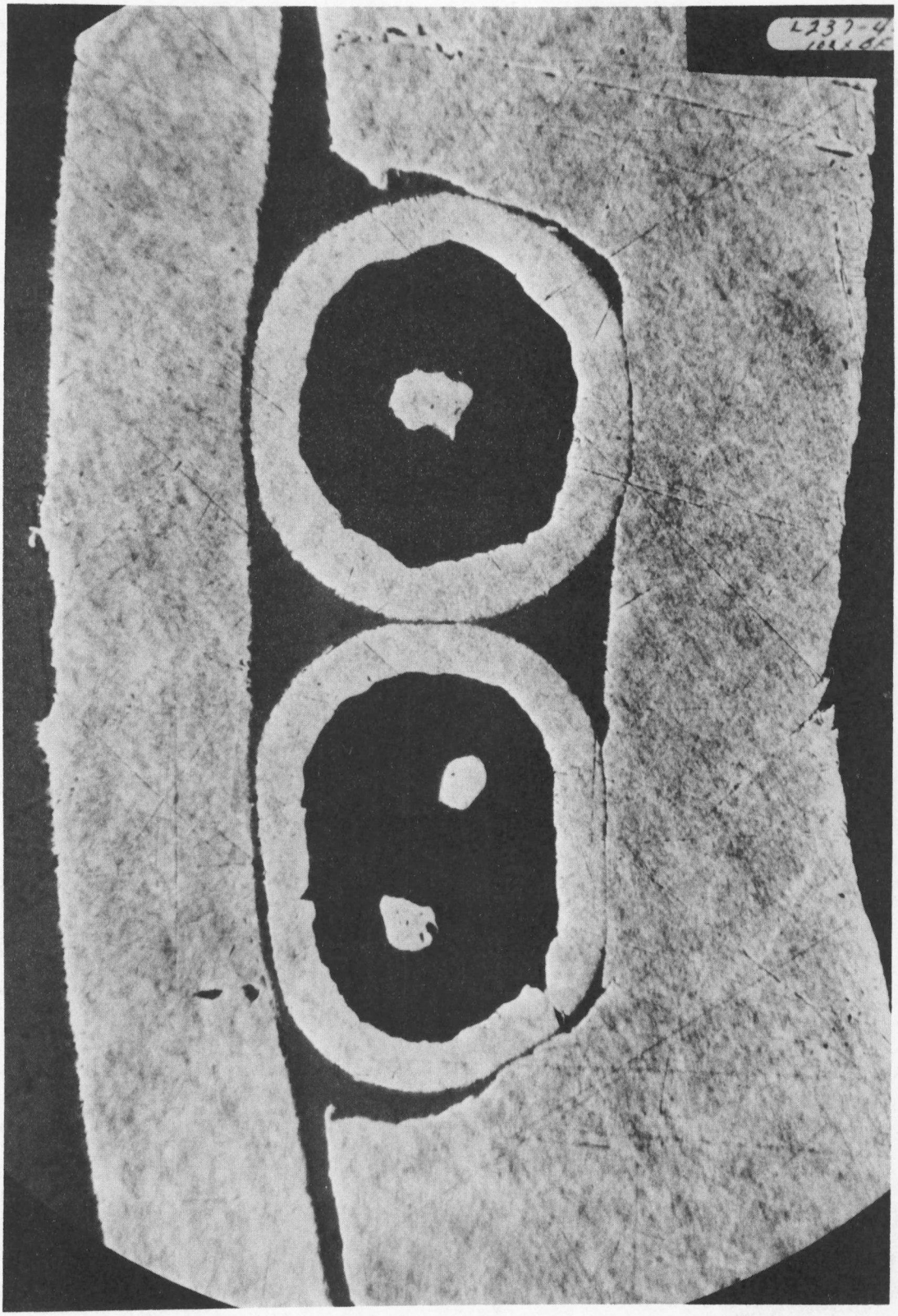

Fig. A-7. Cross section of sheath thermocouples in BDHT heater 150-5.

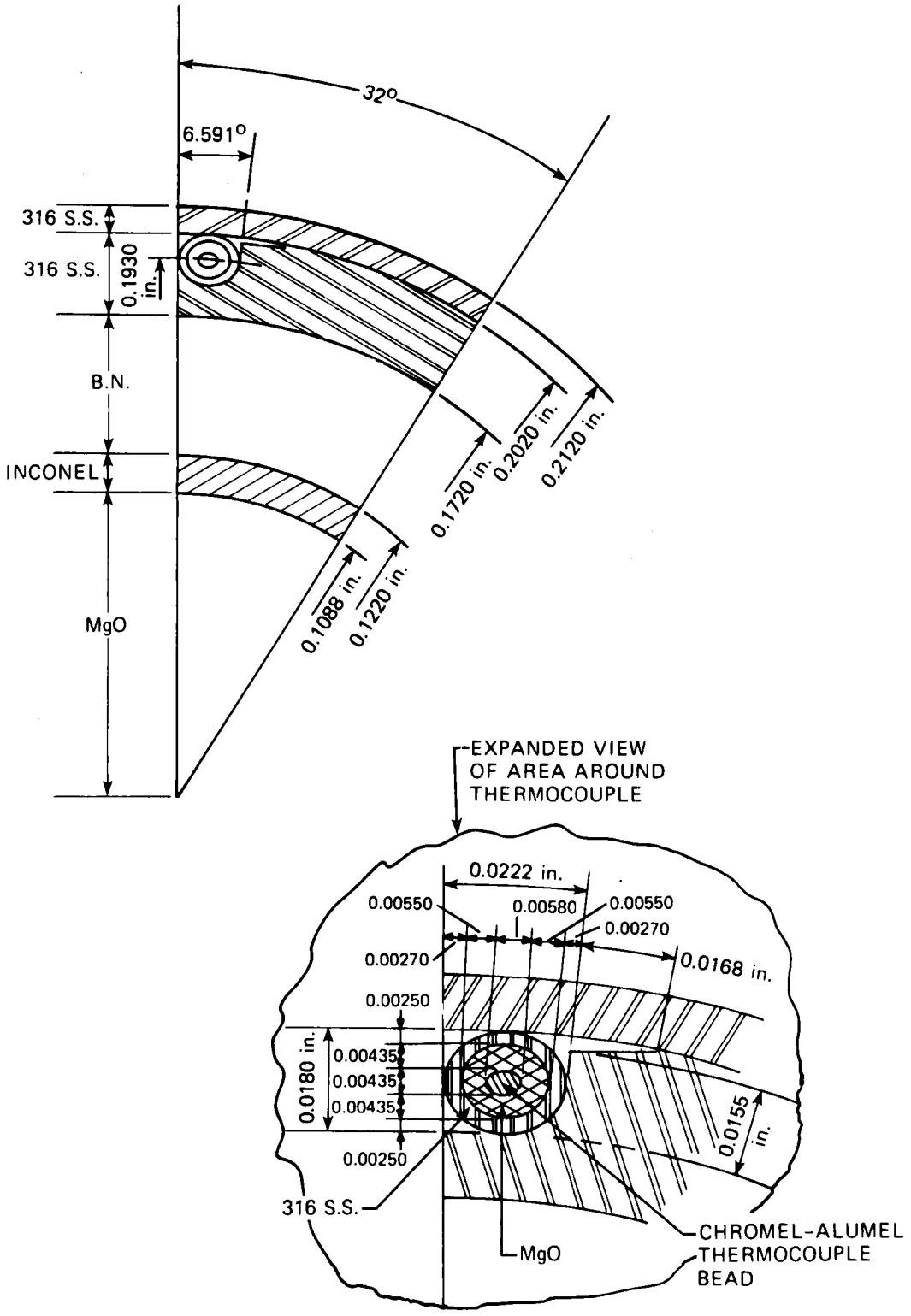

Fig. A-8. Segment of heater rod showing mean dimensions in the thermocouple area. (1 in. = 2.54 cm)

Heater Rod Bundle[1]

The bundle consists of 49 rods in a 7 × 7 array spaced on 1.43-cm (0.563-in.) centers which are contained in a 10.16-cm-square (4-in.) shroud box. Low-pressure-drop grid spacers are provided at approximately 30.48-cm (12-in.) intervals along the box (Fig. A-9). The shroud box supports the spacer grids and forms the bundle flow channel. A cross section of the test section with the shroud box and bundle assembly in place is shown in Fig. A-10.

The nominal locations of thermocouples, together with locations of power steps and spacer grids, are summarized in Table A-2. After the assembly of THTF bundle 1, all thermocouples were tested for open circuits; 337 of 348 sheath thermocouples and 75 of 106 center thermocouples were in good condition. The distribution of these thermocouples in bundle 1 is presented on a grid map in Fig. A-11. A schematic illustration showing the locations of thermocouples at different levels is given in Fig. A-12.

Of the available "good" sheath thermocouples, 50 are monitored by a multichannel temperature monitor (metrascope) with the thermal responses visually displayed. The rods that are cross-hatched in Fig. A-13 are monitored by the metrascope. Also, there are 19 thermocouples on level 0 for which the inverse model in ORINC is not applicable. Therefore, of the thermocouples which are scanned by the computer controlled data acquisition system (CCDAS), there are 266 possible positions in THTF bundle 1 for which inverse calculations can be made.

Heater Rod Radial Dimensions

For the inverse model and calculations, it is essential that the internal radial dimensions of the heater rod be as accurate as possible. However, due to the rod manufacturing procedure, these dimensions are not readily available (i.e., as specifications or in any published form). The following description of the manufacturing procedure clarifies the reasons for this problem. The internal thermocouple cluster along with a piano wire stiffener are inserted into the Inconel tube; MgO cores are inserted over the thermocouple cluster. This assembly is then swaged down to a given outer diameter, crushing and compacting the MgO. Successive sleeves

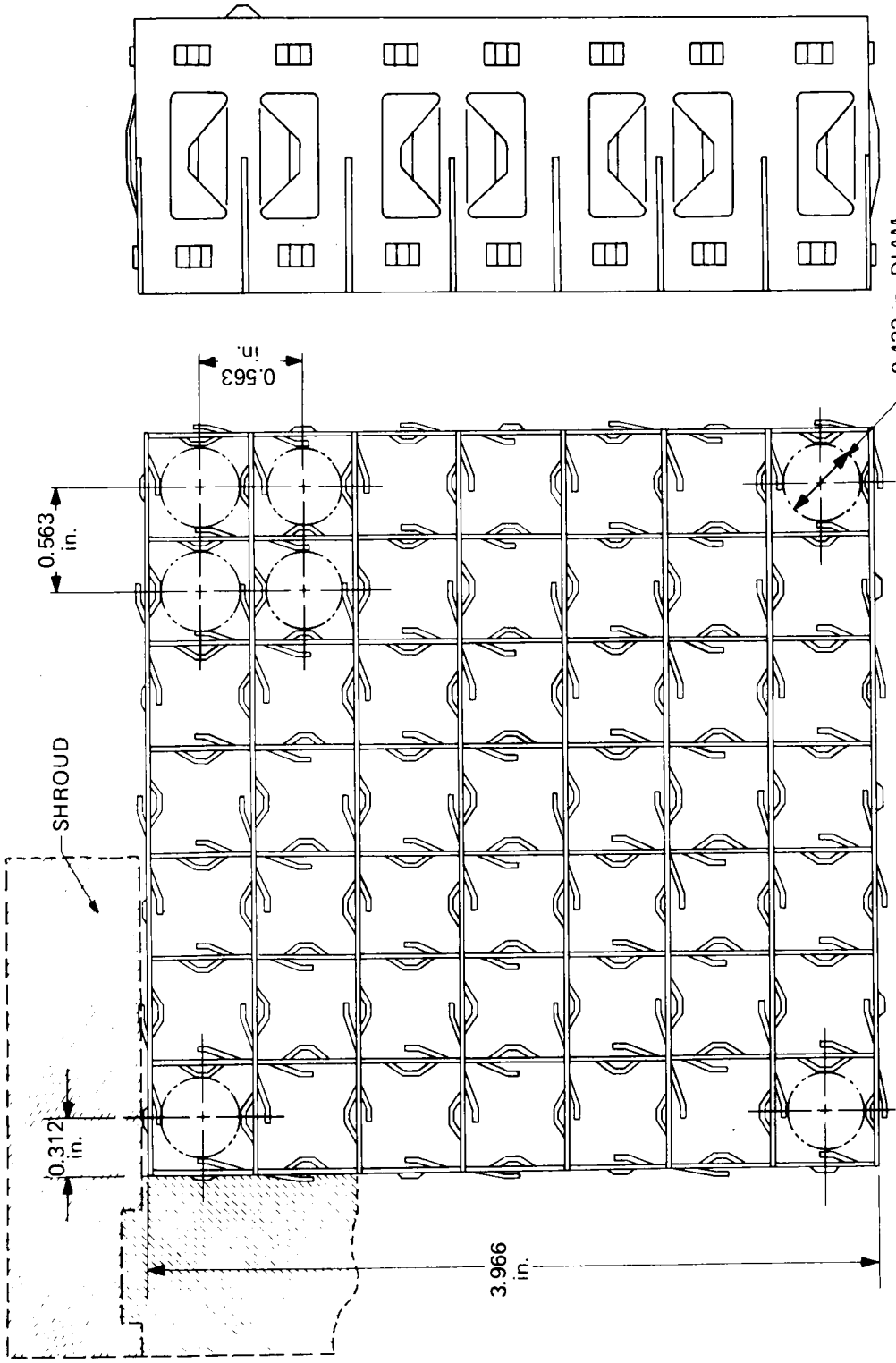

Fig. A-9. Low-pressure-drop spacer grid assembly. (1 in. = 2.54 cm)

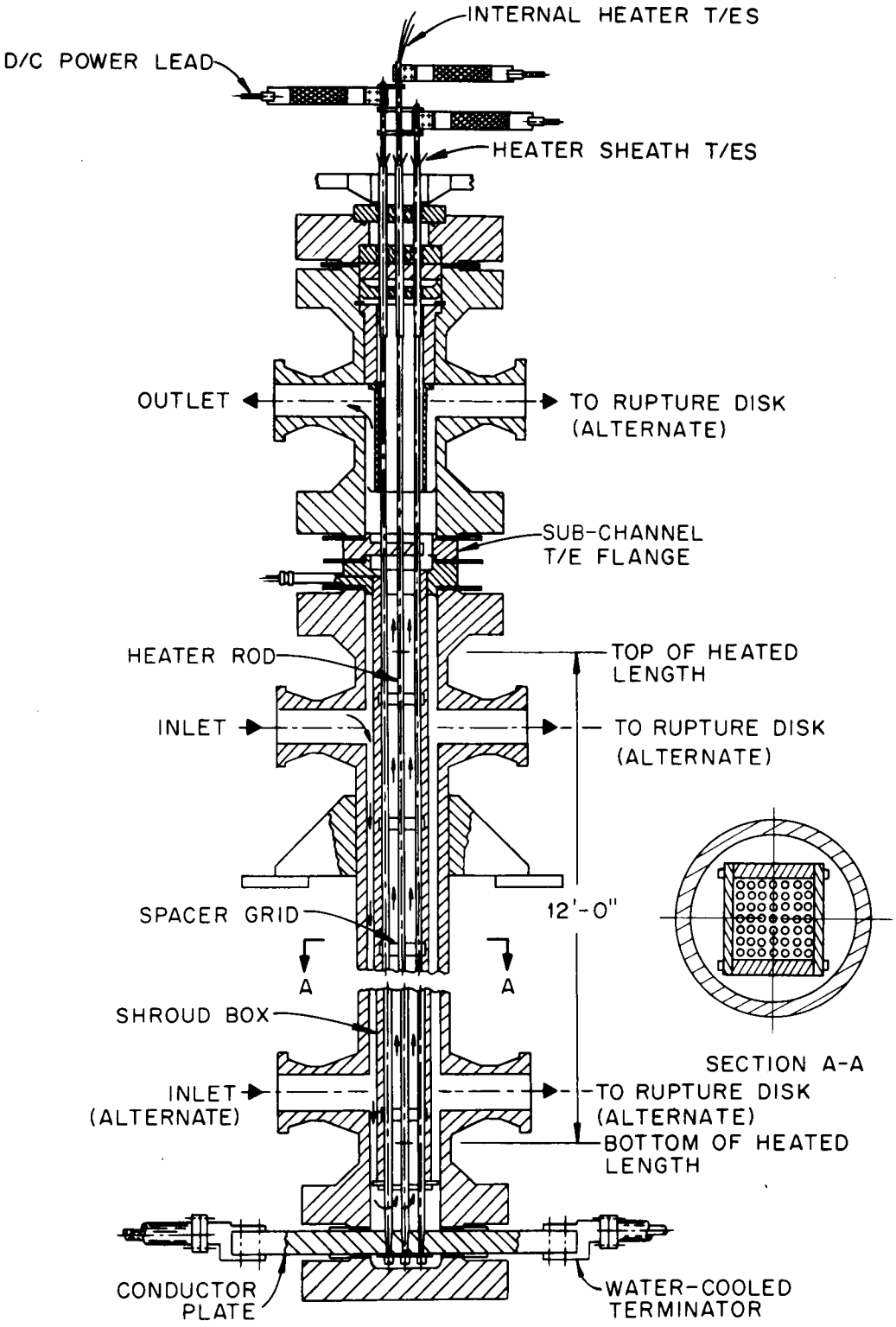

Fig. A-10. Test section using indirect heater rod in 49-rod bundle. (1 ft = 0.3048 m)

Table A-2. Nominal location of thermocouples in THTF bundle 1 relative to power zone steps and grid spacers

(1 in. = 2.54 cm)

Distance (in.) from lower end of heated zone[a]	Grid spacer location	Nominal power kW/m	Nominal power kW/ft	Thermocouple level
−3/4 to +3/4	X			
1				A
11 1/2 to 12 5/8	X	14.12	4.30	
13 1/8				B
18				
19		19.95	6.08	C
23 to 24 1/2	X			
31 1/2				
34 7/8 to 36 3/8	X			
36 7/8		35.56	10.84	D
42				
43				E
45 1/2 to 47	X	42.91	13.08	
54				
55				F
58 5/8 to 60 1/8	X			
70 1/2 to 72	X			
77		55.77	17.0	G
82 3/8 to 83 7/8	X			
89				H
90				
93				I
93 1/2 to 95	X	42.91	13.08	
101				J
102				
105 5/8				K
106 1/8 to 107 5/8	X	35.56	10.84	
111 1/2				L
112 1/2				
118 to 119 1/2	X			
125		19.95	6.08	M
126				
129 7/8 to 131 3/8	X			
141 1/4		14.12	4.30	N
141 3/4 to 143 1/4	X			
144				
145 1/4		1.21	0.37	O

[a]Distances in most cases are nominal and ±1/4 in.

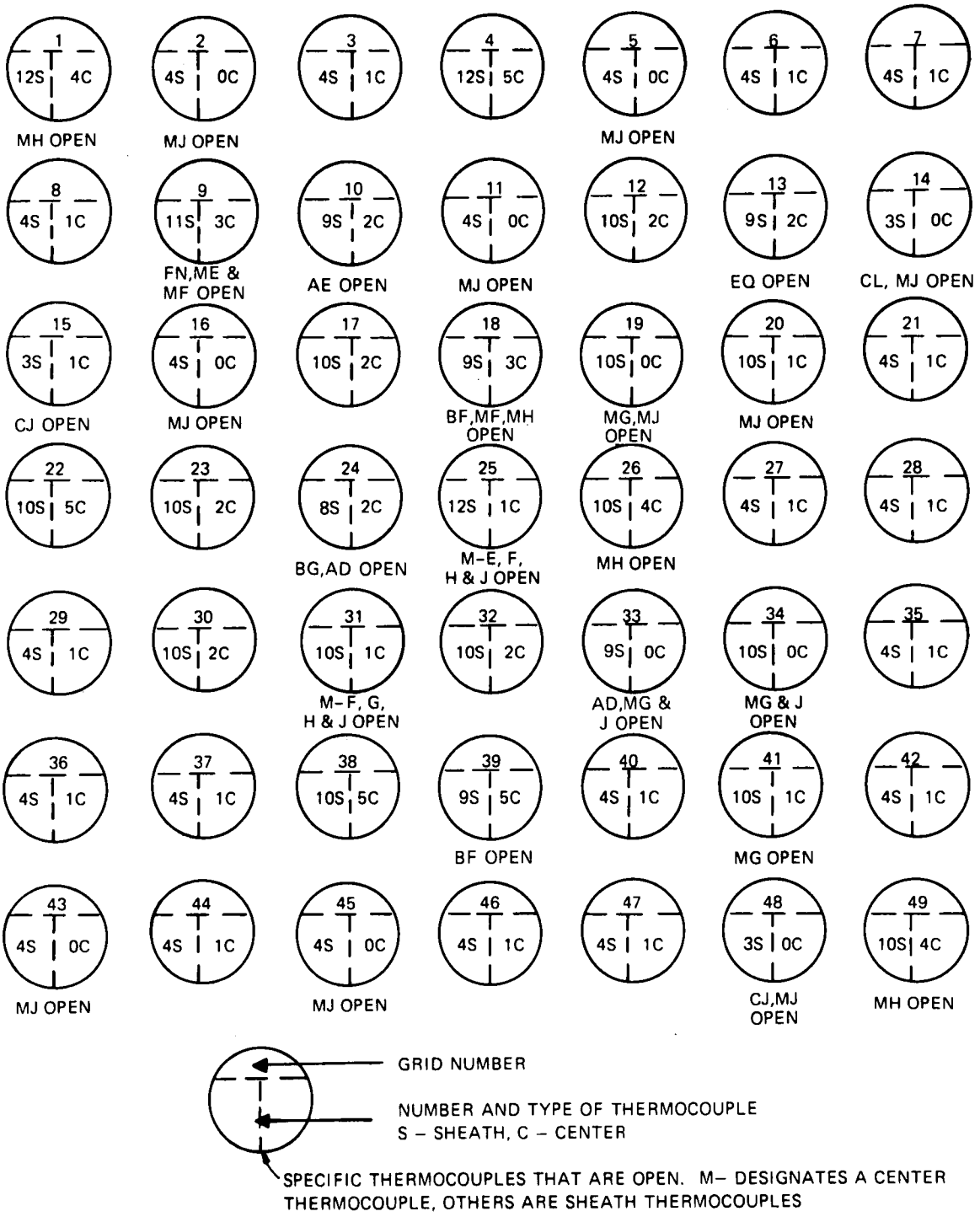

Fig. A-11. Distribution of thermocouples in THTF test bundle 1 (May 24, 1976).

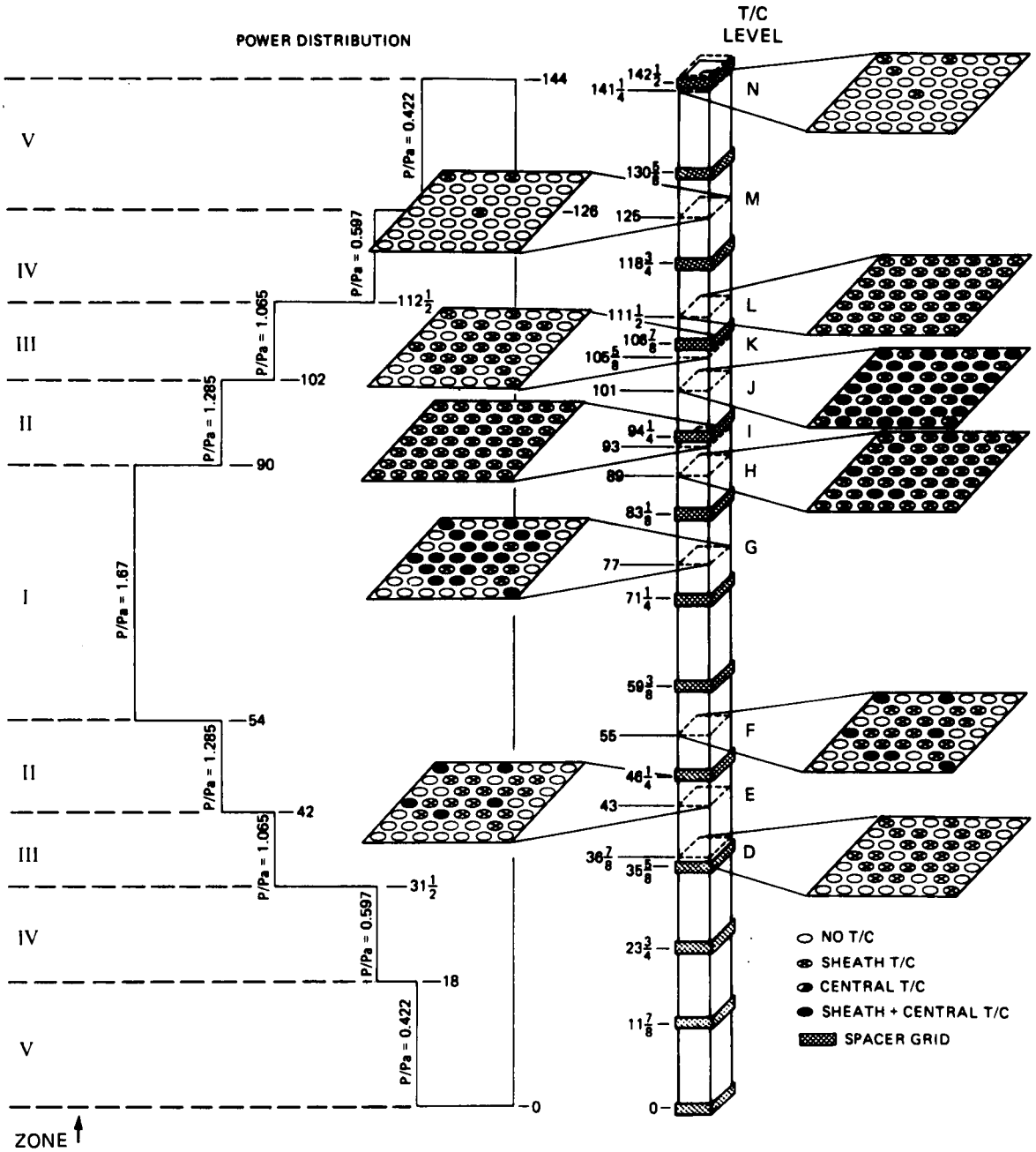

Fig. A-12. Location of thermocouples in THTF bundle 1. (1 in. = 2.54 cm)

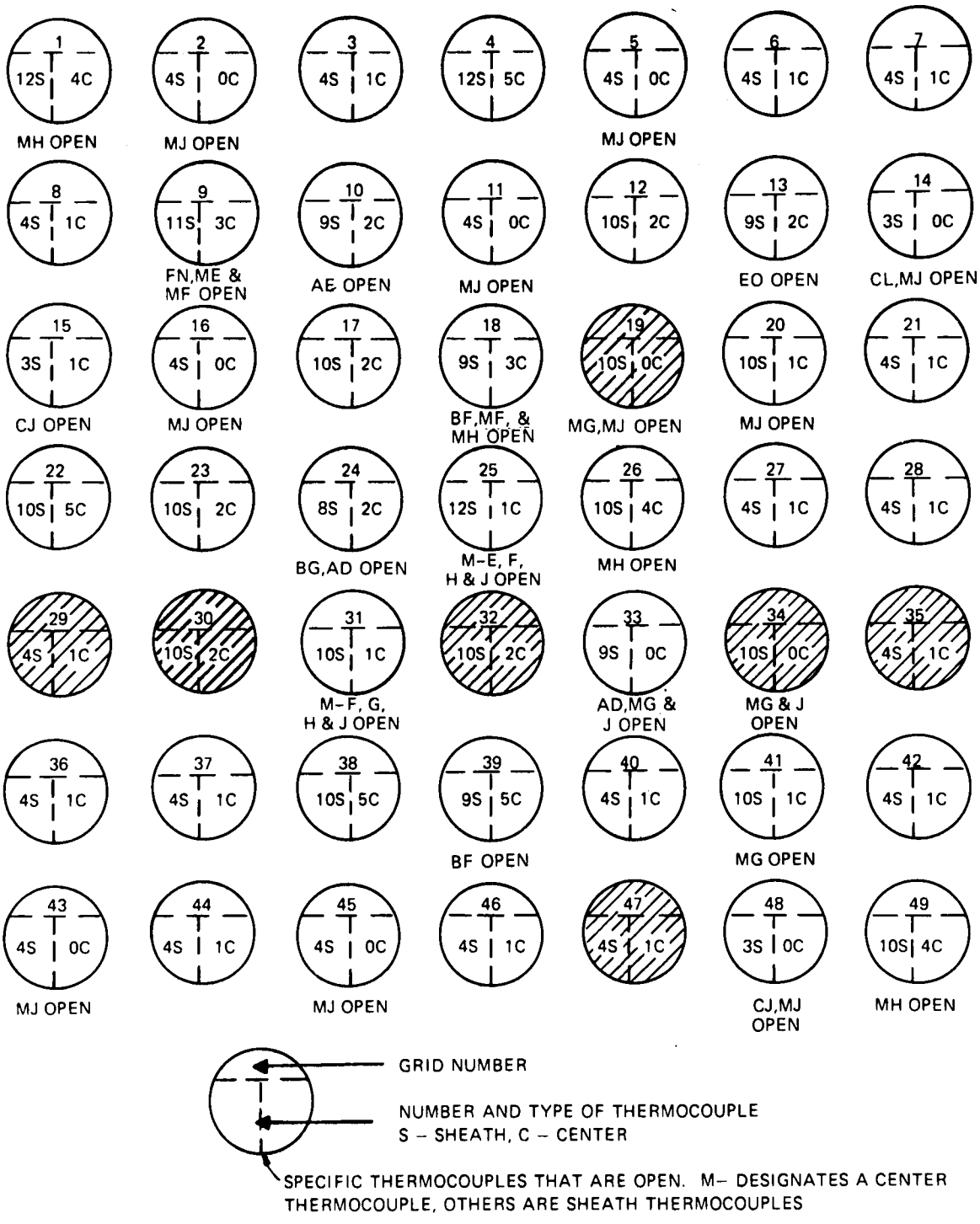

Fig. A-13. THTF test bundle 1 rods monitored by metrascope (shown by cross-hatching).

of Inconel or Cupro Nickel are swaged over the base tube to a uniform outside diameter (further compacting the core and elongating the assembly). The finished heater assembly is placed inside the inner stainless steel sheath, and boron nitride (BN) powder is poured into the annular region and compacted. Another swaging operation is performed and the grooves are milled in the surface. The sheath thermocouples are subsequently tack welded in the grooves and filler rods are added; this assembly is inserted in the outer sheath for the final swaging operation. Obviously, each swaging operation compacts (and elongates) the ceramic insulators and thins (and elongates) the metallic annular regions of the assembly.

The Y-12 Development Division Metallurgical Department measured the internal dimensions[31] of the cross sections of BDHT heater 150-5. The radial dimensions used by ORINC for THTF bundle 1 inverse calculations are tabulated in Table A-3 (see Fig. A-12 for zone designations).

Heater Rod Component Physical Properties

The inverse model and code requires the following physical properties for each component in the heater rod: density ρ, thermal conductivity k, and specific heat Cp.

An extensive literature search[32-43] was conducted to collect the available physical property information for MgO, Inconel-600, Cupro Nickel, BN, and 316 stainless steel. Except for the thermal conductivities of MgO and BN, the optimum polynomial fit in terms of temperature was determined for the heat capacity and thermal conductivity of each component. These least-squares fits are presented in Tables A-4 to A-8.

The difficulty in presenting a single curve for the thermal conductivity of MgO is that it is an extreme function of the packed density (porosity) of the ceramic.[32] As stated previously in the description of the rod manufacturing technique, the compaction of the MgO core varies depending on the axial position in the rod. Therefore, the effective MgO thermal conductivity must be determined in situ and is part of the rod calibration procedure.[44]

Table A-3. THTF heater radial dimensions

Zone (refer to Fig. A-12)	MgO outer diam [cm (in.)]	Base Inconel thickness [cm (in.)]	1st Inconel oversleeve thickness [cm (in.)]	2nd Inconel oversleeve thickness [cm (in.)]	1st Cu-Ni oversleeve thickness [cm (in.)]	2nd Cu-Ni oversleeve thickness [cm (in.)]	Boron nitride thickness [cm (in.)]	Inner SS sheath thickness [cm (in.)]	Outer SS sheath thickness [cm (in.)]
I	0.5527 (0.2176)	0.0335 (0.0132)					0.1270 (0.0500)	0.0762 (0.0300)	0.0254 (0.0100)
II	0.5319 (0.2094)	0.0340 (0.0134)	0.0099 (0.0039)				0.1270 (0.0500)	0.0762 (0.0300)	0.0254 (0.0100)
III	0.5126 (0.2018)	0.0348 (0.0137)	0.0099 (0.0039)	0.0089 (0.0035)			0.1270 (0.0500)	0.0762 (0.0300)	0.0254 (0.0100)
IV	0.4831 (0.1902)	0.0356 (0.0140)	0.0099 (0.0039)	0.0089 (0.0035)	0.0140 (0.0055)		0.1270 (0.0500)	0.0762 (0.0300)	0.0254 (0.0100)
V	0.4552 (0.1792)	0.0356 (0.0140)	0.0099 (0.0039)	0.0089 (0.0035)	0.0140 (0.0055)	0.0140 (0.055)	0.1270 (0.0500)	0.0762 (0.0300)	0.0254 (0.0100)

Zone	MgO outer radius [cm (in.)]	Inconel outer radius [cm (in.)]	Cu-Ni outer radius [cm (in.)]	Boron nitride outer radius [cm (in.)]	Inner sheath outer radius [cm (in.)]	Outer sheath outer radius [cm (in.)]
I	0.2764 (0.1088)	0.3099 (0.1220)		0.4369 (0.1720)	0.5131 (0.2020)	0.5385 (0.2120)
II	0.2659 (0.1047)	0.3099 (0.1220)		0.4369 (0.1720)	0.5131 (0.2020)	0.5385 (0.2120)
III	0.2563 (0.1009)	0.3099 (0.1220)		0.4369 (0.1720)	0.5131 (0.2020)	0.5385 (0.2120)
IV	0.2416 (0.0951)	0.2959 (0.1165)	0.3099 (0.1220)	0.4369 (0.1720)	0.5131 (0.2020)	0.5385 (0.2120)
V	0.2276 (0.0896)	0.2819 (0.1110)	0.3099 (0.1220)	0.4369 (0.1720)	0.5131 (0.2020)	0.5385 (0.2120)

Table A-4. Physical property data for Inconel 600

1 Btu/hr-ft-°F = 1.73 W/m-°C
1 Btu/lb-°F = 1 cal/g-°C
1 lb/ft^3 = 0.01602 g/cm^3
°C = 5/9 (°F − 32)
Density = 526 lb/ft^3
Melting point = 2500–2600°F

Temperature (°F)	Specific heat, Cp (Btu/lb-°F)	Thermal conductivity, k (Btu/hr-ft-°F)
0.	0.0977	8.4
50.	0.1011	8.6
100.	0.1041	8.7
150.	0.1068	8.9
200.	0.1092	9.1
250.	0.1113	9.3
300.	0.1132	9.5
350.	0.1148	9.7
400.	0.1163	9.9
450.	0.1176	10.2
500.	0.1188	10.4
550.	0.1199	10.6
600.	0.1209	10.9
650.	0.1218	11.2
700.	0.1228	11.4
750.	0.1237	11.7
800.	0.1247	12.0
850.	0.1258	12.2
900.	0.1270	12.5
950.	0.1283	12.8
1000.	0.1297	13.1
1050.	0.1314	13.4
1100.	0.1332	13.7
1150.	0.1353	14.0
1200.	0.1377	14.3
1250.	0.1404	14.6
1300.	0.1434	14.9
1350.	0.1467	15.2
1400.	0.1505	15.5
1450.	0.1546	15.8
1500.	0.1592	16.1
1550.	0.1643	16.4
1600.	0.1698	16.7
1650.	0.1759	17.0
1700.	0.1826	17.3
1750.	0.1898	17.6
1800.	0.1977	17.8

Best polynomial fit to data for Cp and k:

$$Cp = 9.77430344 \times 10^{-2} + 7.11642206 \times 10^{-5}\ T - 7.72415660 \times 10^{-8}\ T^2 + 3.80815379 \times 10^{-11}\ T^3,$$

$$k = 8.42944336 + 2.88105011 \times 10^{-3}\ T + 2.42143869 \times 10^{-6}\ T^2 - 6.19365892 \times 10^{-10}\ T^3,$$

where k has units of Btu/hr-ft-°F, Cp has units of Btu/lb-°F, and T has units of °F.

Table A-5. Physical property data for Cupro Nickel

1 Btu/hr-ft-°F = 1.73 W/m-°C
1 Btu/lb-°F = 1 cal/g-°C
1 lb/ft^3 = 0.01602 g/cm^3
°C = 5/9 (°F − 32)
Density = 553 lb/ft^3
Melting point = 2140–2280°F

Temperature (°F)	Specific heat, Cp (Btu/lb-°F)	Thermal conductivity, k (Btu/hr-ft-°F)
0.	0.0950	16.8
50.	0.0965	16.8
100.	0.0978	17.1
150.	0.0991	17.5
200.	0.1004	18.0
250.	0.1016	18.6
300.	0.1027	19.3
350.	0.1039	20.1
400.	0.1049	21.0
450.	0.1060	21.9
500.	0.1070	22.8
550.	0.1080	23.8
600.	0.1090	24.9
650.	0.1100	26.1
700.	0.1110	27.3
750.	0.1119	28.6
800.	0.1129	30.0
850.	0.1139	31.5
900.	0.1149	33.2
950.	0.1159	35.1
1000.	0.1169	37.2
1050.	0.1180	39.5
1100.	0.1191	42.2
1150.	0.1203	45.2
1200.	0.1215	48.6
1250.	0.1227	52.4
1300.	0.1240	56.8
1350.	0.1253	61.7
1400.	0.1268	67.2
1450.	0.1282	73.4
1500.	0.1298	80.4
1550.	0.1314	88.3
1600.	0.1332	97.0
1650.	0.1350	106.8
1700.	0.1369	117.6
1750.	0.1389	129.6
1800.	0.1410	142.9

Best polynomial fit to data for Cp and k:

$$Cp = 9.50193405 \times 10^{-2} + 2.93776393 \times 10^{-5}\ T - 1.41008059 \times 10^{-8}\ T^2 + 6.65068001 \times 10^{-12}\ T^3,$$

$$k = 1.68024902 \times 10^{1} - 1.31225586 \times 10^{-3}\ T + 4.43458557 \times 10^{-5}\ T^2 - 4.77302819 \times 10^{-8}\ T^3 + 2.50679477 \times 10^{-11}\ T^4,$$

where k has units of Btu/hr-ft-°F, Cp has units of Btu/lb-°F, and T has units of °F.

Table A-6. Physical property data for 316 stainless steel

1 Btu/hr-ft-°F = 1.73 W/m-°C
1 Btu/lb-°F = 1 cal/g-°C
1 lb/ft^3 = 0.01602 g/cm^3
°C = 5/9 (°F − 32)
Density = 496 lb/ft^3
Melting point = 2500–2550°F

Temperature (°F)	Specific heat, Cp (Btu/lb-°F)	Thermal conductivity, k (Btu/hr-ft-°F)
0.	0.1042	7.2
50.	0.1072	7.5
100.	0.1099	7.7
150.	0.1124	8.0
200.	0.1148	8.2
250.	0.1170	8.5
300.	0.1190	8.7
350.	0.1209	8.9
400.	0.1227	9.1
450.	0.1243	9.4
500.	0.1259	9.6
550.	0.1274	9.8
600.	0.1288	10.0
650.	0.1301	10.2
700.	0.1313	10.4
750.	0.1325	10.7
800.	0.1337	10.9
850.	0.1348	11.1
900.	0.1359	11.3
950.	0.1369	11.5
1000.	0.1380	11.7
1050.	0.1390	11.9
1100.	0.1400	12.1
1150.	0.1411	12.4
1200.	0.1421	12.6
1250.	0.1431	12.8
1300.	0.1442	13.0
1350.	0.1452	13.2
1400.	0.1463	13.5
1450.	0.1474	13.7
1500.	0.1485	13.9
1550.	0.1496	14.2
1600.	0.1508	14.4
1650.	0.1519	14.7
1700.	0.1531	14.9
1750.	0.1543	15.2
1800.	0.1556	15.4

Best polynomial fit to data for Cp and k:

$$Cp = 1.04247093 \times 10^{-1} + 6.05583191 \times 10^{-5}\ T - 4.37721610 \times 10^{-8}\ T^2 + 2.01225703 \times 10^{-11}\ T^3 - 3.16413562 \times 10^{-15}\ T^4,$$

$$k = 7.24584961 + 5.07926941 \times 10^{-3}\ T - 9.89995897 \times 10^{-7}\ T^2 + 3.82840426 \times 10^{-10}\ T^3,$$

where k has units of Btu/hr-ft-°F, Cp has units of Btu/lb-°F, and T has units of °F.

Table A-7. Physical property data for magnesium oxide

1 Btu/hr-ft-°F = 1.73 W/m-°C
1 Btu/lb-°F = 1 cal/g-°C
1 lb/ft^3 = 0.01602 g/cm^3
°C = 5/9 (°F − 32)
Density = 212 lb/ft^3

Temperature (°F)	Specific heat, Cp (Btu/lb-°F)
0.	0.2243
50.	0.2302
100.	0.2359
150.	0.2413
200.	0.2463
250.	0.2511
300.	0.2557
350.	0.2599
400.	0.2639
450.	0.2677
500.	0.2712
550.	0.2745
600.	0.2776
650.	0.2805
700.	0.2832
750.	0.2856
800.	0.2879
850.	0.2901
900.	0.2920
950.	0.2938
1000.	0.2955
1050.	0.2970
1100.	0.2984
1150.	0.2997
1200.	0.3009
1250.	0.3020
1300.	0.3030
1350.	0.3039
1400.	0.3047
1450.	0.3055
1500.	0.3062
1550.	0.3069
1600.	0.3075
1650.	0.3081
1700.	0.3087
1750.	0.3093
1800.	0.3098

Best polynomial fit to data for Cp:

$$Cp = 2.24258423 \times 10^{-1} + 1.22666359 \times 10^{-4}\ T - 6.35191100 \times 10^{-8}\ T^2 + 1.21040955 \times 10^{-11}\ T^3,$$

where Cp has units of Btu/lb-°F and T has units of °F.

Table A-8. Physical property data for boron nitride

1 Btu/hr-ft-°F = 1.73 W/m-°C
1 Btu/lb-°F = 1 cal/g-°C
1 lb/ft^3 = 0.01602 g/cm^3
°C = 5/9 (°F − 32)
Density = 125 lb/ft^3

Temperature (°F)	Specific heat, Cp (Btu/lb-°F)
0.	0.1678
50.	0.1859
100.	0.2031
150.	0.2195
200.	0.2352
250.	0.2500
300.	0.2641
350.	0.2775
400.	0.2901
450.	0.3021
500.	0.3134
550.	0.3241
600.	0.3342
650.	0.3437
700.	0.3526
750.	0.3610
800.	0.3689
850.	0.3763
900.	0.3832
950.	0.3897
1000.	0.3957
1050.	0.4014
1100.	0.4067
1150.	0.4116
1200.	0.4162
1250.	0.4205
1300.	0.4245
1350.	0.4283
1400.	0.4318
1450.	0.4352
1500.	0.4383
1550.	0.4413
1600.	0.4441
1650.	0.4469
1700.	0.4495
1750.	0.4521
1800.	0.4546

Best polynomial fit to data for Cp:

$$Cp = 1.67812347 \times 10^{-1} + 3.70264053 \times 10^{-4}\ T - 1.73793524 \times 10^{-7}\ T^2 + 3.14486215 \times 10^{-11}\ T^3,$$

where Cp has units of Btu/lb-°F and T has units of °F.

There are several obstacles in the determination of the BN thermal conductivity: (1) thermal conductivity is a function of the packed density;[35] (2) most of the available data has been collected at temperatures in excess of 1089 K (1500°F), which is outside the range of our application;[32] and (3) the thermal conductivity is dependent on the direction of the molding (or applied) pressure, i.e., the ratio of the conductivity measured perpendicular to the molding pressure to the conductivity measured parallel to the molding pressure can be as much as 2.[37] Therefore, the effective BN thermal conductivity must also be determined in situ as part of the rod calibration procedure.[44]

Heater Rod Calibration[44]

Because of rod-to-rod variance in manufacture, the mechanical and thermal transients involved during a blowdown of the THTF, and changing of the bundle response due to "aging," an extensive thermocouple calibration procedure was developed which supplies heater rod performance information to the inverse heat conduction model.

The heater rod is reduced to its final diameter by swaging, often creating an imperfect fit between the inner and outer sheaths at the thermocouple locations and resulting in a gap between the thermocouple junction and the outer sheath (Figs. A-6 and A-7, pages 58 and 59).[30] The thermocouple is welded to the inner sheath, causing the gap between the junction and outer sheath to grow with increasing fluid temperature and to close with increasing heater power. With successive blowdown transients the residual gap increases, apparently due to plastic deformation of the outer sheath.

In order to improve the confidence band on the calculated surface heat flux and temperature, a four-part calibration program, ORTCAL,[44] and an experimental thermocouple calibration procedure were developed. Before each transient test, a succession of steady-state points at different heater rod power levels and fluid temperatures are taken. These points are accumulated on history tapes which contain all the information gathered for each thermocouple position from the first test to present. These tapes are then processed by the first two parts of ORTCAL.

The first part calculates basic gap information such as width and temperature drop and produces the "aging" history of each location. The second part uses the sheath thermocouple and middle thermocouple indicated temperatures to produce the effective thermal conductivity of the BN insulator. This provides necessary in situ information for the inverse program and gives an indication of the mechanical integrity of the heater.

Power drop tests are performed by the third part of ORTCAL which produces the effective thermal conductivity of the MgO insulator. The results indicate up to 20% porosity in this region.

The fourth part of ORTCAL does regression analysis on the output from part one to determine the expansion coefficients and proper bias points for the stainless steel annuli forming the gap. The mechanical model chosen to utilize this information is one-dimensional, which is consistent with the thermal model used in the inverse calculation.

The combined output from ORTCAL is a coefficient data tape which contains the regression and bias information for each thermocouple position in the THTF bundle. This information is then used by ORINC to simulate the thermo-mechanical response of the heater rod.

APPENDIX B

INVERSE MODEL FOR THTF HEATERS

The derivation of the inverse model specifically for THTF heaters will be subdivided as follows:

1. Mathematical model of heat transfer inside a continuous substrate where the heat flow between nodes is assumed constant at any radial position between nodes (i.e., for the BN insulator and the inner and outer stainless steel sheaths).
2. Mathematical model of heat transfer inside a continuous substrate where the heat flow between nodes is assumed proportional to r^2 (i.e., for the MgO core and the laminated heater section).
3. Mathematical model of heat transfer at the MgO-to-heater interface.
4. Mathematical model of heat transfer at the Inconel-to-Cupro Nickel interface.
5. Mathematical model of heat transfer at the heater-to-BN interface.
6. Mathematical model of heat transfer at the BN-to-inner stainless steel sheath interface.
7. Mathematical model of heat transfer at the sheath-to-sheath interface.
8. Mathematical model of heat transfer at the outer sheath-to-fluid boundary.
9. Mathematical model of heat transfer from node 1 in the MgO core to the pin center line (or to r = 0.0).
10. Mathematical model of the thermal-mechanical behavior of the gap between the inner and outer stainless steel sheaths.

In sections 1 to 8, a slightly different approach from the general model derivation is used; for increased physical understanding, a heat balance is made on a node. The approach is different but the resulting equations are the same.

Note that in 3, 5, and 6, the derived models allow for gaps at the interfaces, which ORINC is coded to accept; at present, these gaps have zero width.

Mathematical Model of Heat Transfer Inside a Continuous Substrate with Heat Flow Constant (Fig. B-1)

Assumptions:

1. Heat flow between nodes (e.g., $q_{i-1,i}$) is constant at any r between nodes,
2. Nodal mass $(\rho V)_i$ is constant,
3. Heat capacity Cp_i and thermal conductivity k_i are evaluated at the present nodal temperature $T_i(t)$.

A heat balance on the shaded area (node i) in Fig. B-1 yields

$$q_{i-1,i} - q_{i,i+1} + \dot{q}_i = \rho(CpV)_i \, \partial T_i/\partial t \ . \tag{B.1}$$

Using assumption 1,

$$q_{i-1,i} = -k_{i-1} 2\pi \ell \frac{(T@r_{i-1} - T_{i-1})}{\ln (r_{i-1}/\bar{r}_{i-1})} \tag{B.2}$$

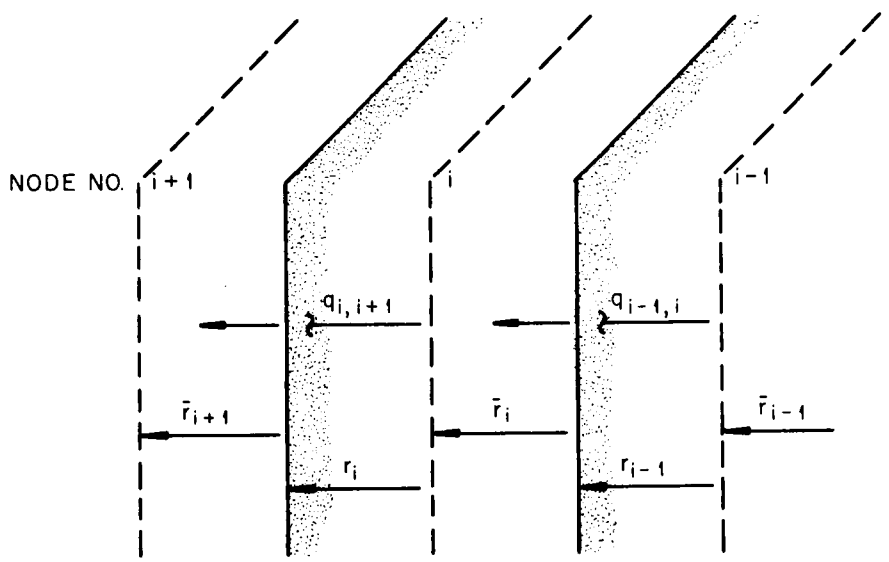

Fig. B-1. Schematic denoting element notation.

and

$$q_{i-1,i} = -k_i 2\pi\ell \frac{(T_i - T@r_{i-1})}{\ln(\bar{r}_i/r_{i-1})} ; \tag{B.3}$$

adding Eqs. (B.2) and (B.3) and with transposition

$$q_{i-1,i} = -\left[\frac{\ln(r_{i-1}/\bar{r}_{i-1})}{2k_{i-1}} + \frac{\ln(\bar{r}_i/r_{i-1})}{2k_i}\right]^{-1} (T_i - T_{i-1})\pi\ell . \tag{B.4}$$

Similarly,

$$q_{i,i+1} = -\left[\frac{\ln(\bar{r}_{i+1}/r_i)}{2k_{i+1}} + \frac{\ln(r_i/\bar{r}_i)}{2k_i}\right]^{-1} (T_{i+1} - T_i)\pi\ell . \tag{B.5}$$

For the heat generation term,

$$\dot{q}_i = \dot{q}_i'''V_i = \dot{q}_i'''\pi\ell(r_i^2 - r_{i-1}^2) . \tag{B.6}$$

Expansion of the accumulation term in Eq. (B.1) yields

$$\rho(CpV)_i \frac{\partial T_i}{\partial t} = \rho Cp_i \pi\ell(r_i^2 - r_{i-1}^2) \frac{T_i(t + \Delta t) - T_i(t)}{\Delta t} . \tag{B.7}$$

After substituting Eqs. (B.4), (B.5), (B.6), and (B.7) into (B.1) and dividing out $\pi\ell$, the implicit formulation of the equation is

$$-\left[\frac{2}{\frac{\ln(\bar{r}_i/r_{i-1})}{k_i} + \frac{\ln(r_{i-1}/\bar{r}_{i-1})}{k_{i-1}}}\right][T_i(t + \Delta t) - T_{i-1}(t + \Delta t)]$$

$$+\left[\frac{2}{\frac{\ln(\bar{r}_{i+1}/r_i)}{k_{i+1}} + \frac{\ln(r_i/\bar{r}_i)}{k_i}}\right][T_{i+1}(t + \Delta t) - T_i(t + \Delta t)]$$

$$+ \dot{q}_i'''(r_i^2 - r_{i-1}^2) = \left[\frac{\rho Cp_i(r_i^2 - r_{i-1}^2)}{\Delta t}\right][T_i(t + \Delta t) - T_i(t)] . \tag{B.8}$$

Rearranging Eq. (B.8) and collecting terms yields

$$\left[\frac{2}{\frac{\ln(\bar{r}_i/r_{i-1})}{k_i}+\frac{\ln(r_{i-1}/\bar{r}_{i-1})}{k_{i-1}}}\right]T_{i-1}(t+\Delta t)$$

$$+\left[-\frac{2}{\frac{\ln(\bar{r}_i/r_{i-1})}{k_i}+\frac{\ln(r_{i-1}/\bar{r}_{i-1})}{k_{i-1}}}-\frac{\rho Cp_i(r_i^2-r_{i-1}^2)}{\Delta t}\right.$$

$$\left.-\frac{2}{\frac{\ln(\bar{r}_{i+1}/r_i)}{k_{i+1}}+\frac{\ln(r_i/\bar{r}_i)}{k_i}}\right]T_i(t+\Delta t)+\left[\frac{2}{\frac{\ln(\bar{r}_{i+1}/r_i)}{k_{i+1}}+\frac{\ln(r_i/\bar{r}_i)}{k_i}}\right]$$

$$\times T_{i+1}(t+\Delta t)=-\dot{q}_i'''(r_i^2-r_{i-1}^2)-\left[\frac{\rho Cp_i(r_i^2-r_{i-1}^2)}{\Delta t}\right]T_i(t)\ . \qquad (B.9)$$

Mathematical Model of Heat Transfer Inside a Continuous Substrate with Heat Flow Proportional to r^2 (Fig. B-1)

Assumptions:

1. Heat flow between nodes (e.g., $q_{i-1,i}$) is proportional to r^2,
2. Nodal mass $(\rho V)_i$ is constant,
3. Heat capacity Cp_i and thermal conductivity k_i are evaluated at the present nodal temperature $T_i(t)$.

A heat balance in the shaded area (node i) in Fig. B-1 yields

$$q_{i-1,i}-q_{i,i+1}+\dot{q}_i=\rho(CpV)_i\,\partial T_i/\partial t\ . \qquad (B.10)$$

Using assumption 1

$$q_{i-1,i}=-\frac{\bar{k}_{i-1,i}\,4\pi\ell\,r_{i-1}^2}{(\bar{r}_i^2-\bar{r}_{i-1}^2)}(T_i-T_{i-1})\ , \qquad (B.11)$$

where

$$\bar{k}_{i-1,i} = \frac{k_{i-1} + k_i}{2} \quad . \tag{B.12}$$

Also,

$$q_{i,i+1} = -\frac{\bar{k}_{i,i+1}\ 4\pi\ell\ r_i^2}{(\bar{r}_{i+1}^2 - \bar{r}_i^2)} (T_{i+1} - T_i) \quad . \tag{B.13}$$

For the heat generation term,

$$\dot{q}_i = \dot{q}_i'''V_i = \dot{q}_i'''\pi\ell\ (r_i^2 - r_{i-1}^2) \quad . \tag{B.14}$$

Expanding the accumulation term in Eq. (B.10),

$$\rho(CpV)_i \frac{\partial T_i}{\partial t} = \rho Cp_i \pi\ell\ (r_i^2 - r_{i-1}^2) \frac{T_i(t + \Delta t) - T_i(t)}{\Delta t} \quad . \tag{B.15}$$

The implicit formulation of the equation resulting from the substitution of Eqs. (B.11) to (B.15) into Eq. (B.10) (and dividing out $\pi\ell$) is

$$-\left[\frac{4\bar{k}_{i-1,i} r_{i-1}^2}{(\bar{r}_i^2 - \bar{r}_{i-1}^2)}\right] [T_i(t + \Delta t) - T_{i-1}(t + \Delta t)]$$

$$+\left[\frac{4\bar{k}_{i,i+1} r_i^2}{(\bar{r}_{i+1}^2 - \bar{r}_i^2)}\right] [T_{i+1}(t + \Delta t) - T_i(t + \Delta t)]$$

$$+ \dot{q}_i'''(r_i^2 - r_{i-1}^2) = \left[\frac{\rho Cp_i (r_i^2 - r_{i-1}^2)}{\Delta t}\right] [T_i(t + \Delta t) - T_i(t)] \quad . \tag{B.16}$$

Rearranging Eq. (B.16) with collection of terms,

$$\left[\frac{4\bar{k}_{i-1,i}r_{i-1}^2}{(\bar{r}_i^2 - \bar{r}_{i-1}^2)}\right] T_{i-1}(t + \Delta t) + \left[- \frac{4\bar{k}_{i-1,i}r_{i-1}^2}{(\bar{r}_i^2 - \bar{r}_{i-1}^2)} - \frac{\rho Cp_i(r_i^2 - r_{i-1}^2)}{\Delta t} \right.$$

$$\left. - \frac{4\bar{k}_{i,i+1}r_i^2}{(\bar{r}_{i+1}^2 - \bar{r}_i^2)}\right] T_i(t + \Delta t) + \left[\frac{4\bar{k}_{i,i+1}r_i^2}{(\bar{r}_{i+1}^2 - \bar{r}_i^2)}\right] T_{i+1}(t + \Delta t)$$

$$= -\dot{q}_i'''(r_i^2 - r_{i-1}^2) - \left[\frac{\rho Cp_i(r_i^2 - r_{i-1}^2)}{\Delta t}\right] T_i(t) \ . \qquad \text{(B.17)}$$

Equation (B.17) can be further simplified for the MgO core by employing the definitions of r_i and $\bar{r}_i$

$$r_{i-1+j} = (r_{i-1}^2 + j\ \Delta r^2)^{1/2} \qquad \text{(B.18)}$$

where j = 0, n and

$$\bar{r}_{i-1+j} = (r_{i-1+j}^2 - 0.5\ \Delta r^2)^{1/2} \ , \qquad \text{(B.19)}$$

where j = 1, n and

$$\Delta r^2 = \frac{r_{i-1+n}^2 - r_{i-1}^2}{n} \ , \qquad \text{(B.20)}$$

where n = number of nodes. Applying the above equations to the radial domain of $(0, r_{NMGO})$ for MgO,

$$\Delta r_{MgO}^2 = r_{NMGO}^2/NMGO \qquad \text{(B.21)}$$

where NMGO = number of nodes in MgO,

$$r_j^2 = j\ \Delta r_{MgO}^2 \qquad \text{(B.22)}$$

where j = 0, NMGO and

$$\bar{r}_j^2 = r_j^2 - 0.5\ \Delta r_{MgO} \qquad \text{(B.23)}$$

where j = 1,NMGO; substituting Eq. (B.22) into (B.23) yields

$$\bar{r}_j^2 = j\,\Delta r_{MgO}^2 - 0.5\,\Delta r_{MgO}^2 = (j - 0.5)\,\Delta r_{MgO}^2 \,. \qquad (B.24)$$

Substituting Eqs. (B.22) and (B.24) into Eq. (B.17) and with $\dot{q}''' = 0$,

$$\left[\frac{4\bar{k}_{i-1,i}\,(i-1)\,\Delta r_{MgO}^2}{(i - 0.5 - i + 1 + 0.5)\Delta r_{MgO}^2}\right] T_{i-1}(t + \Delta t)$$

$$+\left[-\frac{4\bar{k}_{i-1,i}\,(i-1)\Delta r_{MgO}^2}{(i - 0.5 - i + 1 + 0.5)\Delta r_{MgO}^2} - \frac{\rho Cp_i(i - i + 1)\Delta r_{MgO}^2}{\Delta t}\right.$$

$$\left.-\frac{4\bar{k}_{i,i+1}(i)\Delta r_{MgO}^2}{(i + 1 - 0.5 - i + 0.5)\Delta r_{MgO}^2}\right] T_i(t + \Delta t)$$

$$+\left[\frac{4\bar{k}_{i,i+1}(i)\Delta r_{MgO}^2}{(i + 1 - 0.5 - i + 0.5)\Delta r_{MgO}^2}\right] T_{i+1}(t + \Delta t)$$

$$= -\dot{q}_i'''(i - i + 1)\Delta r_{MgO}^2 - \left[\frac{\rho Cp_i(i - i + 1)\Delta r_{MgO}^2}{\Delta t}\right] T_i(t) \,. \qquad (B.25)$$

Equation (B.25) reduces to

$$\left[4\bar{k}_{i-1,i}(i-1)\right] T_{i-1}(t + \Delta t) + \left[-4\bar{k}_{i-1,i}(i-1) - \frac{\rho Cp_i\Delta r_{MgO}^2}{\Delta t}\right.$$

$$\left.-4\bar{k}_{i,i+1}(i)\right] T_i(t + \Delta t) + \left[4\bar{k}_{i,i+1}(i)\right] T_{i+1}(t + \Delta t)$$

$$= -\left[\frac{\rho Cp_i\Delta r_{MgO}^2}{\Delta t}\right] T_i(t) \,. \qquad (B.26)$$

Equation (B.26) is applicable only for the MgO core, whereas Eq. (B.17) can be applied to the Cupro Nickel, Inconel, and MgO regions.

Mathematical Model of Heat Transfer at the MgO-to-Heater Interface (Fig. B-2)

Assumptions:

1. Heat flow between nodes is proportional to r^2,
2. Nodal mass $(\rho V)_i$ is constant, heat capacity Cp_i and thermal conductivity k_i are evaluated at the present nodal temperature $T_i(t)$,
3. A gap exists at the MgO-to-heater interface and heat can be transferred via conduction, convection, and radiation across the gap.

A heat balance on node NMGO in Fig. B-2 yields

$$q_{NMGO-1,NMGO} - q_{NMGO,NM} + \cancel{\dot{q}^{0}_{NMGO}} = \rho(CpV)_{NMGO}\,(\partial T_{NMGO}/\partial t) \; . \qquad (B.27)$$

Applying Eqs. (B.11), (B.12), and (B.24)

$$q_{NMGO-1,NMGO} = -\frac{\bar{k}_{NMGO-1,NMGO}\,4\pi\ell r^2_{NMGO-1}}{(\bar{r}^2_{NMGO} - \bar{r}^2_{NMGO-1})}\,(T_{NMGO} - T_{NMGO-1})$$

$$= -\frac{\bar{k}_{NMGO-1,NMGO}\,4\pi\ell(NMGO-1)\Delta r^2_{MgO}}{(NMGO - 0.5 - NMGO + 1 + 0.5)\Delta r^2_{MgO}}\,(T_{NMGO} - T_{NMGO-1}) \; .$$

Therefore,

$$q_{NMGO-1,NMGO} = -\bar{k}_{NMGO-1,NMGO}\,4\pi\ell(NMGO-1)(T_{NMGO} - T_{NMGO-1}) \; . \qquad (B.28)$$

Also, for $q_{NMGO,NM}$,

$$q_{NMGO,NM} = -\frac{k_{NMGO}\,4\pi\ell r^2_{NMGO}}{(r^2_{NMGO} - \bar{r}^2_{NMGO})}\,(T_{MgO_{surf}} - T_{NMGO})$$

$$= -\frac{k_{NMGO}\,4\pi\ell(NMGO)\Delta r^2_{MgO}}{(NMGO - NMGO + 0.5)\Delta r^2_{MgO}}\,(T_{MgO_{surf}} - T_{NMGO})$$

$$= -k_{NMGO}\,8\pi\ell(NMGO)(T_{MgO_{surf}} - T_{NMGO}) \; ; \qquad (B.29)$$

and considering a gap between the MgO and heater and that heat can be

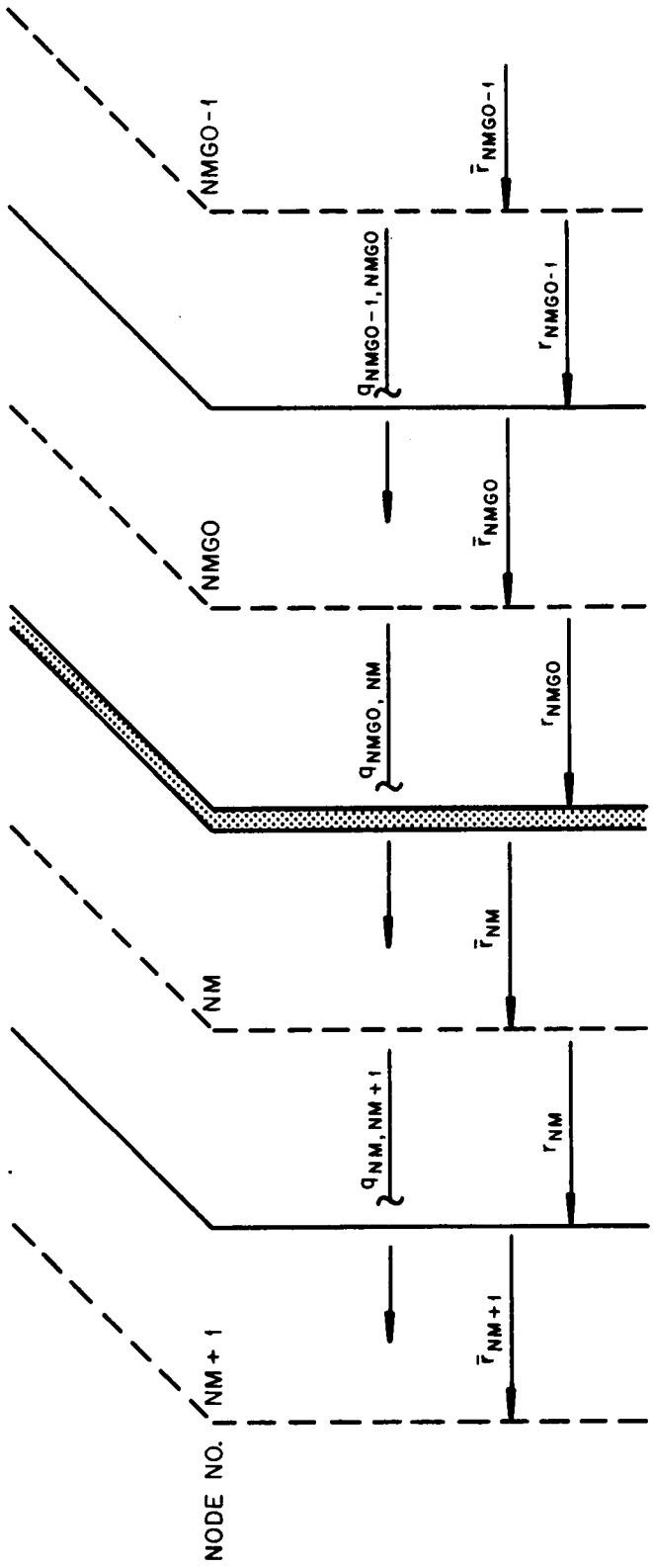

Fig. B-2. Notation relative to the derivation of the heat transfer model at the MgO-heater interface.

transferred via conduction, convection, and radiation across the gap; via conduction

$$q_{NMGO,NM} = -\frac{k_{gap}\,2\pi\ell}{\ln\,(r_{NMGO} + \Delta r_{gap_1}/r_{NMGO})}\,(T_{Heat_{surf}} - T_{MgO_{surf}})\,, \qquad (B.30)$$

via convection

$$q_{NMGO,NM} = -2\pi r_{NMGO}\ell h_{gap_1}\,(T_{Heat_{surf}} - T_{MgO_{surf}})\,, \qquad (B.31)$$

via radiation

$$q_{NMGO,NM} = -2\pi r_{NMGO}\ell h_{r_1}\,(T_{Heat_{surf}} - T_{MgO_{surf}})\,, \qquad (B.32)$$

where

$$h_{r_1} = \sigma f(T^2_{Heat_{surf}} + T^2_{MgO_{surf}})(T_{Heat_{surf}} + T_{MgO_{surf}}) \qquad (B.33)$$

and h_{r_1} is evaluated at present time. Also,

$$q_{NMGO,NM} = -\frac{k_{NM}4\pi\ell r^2_{NMGO}}{(\bar{r}^2_{NM} - r^2_{NMGO})}\,(T_{NM} - T_{Heat_{surf}})$$

$$= -\frac{k_{NM}8\pi\ell r^2_{NMGO}}{\Delta r^2_{heater}}\,(T_{NM} - T_{Heat_{surf}})\,. \qquad (B.34)$$

Adding Eqs. (B.29), (B.30), (B.31), (B.32), and (B.34) with transposition,

$$q_{NMGO,NM} = -\pi\ell\left[\frac{\Delta r^2_{heater}}{8k_{NM}\,r^2_{NMGO}}\right.$$

$$+ \frac{1}{\dfrac{2k_{gap_1}}{\ln\,(r_{NMGO} + \Delta r_{gap_1}/r_{NMGO})} + 2r_{NMGO}h_{gap_1} + 2r_{NMGO}h_{r_1}}$$

$$\left. + \frac{1}{8k_{NMGO}(NMGO)}\right]^{-1}(T_{NM} - T_{NMGO})\,. \qquad (B.35)$$

Substituting Eqs. (B.28) and (B.35) into (B.27) with expansion of the accumulation term and elimination of $\pi\ell$,

$$-\left[\bar{k}_{NMGO-1,NMGO}\,4(NMGO-1)\right]\,[T_{NMGO}(t+\Delta t)-T_{NMGO-1}(t+\Delta t)]$$

$$+\left[\frac{\Delta r^2_{heater}}{8k_{NM}\,r^2_{NMGO}}+\frac{1}{\frac{2k_{gap_1}}{\ln\,(r_{NMGO}+\Delta r_{gap_1}/r_{NMGO})}+2r_{NMGO}h_{gap_1}+2r_{NMGO}h_{r_1}}\right.$$

$$\left.+\frac{1}{8k_{NMGO}(NMGO)}\right]^{-1}[T_{NM}(t+\Delta t)-T_{NMGO}(t+\Delta t)]=\left[\frac{\rho_{MgO}Cp_{NMGO}\Delta r^2_{MgO}}{\Delta t}\right][T_{NMGO}(t+\Delta t)-T_{NMGO}(t)]\,. \qquad \text{(B.36)}$$

Rearranging Eq. (B.36) and collecting terms gives the following equation for node NMGO (the last node in the MgO core):

$$[\bar{k}_{NMGO-1,NMGO}\,4(NMGO-1)]\;T_{NMGO-1}\;(t+\Delta t)+\left[-\bar{k}_{NMGO-1,NMGO}\,4(NMGO-1)-\frac{\rho_{MgO}Cp_{NMGO}\Delta r^2_{MgO}}{\Delta t}\right.$$

$$\left.-\frac{2}{\frac{\Delta r^2_{heater}}{4k_{NM}r^2_{NMGO}}+\frac{1}{\frac{k_{gap_1}}{\ln\,(r_{NMGO}+\Delta r_{gap_1}/r_{NMGO})}+r_{NMGO}h_{gap_1}+r_{NMGO}h_{r_1}}+\frac{1}{4k_{NMGO}(NMGO)}}\right]T_{NMGO}(t+\Delta t)$$

$$+\left[\frac{2}{\frac{\Delta r^2_{heater}}{4k_{NM}r^2_{NMGO}}+\frac{1}{\frac{k_{gap_1}}{\ln\,(r_{NMGO}+\Delta r_{gap_1}/r_{NMGO})}+r_{NMGO}h_{gap_1}+r_{NMGO}h_{r_1}}+\frac{1}{4k_{NMGO}(NMGO)}}\right]T_{NM}(t+\Delta t)$$

$$=-\left[\frac{\rho_{MgO}Cp_{NMGO}\Delta r^2_{MgO}}{\Delta t}\right]T_{NMGO}(t)\,. \qquad \text{(B.37)}$$

A development similar to Eq. (B.37) could be made for node NM in the heater, but since it is analogous, only the final formulation will be presented:

$$\left[\frac{2}{\frac{\Delta r^2_{heater}}{4k_{NM}r^2_{NMGO}}+\frac{1}{\frac{k_{gap_1}}{\ln\,(r_{NMGO}+\Delta r_{gap_1}/r_{NMGO})}+r_{NMGO}h_{gap_1}+r_{NMGO}h_{r_1}}+\frac{1}{4k_{NMGO}(NMGO)}}\right]T_{NMGO}\;(t+\Delta t)$$

$$+\left[-\frac{2}{\frac{\Delta r^2_{heater}}{4k_{NM}r^2_{NMGO}}+\frac{1}{\frac{k_{gap_1}}{\ln\,(r_{NMGO}+\Delta r_{gap_1}/r_{NMGO})}+r_{NMGO}h_{gap_1}+r_{NMGO}h_{r_1}}+\frac{1}{4k_{NMGO}(NMGO)}}\right.$$

$$\left.\frac{\rho_{heater}Cp_{NM}\Delta r^2_{heater}}{\Delta t}-\frac{4\bar{k}_{NM,NM+1}r^2_{NM}}{\Delta r^2_{heater}}\right]T_{NM}(t+\Delta t)+\left[\frac{4\bar{k}_{NM,NM+1}r^2_{NM}}{\Delta r^2_{heater}}\right]T_{NM+1}(t+\Delta t)$$

$$=\dot{q}'''_{NM}\,\Delta r^2_{heater}-\left[\frac{\rho_{heater}Cp_{NM}\Delta r^2_{heater}}{\Delta t}\right]T_{NM}\;(t)\,. \qquad \text{(B.38)}$$

Mathematical Model of Heat Transfer at the Inconel-to-Cupro Nickel Interface (Fig. B-3)

Assumptions:

1. Heat flow between nodes is proportional to r^2,
2. Nodal mass $(\rho V)_i$ is constant, heat capacity Cp_i and thermal conductivity k_i are evaluted at the present nodal temperature $T_i(t)$,
3. A gap does not exist at the interface.

A heat balance on node NOD2 in Fig. B-3 yields

$$q_{NOD2-1,NOD2} - q_{NOD2,NH} + \dot{q}_{NOD2} = \rho(CpV)_{NOD2} \frac{\partial T_{NOD2}}{\partial t} . \tag{B.39}$$

Applying Eq. (B.11),

$$q_{NOD2-1,NOD2} = - \frac{\bar{k}_{NOD2-1,NOD2} 4\pi \ell r^2_{NOD2-1}}{(\bar{r}^2_{NOD2} - \bar{r}^2_{NOD2-1})} (T_{NOD2} - T_{NOD2-1}) \tag{B.40}$$

and

$$q_{NOD2,NH} = - \left[\frac{(r^2_{NOD2} - \bar{r}^2_{NOD2})}{k_{NOD2} 4\pi \ell r^2_{NOD2}} + \frac{(\bar{r}^2_{NH} - r^2_{NOD2})}{k_{NH} 4\pi \ell r^2_{NOD2}} \right]^{-1} (T_{NH} - T_{NOD2}) . \tag{B.41}$$

Equation (B.41) can be simplified since

$$r^2_{NOD2} - \bar{r}^2_{NOD2} = \frac{\Delta r^2_{heater}}{2} \tag{B.42}$$

and

$$\bar{r}^2_{NH} - r^2_{NOD2} = \frac{\Delta r^2_{Cu}}{2} . \tag{B.43}$$

Thus,

$$q_{NOD2,NH} = -\pi \ell \left[\frac{\Delta r^2_{heater}}{8 k_{NOD2} r^2_{NOD2}} + \frac{\Delta r^2_{Cu}}{8 k_{NH} r^2_{NOD2}} \right]^{-1} (T_{NH} - T_{NOD2}) . \tag{B.44}$$

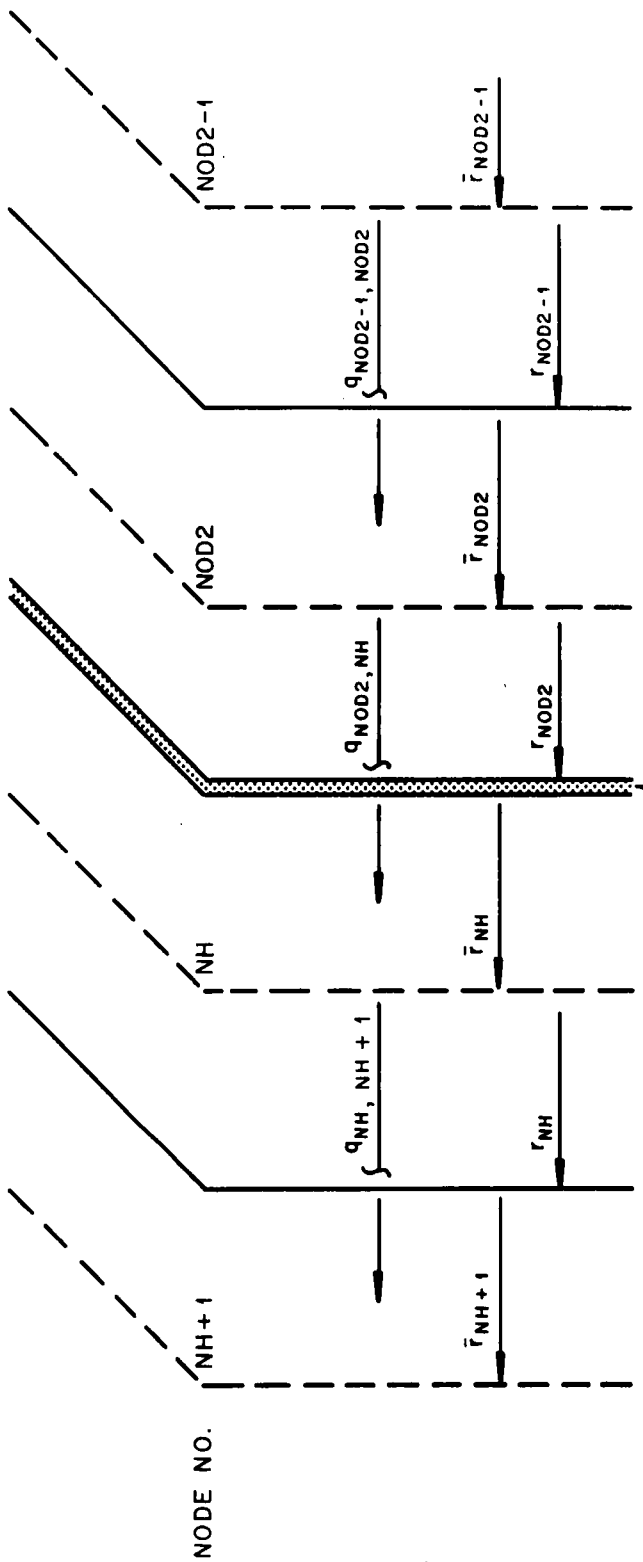

Fig. B-3. Notation relative to the derivation of the heat transfer model at the Inconel to Cupro Nickel interface.

Substituting Eqs. (B.40) and (B.44) into (B.39) with expansion of the heat generation term and accumulation term and elimination of $\pi\ell$ yields

$$-\left[\frac{\bar{k}_{NOD2-1,NOD2}\,4r^2_{NOD2-1}}{(\bar{r}^2_{NOD2}-\bar{r}^2_{NOD2-1})}\right][T_{NOD2}(t+\Delta t)-T_{NOD2-1}(t+\Delta t)]$$

$$+\left[\frac{2}{\frac{\Delta r^2_{heater}}{4k_{NOD2}r^2_{NOD2}}+\frac{\Delta r^2_{Cu}}{4k_{NH}r^2_{NOD2}}}\right][T_{NH}(t+\Delta t)-T_{NOD2}(t+\Delta t)]$$

$$+\dot{q}'''_{NOD2}\Delta r^2_{heater}=\left[\frac{\rho_{heater}Cp_{NOD2}\Delta r^2_{heater}}{\Delta t}\right]$$

$$\times[T_{NOD2}(t+\Delta t)-T_{NOD2}(t)]\ . \qquad (B.45)$$

Rearranging Eq. (B.45) and collecting terms gives the following equation for the last node (NOD2) in the Inconel layer:

$$\left[\frac{\bar{k}_{NOD2-1,NOD2}\,4r^2_{NOD2-1}}{\Delta r^2_{heater}}\right]T_{NOD2-1}(t+\Delta t)+\left[-\frac{\bar{k}_{NOD2-1,NOD2}\,4r^2_{NOD2-1}}{\Delta r^2_{heater}}\right.$$

$$\left.-\frac{\rho_{heater}Cp_{NOD2}\Delta r^2_{heater}}{\Delta t}-\frac{2}{\frac{\Delta r^2_{heater}}{4k_{NOD2}r^2_{NOD2}}+\frac{\Delta r^2_{Cu}}{4k_{NH}r^2_{NOD2}}}\right]T_{NOD2}(t+\Delta t)$$

$$+\left[\frac{2}{\frac{\Delta r^2_{heater}}{4k_{NOD2}r^2_{NOD2}}+\frac{\Delta r^2_{Cu}}{4k_{NH}r^2_{NOD2}}}\right]T_{NH}(t+\Delta t)=-\dot{q}'''_{NOD2}\Delta r^2_{heater}$$

$$-\left[\frac{\rho_{heater}Cp_{NOD2}\Delta r^2_{heater}}{\Delta t}\right]T_{NOD2}(t)\ . \qquad (B.46)$$

Similarly, for node NH in the Cupro Nickel layer

$$\left[\frac{2}{\frac{\Delta r^2_{heater}}{4k_{NOD2}r^2_{NOD2}} + \frac{\Delta r^2_{Cu}}{4k_{NH}r^2_{NOD2}}}\right] T_{NOD2}(t + \Delta t)$$

$$+ \left[- \frac{2}{\frac{\Delta r^2_{heater}}{4k_{NOD2}r^2_{NOD2}} + \frac{\Delta r^2_{Cu}}{4k_{NH}r^2_{NOD2}}} - \frac{\rho_{Cu}Cp_{NH}\Delta r^2_{Cu}}{\Delta t} - \frac{\bar{k}_{NH,NH+1}4r^2_{NH}}{\Delta r^2_{Cu}} \right]$$

$$\times T_{NH}(t + \Delta t) + \left[\frac{\bar{k}_{NH,NH+1}4r^2_{NH}}{\Delta r^2_{Cu}}\right] T_{NH+1}(t + \Delta t)$$

$$= -\dot{q}'''_{NH}\Delta r^2_{Cu} - \left[\frac{\rho_{Cu}Cp_{NH}\Delta r^2_{Cu}}{\Delta t}\right] T_{NH}(t) \quad . \qquad (B.47)$$

Mathematical Model of Heat Transfer at the Heater-to-BN Interface (Fig. B-4)

Assumptions:

1. Heat flow between nodes within the heater element is proportional to r^2,
2. Heat flow between nodes within the BN is constant at any r between nodes,
3. Nodal mass $(\rho V)_i$ is constant,
4. Heat capacity Cp_i and thermal conductivity k_i are evaluated at the present nodal temperature $T_i(t)$,
5. A gap exists at the heater-to-BN interface and heat can be transferred via conduction, convection, and radiation across the gap.

A heat balance on NOD3 in Fig. B-4 yields

$$q_{NOD3-1,NOD3} - q_{NOD3,NC} + \dot{q}_{NOD3} = \rho_{NOD3}(CpV)_{NOD3}\frac{\partial T_{NOD3}}{\partial t} \quad . \qquad (B.48)$$

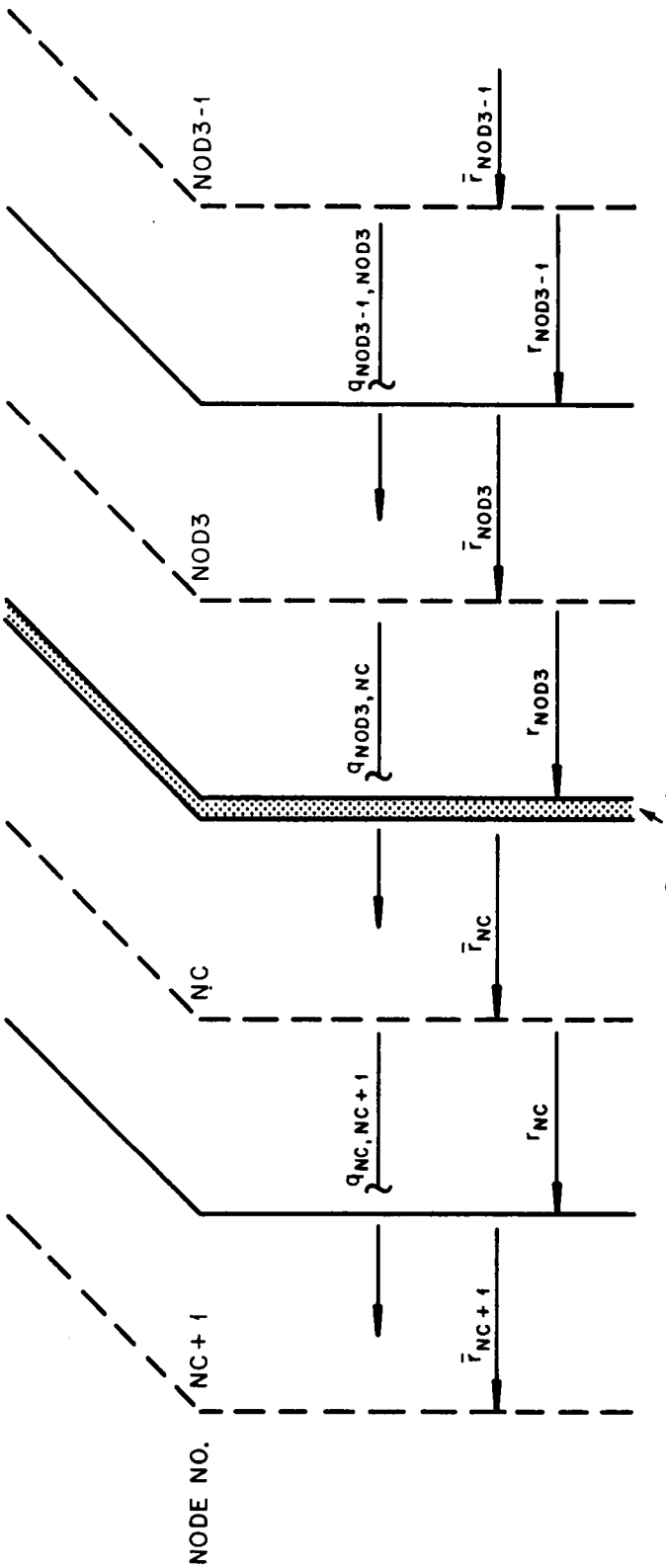

Fig. B-4. Notation relative to the derivation of the heat transfer model at the heater (either Cupro Nickel or Inconel) to boron nitride interface.

Applying Eq. (B.11),

$$q_{NOD3-1,NOD3} = -\frac{\bar{k}_{NOD3-1,NOD3}\,4\pi\ell\,r^2_{NOD3-1}}{(\bar{r}^2_{NOD3} - \bar{r}^2_{NOD3-1})}\,(T_{NOD3} - T_{NOD3-1}) \,. \tag{B.49}$$

A development similar to the one for Eq. (B.35) yields

$$q_{NOD3,NC} = -\pi\ell\left[\frac{2}{\frac{\ln(\bar{r}_{NC}/r_{NOD3})}{k_{NC}} + \frac{1}{\frac{k_{gap_2}}{\ln(r_{NOD3}+\Delta r_{gap_2}/r_{NOD3})} + r_{NOD3}h_{gap_2} + r_{NOD3}h_{r_2}} + \frac{(r^2_{NOD3} - \bar{r}^2_{NOD3})}{2k_{NOD3}r^2_{NOD3}}}\right] \times (T_{NC} - T_{NOD3}) \,. \tag{B.50}$$

Substituting Eqs. (B.49) and (B.50) into (B.48) with expansion of the heat generation term and accumulation term and elimination of $\pi\ell$ gives

$$\left[\frac{k_{NOD3-1,NOD3}\,4r^2_{NOD3-1}}{(\bar{r}^2_{NOD3} - \bar{r}^2_{NOD3-1})}\right][T_{NOD3}(t+\Delta t) - T_{NOD3-1}(t+\Delta t)]$$

$$+\left[\frac{2}{\frac{\ln(\bar{r}_{NC}/r_{NOD3})}{k_{NC}} + \frac{1}{\frac{k_{gap_2}}{\ln(r_{NOD3}+\Delta r_{gap_2}/r_{NOD3})} + r_{NOD3}h_{gap_2} + r_{NOD3}h_{r_2}} + \frac{(r^2_{NOD3} - \bar{r}^2_{NOD3})}{2k_{NOD3}r^2_{NOD3}}}\right]$$

$$\times [T_{NC}(t+\Delta t) - T_{NOD3}(t+\Delta t)] + \dot{q}'''_{NOD3}(r^2_{NOD3} - r^2_{NOD3-1}) = \left[\frac{\rho_{NOD3}c_{p_{NOD3}}(r^2_{NOD3} - r^2_{NOD3-1})}{\Delta t}\right]$$

$$\times [T_{NOD3}(t+\Delta t) - T_{NOD3}(t)] \,. \tag{B.51}$$

Rearranging Eq. (B.51) and collecting terms gives the following implicit formulation of the equation for the last node (NOD3) in the heater (either Inconel or Cupro Nickel):

$$\left[\frac{\bar{k}_{NOD3-1,NOD3}\,4r^2_{NOD3-1}}{(\bar{r}^2_{NOD3} - \bar{r}^2_{NOD3-1})}\right]T_{NOD3-1}(t+\Delta t) + \left[-\frac{\bar{k}_{NOD3-1,NOD3}\,4r^2_{NOD3-1}}{(\bar{r}^2_{NOD3} - \bar{r}^2_{NOD3-1})} - \frac{\rho_{NOD3}c_{p_{NOD3}}(r^2_{NOD3} - r^2_{NOD3-1})}{\Delta t}\right.$$

$$\left.-\frac{2}{\frac{\ln(\bar{r}_{NC}/r_{NOD3})}{k_{NC}} + \frac{1}{\frac{k_{gap_2}}{\ln(r_{NOD3}+\Delta r_{gap_2}/r_{NOD3})} + r_{NOD3}h_{gap_2} + r_{NOD3}h_{r_2}} + \frac{(r^2_{NOD3} - \bar{r}^2_{NOD3})}{2k_{NOD3}r^2_{NOD3}}}\right]$$

$$\times T_{NOD3}(t+\Delta t) + \left[\frac{2}{\frac{\ln(\bar{r}_{NC}/r_{NOD3})}{k_{NC}} + \frac{1}{\frac{k_{gap_2}}{\ln(r_{NOD3}+\Delta r_{gap_2}/r_{NOD3})} + r_{NOD3}h_{gap_2} + r_{NOD3}h_{r_2}} + \frac{(r^2_{NOD3} - \bar{r}^2_{NOD3})}{2k_{NOD3}r^2_{NOD3}}}\right]$$

$$\times T_{NC}(t+\Delta t) = -\dot{q}'''_{NOD3}(r^2_{NOD3} - r^2_{NOD3-1}) - \left[\frac{\rho_{NOD3}c_{p_{NOD3}}(r^2_{NOD3} - r^2_{NOD3-1})}{\Delta t}\right]T_{NOD3}(t) \,. \tag{B.52}$$

Similarly, for node NC in the BN layer

$$\left[\frac{2}{\frac{\ln(\bar{r}_{NC}/r_{NOD3})}{k_{NC}} + \frac{1}{\frac{k_{gap_2}}{\ln(r_{NOD3}+\Delta r_{gap_2}/r_{NOD3})} + r_{NOD3}h_{gap_2} + r_{NOD3}h_{r_2}} + \frac{(r_{NOD3}^2 - \bar{r}_{NOD3}^2)}{2k_{NOD3}r_{NOD3}^2}}\right] T_{NOD3}(t+\Delta t)$$

$$+\left[-\frac{2}{\frac{\ln(\bar{r}_{NC}/r_{NOD3})}{k_{NC}} + \frac{1}{\frac{k_{gap_2}}{\ln(r_{NOD3}+\Delta r_{gap_2}/r_{NOD3})} + r_{NOD3}h_{gap_2} + r_{NOD3}h_{r_2}} + \frac{(r_{NOD3}^2 - \bar{r}_{NOD3}^2)}{2k_{NOD3}r_{NOD3}^2}}\right.$$

$$\left. - \frac{\rho_{BN}Cp_{NC}\Delta r_{BN}^2}{\Delta t} - \frac{2}{\frac{\ln(r_{NC}/\bar{r}_{NC})}{k_{NC}} + \frac{\ln(\bar{r}_{NC+1}/r_{NC})}{k_{NC+1}}}\right] T_{NC}(t+\Delta t) + \left[\frac{2}{\frac{\ln(r_{NC}/\bar{r}_{NC})}{k_{NC}} + \frac{\ln(\bar{r}_{NC+1}/r_{NC})}{k_{NC+1}}}\right]$$

$$\times T_{NC+1}(t+\Delta t) = -\left[\frac{\rho_{BN}Cp_{NC}\Delta r_{BN}^2}{\Delta t}\right] T_{NC}(t) \,. \qquad \text{(B.53)}$$

Mathematical Model of Heat Transfer at the BN-to-Inner Stainless Steel Sheath Interface (Fig. B-5)

Assumptions:

1. Heat flow between nodes is constant at any r between nodes,
2. Nodal mass $(\rho V)_i$ is constant, heat capacity Cp_i and thermal conductivity k_i are evaluated at the present nodal temperature $T_i(t)$,
3. A gap exists at the BN-to-sheath interface and heat can be transferred via conduction, convection, and radiation across the gap.

A heat balance on node NOD4 in Fig. B-5 gives

$$q_{NOD4-1,NOD4} - q_{NOD4,NB} + \cancel{\dot{q}_{NOD4}}^{0} = \rho_{BN}(CpV)_{NOD4}\frac{\partial T_{NOD4}}{\partial t} \,. \qquad \text{(B.54)}$$

Since Eq. (B.4) is applicable for $q_{NOD4-1,NOD4}$,

$$q_{NOD4-1,NOD4} = -\left[\frac{\ln(r_{NOD4-1}/\bar{r}_{NOD4-1})}{2k_{NOD4-1}} + \frac{\ln(\bar{r}_{NOD4}/r_{NOD4-1})}{2k_{NOD4}}\right]^{-1} \times (T_{NOD4} - T_{NOD4-1})\,\pi\ell \,. \qquad \text{(B.55)}$$

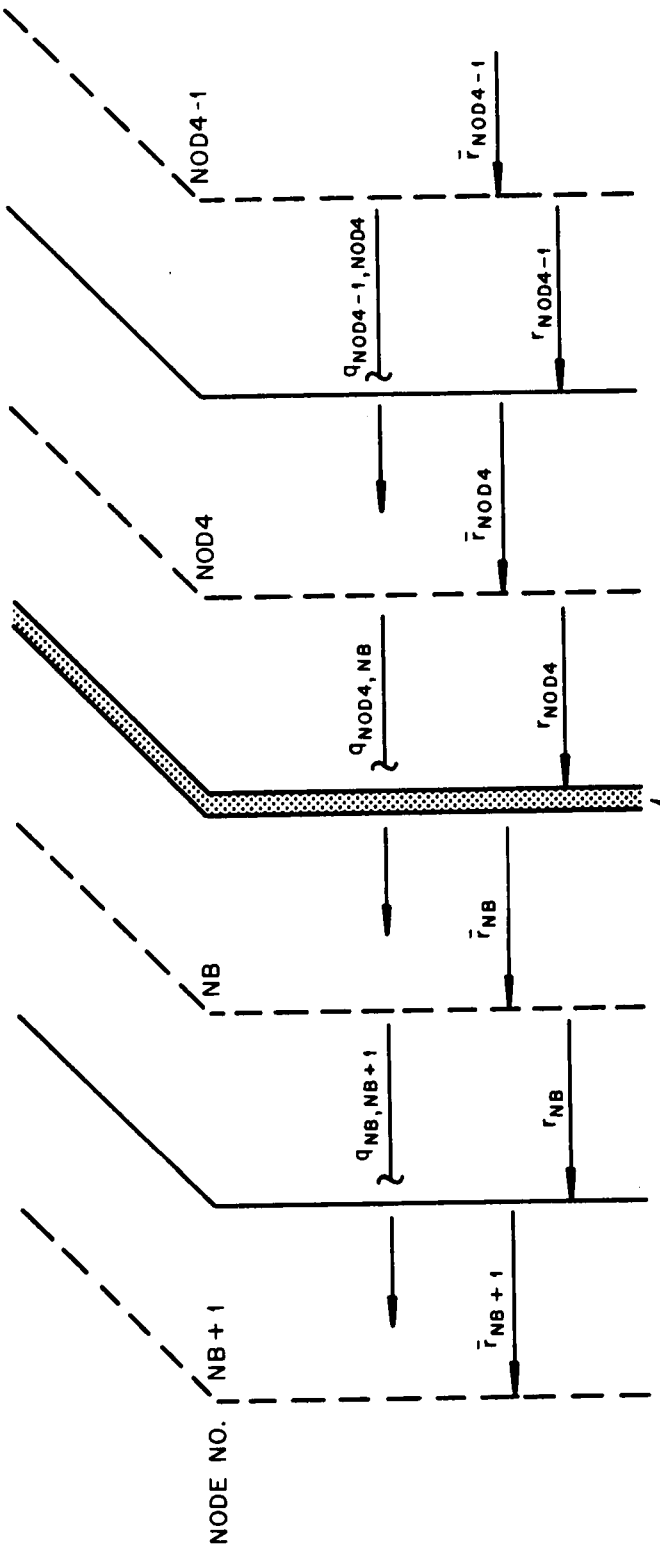

Fig. B-5. Notation relative to the derivation of the heat transfer model at the boron nitride to inner stainless steel sheath interface.

Using the same technique required to develop Eq. (B.35) yields

$$q_{NOD4,NB} = -\pi\ell\left[\frac{2}{\frac{\ln(r_{NOD4}/\bar{r}_{NOD4})}{k_{NOD4}} + \frac{1}{\frac{k_{gap_3}}{\ln(r_{NOD4}+\Delta r_{gap_3}/r_{NOD4})} + r_{NOD4}h_{gap_3} + r_{NOD4}h_{r_3}} + \frac{\ln(\bar{r}_{NB}/r_{NOD4})}{k_{NB}}}\right]$$

$$\times (T_{NB} - T_{NOD4}) . \qquad \text{(B.56)}$$

Substituting Eqs. (B.55) and (B.56) into (B.54) with expansion of the accumulation term and elimination of $\pi\ell$ gives

$$-\left[\frac{2}{\frac{\ln(r_{NOD4-1}/\bar{r}_{NOD4-1})}{k_{NOD4-1}} + \frac{\ln(\bar{r}_{NOD4}/r_{NOD4-1})}{k_{NOD4}}}\right][T_{NOD4}(t+\Delta t) - T_{NOD4-1}(t+\Delta t)]$$

$$+\left[\frac{2}{\frac{\ln(r_{NOD4}/\bar{r}_{NOD4})}{k_{NOD4}} + \frac{1}{\frac{k_{gap_3}}{\ln(r_{NOD4}+\Delta r_{gap_3}/r_{NOD4})} + r_{NOD4}h_{gap_3} + r_{NOD4}h_{r_3}} + \frac{\ln(\bar{r}_{NB}/r_{NOD4})}{k_{NB}}}\right]$$

$$\times [T_{NB}(t+\Delta t) - T_{NOD4}(t+\Delta t)] = \frac{\rho_{BN}Cp_{NOD4}\Delta r_{BN}^2}{\Delta t}[T_{NOD4}(t+\Delta t) - T_{NOD4}(t)] . \qquad \text{(B.57)}$$

Rearranging (B.57) and collecting terms gives the implicit formulation for the last node (NOD4) in the BN annular region:

$$\left[\frac{2}{\frac{\ln(r_{NOD4-1}/\bar{r}_{NOD4-1})}{k_{NOD4-1}} + \frac{\ln(\bar{r}_{NOD4}/r_{NOD4-1})}{k_{NOD4}}}\right] T_{NOD4-1}(t+\Delta t)$$

$$+\left[-\frac{2}{\frac{\ln(r_{NOD4-1}/\bar{r}_{NOD4-1})}{k_{NOD4-1}} + \frac{\ln(\bar{r}_{NOD4}/r_{NOD4-1})}{k_{NOD4}}} - \frac{\rho_{BN}Cp_{NOD4}\Delta r_{BN}^2}{\Delta t}\right.$$

$$\left.-\frac{2}{\frac{\ln(r_{NOD4}/\bar{r}_{NOD4})}{k_{NOD4}} + \frac{1}{\frac{k_{gap_3}}{\ln(r_{NOD4}+\Delta r_{gap_3}/r_{NOD4})} + r_{NOD4}h_{gap_3} + r_{NOD4}h_{r_3}} + \frac{\ln(\bar{r}_{NB}/r_{NOD4})}{k_{NB}}}\right]$$

$$\times T_{NOD4}(t+\Delta t) + \left[\frac{2}{\frac{\ln(r_{NOD4}/\bar{r}_{NOD4})}{k_{NOD4}} + \frac{1}{\frac{k_{gap_3}}{\ln(r_{NOD4}+\Delta r_{gap_3}/r_{NOD4})} + r_{NOD4}h_{gap_3} + r_{NOD4}h_{r_3}} + \frac{\ln(\bar{r}_{NB}/r_{NOD4})}{k_{NB}}}\right]$$

$$\times T_{NB}(t+\Delta t) = -\frac{\rho_{BN}Cp_{NOD4}\Delta r_{BN}^2}{\Delta t} T_{NOD4}(t) . \qquad \text{(B.58)}$$

Similarly, for node NB in the inner stainless steel sheath,

$$\left[\frac{2}{\frac{\ln(r_{NOD4}/\bar{r}_{NOD4})}{k_{NOD4}} + \frac{1}{\frac{k_{gap_3}}{\ln(r_{NOD4}+\Delta r_{gap_3}/r_{NOD4})} + r_{NOD4}h_{gap_3} + r_{NOD4}h_{r_3}} + \frac{\ln(\bar{r}_{NB}/r_{NOD4})}{k_{NB}}}\right] \times T_{NOD4}(t+\Delta t) + \left[-\frac{2}{\frac{\ln(r_{NOD4}/\bar{r}_{NOD4})}{k_{NOD4}} + \frac{1}{\frac{k_{gap_3}}{\ln(r_{NOD4}+\Delta r_{gap_3}/r_{NOD4})} + r_{NOD4}h_{gap_3} + r_{NOD4}h_{r_3}} + \frac{\ln(\bar{r}_{NB}/r_{NOD4})}{k_{NB}}} - \frac{\rho_{SS}Cp_{NB}\Delta r_{SS1}^2}{\Delta t} - \frac{2}{\frac{\ln(r_{NB}/\bar{r}_{NB})}{k_{NB}} + \frac{\ln(\bar{r}_{NB+1}/r_{NB})}{k_{NB+1}}}\right] T_{NB}(t+\Delta t) + \left[\frac{2}{\frac{\ln(r_{NB}/\bar{r}_{NB})}{k_{NB}} + \frac{\ln(\bar{r}_{NB+1}/r_{NB})}{k_{NB+1}}}\right] T_{NB+1}(t+\Delta t)$$

$$= -\left[\frac{\rho_{SS}Cp_{NB}\Delta r_{SS1}^2}{\Delta t}\right] T_{NB}(t) \,. \qquad \text{(B.59)}$$

Mathematical Model of Heat Transfer at the Sheath-to-Sheath Interface (Fig. B-6)

Assumptions:

1. Heat flow between nodes is constant for any r between nodes,
2. Nodal mass $(\rho V)_i$ is constant, heat capacity Cp_i and thermal conductivity k_i are evaluated at the present nodal temperature $T_i(t)$,
3. A gap exists at the sheath-to-sheath interface and heat can be transferred via conduction, convection, and radiation across the gap,
4. The last node (NOD5) temperature (T_{NOD5}) in the inner sheath is known as a function of time (i.e., the known thermocouple response is placed in the last node of the inner sheath),
5. The gap size is evaluated at the present nodal temperatures [$T_{NOD5}(t)$ and $T_{NS}(t)$] via the thermo-mechanical model developed in the last section of Appendix B.

A heat balance on NOD5 in Fig. B-6 yields

$$q_{NOD5-1,NOD5} - q_{NOD5,NS} + \cancel{\dot{q}_{NOD5}}^{0} = \rho_{SS}(CpV)_{NOD5}\,(\partial T_{NOD5}/\partial t) \,. \qquad \text{(B.60)}$$

Applying Eq. (B.4),

$$q_{NOD5-1,NOD5} = -\left[\frac{2}{\frac{\ln(r_{NOD5-1}/\bar{r}_{NOD5-1})}{k_{NOD5-1}} + \frac{\ln(\bar{r}_{NOD5}/r_{NOD5-1})}{k_{NOD5}}}\right] \times (T_{NOD5} - T_{NOD5-1})\,\pi\ell \,. \qquad \text{(B.61)}$$

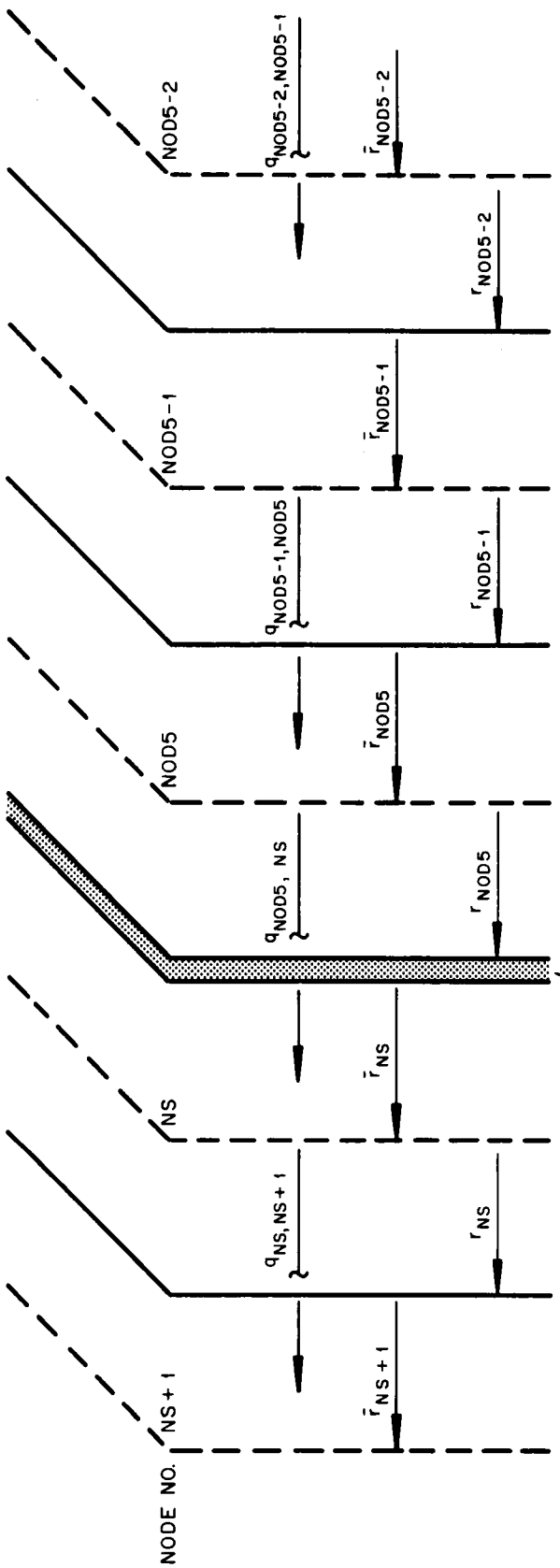

Fig. B-6. Notation relative to the derivation of the heat transfer model at the inner stainless steel sheath to the outer stainless steel sheath interface.

An equation similar to (B.56) applies for $q_{NOD5,NS}$,

$$q_{NOD5,NS} = -\left[\frac{2}{\frac{\ln(r_{NOD5}/\bar{r}_{NOD5})}{k_{NOD5}} + \frac{1}{\frac{k_{gap_4}}{\ln(r_{NOD5}+\Delta r_{gap_4}/r_{NOD5})} + r_{NOD5}h_{gap_4} + r_{NOD5}h_{r_4}} + \frac{\ln(\bar{r}_{NS}/r_{NOD5})}{k_{NS}}}\right] \cdot (T_{NS} - T_{NOD5})\,\pi\ell \,. \qquad \text{(B.62)}$$

Substituting Eqs. (B.61) and (B.62) into Eq. (B.60) with expansion of the accumulation term and elimination of $\pi\ell$ gives

$$-\left[\frac{2}{\frac{\ln(r_{NOD5-1}/\bar{r}_{NOD5-1})}{k_{NOD5-1}} + \frac{\ln(\bar{r}_{NOD5}/r_{NOD5-1})}{k_{NOD5}}}\right][T_{NOD5}(t+\Delta t) - T_{NOD5-1}(t+\Delta t)]$$

$$+\left[\frac{2}{\frac{\ln(r_{NOD5}/\bar{r}_{NOD5})}{k_{NOD5}} + \frac{1}{\frac{k_{gap_4}}{\ln(r_{NOD5}+\Delta r_{gap_4}/r_{NOD5})} + r_{NOD5}h_{gap_4} + r_{NOD5}h_{r_4}} + \frac{\ln(\bar{r}_{NS}/r_{NOD5})}{k_{NS}}}\right]$$

$$\times [T_{NS}(t+\Delta t) - T_{NOD5}(t+\Delta t)] = \left[\frac{\rho_{SS}Cp_{NOD5}\Delta r^2_{SS1}}{\Delta t}\right][T_{NOD5}(t+\Delta t) - T_{NOD5}(t)] \,. \qquad \text{(B.63)}$$

Rearranging Eq. (B.63) and collecting terms gives the implicit formulation of the equation for the last node (NOD5) in the inner sheath:

$$\left[\frac{2}{\frac{\ln(r_{NOD5-1}/\bar{r}_{NOD5-1})}{k_{NOD5-1}} + \frac{\ln(\bar{r}_{NOD5}/r_{NOD5-1})}{k_{NOD5}}}\right] T_{NOD5-1}(t+\Delta t)$$

$$+\left[\frac{2}{\frac{\ln(r_{NOD5}/\bar{r}_{NOD5})}{k_{NOD5}} + \frac{1}{\frac{k_{gap_4}}{\ln(r_{NOD5}+\Delta r_{gap_4}/r_{NOD5})} + r_{NOD5}h_{gap_4} + r_{NOD5}h_{r_4}} + \frac{\ln(\bar{r}_{NS}/r_{NOD5})}{k_{NS}}}\right]$$

$$\times T_{NS}(t+\Delta t) = \left[\frac{2}{\frac{\ln(r_{NOD5-1}/\bar{r}_{NOD5-1})}{k_{NOD5-1}} + \frac{\ln(\bar{r}_{NOD5}/r_{NOD5-1})}{k_{NOD5}}} + \frac{\rho_{SS}Cp_{NOD5}\Delta r^2_{SS1}}{\Delta t}\right.$$

$$\left. + \frac{2}{\frac{\ln(r_{NOD5}/\bar{r}_{NOD5})}{k_{NOD5}} + \frac{1}{\frac{k_{gap_4}}{\ln(r_{NOD5}+\Delta r_{gap_4}/r_{NOD5})} + r_{NOD5}h_{gap_4} + r_{NOD5}h_{r_4}} + \frac{\ln(\bar{r}_{NS}/r_{NOD5})}{k_{NS}}}\right] T_{NOD5}(t+\Delta t)$$

$$-\left[\frac{\rho_{SS}Cp_{NOD5}\Delta r^2_{SS1}}{\Delta t}\right] T_{NOD5}(t) \,. \qquad \text{(B.64)}$$

Similarly, for node NS in the outer stainless steel sheath

$$\left[- \frac{2}{\frac{\ln (r_{NOD5}/\bar{r}_{NOD5})}{k_{NOD5}} + \frac{1}{\frac{k_{gap_4}}{\ln (r_{NOD5} + \Delta r_{gap_4}/r_{NOD5})} + r_{NOD5} h_{gap_4} + r_{NOD5} h_{r_4}} + \frac{\ln (\bar{r}_{NS}/r_{NOD5})}{k_{NS}}} \right.$$

$$\left. - \frac{\rho_{SS} Cp_{NS} \Delta r^2_{SS2}}{\Delta t} - \frac{2}{\frac{\ln (r_{NS}/\bar{r}_{NS})}{k_{NS}} + \frac{\ln (\bar{r}_{NS+1}/r_{NS})}{k_{NS+1}}} \right] T_{NS}(t + \Delta t) + \left[\frac{2}{\frac{\ln (r_{NS}/\bar{r}_{NS})}{k_{NS}} + \frac{\ln (\bar{r}_{NS+1}/r_{NS})}{k_{NS+1}}} \right]$$

$$\times T_{NS+1}(t + \Delta t) = - \left[\frac{2}{\frac{\ln (r_{NOD5}/\bar{r}_{NOD5})}{k_{NOD5}} + \frac{1}{\frac{k_{gap_4}}{\ln (r_{NOD5} + \Delta r_{gap_4}/r_{NOD5})} + r_{NOD5} h_{gap_4} + r_{NOD5} h_{r_4}} + \frac{\ln (\bar{r}_{NS}/r_{NOD5})}{k_{NS}}} \right]$$

$$\times T_{NOD5}(t + \Delta t) - \left[\frac{\rho_{SS} Cp_{NS} \Delta r^2_{SS2}}{\Delta t} \right] T_{NS}(t) \, . \qquad \text{(B.65)}$$

Also, for NOD5-1 in the inner sheath,

$$\left[\frac{2}{\frac{\ln (r_{NOD5-2}/\bar{r}_{NOD5-2})}{k_{NOD5-2}} + \frac{\ln (\bar{r}_{NOD5-1}/r_{NOD5-2})}{k_{NOD5-1}}} \right] T_{NOD5-2}(t + \Delta t)$$

$$+ \left[- \frac{2}{\frac{\ln (r_{NOD5-2}/\bar{r}_{NOD5-2})}{k_{NOD5-2}} + \frac{\ln (\bar{r}_{NOD5-1}/r_{NOD5-2})}{k_{NOD5-1}}} - \frac{\rho_{SS} Cp_{NOD5-1} \Delta r^2_{SS1}}{\Delta t} - \frac{2}{\frac{\ln (r_{NOD5-1}/\bar{r}_{NOD5-1})}{k_{NOD5-1}} + \frac{\ln (\bar{r}_{NOD5}/r_{NOD5-1})}{k_{NOD5}}} \right]$$

$$\times T_{NOD5-1}(t + \Delta t) = - \left[\frac{2}{\frac{\ln (r_{NOD5-1}/\bar{r}_{NOD5-1})}{k_{NOD5-1}} + \frac{\ln (\bar{r}_{NOD5}/r_{NOD5-1})}{k_{NOD5}}} \right] T_{NOD5}(t + \Delta t) - \left[\frac{\rho_{SS} Cp_{NOD5-1} \Delta r^2_{SS1}}{\Delta t} \right] T_{NOD5-1}(t) \, . \qquad \text{(B.66)}$$

Mathematical Model of Heat Transfer at the Outer Sheath-to-Fluid Boundary (Fig. B-7)

Assumptions:

1. Heat flow between nodes is constant at any r between nodes,
2. Nodal mass $(\rho V)_i$ is constant, heat capacity Cp_i and thermal conductivity k_i are evaluated at the present nodal temperature $T_i(t)$.

A heat balance on NOD6 in Fig. B-7 gives

$$q_{NOD6-1,NOD6} - \Phi + \cancel{\dot{q}_{NOD6}}^{\,0} = \rho_{SS} (CpV)_{NOD6} \frac{\partial T_{NOD6}}{\partial t} \, . \qquad \text{(B.67)}$$

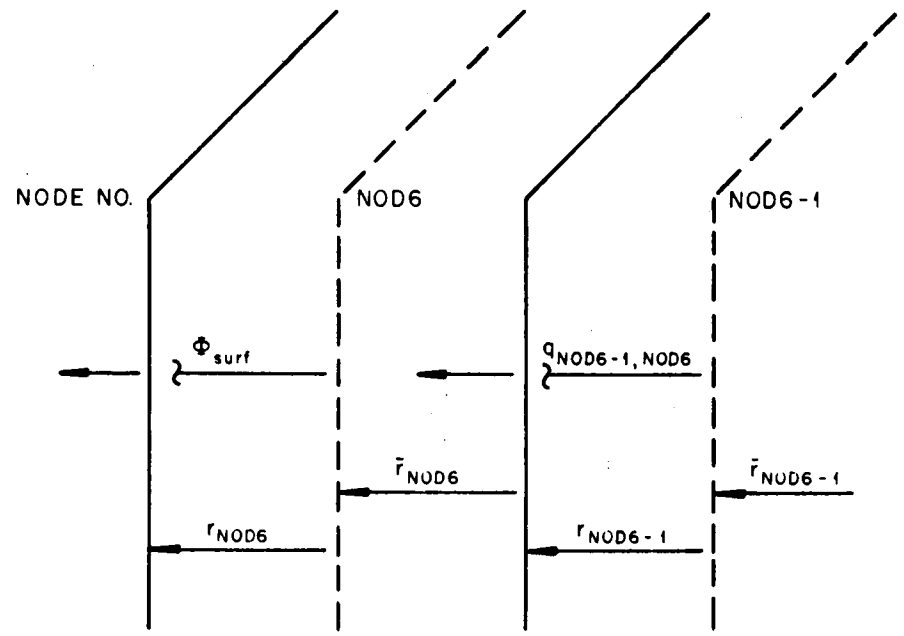

Fig. B-7. Notation relative to the derivation of the heat transfer model at the heater surface.

Applying Eq. (B.4),

$$q_{NOD6-1,NOD6} = -\left[\frac{2}{\frac{\ln\left(r_{NOD6-1}/\bar{r}_{NOD6-1}\right)}{k_{NOD6-1}} + \frac{\ln\left(\bar{r}_{NOD6}/r_{NOD6-1}\right)}{k_{NOD6}}}\right] \times \left(T_{NOD6} - T_{NOD6-1}\right) \pi\ell \ . \qquad (B.68)$$

Substituting Eq. (B.68) into (B.67) with expansion of the accumulation term and elimination of $\pi\ell$ yields

$$-\left[\frac{2}{\frac{\ln\left(r_{NOD6-1}/\bar{r}_{NOD6-1}\right)}{k_{NOD6-1}} + \frac{\ln\left(\bar{r}_{NOD6}/r_{NOD6-1}\right)}{k_{NOD6}}}\right] \times \left[T_{NOD6}(t+\Delta t) - T_{NOD6-1}(t+\Delta t)\right] - \Phi(t+\Delta t)$$

$$= \left[\frac{\rho_{SS} Cp_{NOD6} \Delta r_{SS2}^2}{\Delta t}\right] \left[T_{NOD6}(t+\Delta t) - T_{NOD6}(t)\right] \ . \qquad (B.69)$$

Rearranging Eq. (B.69) and collecting terms gives the implicit formulation of the equation for the last node (NOD6) in the outer sheath:

$$\left[\frac{2}{\frac{\ln\left(r_{NOD6-1}/\bar{r}_{NOD6-1}\right)}{k_{NOD6-1}} + \frac{\ln\left(\bar{r}_{NOD6}/r_{NOD6-1}\right)}{k_{NOD6}}}\right] T_{NOD6-1}(t+\Delta t)$$

$$+\left[-\frac{2}{\frac{\ln\left(r_{NOD6-1}/\bar{r}_{NOD6-1}\right)}{k_{NOD6-1}} + \frac{\ln\left(\bar{r}_{NOD6}/r_{NOD6-1}\right)}{k_{NOD6}}} - \frac{\rho_{SS}Cp_{NOD6}\Delta r^2_{SS2}}{\Delta t}\right] T_{NOD6}(t+\Delta t) - \Phi(t+\Delta t)$$

$$= -\left[\frac{\rho_{SS}Cp_{NOD6}\Delta r^2_{SS2}}{\Delta t}\right] T_{NOD6}(t) \,. \qquad \text{(B.70)}$$

Since

$$\Phi = -\left[\frac{2}{\frac{\ln\left(r_{NOD6}/\bar{r}_{NOD6}\right)}{k_{NOD6}}}\right](T_{surf} - T_{NOD6}) \,, \qquad \text{(B.71)}$$

the surface temperature can be calculated from

$$T_{surf}(t+\Delta t) = T_{NOD6}(t+\Delta t) - \frac{\Phi(t+\Delta t)}{\left[\frac{2k_{NOD6}}{\ln\left(r_{NOD6}/\bar{r}_{NOD6}\right)}\right]} \qquad \text{(B.72)}$$

Mathematical Model of Heat Transfer from Node 1 in the MgO Core to the Heater Center Line (Fig. B-8)

Consider the fundamental differential equation for the conduction of heat in a solid with an internal heat source:

$$\bar{\nabla}\cdot k\bar{\nabla}T + \dot{q}''' = \rho Cp\,\frac{\partial T}{\partial t} \,. \qquad \text{(B.73)}$$

Volume integration of Eq. (B.73) yields

$$\int_V (\bar{\nabla}\cdot k\bar{\nabla}T + \dot{q}''')dV = \int_V \rho Cp\,\frac{\partial T}{\partial t}\,dV \,. \qquad \text{(B.74)}$$

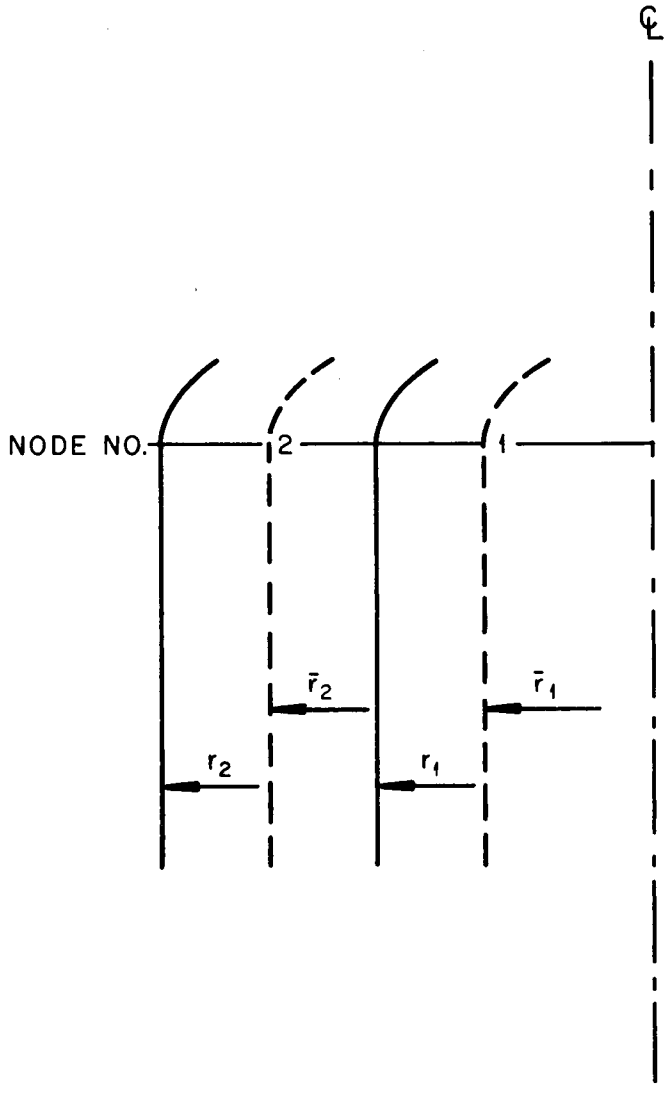

Fig. B-8. Notation relative to the derivation of the heat transfer model in the MgO core to the heater center line.

Since, for the MgO core,

$$\int_V \dot{q}'''' dV = 0 \tag{B.75}$$

and with the application of the divergence theorem to the left side of

Eq. (B.74), it reduces to

$$\int_A k\bar{\nabla}T\cdot\bar{n}dA = \int_V \rho Cp \frac{\partial T}{\partial t} dV \ . \tag{B.76}$$

Expanding the gradient of T in cylindrical coordinates,

$$\int_A k\left(\frac{\partial T}{\partial r}\bar{r} + \frac{1}{r}\frac{\partial T}{\partial \theta}\bar{\theta} + \frac{\partial T}{\partial Z}\bar{Z}\right)\cdot\bar{n}dA = \int_V \rho Cp \frac{\partial T}{\partial t} dV \ . \tag{B.77}$$

Assuming there is no azimuthal temperature dependence and no axial conduction (i.e., $\partial T/\partial\theta = \partial T/\partial Z = 0$), Eq. (B.77) reduces to

$$\int_A k \frac{\partial T}{\partial r}(\bar{r}\cdot\bar{n})dA = \int_V \rho Cp \frac{\partial T}{\partial t} dV \ . \tag{B.78}$$

With the assumption that $k(\partial T/\partial r)$ is a function of r and t only and that

$$\left.\frac{\partial T}{\partial r}\right|_{r=0} = 0 \ , \tag{B.79}$$

then

$$-2\pi k\ell\Big|_r r \left.\frac{\partial T}{\partial t}\right|_r = \int_V \rho Cp \frac{\partial T}{\partial t} dV \tag{B.80}$$

for the radial interval (0,r). Also, assuming k is constant on the interval (0,r), expanding the right side of Eq. (B.80), and integrating over the domain (0,r) yields

$$-2\pi k\ell r \left.\frac{\partial T}{\partial t}\right|_r = \int_0^r 2\pi r\ell\pi Cp \frac{\partial T}{\partial t} dr \ . \tag{B.81}$$

Assuming that $\partial T/\partial t$ can be expressed as an average, then

$$-2\pi k\ell r \left.\frac{\partial T}{\partial r}\right|_r = \pi r^2 \ell\rho Cp \overline{\frac{\partial T}{\partial t}} \ . \tag{B.82}$$

The simplification of Eq. (B.82) gives

$$-\frac{2k}{r\rho Cp}\left.\frac{\partial T}{\partial r}\right|_{r} = \frac{\overline{\partial T}}{\partial t} \cdot \tag{B.83}$$

Assigning $\overline{\partial T}/\partial t$ at $r = \bar{r}_1$

$$\frac{\overline{\partial T}}{\partial t} = -\frac{2k}{\rho Cp\bar{r}_1}\left.\frac{\partial T}{\partial r}\right|_{\bar{r}_1} \cdot \tag{B.84}$$

Assuming that Eq. (B.84) is a wave propagation formulation with characteristic velocity $\bar{v}$,

$$\frac{\overline{\partial T}}{\partial t} = -\bar{v}\left.\frac{\partial T}{\partial r}\right|_{\bar{r}_1} \cdot \tag{B.85}$$

Also, assuming that $\bar{v}$ is constant in the MgO domain of (0,r), then the time lag of $\partial T/\partial t$ arriving at $r = 0$ is

$$\left.\frac{\partial T}{\partial t}\right|_{r=0}(t) = \left.\frac{\partial T}{\partial t}\right|_{r=\bar{r}_1}\left(t - \frac{\bar{r}_1}{\bar{v}}\right), \tag{B.86}$$

or

$$\left.\frac{\partial T}{\partial t}\right|_{r=0}(t) = \left.\frac{\partial T}{\partial t}\right|_{r=\bar{r}_1}\left(t - \frac{\rho Cp\bar{r}_1^2}{2k}\right). \tag{B.87}$$

This formulation is known as the Hedrick Wave Theory of Heat Propagation.[45]

Mathematical Model of the Thermal-Mechanical Behavior of the Gap Between the Inner and Outer Stainless Steel Sheaths (Fig. B-9)

Consider the definition for the coefficient of linear expansion

$$\alpha \equiv \frac{1}{L}\left(\frac{\partial L}{\partial T}\right)_p , \tag{B.88}$$

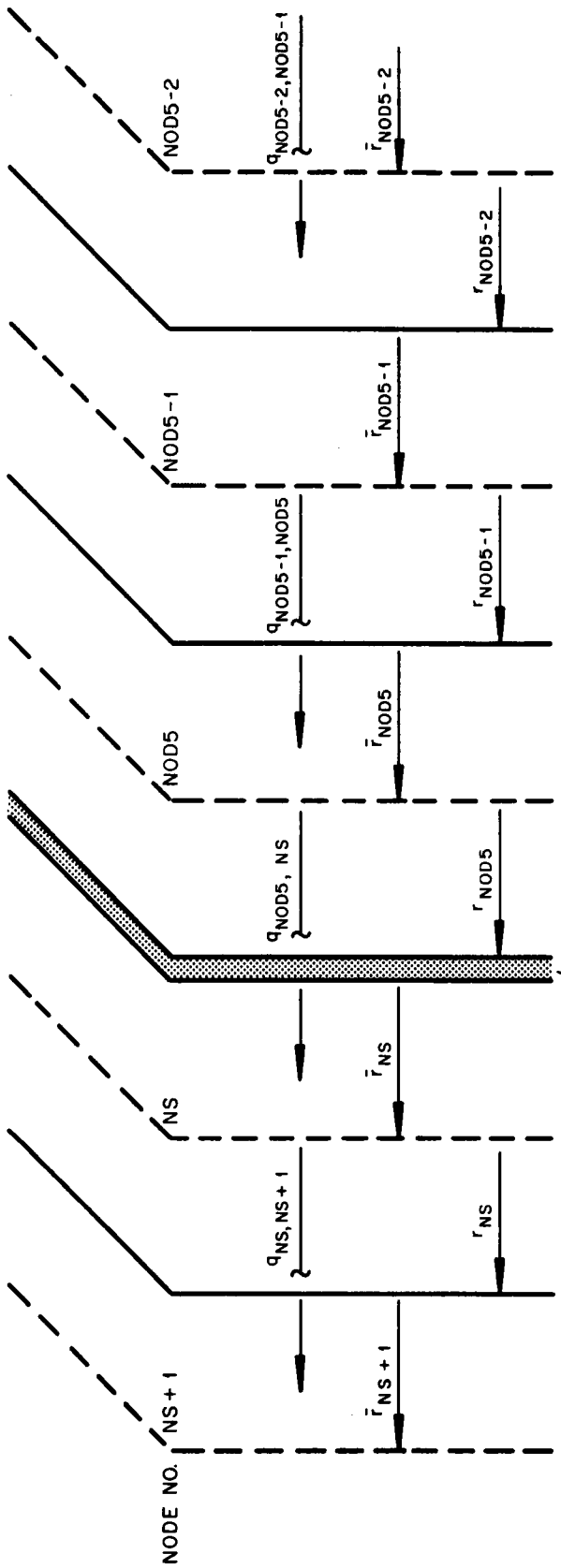

Fig. B-9. Notation relative to the derivation of the mathematical model of the thermomechanical behavior of the gap between the inner and outer stainless steel sheaths.

which for solids is approximated by

$$\alpha \doteq \frac{1}{L}\frac{dL}{dT} . \tag{B.89}$$

Assuming α is a function of T only and that it can be approximated by a polynomial in terms of T, then

$$\alpha(T) \doteq C_1 + C_2T + C_3T^2 . \tag{B.90}$$

Substituting Eq. (B.90) into (B.89) and separating variables gives

$$\{C_1 + C_2T + C_3T^2\}\, dT = \frac{dL}{L} . \tag{B.91}$$

Upon integration,

$$\ln L = C_1T + \frac{C_2}{2}T^2 + \frac{C_3}{3}T^3 + \text{constant} . \tag{B.92}$$

For the initial conditions of

$$L = L_0 \text{ at } T = T_0 , \tag{B.93}$$

and referring to Eq. (B.92),

$$\text{Constant} = \ln L_0 - C_1T_0 - (C_2/2)T_0^2 - (C_3/3)T_0^3 . \tag{B.94}$$

Substituting Eq. (B.94) into (B.92) and simplifying yields

$$\ln \frac{L}{L_0} = C_1(T - T_0) + \frac{C_2}{2}(T^2 - T_0^2) + \frac{C_3}{3}(T^3 - T_0^3) . \tag{B.95}$$

Exponentiation of Eq. (B.95) gives

$$\frac{L}{L_0} = \exp\left[C_1(T - T_0) + \frac{C_2}{2}(T^2 - T_0^2) + \frac{C_3}{3}(T^3 - T_0^3)\right] . \tag{B.96}$$

Subtracting 1 from both sides of Eq. (B.96) and multiplying through by L_0 gives

$$L - L_0 = L_0\left\{\exp\left[C_1(T - T_0) + \frac{C_2}{2}(T^2 - T_0^2) + \frac{C_3}{3}(T^3 - T_0^3)\right] - 1\right\} . \tag{B.97}$$

Therefore, for a change in temperature, the resulting change in L (ΔL) can be determined by Eq. (B.97).

The linear gap model used in ORINC is

$$\Delta gap = \Delta gap_0 + \Delta\bar{r}_{NS} - \Delta\bar{r}_{NOD5} \ . \tag{B.98}$$

Expanding $\Delta\bar{r}_{NS}$ and $\Delta\bar{r}_{NOD5}$ by Eq. (B.97),

$$\Delta\bar{r}_{NS} = \bar{r}_{NS} \left(\exp \left[C_1 (T_{NS} - T_{NS}|_0) + \frac{C_2}{2} (T_{NS}^2 - T_{NS}|_0^2) + \frac{C_3}{3} (T_{NS}^3 - T_{NS}|_0^3) \right] - 1 \right) , \tag{B.99}$$

and

$$\Delta\bar{r}_{NOD5} = \bar{r}_{NOD5} \left(\exp \left[C_1 (T_{NOD5} - T_{NOD5}|_0) + \frac{C_2}{2} (T_{NOD5}^2 - T_{NOD5}|_0^2) + \frac{C_3}{3} (T_{NOD5}^3 - T_{NOD5}|_0^3) \right] - 1 \right) . \tag{B.100}$$

Therefore, Eq. (B.98) becomes

$$\Delta gap = \Delta gap_0 + \bar{r}_{NS} \left(\exp \left[C_1 (T_{NS} - T_{NS}|_0) + \frac{C_2}{2} (T_{NS}^2 - T_{NS}|_0^2) + \frac{C_3}{3} (T_{NS}^3 - T_{NS}|_0^3) \right] - 1 \right) - \bar{r}_{NOD5} \left(\exp \left[C_1 (T_{NOD5} - T_{NOD5}|_0) + \frac{C_2}{2} (T_{NOD5}^2 - T_{NOD5}|_0^2) + \frac{C_3}{3} (T_{NOD5}^3 - T_{NOD5}|_0^3) \right] - 1 \right) . \tag{B.101}$$

In the above equation, Δgap_0 is the bias gap and $T_{NS}|_0$ and $T_{NOD5}|_0$ are the bias nodal temperatures.

APPENDIX C

ORINC LISTING

This section contains a complete listing of the ORNL Inverse Code (ORINC) that is operational on the ORNL IBM 360/91 and 360/195 computers effective April 1, 1977.

The programming language is FORTRAN IV. The program consists of approximately 3200 lines of coding with a main driving routine, 26 subroutines and subprograms, and a block data section containing information pertinent to the computer data acquisition system, the THTF bundle 1, and the RELAP model of the core.

```
C*****************************************************************************ORI10001
C*****************************************************************************ORI10002
C************************                                 *********************ORI10003
C********************** DRIVER FOR ROUTINE INVERSE *********************ORI10004
C************************                                 *********************ORI10005
C*****************************************************************************ORI10006
C*****************************************************************************ORI10007
C                                                                              ORI10008
C      INVERSE DETERMINES THE TRANSIENT HEAT TRANSFER COEFFICIENT AT THE ORI10009
C      SURFACE OF AN ELECTRICALLY HEATED PIN GIVEN THE HEAT INPUT ,SHEATHORI10010
C      THERMOCOUPLE TEMPERATURE, AND FLUID BULK TEMPERATURE                    ORI10011
C                                                                              ORI10012
C   OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                      ORI10013
      EXTERNAL GAP                                                             ORI10014
      REAL K,KGAP,CC(21),XXX(601),DTDT(30)                                     ORI10015
      DIMENSION INN(20),VAR(55),TIM(2),TSAVE(40,2),TCM(601)                    ORI10016
C                                                                              ORI10017
C*****COMMON BLOCKS                                                            ORI10018
      COMMON /INPUT/ITCNUM,KICK,HED(17),IS(6),TCSS(601),TCMM(601),             ORI10019
     1               GAVGG(601),TIMEE(501),TIMR(601),TBR(601),TSATR(601),ORI10020
     2               PRESUR(601),QUALR(501),AMFR(601),HBR(601),                ORI10021
     3               SFLUXR(601),TSJRR(501),MODER(601),TRPEND,JRP              ORI10022
     4,              IRP,ICS7                                                  ORI10023
      COMMON /PIN/   RHT(15,7),PFFR(15,2),TCL(15),SGV(7),HLENG(49)             ORI10024
      COMMON /CCDAS/ITCS(348),ICHTCS(348),ISUBCH(348),ITCM(106),               ORI10025
     1               ICHTCM(106),ICHEIE(49),ICHEEE(49),ICHBW1,ICHBW2,          ORI10026
     2               IRVOL(15,3),NTRY1(348),NTRY2(106),NTRY3(49),              ORI10027
     3               NTRY4(49),NBW1,NBW2,IC(1000),                             ORI10028
     4               NTC(348),NCHTCS(348),NK,IRSLB(15,3),NSLAB                 ORI10029
      COMMON /COEFF/NTCS(348),NTCM(348),DAT(348,3),PFAX(348),KD4(348),         ORI10030
     1               CBNO(348,4),VR1(348),KD1(348),CMGO(348,5),VR2(348),       ORI10031
     2               KD2(348),GAPCF(348,3),GAPSD(348,3),VR3(348),KD3(348)ORI10032
     3              ,GAPO(348),TNOD5(348),TNS(348),FEEBEE(348),ZERO(348,6)ORI10033
     4              ,PRSS(348),TMAX(348)                                       ORI10034
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,ORI10035
     1               NW,NH,NC,NB,NS,NIN,NOJT,R(40),RBAR(40),RHEAT(7),          ORI10036
     2               DLRMGO,DLRHTR,DLRCJ,DLRBN,DLRSS1,DLRSS2                   ORI10037
      COMMON /SAVE/  T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,         ORI10038
     1               ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ         ORI10039
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB                         ORI10040
      COMMON /OUT/   TO(40,12),TIME(12),HO(12),QO(12),TBO(12),SFLUX(12),       ORI10041
     1               TSURO(12),DELH,SUMCP,SUMQ,EQNRT,ERROR1,ERROR2,            ORI10042
     2               FSO(12),TSATO(12),HSATO(12),AMFO(12),QUALO(12),           ORI10043
     3               RHBO(12),RSFXO(12),RTSJRO(12),MODEO(12),NO,JO             ORI10044
     4              ,DELRO(12)                                                 ORI10045
      COMMON /GAPCAL/GP8,GP1(3),TNSB,TND5B,TND5,TNSS,QDPI,GPCAL,FEEB,          ORI10046
     1               TMAXX,IODE                                                ORI10047
      COMMON/PROP1/DMGO,DHTR,DCUNI,DBN,DSS,C(40),K(40),CBNA(4),CMGA(5),        ORI10048
     1               KGAP(4),KOD2,PRS                                          ORI10049
C                                                                              ORI10050
C-----SET UP INPUT,OUTPUT DEVICES                                              ORI10051
C      CARD READER                        (NIN=5)                              ORI10052
C      PAPER (OR MICROFICHE) OUTPUT        (NOUT=6)                            ORI10053
C      NTAPE=9, TAPE OUTPUT FOR ORINC                                          ORI10054
C            FILE 1 (FT09F001), INVERSE CALCULATIONS                           ORI10055
C            FILE 2 (FT09F002), CASE INFORMATION                               ORI10056
C      NTAPE=10, TAPE INPUT----BLOW-DOWN, SET-UP IN SUBROUTINE INPTBD          ORI10057
C      NTAPE=11, TAPE INPUT----RELAP INTERFACE TAPE,                           ORI10058
C                               SET-UP IN SUBROUUTINE INPTRP                   ORI10059
C      NTAPE=12, TAPE INPUT----COEFFICIENT DATA TAPE,                          ORI10060
C                               SET-UP IN SUBROUTINE CDT1                      ORI10061
C      NTAPE=13,TAPE OUTPUT----USED LATER IN CREATION OF RELAP                 ORI10062
C                               PLOTTAPE SET-UP IN SUBROUTINE MNFLXO           ORI10063
C      SYSDA:     TEMPORARY DISK WORKING SPACE                                 ORI10064
C           FILE 1, TEMPORARY STORAGE FOR CASE INFORMATION                     ORI10065
C           FILE 8, TEMPORARY STORAGE FOR RELAP INTERFACE                      ORI10066
C                   INFORMATION, SET-UP IN INPTRP                              ORI10067
C           FILE 7, TEMPORARY STORAGE FOR 30 SECONDS OF                        ORI10068
C                   BLOW-DOWN TRANSIENT, SET-UP IN INPTBD                      ORI10069
      NIN=5                                                                    ORI10070
      NOUT=6                                                                   ORI10071
      REWIND 9                                                                 ORI10072
C                                                                              ORI10073
C-----READ CARD INPUT                                                          ORI10074
      CALL INPUTO                                                              ORI10075
C                                                                              ORI10076
C-----SET-UP WORKING FILES ON DISK                                             ORI10077
      CALL INPTBD                                                              ORI10078
      CALL INPTRP                                                              ORI10079
C                                                                              ORI10080
C-----READ COEFFICIENT DATA TAPE                                               ORI10081
      CALL CDT1                                                                ORI10082
C                                                                              ORI10083
C-----INITIALIZE MEAN FLUX ROUTINE                                             ORI10084
      IF(ICS7.EQ.1) CALL MNFLXO                                                ORI10085
C                                                                              ORI10086
C*****MAIN DO LOOP                                                             ORI10087
      DO 200 LOOP=1,NK                                                         ORI10088
      ITCNUM=NTC(LOOP)                                                         ORI10089
      IF(NCHTCS(LOOP).LE.0)GO TO 200                                           ORI10090
      IROD=IFIX(FLOAT(ITCNUM-300000)/1000.0)                                   ORI10091
      ISGV=IFIX(FLOAT(ITCNUM-300000-IROD*1000)/100.0)                          ORI10092
```

```
      ITCL=ITCNUM-300000 -IROD*1000-ISGV*100                            ORI10093
      IF(ITCL.EQ.15)GO TO 200                                           ORI10094
      DO 10 I=1,4                                                       ORI10095
   10 DELGAP(I)=0.0                                                     ORI10096
C-----SEARCH ITCS FILE FOR ITCNUM AND ASSIGN VALUES TO REQUIRED         ORI10097
C     ARRAYS FOR ITCNUM                                                 ORI10098
      DO 20 I=1,348                                                     ORI10099
      JC=I                                                              ORI10100
      IF(ITCNUM.EQ.NTCS(I))GO TO 28                                     ORI10101
   20 CONTINUE                                                          ORI10102
C-----SET-UP COEFFICIENT ARRAYS FROM CDT                                ORI10103
C     AXIAL PEAKING FACTOR                                              ORI10104
   28 PFA=PFAX(JC)                                                      ORI10105
C     KBN COEFFICIENTS                                                  ORI10106
      DO 30 I=1,4                                                       ORI10107
   30 CBNA(I)=CBNO(JC,I)                                                ORI10108
C     KMGO COEFFICIENTS                                                 ORI10109
      DO 40 I=1,5                                                       ORI10110
   40 CMGA(I)=CMGO(JC,I)                                                ORI10111
      PRS=PRSS(JC)                                                      ORI10112
      KOD2=KD2(JC)                                                      ORI10113
C     GAP PARAMETERS                                                    ORI10114
      DO 50 I=1,3                                                       ORI10115
   50 GP1(I)=GAPCF(JC,I)                                                ORI10116
      GPB=GAPO(JC)                                                      ORI10117
      TNSB=TNS(JC)                                                      ORI10118
      TND5B=TNOD5(JC)                                                   ORI10119
      FEEB=FEEBEE(JC)                                                   ORI10120
      TMAXX=TMAX(JC)                                                    ORI10121
      IODE=KD3(JC)                                                      ORI10122
C-----OUTPUT COEFFICIENT ARRAYS FOR ITCNUM                              ORI10123
      CALL CDT                                                          ORI10124
C-----SET-UP RADII,NODING ETC.                                          ORI10125
      NCU=0                                                             ORI10126
      DO 60 I=1,7                                                       ORI10127
   60 RHEAT(I)=RHT(ITCL,I)                                              ORI10128
      IF(ITCL.LT.4.OR.ITCL.GT.12)NCU=2                                  ORI10129
      CALL RADI                                                         ORI10130
      PFR(1)=PFFR(ITCL,1)                                               ORI10131
      PFR(2)=PFFR(ITCL,2)                                               ORI10132
C-----OUTPUT INFORMATION ON PIN NODING, PIN RADIAL DIMENSIONS,          ORI10133
C     AND PEAKING FACTORS                                               ORI10134
      CALL OUTPUT                                                       ORI10135
C-----LOAD BLOW-DOWN INPUT ARRAYS                                       ORI10136
C     (TCSS,QAVGG,TCHN,TIMEE)                                           ORI10137
      CALL INBD                                                         ORI10138
C-----LOAD RELAP INTERFACE INPUT ARRAYS                                 ORI10139
C     (TIMR,TBR,TSATR,PRESSUR,QUALR,AMFR,HBR,SFLUXR,TSURR,MODER,        ORI10140
C      TRPEND,AND JRP)                                                  ORI10141
      CALL INRELP                                                       ORI10142
C                                                                       ORI10143
C-----STEADY STATE TEMPERATURE PROFILE AND FILM COEFFICIENT DETERMINATIOORI10144
      PI=3.14159265                                                     ORI10145
      QAVG=QAVGG(1)                                                     ORI10146
      TCS=TCSS(1)                                                       ORI10147
      TB=TBR(1)                                                         ORI10148
      HFR=HBR(1)/3600.0                                                 ORI10149
      TSAT=TSATR(1)                                                     ORI10150
      QTOT=PFA*QAVG                                                     ORI10151
      QDPI=QTOT/PI                                                      ORI10152
C                                                                       ORI10153
C-----DETERMINE GAP AT STEADY STATE                                     ORI10154
      ESP=0.0001                                                        ORI10155
      T1=TNSB                                                           ORI10156
      TND5=TCS                                                          ORI10157
      IF(GPB.LE.0.0001)GO TO 68                                         ORI10158
      CALL FALSE(T1,10.0,GAP,TZERO,50.1,ESP,NOUT)                       ORI10159
      GO TO 69                                                          ORI10160
   68 GPCAL=0.0                                                         ORI10161
      TZERO=TNSB                                                        ORI10162
   69 DELGAP(4)=GPCAL                                                   ORI10163
      DELRO(1)=GPCAL*12000.0                                            ORI10164
      TNSS=TZERO                                                        ORI10165
C                                                                       ORI10166
C-----DETERMINE STEADY STATE TEMPERATURE PROFILE                        ORI10167
      CALL STEADY(CBNA,TSAT,HFR,KD)                                     ORI10168
      SFLUX(1)=QTOT/(2.0*PI*R(NOD5))*3500.0                             ORI10169
      TSURO(1)=TSURF(9)                                                 ORI10170
C                                                                       ORI10171
C-----INITIAL PIN INTERNAL ENERGY CONTENT                               ORI10172
      CALL ENTHAL(HINIT)                                                ORI10173
C                                                                       ORI10174
C-----ZERO HEAT AND B MATRICES                                          ORI10175
      DO 70 I=1,40                                                      ORI10176
      B(I)=0.0                                                          ORI10177
      DO 70 J=1,40                                                      ORI10178
      HEAT(I,J)=0.0                                                     ORI10179
   70 CONTINUE                                                          ORI10180
C                                                                       ORI10181
C*****TRANSIENT CALCULATIONS                                            ORI10182
C-----INITIALIZE SCRATCH MATRICES                                       ORI10183
      TIM(1)=TIMEE(1)                                                   ORI10184
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      TIME(1)=TIMEE(1)                                                  ORI10185
      DO 80 I=1,NOD6                                                    ORI10186
      TSAVE(I,1)=T(I)                                                   ORI10187
   80 TO(I,1)=T(I)                                                      ORI10188
      HO(1)=HF*3600.0                                                   ORI10189
      QO(1)=QTOT                                                        ORI10190
      TBO(1)=TB                                                         ORI10191
      PSO(1)=PRESUR(1)                                                  ORI10192
      TSATO(1)=TSAT                                                     ORI10193
      HSATO(1)=SFLUX(1)/(TSURO(1)-TSATO(1))                             ORI10194
      AMFO(1)=AMFR(1)                                                   ORI10195
      QUALO(1)=QUALR(1)                                                 ORI10196
      RHBO(1)=HBR(1)                                                    ORI10197
      RSFXO(1)=SFLUXR(1)                                                ORI10198
      RTSURO(1)=TSURR(1)                                                ORI10199
      MODEO(1)=MODER(1)                                                 ORI10200
      TCM(1)=T(1)                                                       ORI10201
C                                                                       ORI10202
C-----ZERO DTDT MATRIX                                                  ORI10203
      DO 90 I=1,30                                                      ORI10204
   90 DTDT(I)=0.0                                                       ORI10205
C-----CALL PROP AND THEN DETERMINE TIME DELAY                           ORI10206
      CALL PROP                                                         ORI10207
      DELAY=OMGO*C(1)*RBAR(1)**2/(2.0*K(1))                             ORI10208
      ISTAR=IFIX(DELAY/0.05)                                            ORI10209
      DELD=DELAY/0.05-FLOAT(ISTAR)                                      ORI10210
C                                                                       ORI10211
C-----TRANSIENT COUNTER INITIALIZATION                                  ORI10212
C     AND FIRST CALLS TO OUTTAP AND MNFLX1                              ORI10213
      LO=1                                                              ORI10214
      JO=1                                                              ORI10215
      KO=1                                                              ORI10216
      CALL OUTTAP(KO)                                                   ORI10217
      IF(ICS7.EQ.1) CALL MNFLX1 (KO,LO)                                 ORI10218
      KO=2                                                              ORI10219
      LINES=18                                                          ORI10220
      CALL OUTSS(KO,QAVG)                                               ORI10221
C-----TRANSIENT INPUT                                                   ORI10222
      SUMCP=0.0                                                         ORI10223
      SUMQ=0.0                                                          ORI10224
      SUMFLX=0.0                                                        ORI10225
   98 LO=LO+1                                                           ORI10226
C-----TRANSIENT CALCULATIONS AND OUTPUT                                 ORI10227
      TIM(2)=TIMEE(LO)                                                  ORI10228
      QTOT=PFA*QAVGG(LO)                                                ORI10229
      DELT=TIM(2)-TIM(1)                                                ORI10230
      SUMQ=SUMQ+QTOT*DELT                                               ORI10231
      TB=TBR(LO)                                                        ORI10232
      TCS=TCSS(LO)                                                      ORI10233
      TSAT=TSATR(LO)                                                    ORI10234
      JO=JO+1                                                           ORI10235
      CALL TRANS                                                        ORI10236
      DO 100 I=1,NOD6                                                   ORI10237
      TSAVE(I,2)=T(I)                                                   ORI10238
  100 TO(I,JO)=T(I)                                                     ORI10239
      TCM(LO)=TCM(LO-1)+DELT*(DTDT(ISTAR)  +DELD*(DTDT(ISTAR+1)         ORI10240
     1                        -DTDT(ISTAR)))                          ORI10241
      DO 120 JA=1,29                                                    ORI10242
      JB=31-JA                                                          ORI10243
  120 DTDT(JB)=DTDT(JB-1)                                               ORI10244
      DTDT(1)=(TSAVE(1,2)-TSAVE(1,1))/DELT                              ORI10245
      TIME(JO)=TIM(2)                                                   ORI10246
      TIM(1)=TIM(2)                                                     ORI10247
      QO(JO)=QTOT                                                       ORI10248
      TBO(JO)=TB                                                        ORI10249
      SUMFLX=SUMFLX+HF*DELT                                             ORI10250
      CALL ENERGY(TSAVE,DELU)                                           ORI10251
      SUMCP=SUMCP+DELU                                                  ORI10252
      DO 130 I=1,NOD6                                                   ORI10253
  130 TSAVE(I,1)=TSAVE(I,2)                                             ORI10254
      SFLUX(JO)=HF*3600.0                                               ORI10255
      TSURO(JO)=T(NOD6)-2.0*R(NOD6)*HF/ZZ                               ORI10256
      HO(JO)=SFLUX(JO)/(TSURO(JO)-TB)                                   ORI10257
      PSO(JO)=PRESUR(LO)                                                ORI10258
      AMFO(JO)=AMFR(LO)                                                 ORI10259
      QUALO(JO)=QUALR(LO)                                               ORI10260
      RHBO(JO)=HBR(LO)                                                  ORI10261
      RSFXO(JO)= SFLUXR(LO)                                             ORI10262
      RTSURO(JO)= TSURR(LO)                                             ORI10263
      MODEO(JO)=MODER(LO)                                               ORI10264
      TSATO(JO)=TSAT                                                    ORI10265
      HSATO(JO)=SFLUX(JO)/(TSURO(JO)-TSATO(JO))                         ORI10266
      DELRO(JO)=DELGAP(4)*12000.0                                       ORI10267
      CALL OUTTAP(KO)                                                   ORI10268
      IF(ICS7.EQ.1) CALL MNFLX1(KO,LO)                                  ORI10269
      IF((LO.GE.JRP.OR.LO.GE.IRP).OR.LO.GE.601) GO TO 138               ORI10270
      IF(JO-12)98,138,138                                               ORI10271
  138 LINES=LINES+NOD6+20                                               ORI10272
      IF(LINES-68)148,158,158                                           ORI10273
  148 NO=1                                                              ORI10274
      CALL OUTTNS                                                       ORI10275
      JO=0                                                              ORI10276
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      IF((LO.GE.JRP.OR.LO.GE.IRP).OR.LO.GE.601) GO TO 168
      GO TO 98
  158 NO=2
      CALL OUTTNS
      JO=0
      LINES=NOD6+20
      IF((LO.GE.JRP.OR.LO.GE.IRP).OR.LO.GE.601) GO TO 168
      GO TO 98
  168 CONTINUE
C
C-----FINAL PIN INTERNAL ENERGY CONTENT AND OUTPUT
      CALL ENTHAL(HFINAL)
      EQNLFT=SUMCP+SUMQ
      DELH=HINIT-HFINAL
      EQNRT=2.0*PI*R(NOD6)*SUMFLX
      ERROR1=ABS(EQNLFT-EQNRT)/EQNLFT*100.0
      ERROR2=ABS(DELH+SUMQ-EQNRT)/(DELH+SUMQ)*100.0
      CALL OUTFNL
C
C-----PLOT TCM VERSUS TCMM
      IF(TCMM(1)-10.0)188,188,178
  178 NDP=JRP
      IF(NDP.GE.IRP) NDP=IRP
      SX=0.0
      EX=TRPEND
      ANTELX=0.05
      CALL MAXMIN(TCM,TCMM,EY,SY,NDP)
      ITYPE=2
      NUM=JRP
      IF(NUM.GE.IRP) NUM=IRP
      IORD=1
      DO 180 I=1,NDP
  180 XXX(I)=TIMEE(I)
      WRITE(NOUT,187)
  187 FORMAT(1H1,T11,'OVERLAY OF MIDDLE T/C RESPONSE (ASTERISES) VERSUS
     1ORINC PREDICTED RESPONSE (X-S)')
      CALL PLOT(NDP,TIMEE,TCMM,SX,EX,ANTELX,SY,EY,ITYPE,M,CC,NUM,
     1          XXX,TCM,IORD)
C
C-----DENOTE END OF RECORD FOR THIS T/C
  188 VAR(1)=-100.0
      KB=NOD6+18
      DO 190 I=2,KB
  190 VAR(I)=0.0
      WRITE(9)(VAR(I),I=1,KB)
  200 CONTINUE
      END FILE 9
C
C*****FINAL CALL TO MNFLX2:  TO COMPUTE MEAN FLUXES
C     AND TO OUTPUT TO RELAP PLOTTAPE
      IF(ICS7.EQ.1) CALL MNFLX2
C
C*****RETRIEVE CASE INFORMATION FROM DISK (FILE 1)
C*****AND WRITE TO SECOND FILE OF NTAPE=9
      END FILE 1
      REWIND 1
  208 READ(1,207,END=218) INN
  207 FORMAT(20A4)
      WRITE(9,207)INN
      GO TO 208
  218 END FILE 9
      STOP 1002
      END
```

```
C*********************************************************************
C*********************************************************************
C**********************                    ********************
C**********************      SUBROUTINE RADI    ********************
C**********************                    ********************
C*********************************************************************
C*********************************************************************
      SUBROUTINE RADI
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),
     2               DLRMGO,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2
C
C     NMGO= NUMBER OF NODES IN THE MGO CORE (.GE.2)
C     NHT = NUMBER OF NODES IN THE INCONNEL-600 HEATER LAYER (.GE.1)
C     NCU = NUMBER OF NODES IN THE CUPRO-NICKEL HEATER LAYER (.GE.0)
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C      NBN = NUMBER OF NODES IN THE BORON NITRIDE ANNULAR SECTION (.GE.1)ORI10356
C      NSS1= NUMBER OF NODES IN THE FIRST S.S.SHEATH (.GE.1)             ORI10357
C      NSS2= NUMBER OF NODES IN THE SECOND (OUTER) S.S.SHEATH (.GE.1)    ORI10358
C                                                                        ORI10359
C   SET-UP RADII (I.E. R AND RBAR)                                       ORI10360
C   ***IN THE MGO CORE                                                   ORI10361
       DLRMGO=RHEAT(2)**2/FLOAT(NMGO)                                    ORI10362
       RBAR(1)=SQRT(0.5*DLRMGO)                                          ORI10363
       R(1)=SQRT(DLRMGO)                                                 ORI10364
       RHEAT(1)=R(1)                                                     ORI10365
       DO 10 I=2,NMGO                                                    ORI10366
       RBAR(I)=SQRT(R(I-1)**2+0.5*DLRMGO)                                ORI10367
    10 R(I)=SQRT(R(I-1)**2+DLRMGO)                                       ORI10368
C   ***IN THE HEATER (INCONEL-600 LAYER)                                 ORI10369
       NOD2=NMGO+NHT                                                     ORI10370
       DLRHTR=(RHEAT(3)**2-R(NMGO)**2)/FLOAT(NHT)                        ORI10371
       NH=NMGO+1                                                         ORI10372
       DO 20 I=NH,NOD2                                                   ORI10373
       RBAR(I)=SQRT(R(I-1)**2+0.5*DLRHTR)                                ORI10374
    20 R(I)=SQRT(R(I-1)**2+DLRHTR)                                       ORI10375
C   ***IN THE HEATER (CUPRO-NICKEL LAYER)                                ORI10376
       NOD3=NOD2+NCU                                                     ORI10377
       NH=NOD2+1                                                         ORI10378
       IF(NCU)23,23,21                                                   ORI10379
    21 DLRCU=(RHEAT(4)**2-R(NOD2)**2)/FLOAT(NCU)                         ORI10380
       DO 22 I=NH,NOD3                                                   ORI10381
       RBAR(I)=SQRT(R(I-1)**2+0.5*DLRCU)                                 ORI10382
    22 R(I)=SQRT(R(I-1)**2+DLRCU)                                        ORI10383
C   ***IN THE BORON NITRIDE LAYER                                        ORI10384
    23 NOD4=NOD3+NBN                                                     ORI10385
       DLRBN =(RHEAT(5)**2-R(NOD3)**2)/FLOAT(NBN)                        ORI10386
       NC=NOD3+1                                                         ORI10387
       DO 30 I=NC,NOD4                                                   ORI10388
       RBAR(I)=SQRT(R(I-1)**2+0.5*DLRBN)                                 ORI10389
    30 R(I)=SQRT(R(I-1)**2+DLRBN)                                        ORI10390
C   ***IN THE FIRST S.S. SHEATH                                          ORI10391
       NOD5=NOD4+NSS1                                                    ORI10392
       DLRSS1=(RHEAT(6)**2-R(NOD4)**2)/FLOAT(NSS1)                       ORI10393
       NB=NOD4+1                                                         ORI10394
       DO 40 I=NB,NOD5                                                   ORI10395
       RBAR(I)=SQRT(R(I-1)**2+0.5*DLRSS1)                                ORI10396
    40 R(I)=SQRT(R(I-1)**2+DLRSS1)                                       ORI10397
C   ***IN THE OUTER S.S. SHEATH                                          ORI10398
       NOD6=NOD5+NSS2                                                    ORI10399
       DLRSS2=(RHEAT(7)**2-R(NOD5)**2)/FLOAT(NSS2)                       ORI10400
       NS=NOD5+1                                                         ORI10401
       DO 50 I=NS,NOD6                                                   ORI10402
       RBAR(I)=SQRT(R(I-1)**2+0.5*DLRSS2)                                ORI10403
    50 R(I)=SQRT(R(I-1)**2+DLRSS2)                                       ORI10404
C                                                                        ORI10405
       RETURN                                                            ORI10406
       END                                                               ORI10407
```

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C*************************************************************************ORI10408
C*************************************************************************ORI10409
C*************                                              ******ORI10410
C************* GENERATION OF STEADY STATE TEMPERATURES IN THE PIN ******ORI10411
C*************                                              ******ORI10412
C*************************************************************************ORI10413
C*************************************************************************ORI10414
      SUBROUTINE STEADY(CBNO,TSAT,HFR,KD)                                ORI10415
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                 ORI10416
      REAL K(40),KGAP(4),TS(40),HT(40),HCGAP(4),TT(2,40),TSF(2),HSF(2)   ORI10417
     1    ,CBNO(4)                                                       ORI10418
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,ORI10419
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),     ORI10420
     2              DLRMGC,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2              ORI10421
      COMMON /SAVE/ T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,    ORI10422
     1              ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ    ORI10423
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB                   ORI10424
      DATA HCGAP/4*0.0/                                                  ORI10425
C  THERMAL CONDUCTIVITY FUNCTIONS FOR PIN COMPONENTS                     ORI10426
      AKGAP(A)=(0.013+0.0000216*A)/3600.0                                ORI10427
      AKHTR(A)=(8.42944336+A*(2.89105011E-03+A*(2.42143869E-06           ORI10428
     1          -6.19365892E-10*A)))/3600.0                              ORI10429
      AKCUN(A)=(16.8024902-A*(1.31225586E-03-A*(4.43458557E-05-A*(       ORI10430
     1         4.77302819E-08-2.50679477E-11*A))))/3600.0                ORI10431
      AKBN(A)=(DA+A*(DB+A*(DC+DD*A)))/3600.0                             ORI10432
      AKSS(A)=(7.24584961+A*(5.07926941E-03-A*(9.89995897E-07            ORI10433
     1        -3.82840426E-10*A)))/3600.0                                ORI10434
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C                                                                       ORI10435
C       SET-UP AKBN COEFFICIENTS                                        ORI10436
        DA=CBNO(1)                                                      ORI10437
        DB=CBNO(2)                                                      ORI10438
        DC=CBNO(3)                                                      ORI10439
        DD=CBNO(4)                                                      ORI10440
C  CALCULATE STEADY STATE OUTSIDE FILM COEFFICIENT (HF), AND TEMPERATUREORI10441
C       PROFILE IN THE OUTER S.S.SHEATH                                 ORI10442
C-----ESTIMATE SURFACE TEMPERATURE OF OUTER SHEATH OPOSITE THERMOCOUPLE ORI10443
        PI=3.14159265                                                   ORI10444
        STEFAN=0.1714E-08/3600.0                                        ORI10445
        QDPI=QTOT/PI                                                    ORI10446
        IF(DELGAP(4).LE.8.0E-09)GO TO 18                                ORI10447
        TSURF(7)=TCS-QDPI/(2.0/(ALOG(R(NOD5)/RBAR(NOD5))/AKSS(TCS)))    ORI10448
        KGAP(4)=AKGAP(TSURF(7))                                         ORI10449
        TSURF(8)= TSURF(7)-QDPI/2.0*ALOG((R(NOD5)+DELGAP(4))/R(NOD5))/  ORI10450
       1(KGAP(4)+R(NOD5)*HCGAP(4)*ALOG((R(NOD5)+DELGAP(4))/R(NOD5)))    ORI10451
        DO 20 I=1,10                                                    ORI10452
        KGAP(4)=AKGAP((TSURF(7)+TSURF(8))/2.0)                          ORI10453
        RTCS=TSURF(7)+459.67                                            ORI10454
        RTSURF=TSURF(8)+459.67                                          ORI10455
        HR4=STEFAN*(RTCS**2+RTSURF**2)*(RTCS+RTSURF)                    ORI10456
        TSUR    = TSURF(7)-QDPI/2.0*ALOG((R(NOD5)+DELGAP(4))/R(NOD5))/  ORI10457
       1(KGAP(4)+(R(NOD5)*HCGAP(4)+R(NOD5)*HR4)*ALOG((R(NOD5)+DELGAP(4)))/ ORI10458
       2R(NOD5)))                                                       ORI10459
        ERROR=ABS(TSUR-TSURF(8))/TSUR                                   ORI10460
        TSURF(8)=TSUR                                                   ORI10461
        IF(ERROR.LT.0.0001)GO TO 28                                     ORI10462
   20 CONTINUE                                                          ORI10463
        IF(ERROR.GT.0.001)WRITE(NOUT,7)                                 ORI10464
    7 FORMAT(1H1,'***WARNING--STEADY--DETERMINATION OF SURFACE TEMPERATURORI10465
       1E (GAP 4) FOR HR CALCULATION DID NOT CONVERGE (I.E.,WITHIN ERROR CORI10466
       2RITERION)')                                                     ORI10467
        GO TO 28                                                        ORI10468
   18 TSURF(7)=TCS-QDPI/(2.0/(ALOG(R(NOD5)/RBAR(NOD5))/AKSS(TCS)))      ORI10469
        TSURF(8)=TSURF(7)                                               ORI10470
   28 RTSURF=TSURF(8)+459.67                                            ORI10471
        RTCS=TSURF(7)+459.67                                            ORI10472
        HRGAP(4)=STEFAN*(RTCS**2+RTSURF**2)*(RTCS+RTSURF)               ORI10473
        KGAP(4)=AKGAP((TSURF(7)+TSURF(8))/2.0)                          ORI10474
C-----DETERMINATION OF HF AT STEADY STATE                               ORI10475
        KD=0                                                            ORI10476
        TD=TB                                                           ORI10477
   25 J=0                                                               ORI10478
        KD=KD+1                                                         ORI10479
        DO 30 I=NS,NOD6                                                 ORI10480
   30 T(I)=TSURF(8)                                                     ORI10481
   35 DO 40 I=NS,NOD6                                                   ORI10482
   40 K(I)=AKSS(T(I))                                                   ORI10483
        HT(NOD5)=      ALOG(RBAR(NS)/R(NOD5))/K(NS)                     ORI10484
        IF(NSS2.LT.2)GO TO 68                                           ORI10485
        DO 60 I=NS,NOD6                                                 ORI10486
        IF(I.EQ.NOD6)GO TO 68                                           ORI10487
   60 HT(I)=     ALOG(R(I)/RBAR(I))/K(I)+ALOG(RBAR(I+1)/R(I))/K(I+1)    ORI10488
   68 HT(NOD6)=  ALOG(R(NOD6)/RBAR(NOD6))/K(NOD6)                       ORI10489
        SUM=0.0                                                         ORI10490
        DO 70 I=NOD5,NOD6                                               ORI10491
   70 SUM=SUM+HT(I)                                                     ORI10492
        IF(QDPI.LE.0.001) GO TO 74                                      ORI10493
        HF=1.0/(R(NOD6)*((TSURF(8)-TD)*2.0/QDPI-SUM))                   ORI10494
        GO TO 76                                                        ORI10495
   74 HF=HFR                                                            ORI10496
        TSURF(9)= T(NOD6)                                               ORI10497
        GO TO 116                                                       ORI10498
   76 Z=2.0/(1.0/(HF*R(NOD6))+HT(NOD6))                                 ORI10499
C-----DETERMINATION OF TEMPERATURE PROFILE IN OUTER S.S.SHEATH          ORI10500
        TS(NOD6)=QDPI/Z +TD                                             ORI10501
        TSURF(9)=QDPI/(2.0/(1.0/(HF*R(NOD6))))+TD                       ORI10502
        IF(NSS2.LT.2)GO TO 88                                           ORI10503
        DO 80 I=1,NOD6                                                  ORI10504
        N1=NOD6-I                                                       ORI10505
        N2=N1+1                                                         ORI10506
        TS(N1)=QDPI/(2.0/HT(N1))+TS(N2)                                 ORI10507
        IF(N1.EQ.NS)GO TO 88                                            ORI10508
   80 CONTINUE                                                          ORI10509
   88 ERROR=0.0                                                         ORI10510
        DO 90 I=NS,NOD6                                                 ORI10511
        ERROR=ERROR+ABS(TS(I)-T(I))                                     ORI10512
   90 T(I)=TS(I)                                                        ORI10513
        IF(ERROR.LT.0.0020)GO TO 108                                    ORI10514
        J=J+1                                                           ORI10515
        IF(J-10)38,38,98                                                ORI10516
   98 WRITE(NOUT,107)                                                   ORI10517
  107 FORMAT(1H1,'***WARNING--STEADY--TEMPERATURE PROFILE DETERMINATION IORI10518
       1N OUTER S.S.SHEATH DID NOT CONVERGE. CALCULATIONS TERMINATED')  ORI10519
        STOP                                                            ORI10520
  108 CONTINUE                                                          ORI10521
        DO 109 I=NS,NOD6                                                ORI10522
  109 TT(KD,I)=T(I)                                                     ORI10523
        TSF(KD)=TSURF(9)                                                ORI10524
        HSF(KD)=HF                                                      ORI10525
        TO=TSAT                                                         ORI10526
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```
      IF(KD.LT.2)GO TO 29                                                    ORI10527
      CALL TSMIN(TI,T,TSF,TSURF(9),HSF,HF,KD)                                ORI10528
C  DETERMINATION OF TEMPERATURE PROFILE IN INNER S.S.SHEATH                  ORI10529
  116 J=0                                                                    ORI10530
      DO 110 I=NB,NOD5                                                       ORI10531
  110 T(I)=TCS                                                               ORI10532
      TSURF(6)=TCS                                                           ORI10533
  118 DO 120 I=NB,NOD5                                                       ORI10534
  120 K(I)=AKSS(T(I))                                                        ORI10535
      HT(NOD4)= ALOG(RBAR(NB)/R(NOD4))/K(NB)                                 ORI10536
      IF(NSS1.LT.2)GO TO 138                                                 ORI10537
      DO 130 I=NB,NOD5                                                       ORI10538
      IF(I.EQ.NOD5)GO TO 138                                                 ORI10539
  130 HT(I)= ALOG(R(I)/RBAR(I))/K(I)+ALOG(RBAR(I+1)/R(I))/K(I+1)             ORI10540
  138 TS(NOD5)=TCS                                                           ORI10541
      IF(NSS1.LT.2)GO TO 148                                                 ORI10542
      DO 140 I=1,NOD5                                                        ORI10543
      N1=NOD5-I                                                              ORI10544
      N2=N1+1                                                                ORI10545
      TS(N1)=QDPI/(2.0/HT(N1))+TS(N2)                                        ORI10546
      IF(N1.EQ.NB)GO TO 148                                                  ORI10547
  140 CONTINUE                                                               ORI10548
  148 TSUR     =QDPI/(2.0/HT(NOD4))+TS(NB)                                   ORI10549
      ERROR=ABS(TSUR-TSURF(6))                                               ORI10550
      TSURF(6)=TSUR                                                          ORI10551
      DO 150 I=NB,NOD5                                                       ORI10552
      ERROR=ERROR+ABS(TS(I)-T(I))                                            ORI10553
  150 T(I)=TS(I)                                                             ORI10554
      IF(ERROR.LT.0.0020)GO TO 168                                           ORI10555
      J=J+1                                                                  ORI10556
      IF(J-10)118,118,158                                                    ORI10557
  158 WRITE(NOUT,167)                                                        ORI10558
  167 FORMAT(1H1,'**WARNING--STEADY--TEMPERATURE PROFILE DETERMINATION IORI10559
     1N INNER S.S.SHEATH DID NOT CONVERGE. CALCULATIONS TERMINATED')         ORI10560
      STOP                                                                   ORI10561
  168 CONTINUE                                                               ORI10562
C-----CALCULATION OF BN OUTSIDE SURFACE TEMPERATURE                          ORI10563
      IF(DELGAP(3).EQ.0.0)GO TO 188                                          ORI10564
      KGAP(3)=AKGAP(TSURF(6))                                                ORI10565
      TSURF(5)=TSURF(6)+QDPI/(2.0*(KGAP(3)/ALOG((R(NOD4)+DELGAP(3))/         ORI10566
     1                              R(NOD4))+R(NOD4)*HCGAP(3)))              ORI10567
      DO 170 I=1,10                                                          ORI10568
      KGAP(3)=AKGAP((TSURF(5)+TSURF(6))/2.0)                                 ORI10569
      RT5=TSURF(5)+459.67                                                    ORI10570
      RT6=TSURF(6)+459.67                                                    ORI10571
      HR3=STEFAN*(RT5**2+RT6**2)*(RT5+RT6)                                   ORI10572
      TSUR=TSURF(6)+QDPI/(2.0*(KGAP(3)/ALOG((R(NOD4)+DELGAP(3))/             ORI10573
     1                        R(NOD4))+R(NOD4)*HCGAP(3)+R(NOD4)*HR3))        ORI10574
      ERROR=ABS(TSUR-TSURF(5))/TSUR                                          ORI10575
      TSURF(5)=TSUR                                                          ORI10576
      IF(ERROR.LT.0.0001)GO TO 198                                           ORI10577
  170 CONTINUE                                                               ORI10578
      IF(ERROR.GT.0.001)WRITE(NOUT,177)                                      ORI10579
  177 FORMAT(1H1,'**WARNING--STEADY--DETERMINATION OF SURFACE TEMPERATURORI10580
     1E (GAP 3) FOR HR CALCULATION DID NOT CONVERGE (I.E.,WITHIN ERROR CORI10581
     2RITERION)')                                                            ORI10582
      GO TO 198                                                              ORI10583
  188 TSURF(5)=TSURF(6)                                                      ORI10584
  198 RT5=TSURF(5)+459.67                                                    ORI10585
      RT6=TSURF(6)+459.67                                                    ORI10586
      HRGAP(3)=STEFAN*(RT5**2+RT6**2)*(RT5+RT6)                              ORI10587
C  DETERMINATION OF TEMPERATURE PROFILE IN BN ANNULAR LAYER                  ORI10588
      J=0                                                                    ORI10589
      DO 200 I=NC,NOD4                                                       ORI10590
  200 T(I)=TSURF(5)                                                          ORI10591
      TSURF(4)=TSURF(5)                                                      ORI10592
  208 DO 210 I=NC,NOD4                                                       ORI10593
  210 K(I)=AKBN(T(I))                                                        ORI10594
      HT(NOD3)=ALOG(RBAR(NC)/R(NOD3))/K(NC)                                  ORI10595
      IF(NBN.LT.2)GO TO 228                                                  ORI10596
      DO 220 I=NC,NOD4                                                       ORI10597
      IF(I.EQ.NOD4)GO TO 228                                                 ORI10598
  220 HT(I)=ALOG(R(I)/RBAR(I))/K(I)+ALOG(RBAR(I+1)/R(I))/K(I+1)              ORI10599
  228 HT(NOD4)=ALOG(R(NOD4)/RBAR(NOD4))/K(NOD4)                              ORI10600
      TS(NOD4)=QDPI/(2.0/HT(NOD4))+TSJRF(5)                                  ORI10601
      IF(NBN.LT.2)GO TO 238                                                  ORI10602
      DO 230 I=1,NOD4                                                        ORI10603
      N1=NOD4-I                                                              ORI10604
      N2=N1+1                                                                ORI10605
      TS(N1)=QDPI/(2.0/HT(N1))+TS(N2)                                        ORI10606
      IF(N1.EQ.NC)GO TO 238                                                  ORI10607
  230 CONTINUE                                                               ORI10608
  238 TSUR= QDPI/(2.0/HT(NOD3))+TS(NC)                                       ORI10609
      ERROR=ABS(TSUR-TSURF(4))                                               ORI10610
      TSURF(4)=TSUR                                                          ORI10611
      DO 240 I=NC,NOD4                                                       ORI10612
      ERROR=ERROR+ABS(TS(I)-T(I))                                            ORI10613
  240 T(I)=TS(I)                                                             ORI10614
      IF(ERROR.LT.0.0050)GO TO 258                                           ORI10615
      J=J+1                                                                  ORI10616
      IF(J-10)208,208,248                                                    ORI10617
  248 WRITE(NOUT,257)                                                        ORI10618
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  257 FORMAT(1H1,'**WARNING--STEADY--TEMPERATURE PROFILE DETERMINATION  IORI10619
     1N BN DID NCT CCNVERGE. CALCULATIONS TERMINATED')                  ORI10620
      STOP                                                              ORI10621
  25E CCNTINUE                                                          ORI10622
C-----CALCULATION OF HEATER ELEMENT OUTSIDE SURFACE TEMPERATURE         ORI10623
      IF(DELGAP(2).EQ.0.0)GC TO 278                                     ORI10624
      KGAP(2)=AKGAP(TSURF(4))                                           ORI10625
      TSURF(3)=TSURF(4)+QDPI/(2.0*(KGAP(2)/ALOG((R(NOD3)+DELGAP(2))/    ORI10626
     1                                R(NOD3))+R(NOD3)*HCGAP(2)))        ORI10627
      DO 260 I=1,10                                                     ORI10628
      KGAP(2)=AKGAP((TSURF(3)+TSURF(4))/2.0)                            ORI10629
      RT3=TSURF(3)+459.67                                               ORI10630
      RT4=TSURF(4)+459.67                                               ORI10631
      HR2=STEFAN*(RT3**2+RT4**2)*(RT3+RT4)                              ORI10632
      TSUR=TSURF(4)+QDPI/(2.0*(KGAP(2)/ALOG((R(NOD3)+DELGAP(2))/        ORI10633
     1                      R(NOD3))+R(NOD3)*HCGAP(2)+R(NOD3)*HR2))     ORI10634
      ERROR=ABS(TSUR-TSURF(3))/TSUR                                     ORI10635
      TSURF(3)=TSUR                                                     ORI10636
      IF(ERROR.LT.0.0001)GO TO 288                                      ORI10637
  26C CONTINUE                                                          ORI10638
      IF(ERROR.GT.0.001)WRITE(NOUT,267)                                 ORI10639
  267 FORMAT(1H1,'**WARNING--STEADY--DETERMINATION OF SURFACE TEMPERATURORI10640
     1E (GAP 2) FOR HR CALCULATION DID NOT CONVERGE (I.E.,WITHIN ERROR CORI10641
     2RITERION)')                                                       ORI10642
      GO TO 288                                                         ORI10643
  27E TSURF(3)=TSURF(4)                                                 ORI10644
  28E RT3=TSURF(3)+459.67                                               ORI10645
      RT4=TSURF(4)+459.67                                               ORI10646
      HRGAP(2)=STEFAN*(RT3**2+RT4**2)*(RT3+RT4)                         ORI10647
C  DETERMINATION OF TEMPERATURE PROFILE IN HEATER ELEMENT               ORI10648
      JCU=0                                                             ORI10649
      JIN=0                                                             ORI10650
      IF(NCU)298,298,368                                                ORI10651
C-----INCONEL-600 HEATER ELEMENT SECTION                                ORI10652
  29E QINCON=PFR(1)*QDPI                                                ORI10653
      QIN=QINCON/FLOAT(NHT)                                             ORI10654
      IF(NCU.EQ.0)TI=TSURF(3)                                           ORI10655
      DO 300 I=NM,NOD2                                                  ORI10656
  3CC T(I)=TI                                                           ORI10657
  3C8 DO 310 I=NM,NOD2                                                  ORI10658
  31C K(I)=AKHTR(T(I))                                                  ORI10659
      IF(NHT.LT.2)GO TO 328                                             ORI10660
      DO 320 I=NM,NOD2                                                  ORI10661
      IF(I.EQ.NOD2)GO TO 328                                            ORI10662
  32C HT(I)=DLRHTR/R(I)/R(I)/2.0/((K(I)+K(I+1))/2.0)                    ORI10663
  32E HT(NOD2)=DLRHTR/R(NOD2)/R(NOD2)/4.0/K(NOD2)                       ORI10664
      TS(NOD2)=QINCON/(2.0/HT(NOD2))+TI                                 ORI10665
      IF(NHT.LT.2)GO TO 338                                             ORI10666
      QSUM=QINCON                                                       ORI10667
      DO 330 I=1,NOD2                                                   ORI10668
      QSUM=QSUM-QIN                                                     ORI10669
      N1=NOD2-I                                                         ORI10670
      N2=N1+1                                                           ORI10671
      TS(N1)=QSUM/(2.0/HT(N1))+TS(N2)                                   ORI10672
      IF(N1.EQ.NM)GO TO 338                                             ORI10673
  33C CONTINUE                                                          ORI10674
  33E ERROR=0.0                                                         ORI10675
      DO 340 I=NM,NOD2                                                  ORI10676
      ERROR=ERROR+ABS(TS(I)-T(I))                                       ORI10677
  340 T(I)=TS(I)                                                        ORI10678
      IF(ERROR.LT.0.0020)GO TO 358                                      ORI10679
      JIN=JIN+1                                                         ORI10680
      IF(JIN-10)308,308,348                                             ORI10681
  348 WRITE(NOUT,357)                                                   ORI10682
  357 FORMAT(1H1,'**WARNING--STEADY--TEMPERATURE PROFILE DETERMINATION  IORI10683
     1N INCONEL HEATER ELEMENT DID NOT CONVERGE. CALCULATIONS TERMINATEDORI10684
     2')                                                                ORI10685
      STOP                                                              ORI10686
  35E CONTINUE                                                          ORI10687
      TSURF(2)=T(NM)                                                    ORI10688
      TSURF(1)=T(NM)                                                    ORI10689
      DO 360 I=1,NMGC                                                   ORI10690
  36C T(I)=TSURF(1)                                                     ORI10691
      RT2=TSURF(2)+459.67                                               ORI10692
      RT1=TSURF(1)+459.67                                               ORI10693
      HRGAP(1)=STEFAN*(RT2**2+RT1**2)*(RT2+RT1)                         ORI10694
C                                                                       ORI10695
C  STEADY STATE TEMPERATURE PROFILE DETERMINATION COMPLETED             ORI10696
C                                                                       ORI10697
      RETURN                                                            ORI10698
C-----CUPRO-NICKEL HEATER ELEMENT SECTION                               ORI10699
  36E QCUNI=PFR(2)*QDPI                                                 ORI10700
      QCU=QCUNI/FLOAT(NCU)                                              ORI10701
      DO 370 I=NH,NOD3                                                  ORI10702
  37C T(I)=TSURF(3)                                                     ORI10703
      TI=TSURF(3)                                                       ORI10704
  37E DO 380 I=NH,NOD3                                                  ORI10705
  38C K(I)=AKCUN(T(I))                                                  ORI10706
      HT(NOD2)=DLRCU/R(NOD2)/R(NOD2)/4.0/K(NH)                          ORI10707
      IF(NCU.LT.2)GO TO 398                                             ORI10708
      DO 390 I=NH,NOD3                                                  ORI10709
      IF(I.EQ.NOD3)GO TO 398                                            ORI10710
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  350 HT(I)=DLRCU/R(I)/R(I)/2.0/((K(I)+K(I+1))/2.0)                    ORI1C711
  360 HT(NOD3)=DLRCU/R(NOD3)/R(NOD3)/4.0/K(NOD3)                       ORI1C712
      QSUM=GDPI                                                        ORI1C713
      TS(NOD3)=QSUM/(2.0/HT(NOD3))+TSURF(3)                            ORI1C714
      IF(NCU.LT.2)GO TO 408                                            ORI1C715
      DO 400 I=1,NOD3                                                  ORI1C716
      QSUM=QSUM-QCU                                                    ORI1C717
      N1=NOD3-I                                                        ORI1C718
      N2=N1+1                                                          ORI1C719
      TS(N1)=QSUM/(2.0/HT(N1))+TS(N2)                                  ORI1C720
      IF(N1.EQ.NH)GO TO 408                                            ORI1C721
  400 CONTINUE                                                         ORI1C722
  408 QSUM=QSUM-QCU                                                    ORI1C723
      TSUR=QSUM/(2.0/HT(NOD2))+TS(NH)                                  ORI1C724
      ERROR=ABS(TSUR-TI)                                               ORI1C725
      TI=TSUR                                                          ORI1C726
      DO 410 I=NH,NOD3                                                 ORI1C727
      ERROR=ERROR+ABS(TS(I)-T(I))                                      ORI1C728
  410 T(I)=TS(I)                                                       ORI1C729
      IF(ERROR.LT.0.0020)GO TO 298                                     ORI1C730
      JCU=JCU+1                                                        ORI1C731
      IF(JCU-10)378,378,418                                            ORI1C732
  418 WRITE(NOUT,427)                                                  ORI1C733
  427 FORMAT(1H1,'***WARNING--STEADY--TEMPERATURE PROFILE DETERMINATION ORI1C734
     1N CU-NI HEATER ELEMENT DID NOT CONVERGE. CALCULATIONS TERMINATED')ORI1C735
C                                                                      ORI1C736
C     END OF STEADY                                                    ORI1C737
C                                                                      ORI1C738
      STOP                                                             ORI1C739
      END                                                              ORI1C740
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      SUBROUTINE TSMIN(TT,T,TSF,TSURF,HSF,HF,KD)                       ORI1C741
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77               ORI1C742
      DIMENSION  TT(2,40),T(40),TSF(2),HSF(2)                          ORI1C743
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,ORI1C744
     1              NM,NH,NC,NB,NS,NIN,NOJT,R(40),RBAR(40),RHEAT(7),   ORI1C745
     2              DLRMGO,DLRHTR,DLRCJ,DLRBN,DLRSS1,DLRSS2            ORI1C746
      IF(HSF(2))18,18,8                                                ORI1C747
    8 IF(TSF(1).LT.TSF(2))GO TO 18                                     ORI1C748
      DO 10 I = NS,NOD6                                                ORI1C749
   10 T(I) =TT(2,I)                                                    ORI1C750
      TSURF=TSF(2)                                                     ORI1C751
      HF = HSF(2)                                                      ORI1C752
      KD=2                                                             ORI1C753
      RETURN                                                           ORI1C754
   18 DO 20 I = NS, NOD6                                               ORI1C755
   20 T(I) = TT(1,I)                                                   ORI1C756
      TSURF=TSF(1)                                                     ORI1C757
      HF = HSF(1)                                                      ORI1C758
      KD=1                                                             ORI1C759
      RETURN                                                           ORI1C760
      END                                                              ORI1C761
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C*********************************************************************ORI1C762
C*********************************************************************ORI1C763
C*************************                   *************************ORI1C764
C*************************    SUBROUTINE TRANS   *************************ORI1C765
C*************************                   *************************ORI1C766
C*********************************************************************ORI1C767
C*********************************************************************ORI1C768
C                                                                      ORI1C769
C     SUBROUTINE TRANS IS THE TRANSIENT DRIVING ROUTINE                ORI1C770
C                                                                      ORI1C771
      SUBROUTINE TRANS                                                 ORI1C772
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77               ORI1C773
      REAL K,KGAP                                                      ORI1C774
      LOGICAL SING                                                     ORI1C775
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      DIMENSION A(40,40),AB(40),X(40)                                   ORI1C77E
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,ORI10777
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),    ORI1C77E
     2              DLRMGO,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2             ORI1C77S
      COMMON/PROP1/DMGO,DHTR,DCUNI,DBN,DSS,C(40),K(40),CBNO(4),CMGO(5),ORI1C7EC
     1             KGAP(4),KOD2,PRS                                     ORI1C781
      COMMON /SAVE/ T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,   ORI1C782
     1              ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ   ORI1C783
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB                  ORI1C784
      STEFAN=0.1714E-08/3600.0                                          ORI1C7E5
      PI=3.14159265                                                     ORI1C7E6
C                                                                       ORI1C7E7
C  CALCULATE RADIAL HEAT GENERATION FOR EACH NODE                       ORI1C7EE
      QINCON=(PFR(1)*QTOT)/FLOAT(NHT)/PI                                ORI1C7E9
      QCUNI=0.0                                                         ORI1C7SC
      IF(NCU.GT.0)QCUNI=(PFR(2)*QTOT)/FLOAT(NCU)/PI                     ORI1C7S1
C                                                                       ORI1C7S2
C-----MGO CORE                                                          ORI1C7S3
      DO 10 I=1,NMGO                                                    ORI1C7S4
   10 Q(I)=0.0                                                          ORI1C7S5
C                                                                       ORI1C7S6
C-----HEATER SECTION (INCONEL-600 LAYER)                                ORI1C7S7
      DO 20 I=NM,NOD2                                                   ORI1C7SE
   20 Q(I)=QINCON                                                       ORI1C7S9
C                                                                       ORI1C8CC
C-----HEATER SECTION (CUPRO-NICKEL LAYER, IF ANY)                       ORI1C8C1
      IF(NCU)38,38,28                                                   ORI1C802
   28 DO 30 I=NH,NOD3                                                   ORI1C803
   30 Q(I)=QCUNI                                                        ORI1C804
C                                                                       ORI1C805
C-----BORON NITRIDE SECTION,AND STAINLESS STEEL SHEATHS                 ORI1C8C6
   38 DO 40 I=NC,NOD6                                                   ORI10807
   40 Q(I)=0.0                                                          ORI1080E
C                                                                       ORI1C8C9
C  CALCULATE GAP RADIATION HEAT TRANSFER COEFFICIENTS                   ORI1C81C
      DO 50 I=1,4                                                       ORI1C811
   50 HRGAP(I)=0.0                                                      ORI1C812
      IF(DELGAP(1).NE.0.0)HRGAP(1)=STEFAN*((T(NMGO)+459.67)**2+(T(NM)+  ORI10813
     1                    459.67)**2)*((T(NMGO)+459.67)+(T(NM)+459.67)) ORI10814
      IF(DELGAP(2).NE.0.0)HRGAP(2)=STEFAN*((T(NOD3)+459.67)**2+(T(NC)+  ORI1C815
     1                    459.67)**2)*((T(NOD3)+459.67)+(T(NC)+459.67)) ORI10816
      IF(DELGAP(3).NE.0.0)HRGAP(3)=STEFAN*((T(NOD4)+459.67)**2+(T(NB)+  ORI1C817
     1                    459.67)**2)*((T(NOD4)+459.67)+(T(NB)+459.67)) ORI1081E
      IF(DELGAP(4).NE.0.0)HRGAP(4)=STEFAN*((T(NOD5)+459.67)**2+(T(NS)+  ORI1C81S
     1                    459.67)**2)*((T(NOD5)+459.67)+(T(NS)+459.67)) ORI1082C
C                                                                       ORI1C821
C  SET-UP HEAT MATRIX AND CONSTANT B VECTOR                             ORI1C822
      CALL PROP                                                         ORI10823
      CALL GAPTNS                                                       ORI1C824
      CALL HEATR                                                        ORI10825
      CALL BVECTR                                                       ORI1C826
C                                                                       ORI1C827
C  SOLVE THE SYSTEM OF EQUATIONS                                        ORI1C82E
C                                                                       ORI1C82S
      ZZ=2.0/(ALOG(R(NOD6)/REAR(NOD6))/K(NOD6))                         ORI1C83C
      HEAT(NOD6,NOD6)=-HEAT(NOD6,NOD6-1)    -ASS2*C(NOD6)               ORI1C831
      B(NOD6)=-ASS2*C(NOD6)*T(NOD6)-Q(NOD6)                             ORI1C832
      DO 60 I=1,40                                                      ORI1C833
      AB(I)=B(I)                                                        ORI1C834
      DO 60 J=1,40                                                      ORI1C835
      A(I,J)=HEAT(I,J)                                                  ORI1C836
      A(I,NOD5) = 0.0                                                   ORI1C837
   60 CONTINUE                                                          ORI1C83E
      A(NOD6,NOD5) = -1.0                                               ORI1C83S
      AB(NOD5-1) = AB(NOD5-1) - HEAT(NOD5-1,NOD5)*TCS                   ORI1C840
      AB(NOD5+1) = AB(NOD5+1) - HEAT(NOD5+1,NOD5)*TCS                   ORI1C841
      AB(NOD5) = AB(NOD5) - HEAT(NOD5,NOD5)*TCS                         ORI1C842
      CALL SOLVE(A,40,40,NOD6,AB,X,SING)                                ORI10843
      IF(.NOT.SING)GO TO 88                                             ORI1C844
      WRITE(NOUT,67)                                                    ORI1C845
   67 FORMAT(1H1,22HTHE MATRIX IS SINGULAR)                             ORI1C846
   68 WRITE(NOUT,69)IJ,DEV                                              ORI1C847
   69 FORMAT(1H1,3HIJ=,I3,10X,4HDEV=,1PE17.9)                           ORI1C84E
      STOP                                                              ORI1C84S
C                                                                       ORI1C850
C  OUTPUT T VECTOR                                                      ORI1C851
   88 DO 90 I=1,NOD6                                                    ORI1C852
   90 T(I)=X(I)                                                         ORI1C853
      T(NOD5) = TCS                                                     ORI1C854
      HF = X(NOD5)/(2.0*R(NOD6))                                        ORI1C855
C                                                                       ORI1C856
C  TRANSIENT CALCULATIONS FOR THIS TIME STEP ARE COMPLETED              ORI1C857
      RETURN                                                            ORI1C85E
      END                                                               ORI1C85S
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C*****************************************************************************ORI1C860
C*****************************************************************************ORI1C861
C**********************                                 **********************ORI1C862
C*********************  GENERATION OF HEAT MATRIX  *********************ORI1C863
C**********************                                 **********************ORI1C864
C*****************************************************************************ORI1C865
C*****************************************************************************ORI1C866
      SUBROUTINE HEATR                                                          ORI1C867
C   OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                     ORI1C868
      REAL  K,KGAP,HCGAP(4)                                                     ORI1C869
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,ORI1087C
     1               NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),     ORI1C871
     2                DLRMGC,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2             ORI1C872
      COMMON/PROP1/DMGO,DHTR,DCUNI,DBN,DSS,C(40),K(40),CBNO(4),CMGO(5),     ORI1C873
     1              KGAP(4),KOD2,PRS                                        ORI1C874
      COMMON /SAVE/ T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,       ORI1C875
     1              ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ       ORI1C876
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB                      ORI1C877
      DATA HCGAP/4*0.0/                                                     ORI1C878
C                                                                           ORI1C879
C   SET-UP MATRIX ARRAY                                                     ORI1C880
C   ***FOR THE MGO CORE AND CORE-HEATER BOUNDARY                            ORI1C881
      HEAT(1,2)=4.0*(K(1)+K(2))/2.0                                         ORI1C882
      AMGO=DMGO*DLRMGC/DELT                                                 ORI1C883
      HEAT(1,1)=-HEAT(1,2)-AMGO*C(1)                                        ORI10884
      HEAT(2,1)=HEAT(1,2)                                                   ORI1C885
      IF(NMGO.LT.3)GO TO 8                                                  ORI1C886
      DO 70 I=3,NMGC                                                        ORI1C887
      HEAT(I-1,I)=4.0*FLOAT(I-1)*(K(I-1)+K(I))/2.0                          ORI10888
   70 HEAT(I,I-1)=HEAT(I-1,I)                                               ORI1C889
    8 IF(DELGAP(1).EQ.0.0)GO TO 28                                          ORI1C890
      IF((KGAP(1)+HCGAP(1)).EQ.0.0.AND.HRGAP(1).EQ.0.0)GO TO 18             ORI1C891
      RESIST(1)=1.0/(KGAP(1)/ALOG((R(NMGO)+DELGAP(1))/R(NMGO))+             ORI1C892
     1           R(NMGO)*HCGAP(1)+R(NMGO)*HRGAP(1))                         ORI1C893
      GO TO 38                                                              ORI1C894
   18 WRITE(NOUT,7)                                                         ORI1C895
    7 FORMAT(1H1,'***WARNING--HEATR--INFINITE RESISTANCE AT MGO-HTR INTERORI1C896
     1FACE')                                                                ORI1C897
      STOP                                                                  ORI1C898
   28 RESIST(1)=0.0                                                         ORI10899
   38 HEAT(NMGO,NM)=2.0/(DLRHTR/R(NMGO)/R(NMGO)/4.0/K(NM)+RESIST(1)+        ORI10900
     1                   DLRMGC/R(NMGO)/R(NMGO)/4.0/K(NMGO))              ORI10901
      HEAT(NM,NMGO)=HEAT(NMGC,NM)                                           ORI10902
      DO 80 I=2,NMGC                                                        ORI10903
   80 HEAT(I,I)=-HEAT(I,I-1)-HEAT(I,I+1)-AMGO*C(I)                          ORI10904
C   ***FOR THE HEATER AND HEATER-BN3 BOUNDARY                               ORI10905
      IF(NCU)81,81,82                                                       ORI10906
C              INCONEL-HEATER-WITH-NO-CUPRO-NICKEL-OVERSLEEVES              ORI10907
   81 AHTR=DHTR*DLRHTR/DELT                                                 ORI10908
      IF(NHT.LT.2)GO TO 48                                                  ORI10909
      J=NM+1                                                                ORI10910
      DO 90 I=J,NOD2                                                        ORI10911
      HEAT(I-1,I)=4.0*(K(I)+K(I-1))/2.0*R(I-1)*R(I-1)/DLRHTR                ORI10912
   90 HEAT(I,I-1)=HEAT(I-1,I)                                               ORI10913
   48 IF(DELGAP(2).EQ.0.0)GO TO 68                                          ORI10914
      IF((KGAP(2)+HCGAP(2)).EQ.0.0.AND.HRGAP(2).EQ.0.0)GO TO 58             ORI10915
      RESIST(2)=1.0/(KGAP(2)/ALOG((R(NOD2)+DELGAP(2))/R(NOD2))+             ORI10916
     1           R(NOD2)*HCGAP(2)+R(NOD2)*HRGAP(2))                         ORI10917
      GO TO 78                                                              ORI10918
   58 WRITE(NOUT,17)                                                        ORI10919
   17 FORMAT(1H1,'***WARNING--HEATR--INFINITE RESISTANCE AT HTR-BN INTERFORI10920
     1ACE')                                                                 ORI10921
      STOP                                                                  ORI10922
   68 RESIST(2)=0.0                                                         ORI10923
   78 HEAT(NOD2,NH)=2.0/(DLRHTR/R(NOD2)/R(NOD2)/4.0/K(NOD2)+RESIST(2)+      ORI10924
     1                   ALOG(REAR(NH)/R(NOD2))/K(NH))                    ORI10925
      HEAT(NH,NOD2)=HEAT(NOD2,NH)                                           ORI10926
      DO 100 I=NM,NOD2                                                      ORI10927
  100 HEAT(I,I)=-HEAT(I,I-1)-HEAT(I,I+1)-AHTR*C(I)                          ORI10928
      GO TO 1002                                                            ORI10929
C              INCONEL HEATER WITH CUPRO-NICKEL OVERSLEEVES                 ORI10930
   82 AHTR=DHTR*DLRHTR/DELT                                                 ORI10931
      ACU=DCUNI*DLRCU/DELT                                                  ORI10932
      IF(NHT.LT.2)GO TO 480                                                 ORI10933
      J=NM+1                                                                ORI10934
      DO 900 I=J,NOD2                                                       ORI10935
      HEAT(I-1,I)=4.0*(K(I)+K(I-1))/2.0*R(I-1)*R(I-1)/DLRHTR                ORI10936
  900 HEAT(I,I-1)=HEAT(I-1,I)                                               ORI10937
  480 HEAT(NOD2,NH)=2.0/(DLRHTR/R(NOD2)/R(NOD2)/4.0/K(NOD2)+                ORI10938
     1                   DLRCU/R(NOD2)/R(NOD2)/4.0/K(NH))                 ORI10939
      HEAT(NH,NOD2)=HEAT(NOD2,NH)                                           ORI10940
      DO 1000 I=NM,NOD2                                                     ORI10941
 1000 HEAT(I,I)=-HEAT(I,I-1)-HEAT(I,I+1)-AHTR*C(I)                          ORI10942
      IF(NCU.LT.2)GO TO 481                                                 ORI10943
      J=NH+1                                                                ORI10944
      DO 901 I=J,NOD3                                                       ORI10945
      HEAT(I-1,I)=4.0*(K(I)+K(I-1))/2.0*R(I-1)*R(I-1)/DLRCU                 ORI10946
  901 HEAT(I,I-1)=HEAT(I-1,I)                                               ORI10947
  481 IF(DELGAP(2).EQ.0.0)GO TO 680                                         ORI10948
      IF((KGAP(2)+HCGAP(2)).EQ.0.0.AND.HRGAP(2).EQ.0.0)GO TO 580            ORI10949
      RESIST(2)=1.0/(KGAP(2)/ALOG((R(NOD3)+DELGAP(2))/R(NOD3))+             ORI10950
     1           R(NOD3)*HCGAP(2)+R(NOD3)*HRGAP(2))                         ORI10951
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      GO TO 780                                                                 ORI10952
  5EC WRITE(NOUT,17)                                                            ORI10953
      STOP                                                                      ORI10954
  6EC RESIST(2)=0.0                                                             ORI10955
  78C HEAT(NOD3,NC)=2.0/(DLRCU/R(NOD3)/R(NOD3)/4.0/K(NOD3)+RESIST(2)+           ORI10956
     1              ALOG(RBAR(NC)/R(NOD3))/K(NC))                              ORI10957
      HEAT(NC,NOD3)=HEAT(NOD3,NC)                                               ORI10958
      DO 1001 I=NH,NOD3                                                         ORI10959
 1CC1 HEAT(I,I)=-HEAT(I,I-1)-HEAT(I,I+1)-ACU*C(I)                               ORI10960
C   ***FOR THE BN  LAYER AND BN -SS1 BOJNDARY                                   ORI10961
 1CC2 ABN =DBN *DLRBN /DELT                                                     ORI10962
      IF(NBN .LT.2)GO TO 88                                                     ORI10963
      J=NC+1                                                                    ORI10964
      DO 110 I=J,NOD4                                                           ORI10965
      HEAT(I-1,I)=2.0/(ALOG(R(I-1)/RBAR(I-1))/K(I-1)+ALOG(RBAR(I)/              ORI10966
     1          R(I-1))/K(I))                                                   ORI10967
  11C HEAT(I,I-1)=HEAT(I-1,I)                                                   ORI10968
   8E IF(DELGAP(3).EQ.0.0)GO TO 108                                             ORI10969
      IF((KGAP(3)+HCGAP(3)).EQ.0.0.AND.HRGAP(3).EQ.0.0)GO TO 98                 ORI10970
      RESIST(3)=1.0/(KGAP(3)/ALOG((R(NOD4)+DELGAP(3))/R(NOD4))+                 ORI10971
     1          R(NOD4)*HCGAP(3)+R(NOD4)*HRGAP(3))                             ORI10972
      GO TO 118                                                                 ORI10973
   9E WRITE(NOUT,27)                                                            ORI10974
   27 FORMAT(1H1,'***WARNING--HEATR--INFINITE RESISTANCE AT BN-SS1 INTERFORI10975
     1ACE')                                                                     ORI10976
      STOP                                                                      ORI10977
  1CE RESIST(3)=0.0                                                             ORI10978
  118 HEAT(NOD4,NB)=2.0/(ALOG(R(NOD4)/RBAR(NOD4))/K(NOD4)+RESIST(3)+            ORI10979
     1              ALOG(RBAR(NB)/R(NOD4))/K(NB))                              ORI10980
      HEAT(NB,NOD4)=HEAT(NOD4,NB)                                               ORI10981
      DO 120 I=NC,NOD4                                                          ORI10982
  120 HEAT(I,I)=-HEAT(I,I-1)-HEAT(I,I+1)-ABN *C(I)                              ORI10983
C   ***FOR THE SS.SHEATH (INNER) AND SHEATH-TO-SHEATH BOUNDARY                  ORI10984
      ASS1=DSS *DLRSS1/DELT                                                     ORI10985
      IF(NSS1.LT.2)GO TO 128                                                    ORI10986
      J=NB+1                                                                    ORI10987
      DO 130 I=J,NOD5                                                           ORI10988
      HEAT(I-1,I)=2.0/(ALOG(R(I-1)/RBAR(I-1))/K(I-1)+ALOG(RBAR(I)/              ORI10989
     1          R(I-1))/K(I))                                                   ORI10990
  130 HEAT(I,I-1)=HEAT(I-1,I)                                                   ORI10991
  128 IF(DELGAP(4).LE.8.0E-09)GO TO 148                                         ORI10992
      IF((KGAP(4)+HCGAP(4)).EQ.0.0.AND.HRGAP(4).EQ.0.0)GO TO 138                ORI10993
      RESIST(4)= ALOG((R(NOD5)+DELGAP(4))/R(NOD5))/                             ORI10994
     1(KGAP(4)+(R(NOD5)*HCGAP(4)+R(NOD5)*HRGAP(4))*                             ORI10995
     2ALOG((R(NOD5)+DELGAP(4))/R(NOD5)))                                        ORI10996
      GO TO 158                                                                 ORI10997
  138 WRITE(NOUT,37)                                                            ORI10998
   37 FORMAT(1H1,'***WARNING--HEATR--INFINITE RESISTANCE AT SHEATH-TO-SHEORI10999
     1ATH INTERFACE')                                                           ORI11000
      STOP                                                                      ORI11001
  148 RESIST(4)=0.0                                                             ORI11002
  158 HEAT(NOD5,NS)=2.0/(ALOG(R(NOD5)/RBAR(NOD5))/K(NOD5)+RESIST(4)+            ORI11003
     1              ALOG(RBAR(NS)/R(NOD5))/K(NS))                              ORI11004
      HEAT(NS,NOD5)=HEAT(NOD5,NS)                                               ORI11005
      DO 140 I=NB,NOD5                                                          ORI11006
  140 HEAT(I,I)=-HEAT(I,I-1)-HEAT(I,I+1)-ASS1*C(I)                              ORI11007
C   ***FOR THE S.S.SHEATH (OUTER) AND SHEATH-TO-WATER BOUNDARY                  ORI11008
      ASS2=DSS *DLRSS2/DELT                                                     ORI11009
      IF(NSS2.LT.2)GO TO 168                                                    ORI11010
      J=NS+1                                                                    ORI11011
      DO 150 I=J,NOD6                                                           ORI11012
      HEAT(I-1,I)=2.0/(ALOG(R(I-1)/RBAR(I-1))/K(I-1)+ALOG(RBAR(I)/              ORI11013
     1          R(I-1))/K(I))                                                   ORI11014
  15C HEAT(I,I-1)=HEAT(I-1,I)                                                   ORI11015
      DO 160 I=NS,NOD6                                                          ORI11016
      IF(I.EQ.NOD6)GO TO 168                                                    ORI11017
  160 HEAT(I,I)=-HEAT(I,I-1)-HEAT(I,I+1)-ASS2*C(I)                              ORI11018
  16E CONTINUE                                                                  ORI11019
C                                                                               ORI11020
C   HEAT MATRIX COMPLETED                                                       ORI11021
C                                                                               ORI11022
      RETURN                                                                    ORI11023
      END                                                                       ORI11024
```

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C*********************************************************************
C*********************************************************************
C***************************                   ***********************
C***************************   SUBROUTINE BVECTR   ***********************
C***************************                   ***********************
C*********************************************************************
C*********************************************************************
C
C      SET-UP CONSTANT E VECTOR
C
      SUBROUTINE BVECTR
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77
      REAL K,KGAP
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),
     2              DLRMGO,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2
      COMMON/PROP1/DMGO,DHTR,DCUNI,DBN,DSS,C(40),K(40),CBNO(4),CMGO(5),
     1             KGAP(4),KOD2,PRS
      COMMON /SAVE/ T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,
     1              ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB
C
C-----MGO CORE
      DO 10 I=1,NMGO
      B(I)=-AMGO*C(I)*T(I)-Q(I)
   10 CONTINUE
C
C-----HEATER SECTION (INCONEL-600 LAYER)
      DO 20 I=NM,NOD2
      B(I)=-AHTR*C(I)*T(I)-Q(I)
   20 CONTINUE
C
C-----HEATER SECTION (CUPRO-NICKEL LAYER,IF ANY)
      IF(NCU)38,38,28
   28 DO 30 I=NH,NOD3
      B(I)=-ACU*C(I)*T(I)-Q(I)
   30 CONTINUE
C
C-----BORON NITRIDE SECTION
   38 DO 40 I=NC,NOD4
      B(I)=-ABN*C(I)*T(I)-Q(I)
   40 CONTINUE
C
C-----INNER S.S.SHEATH
      DO 50 I=NB,NOD5
      B(I)=-ASS1*C(I)*T(I)-Q(I)
   50 CONTINUE
C
C-----OUTER S.S.SHEATH
      NO6=NOD6-1
      DO 60 I=NS,NO6
      B(I)=-ASS2*C(I)*T(I)-Q(I)
   60 CONTINUE
      RETURN
      END
```

```
C*********************************************************************
C***************************                   ***********************
C***************************  SUBROUTINE PROP  ***********************
C***************************                   ***********************
C*********************************************************************
C
C      DETERMINATION OF PIN COMPONENT PHYSICAL PROPERTIES (I.E.;SPECIFIC
C      HEAT-C,AND THERMAL CONDUCTIVITY-K ) AS FUNCTIONS OF TEMPERATURE:
C              WHERE;
C                    K HAS UNITS OF BTU/(SEC*FT**2/FT*F)
C                    C HAS UNITS OF BTU/(LB*F)
C                    T HAS UNITS OF DEGREES F
C                    DENSITIES HAVE UNITS OF LB/FT**3
C
      SUBROUTINE PROP
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77
      REAL K,KGAP
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),
     2              DLRMGO,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2
      COMMON/PROP1/DMGO,DHTR,DCUNI,DBN,DSS,C(40),K(40),CBNO(4),CMGO(5),
     1             KGAP(4),KOD2,PRS
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      COMMON /SAVE/ T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,     ORI11102
     1              ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ     ORI11103
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB                    ORI11104
      CMGOO(A)=0.224258423+A*(1.22666359E-04-A*(6.351911E-08               ORI11105
     1       -1.21040955E-11*A))                                          ORI11106
      AKMGO(A)=CA+A*(CB+A*(CC+A*(CD+A*CE)))                               ORI11107
      CHTR(A)=0.0977430344+A*(7.11642206E-05-A*(7.7241566E-08             ORI11108
     1       -3.8081537E-11*A))                                           ORI11109
      AKHTR(A)=8.42944336+A*(2.88105011E-03+A*(2.42143869E-06             ORI11110
     1       -6.19365892E-10*A))                                          ORI11111
      CCUN(A)=0.0950193405+A*(2.93776393E-05-A*(1.41008059E-08             ORI11112
     1       -6.65068001E-12*A))                                          ORI11113
      AKCUN(A)=16.8024902-A*(1.31225586E-03-A*(4.43458557E-05-A*(         ORI11114
     1        4.77302819E-08-2.50679477E-11*A)))                          ORI11115
      CBN(A) =0.167812347+A*(3.70264053E-04-A*(1.73793524E-07             ORI11116
     1       -3.14486215E-11*A))                                          ORI11117
      AKBN(A)=DA+A*(DB+A*(DC+DD*A))                                       ORI11118
      CSS(A) =0.104247093+A*(6.05583191E-05-A*(4.3772161E-08-A*(          ORI11119
     1        2.01225703E-11-3.16413562E-15*A)))                          ORI11120
      AKSS(A) =7.24584961+A*(5.07926941E-03-A*(9.89995897E-07             ORI11121
     1       -3.82840426E-10*A))                                          ORI11122
      AKGAP(A)= 0.013+0.0000216*A                                         ORI11123
      AKCONT(A)=33.2194824-A*(5.2362442E-02-A*(3.97711992E-05-A*(         ORI11124
     1         1.46937964E-08-2.15005791E-12*A)))                        ORI11125
C                                                                         ORI11126
C  DENSITY DATA                                                           ORI11127
      DMGO=212.0                                                          ORI11128
      DHTR=526.0                                                          ORI11129
      DCUNI=553.0                                                         ORI11130
      DBN=125.0                                                           ORI11131
      DSS=496.0                                                           ORI11132
C                                                                         ORI11133
C     SET CONSTANTS FOR AKMGO AND AKBN                                    ORI11134
      CA=CMGO(1)                                                          ORI11135
      CB=CMGO(2)                                                          ORI11136
      CC=CMGO(3)                                                          ORI11137
      CD=CMGO(4)                                                          ORI11138
      CE=CMGO(5)                                                          ORI11139
      DA=CBNO(1)                                                          ORI11140
      DB=CBNO(2)                                                          ORI11141
      DC=CBNO(3)                                                          ORI11142
      DD=CBNO(4)                                                          ORI11143
C                                                                         ORI11144
C  THERMAL CONDUCTIVITY AND SPECIFIC HEAT DATA                            ORI11145
C                                                                         ORI11146
C*****MAGNESIUM OXIDE CORE                                                ORI11147
      IF(KOD2-2)8,8,14                                                    ORI11148
    8 DO 10 I=1,NMGO                                                      ORI11149
      C(I)=CMGOO(T(I))                                                    ORI11150
   10 K(I)=AKMGO(T(I))/3600.0                                             ORI11151
      KGAP(1)=AKGAP((T(NMGO)+T(NM))/2.0)/3600.0                           ORI11152
      GO TO 18                                                            ORI11153
   14 DO 16 I=1,NMGC                                                      ORI11154
      C(I)=CMGOO(T(I))                                                    ORI11155
      AX=3.891*PRS                                                        ORI11156
      GAMMA=AKGAP(T(I))/AKCONT(T(I))-1.0                                  ORI11157
      FAC=(1.0+AX**0.85599*GAMMA)/(1.0+AX**0.85599*GAMMA-AX*GAMMA)        ORI11158
   16 K(I)=FAC*AKCONT(T(I))/3600.0                                        ORI11159
      KGAP(1)=AKGAP((T(NMGO)+T(NM))/2.0)/3600.0                           ORI11160
C                                                                         ORI11161
C*****HEATER (INCONEL-600 LAYERS)                                         ORI11162
   18 DO 20 I=NM,NOD2                                                     ORI11163
      C(I)=CHTR(T(I))                                                     ORI11164
   20 K(I)=AKHTR(T(I))/3600.0                                             ORI11165
C                                                                         ORI11166
C*****HEATER (CUPRO-NICKEL LAYERS, IF ANY)                                ORI11167
      IF(NCU)38,38,28                                                     ORI11168
   28 DO 30 I=NH,NOD3                                                     ORI11169
      C(I)=CCUN(T(I))                                                     ORI11170
   30 K(I)=AKCUN(T(I))/3600.0                                             ORI11171
   38 KGAP(2)=AKGAP((T(NOD3)+T(NC))/2.0)/3600.0                           ORI11172
C                                                                         ORI11173
C*****BORON NITRIDE ANNULAR LAYER                                         ORI11174
      DO 40 I=NC,NOD4                                                     ORI11175
      C(I)=CBN(T(I))                                                      ORI11176
   40 K(I)=AKBN(T(I))/3600.0                                              ORI11177
      KGAP(3)=AKGAP((T(NOD4)+T(NB))/2.0)/3600.0                           ORI11178
C                                                                         ORI11179
C*****FIRST S.S. SHEATH                                                   ORI11180
      DO 50 I=NB,NOD5                                                     ORI11181
      C(I)=CSS(T(I))                                                      ORI11182
   50 K(I)=AKSS(T(I))/3600.0                                              ORI11183
      KGAP(4)=AKGAP((T(NOD5)+T(NS))/2.0)/3600.0                           ORI11184
C                                                                         ORI11185
C*****SECOND S.S. SHEATH                                                  ORI11186
      DO 60 I=NS,NOD6                                                     ORI11187
      C(I)=CSS(T(I))                                                      ORI11188
   60 K(I)=AKSS(T(I))/3600.0                                              ORI11189
C                                                                         ORI11190
      RETURN                                                              ORI11191
      END                                                                 ORI11192
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C*********************************************************************
C*********************************************************************
C**********************                    ***************************
C*********************  ENTHALPY CALCULATIONS  ***************************
C**********************                    ***************************
C*********************************************************************
C*********************************************************************
C
C     DETERMINATION OF PIN INTERNAL ENERGY CONTENT (VIA INTEGRATION OF
C     CP*DT OVER THE INTERVAL FROM TREF TO T ):
C              WHERE;
C                    H--- HAS UNITS OF BTUS/LBM
C                    T HAS UNITS OF DEG F
C                    TREF = 32 DEG F
C
      SUBROUTINE ENTHAL(HTOT)
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,
     1              NM,NH,NC,NB,NS,NIN,NOJT,R(40),RBAR(40),RHEAT(7),
     2              DLRMGC,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2
      COMMON /SAVE/ T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,
     1              ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB
C*****STATEMENT FUNCTIONS FOR COMPONENT ENTHALPIES:
      HMGO(A)=-7.238384087+A*(0.224258423+A*(0.613331795E-04
     1        -A*(2.117303667E-08-0.302602388E-11*A)))
      HHTR(A)=-3.163379481+A*(0.0977430344+A*(3.55821103E-05
     1        -A*(2.574718867E-08-0.952038448E-11*A)))
      HCUN(A)=-3.055507956+A*(0.0950193405+A*(1.468881965E-05
     1        -A*(0.470026863E-08-1.66267E-12*A)))
      HBN(A)= -5.557680254+A*(0.167812347+A*(1.851320265E-04
     1        -A*(0.579311747E-07-0.786215538E-11*A)))
      HSS(A)= -3.36643998+A*(0.104247093+A*(3.027915955E-05
     1        -A*(1.45907203E-08-A*(0.503064258E-11-0.632827124E-15*A))))
C
C*****COMPONENT DENSITIES
      DMGO=212.0
      DHTR=526.0
      DCUNI=553.0
      DBN=125.0
      DSS=496.0
C
C*****MAGNESIUM OXIDE CORE
      SUM=0.0
      DO 10 I=1,NMGO
   10 SUM=SUM+DLRMGC*DMGC*HMGO(T(I))
C
C*****HEATER (INCONEL-600 LAYER)
      DO 20 I=NM,NOD2
   20 SUM=SUM+DLRHTR*DHTR*HHTR(T(I))
C
C*****HEATER (CUPRO-NICKEL LAYER, IF ANY)
      IF(NCU)38,38,28
   28 DO 30 I=NH,NOD3
   30 SUM=SUM+DLRCU*DCUNI*HCUN(T(I))
C
C*****BORON NITRIDE ANNULAR LAYER
   38 DO 40 I=NC,NOD4
   40 SUM=SUM+DLRBN*DBN*HBN(T(I))
C
C*****FIRST S.S.SHEATH
      DO 50 I=NB,NOD5
   50 SUM=SUM+DLRSS1*DSS*HSS(T(I))
C
C*****SECOND S.S.SHEATH
      DO 60 I=NS,NOD6
   60 SUM=SUM+DLRSS2*DSS*HSS(T(I))
C
      HTOT=3.14159265*SUM
      RETURN
      END
```

```
C*********************************************************************
C*********************************************************************
C*********************                                 ***********************
C******************** INTERNAL ENERGY CALCULATIONS ***********************
C*********************                                 ***********************
C*********************************************************************
C*********************************************************************
C
C     DETERMINATION OF PIN INTERNAL ENERGY CONTENT
C              WHERE;
C                    PIN ENERGY = SUM OF RHO*CP*PI*DELR*DIFFERENCE IN T'S
C
      SUBROUTINE ENERGY(TSAVE,DELU)
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77
      REAL K,TSAVE(40,2)
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),
     2              DLRMGO,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2
C
C*****COMPONENT CP STATEMENT FUNCTIONS
      CMGO(A)=0.224258423+A*(1.22666359E-04-A*(6.351911E-08
     1        -1.21040955E-11*A))
      CHTR(A)=0.0977430344+A*(7.11642206E-05-A*(7.7241566E-08
     1        -3.8081537E-11*A))
      CCUN(A)=0.0950193405+A*(2.93776393E-05-A*(1.41008059E-08
     1        -6.65068001E-12*A))
      CBN(A) =0.167812347+A*(3.70264)53E-04-A*(1.73793524E-07
     1        -3.14486215E-11*A))
      CSS(A) =0.104247093+A*(6.05583191E-05-A*(4.3772161E-08-A*(
     1         2.01225703E-11-3.16413562E-15*A)))
C
C*****COMPONENT DENSITIES
      DMGO=212.0
      DHTR=526.0
      DCUNI=553.0
      DBN=125.0
      DSS=496.0
C
C*****MAGNESIUM OXIDE CORE
      SUM=0.0
      DO 10 I=1,NMGO
   10 SUM=SUM+DLRMGO*DMGO*CMGO(TSAVE(I,1))*(TSAVE(I,1)-TSAVE(I,2))
C
C*****HEATER (INCONEL-600 LAYER)
      DO 20 I=NM,NOD2
   20 SUM=SUM+DLRHTR*DHTR*CHTR(TSAVE(I,1))*(TSAVE(I,1)-TSAVE(I,2))
C
C*****HEATER (CUPRO-NICKEL LAYER, IF ANY)
      IF(NCU)38,38,28
   28 DO 30 I=NH,NOD3
   30 SUM=SUM+DLRCU*DCUNI*CCUN(TSAVE(I,1))*(TSAVE(I,1)-TSAVE(I,2))
C
C*****BORON NITRIDE ANNULAR LAYER
   38 DO 40 I=NC,NOD4
   40 SUM=SUM+DLRBN*DBN*CBN(TSAVE(I,1))*(TSAVE(I,1)-TSAVE(I,2))
C
C*****FIRST S.S.SHEATH
      DO 50 I=NB,NOD5
   50 SUM=SUM+DLRSS1*DSS*CSS(TSAVE(I,1))*(TSAVE(I,1)-TSAVE(I,2))
C
C*****SECOND S.S.SHEATH
      DO 60 I=NS,NOD6
   60 SUM=SUM+DLRSS2*DSS*CSS(TSAVE(I,1))*(TSAVE(I,1)-TSAVE(I,2))
C
      DELU=3.14159265*SUM
      RETURN
      END
```

```
C
C     FUNCTION USED TO DETERMINE SHEATH GAP AND NS TEMPERATURE FOR S.STA
C
      FUNCTION GAP(T)
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),
     2              DLRMGO,DLRHTR,DLRCU,DLRBN,DLRSS1,DLRSS2
      COMMON /GAPCAL/GFB,GP1(3),TNSB,TND5B,TND5,TNS,QDPI, YCAL,FEEB,
     1              TMAX,ICDE
C
C     STATEMENT FUNCTIONS
      AKGAP(A)=(0.013+0.0000216*A)/3600.0
```

```
      AKSS(A)=(7.24584961+A*(5.07926941E-03-A*(9.89995897E-07          ORI11344
     1         -3.82840426E-10*A)))/3600.0                             ORI11345
C                                                                      ORI11346
      RD5=RBAR(NOD5)*1.0E+07                                           ORI11347
      RS=RBAR(NS)*1.0E+07                                              ORI11348
      GP=GPB/1.2E-03                                                   ORI11349
      IF(GPB.EQ.0.0)GO TO 6                                            ORI11350
      IF(IODE-2)4,4,6                                                  ORI11351
    4 A1=T-TNSB                                                        ORI11352
      A2=TND5-TND5B                                                    ORI11353
      B1=T**2-TNSB**2                                                  ORI11354
      B2=TND5**2-TND5B**2                                              ORI11355
      C1=T**3-TNSB**3                                                  ORI11356
      C2=TND5**3-TND5B**3                                              ORI11357
      F1=(GP1(1)*A1+GP1(2)*B1+GP1(3)*C1)*1.0E-07                       ORI11358
      F2=(GP1(1)*A2+GP1(2)*B2+GP1(3)*C2)*1.0E-07                       ORI11359
      FS=EXP(F1)                                                       ORI11360
      FD5=EXP(F2)                                                      ORI11361
      YCAL=GP+RS*(FS-1.0)-RD5*(FD5-1.0)                                ORI11362
      IF(YCAL.LE.0.0)YCAL=0.0                                          ORI11363
      GO TO 8                                                          ORI11364
    6 YCAL=GP                                                          ORI11365
    8 YCAL=YCAL*1.0E-07                                                ORI11366
      TSURF7=TND5-QDPI/(2.0/(ALOG(R(NOD5)/RBAR(NOD5))/AKSS(TND5)))     ORI11367
      IF(YCAL.LE.0.0)GO TO 18                                          ORI11368
      TSURF8=TSURF7-QDPI/2.0*ALOG((R(NOD5)+YCAL)/R(NOD5))/             ORI11369
     1       AKGAP(TSURF7)                                             ORI11370
      STEFAN=0.1714E-08/3600.0                                         ORI11371
      DO 10 I=1,10                                                     ORI11372
      RT7=TSURF7+459.67                                                ORI11373
      RT8=TSURF8+459.67                                                ORI11374
      HR4=STEFAN*(RT7**2+RT8**2)*(RT7+RT8)                             ORI11375
      TSUR=TSURF7-QDPI/2.0*ALOG((R(NOD5)+YCAL)/R(NOD5))/               ORI11376
     1       (AKGAP((TSURF7+TSURF8)/2.0)+R(NOD5)*HR4*                  ORI11377
     2       ALOG((R(NOD5)+YCAL)/R(NOD5)))                             ORI11378
      ERROR=ABS(TSUR-TSURF8)/TSUR                                      ORI11379
      TSURF8=TSUR                                                      ORI11380
      IF(ERROR.LT.0.00015)GO TO 28                                     ORI11381
   10 CONTINUE                                                         ORI11382
      WRITE(6,17)                                                      ORI11383
   17 FORMAT(1H1,'***WARNING--GAP--DETERMINATION OF SURFACE TEMPERATURE ORI11384
     1DID NOT CONVERGE.',/,T20,'JOB TERMINATED.')                      ORI11385
      STOP                                                             ORI11386
   18 TSURF8=TSURF7                                                    ORI11387
   28 TNS=TSURF8-QDPI/(2.0/(ALOG(RBAR(NS)/R(NOD5)   )/AKSS(TSURF8)))   ORI11388
      DO 30 I=1,20                                                     ORI11389
      TC =TSURF8-QDPI/(2.0/(ALOG(RBAR(NS)/R(NOD5)   )/AKSS(TNS)))      ORI11390
      ERROR=ABS(TC-TNS)/TC                                             ORI11391
      TNS=TC                                                           ORI11392
      IF(ERROR.LT.0.00015)GO TO 38                                     ORI11393
   30 CONTINUE                                                         ORI11394
      WRITE(6,37)                                                      ORI11395
   37 FORMAT(1H1,'***WARNING--GAP--DETERMINATION OF NS    TEMPERATURE DIDORI11396
     1 NOT CONVERGE.',/,T20,'JOB TERMINATED.')                         ORI11397
      STOP                                                             ORI11398
   38 GAP=TNS-T                                                        ORI11399
      RETURN                                                           ORI11400
      END                                                              ORI11401
```

```
      SUBROUTINE GAPTNS                                                ORI11402
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                ORI11403
C                                                                      ORI11404
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,ORI11405
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),    ORI11406
     2              DLRMGO,DLRHTR,DLRCJ,DLRBN,DLRSS1,DLRSS2             ORI11407
      COMMON /SAVE/ T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,  ORI11408
     1              ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ   ORI11409
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB                  ORI11410
      COMMON /GAPCAL/GPB,GP1(3),TNSB,TND5B,TND5,TNS,QDPI,GPCAL,FEEB,   ORI11411
     1               TMAX,ICDE                                         ORI11412
C                                                                      ORI11413
      F1(X,Y)=X-Y                                                      ORI11414
      F2(X,Y)=X*X-Y*Y                                                  ORI11415
      F3(X,Y)=X**3-Y**3                                                ORI11416
C                                                                      ORI11417
      IF(GPB.LE.0.0001)GO TO 77                                        ORI11418
      IF(IODE.EQ.3)GO TO 78                                            ORI11419
      RD5=RBAR(NOD5)*1.0E+07                                           ORI11420
```

```
      RS=RBAR(NS)*1.0E+07                                                    ORI11421
      GP=GPB/1.2E-03                                                         ORI11422
C                                                                            ORI11423
C-----OUTER S.S.SHEATH                                                       ORI11424
      IF(T(NS)-TMAX)18,18,28                                                 ORI11425
   18 FO=(GP1(1)*F1(T(NS),TNSB)+GP1(2)*F2(T(NS),TNSB)+                       ORI11426
     1     GP1(3)*F3(T(NS),TNSB))*1.0E-07                                    ORI11427
      FSO=EXP(FO)                                                            ORI11428
      GO TO 38                                                               ORI11429
   28 FOX=(GP1(1)*F1(TMAX,TNSB)+GP1(2)*F2(TMAX,TNSB)+                        ORI11430
     1     GP1(3)*F3(TMAX,TNSB))*1.0E-07                                     ORI11431
      DFOX=(GP1(1)+2.0*GP1(2)*TMAX+3.0*GP1(3)*TMAX*TMAX)*EXP(FOX)            ORI11432
     1       *1.0E-07                                                        ORI11433
      FSO=EXP(FOX)+DFOX*(T(NS)-TMAX)                                         ORI11434
   38 CONTINUE                                                               ORI11435
C                                                                            ORI11436
C-----INNER S.S.SHEATH                                                       ORI11437
      IF(T(NOD5)-TMAX)48,48,58                                               ORI11438
   48 FI=(GP1(1)*F1(T(NOD5),TND5B)+GP1(2)*F2(T(NOD5),TND5B)+                 ORI11439
     1     GP1(3)*F3(T(NOD5),TND5B))*1.0E-07                                 ORI11440
      FSI=EXP(FI)                                                            ORI11441
      GO TO 68                                                               ORI11442
   58 FOX=(GP1(1)*F1(TMAX,TND5B)+GP1(2)*F2(TMAX,TND5B)+                      ORI11443
     1     GP1(3)*F3(TMAX,TND5B))*1.0E-07                                    ORI11444
      DFOX=(GP1(1)+2.0*GP1(2)*TMAX+3.0*GP1(3)*TMAX*TMAX)*EXP(FOX)            ORI11445
     1       *1.0E-07                                                        ORI11446
      FSI=EXP(FOX)+DFOX*(T(NOD5)-TMAX)                                       ORI11447
   68 CONTINUE                                                               ORI11448
C                                                                            ORI11449
C-----NEW GAP BETWEEN SHEATHS                                                ORI11450
      YCAL=GP+RS*(FSO-1.0)-RD5*(FSI-1.0)                                     ORI11451
      IF(YCAL.LE.0.0)YCAL=0.0                                                ORI11452
      YCAL=YCAL*1.0E-07                                                      ORI11453
      GO TO 88                                                               ORI11454
   77 GPB=0.0                                                                ORI11455
   78 YCAL=GPB/1.2E-03*1.0E-07                                               ORI11456
   88 DELGAP(4)=YCAL                                                         ORI11457
      RETURN                                                                 ORI11458
      END                                                                    ORI11459
```

```
      SUBROUTINE MNFLXO                                                      ORI11460
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                     ORI11461
      LOGICAL SLAB                                                           ORI11462
      COMMON /CCDAS/ITCS(348),ICHTCS(348),ISUBCH(348),ITCM(106),             ORI11463
     1               ICHTCM(106),ICHEIE(49),ICHEEE(49),ICHBW1,ICHBW2,        ORI11464
     2               IRVOL(15,3),NTRY1(348),NTRY2(106),NTRY3(49),            ORI11465
     3               NTRY4(49),NBW1,NBW2,IC(1000),                           ORI11466
     4               NTC(348),NCHTCS(348),NK,IRSLB(15,3),NSLAB               ORI11467
      COMMON /OUT/  TO(40,12),TIME(12),HO(12),QO(12),TBO(12),SFLUX(12),      ORI11468
     1               TSURO(12),DELH,SJMCP,SUMQ,EQNRT,ERROR1,ERROR2,          ORI11469
     2               FSO(12),TSATO(12),HSATO(12),AMFO(12),QUALO(12),         ORI11470
     3               RHBO(12),RSFXO(12),RTSURO(12),MODEO(12),NO,JO           ORI11471
     4              ,DELRO(12)                                               ORI11472
      COMMON /INPUT/ITCNUM,KICK,HED(17),IS(6),TCSS(601),TCMM(601),           ORI11473
     1               QAVGG(601),TIMEE(601),TIMR(601),TBR(601),TSATR(601),    ORI11474
     2               PRESUR(601),QUALR(601),AMFR(601),HBR(601),              ORI11475
     3               SFLUXR(601),TSURR(601),MODER(601),TRPEND,JRP            ORI11476
     4,              IRF,ICS7                                                ORI11477
      COMMON /FLUSH/ SLAB(50),PFAA(15)                                       ORI11478
      DIMENSION FLXMN(50,601),TCMMN(50,601),TSFMN(50,601),NSUM(50)           ORI11479
C                                                                            ORI11480
C*****ZERO NSUM AND FLXMN ARRAYS                                             ORI11481
      DO 10 I=1,50                                                           ORI11482
      NSUM(I)=0                                                              ORI11483
      DO 10 J=1,601                                                          ORI11484
      TCMMN(I,J)= 0.0                                                        ORI11485
      TSFMN(I,J)= 0.0                                                        ORI11486
      FLXMN(I,J)= 0.0                                                        ORI11487
   10 CONTINUE                                                               ORI11488
      RETURN                                                                 ORI11489
C                                                                            ORI11490
C*****SUMMATION CALL                                                         ORI11491
      ENTRY MNFLX1(KC,LO)                                                    ORI11492
      GO TO (18,28),KO                                                       ORI11493
   18 NSUM(NSLAB)= NSUM(NSLAB)+1                                             ORI11494
   28 FLXMN(NSLAB,LC)= FLXMN(NSLAB,LO)+ SFLUX(JO)                            ORI11495
      TCMMN(NSLAB,LC)= TCMMN(NSLAB,LO) + TO(1,JO)                            ORI11496
      TSFMN(NSLAB,LO)= TSFMN(NSLAB,LO) + TSURO(JO)                           ORI11497
      RETURN                                                                 ORI11498
C                                                                            ORI11499
```

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C*****COMPUTATION OF MEANS                                                ORI11500
      ENTRY MNFLX2                                                        ORI11501
      DO 40 I=1,50                                                        ORI11502
      IF(NSUM(I).EQ.0.OR.(.NOT.SLAB(I))) GO TO 40                         ORI11503
      ASUM= FLOAT(NSUM(I))                                                ORI11504
      DO 30 J=1,601                                                       ORI11505
      TCMMN(I,J)= TCMMN(I,J)/ASUM                                         ORI11506
      TSFMN(I,J)= TSFMN(I,J)/ASUM                                         ORI11507
   30 FLXMN(I,J)= FLXMN(I,J)/ASUM                                         ORI11508
   40 CONTINUE                                                            ORI11509
C-----CHECK FOR SLABS WHICH HAVE NSUM(NSLAB)=0, AND LOAD                  ORI11510
C     CENTRAL SUBCHANNEL SLAB MEAN FLUX(NSLAB,-) VALUES                   ORI11511
C     IN THE ZEROED MEAN FLUX ARRAY:                                      ORI11512
      DO 120 I=1,50                                                       ORI11513
      IF(NSUM(I).NE.0) GO TO 120                                          ORI11514
      IF(.NOT.SLAB(I)) GO TO 120                                          ORI11515
C     SEARCH IRSLB ARRAY FOR LEVEL                                        ORI11516
      DO 50 J=1,15                                                        ORI11517
      JBAR= J                                                             ORI11518
      DO 50 K=1,3                                                         ORI11519
      KBAR= K                                                             ORI11520
      IF(I.EQ.IRSLB(J,K)) GO TO 58                                        ORI11521
   50 CONTINUE                                                            ORI11522
      STOP 1111                                                           ORI11523
C     CHECK CENTRAL SUBCHANNEL SLAB                                       ORI11524
   58 CONTINUE                                                            ORI11525
      KI= 1                                                               ORI11526
      IF(NSUM(IRSLE(JBAR,1)).EQ.0) GO TO 68                               ORI11527
   59 DO 60 K=1,601                                                       ORI11528
      TCMMN(I,K)= TCMMN(IRSLE(JBAR,KI),K)                                 ORI11529
      TSFMN(I,K)= TSFMN(IRSLB(JBAR,KI),K)                                 ORI11530
   60 FLXMN(I,K) = FLXMN(IRSLE(JBAR,KI),K)                                ORI11531
      GO TO 120                                                           ORI11532
   68 KI=2                                                                ORI11533
      IF(NSUM(IRSLE(JBAR,2)).NE.0) GO TO 59                               ORI11534
      KI=3                                                                ORI11535
      IF(NSUM(IRSLE(JBAR,3)).NE.0) GO TO 59                               ORI11536
      IF(JBAR-7) 78,78,98                                                 ORI11537
   78 JJ= JBAR                                                            ORI11538
   80 JJ= JJ+1                                                            ORI11539
      IF(NSUM(IRSLE(JJ,1)).EQ.0) GO TO 80                                 ORI11540
      DO 90 K=1,601                                                       ORI11541
   90 FLXMN(I,K)= FLXMN(IRSLB(JJ,1),K) * PFAA(JBAR)/PFAA(JJ)              ORI11542
      GO TO 120                                                           ORI11543
   98 JJ= JBAR                                                            ORI11544
  100 JJ= JJ-1                                                            ORI11545
      IF(NSUM(IRSLB(JJ,1)).EQ.0) GO TO 100                                ORI11546
      DO 110 K=1,601                                                      ORI11547
  110 FLXMN(I,K)= FLXMN(IRSLB(JJ,1),K) * PFAA(JBAR)/PFAA(JJ)              ORI11548
  120 CONTINUE                                                            ORI11549
      WRITE(6,127) (IRSLB(1,I),I=1,3)                                     ORI11550
  127 FORMAT(1H1,T7,'***OUTPUT OF MEAN FLUX ROUTINE***',                  ORI11551
     1       //,T34,'(CENTRAL)',T69,'(WALL)',T99,'(CORNER)',/,           ORI11552
     2       T7,'RELAP SLAB NO.',T37,I3,T69,I3,T101,I3,//,              ORI11553
     3       T13,'TIME',T27,'FLUX',T43,'TSURF',T59,'FLUX',T75,'TSURF',  ORI11554
     4       T91,'FLUX',T107,'TSURF',/)                                 ORI11555
      KRP=JRP                                                             ORI11556
      IF(KRP.GE.IRP) KRP=IRP                                              ORI11557
      DO 130 I=1,KRP                                                      ORI11558
      WRITE(6,137) TIMEE(I),FLXMN(IRSLB(1,1),I),TSFMN(IRSLB(1,1),I),     ORI11559
     1             FLXMN(IRSLB(1,2),I),TSFMN(IRSLB(1,2),I),             ORI11560
     2             FLXMN(IRSLB(1,3),I),TSFMN(IRSLB(1,3),I)              ORI11561
  130 CONTINUE                                                            ORI11562
  137 FORMAT(T11,F6.2,6X,E13.6,5X,F7.1,7X,E13.6,5X,F7.1,7X,E13.6,5X,      ORI11563
     1       F7.1)                                                        ORI11564
      DO 150 J=2,14                                                       ORI11565
      IF(IRSLB(J,1).EQ.IRSLE(J-1,1)) GO TO 150                            ORI11566
      WRITE(6,127) (IRSLB(J,I),I=1,3)                                     ORI11567
      DO 140 I=1,KRP                                                      ORI11568
      WRITE(6,137) TIMEE(I),(FLXMN(IRSLB(J,K),I),                         ORI11569
     1             TSFMN(IRSLB(J,K),I),K=1,3)                           ORI11570
  140 CONTINUE                                                            ORI11571
  150 CONTINUE                                                            ORI11572
C GET THE NUMBER OF SLABS IN THE RELAP MODEL                              ORI11573
C THEN WRITE 51 RECORDS TO UNIT 13 THAT HAS THE FLUXES SAVED FOR LATER    ORI11574
C CALLS TO RPMAIN                                                         ORI11575
      CALL INPSLB(ISLAB)                                                  ORI11576
      WRITE (13) ISLAB,TIMEE                                              ORI11577
      DO 200 I=1,50                                                       ORI11578
      WRITE(13) (FLXMN(I,J),TCMMN(I,J),TSFMN(I,J),J=1,601)                ORI11579
  200 CONTINUE                                                            ORI11580
      RETURN                                                              ORI11581
      END                                                                 ORI11582
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      SUBROUTINE SOLVE(A,MA,NA,N,B,X,SING)                              ORI11583
C   OAK RIDGE INVERSE CODE      VERSION 1.0      4-1-77                 ORI11584
      LOGICAL SING                                                      ORI11585
      DIMENSION A(MA,NA),B(N),X(N)                                      ORI11586
      CALL INVERT(A,N,MA,SING)                                          ORI11587
      IF(SING)RETURN                                                    ORI11588
      DO 10 I=1,N                                                       ORI11589
      X(I)=0.0                                                          ORI11590
      DO 10 J=1,N                                                       ORI11591
   10 X(I)=X(I)+A(I,J)*B(J)                                             ORI11592
      RETURN                                                            ORI11593
      END                                                               ORI11594
```

```
      SUBROUTINE INVERT(A,ORDER,DIM A,SING)                             ORI11595
C                                                                       ORI11596
C   OAK RIDGE INVERSE CODE      VERSION 1.0      4-1-77                 ORI11597
C     INVERT INVERTS A MATRIX IN ITS OWN SPACE USING THE GAUSS-JORDAN   ORI11598
C     METHOD AS ARRANGED BY H. RUTISHAUSER WITH FULL PIVOTING.          ORI11599
C                                                                       ORI11600
C     ARGUMENTS                                                         ORI11601
C                                                                       ORI11602
C     A         IS THE MATRIX TO BE INVERTED.  A IS SINGLE PRECISION.   ORI11603
C               THE INVERSE OF A IS RETURNED IN A.                      ORI11604
C                                                                       ORI11605
C     ORDER     IS AN INTEGER VARIABLE.  THE ORDER OF THE MATRIX TO BE  ORI11606
C               INVERTED.                                               ORI11607
C                                                                       ORI11608
C     DIM A     IS AN INTEGER VARIABLE CONTAINING THE FIRST DIMENSION   ORI11609
C               OF THE VARIABLE A IN THE CALLING PROGRAM. DIM A MAY BE  ORI11610
C               GREATER THAN ORDER.                                     ORI11611
C                                                                       ORI11612
C     SING      IS A LOGICAL VARIABLE.  WHEN THE ROUTINE RETURNS        ORI11613
C               SING IS .FALSE. IF THE MATRIX WAS NON-SINGULAR AND      ORI11614
C               .TRUE. IF THE MATRIX WAS SINGULAR. IF SING IS .TRUE.    ORI11615
C               THE MATRIX A CONTAINS GARBAGE.                          ORI11616
C                                                                       ORI11617
      INTEGER ORDER,DIM A                                               ORI11618
      REAL A(DIM A,1),B(100),C(100)                                     ORI11619
      N=ORDER                                                           ORI11620
      LOGICAL SING                                                      ORI11621
      INTEGER IP(100),IQ(100)                                           ORI11622
      DO 1 K=1,N                                                        ORI11623
C     DETERMINATION OF PIVOT ELEMENT                                    ORI11624
      PIVOT=0.                                                          ORI11625
      DO 100 I=K,N                                                      ORI11626
      DO 100 J=K,N                                                      ORI11627
      IF(ABS(A(I,J))-ABS(PIVOT))100,100,101                             ORI11628
  101 PIVOT=A(I,J)                                                      ORI11629
      IP(K)=I                                                           ORI11630
      IQ(K)=J                                                           ORI11631
  100 CONTINUE                                                          ORI11632
      IF(PIVOT)102,900,102                                              ORI11633
  102 IPK=IP(K)                                                         ORI11634
      IQK=IQ(K)                                                         ORI11635
C     EXCHANGE OF THE PIVOTAL ROW WITH THE KTH ROW                      ORI11636
      IF(IPK-K)200,299,200                                              ORI11637
  200 DO 201 J=1,N                                                      ORI11638
      Z=A(IPK,J)                                                        ORI11639
      A(IPK,J)=A(K,J)                                                   ORI11640
  201 A(K,J)=Z                                                          ORI11641
  299 CONTINUE                                                          ORI11642
C     EXCHANGE OF THE PIVOTAL COLUMN WITH THE KTH COLUMN                ORI11643
      IF(IQK-K)300,399,300                                              ORI11644
  300 DO 301 I=1,N                                                      ORI11645
      Z=A(I,IQK)                                                        ORI11646
      A(I,IQK)=A(I,K)                                                   ORI11647
  301 A(I,K)=Z                                                          ORI11648
  399 CONTINUE                                                          ORI11649
C     JORDAN ELIMINATION STEP                                           ORI11650
      DO 400 J=1,N                                                      ORI11651
      IF(J-K)403,402,403                                                ORI11652
  402 B(J)=1./PIVOT                                                     ORI11653
      C(J)=1.                                                           ORI11654
      GOTO 404                                                          ORI11655
  403 B(J)=-A(K,J)/PIVOT                                                ORI11656
      C(J)=A(J,K)                                                       ORI11657
  404 A(K,J)=0.                                                         ORI11658
  400 A(J,K)=0.                                                         ORI11659
      DO 405 I=1,N                                                      ORI11660
      DO 405 J=1,N                                                      ORI11661
```

```
 405   A(I,J)=A(I,J)+C(I)*E(J)                                          ORI11662
  1    CONTINUE                                                         ORI11663
C      REORDERING THE MATRIX                                            ORI11664
       K=N                                                              ORI11665
       DO 500 KDUM=1,N                                                  ORI11666
       IPK=IP(K)                                                        ORI11667
       IQK=IQ(K)                                                        ORI11668
       IF(IPK-K)501,502,501                                             ORI11669
 501   DO 503 I=1,N                                                    ORI11670
       Z=A(I,IPK)                                                       ORI11671
       A(I,IPK)=A(I,K)                                                  ORI11672
 503   A(I,K)=Z                                                         ORI11673
 502   IF(IQK-K)504,500,504                                             ORI11674
 504   DO 506 J=1,N                                                    ORI11675
       Z=A(IQK,J)                                                       ORI11676
       A(IQK,J)=A(K,J)                                                  ORI11677
 506   A(K,J)=Z                                                         ORI11678
 500   K=K-1                                                            ORI11679
       SING = .FALSE.                                                   ORI11680
       RETURN                                                           ORI11681
 555   SING = .TRUE.                                                    ORI11682
       RETURN                                                           ORI11683
       END                                                              ORI11684
```

```
       SUBROUTINE FALSE(X1,XINC,F,XZERO,NTRIES,IERR,ESP,NOUT)           ORI11685
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                ORI11686
C                                                                       ORI11687
C                                                                       ORI11688
C                                                                       ORI11689
C      XINC=X INCREMENT(I.E., INTERVAL ON THE X1AXIS BY WHICH X IS INCREMORI11690
C           ENTED UNTIL A ROOT OF F(X) IS BRACKETED                     ORI11691
C      X1=INITIAL VALUE OF X                                            ORI11692
C      F=F(X)=FUNCTION SUBPROGRAM SUPPLIED BY USER (EXTERNAL-ED IN USER ORI11693
C        MAIN)                                                          ORI11694
C      XZERO=ROOT OF F(X),WHERE F(XZERO)=0.0                            ORI11695
C      NTRIES=NUMBER OF TIMES X IS INCREMENTED IN SEARCH FOR CROSSOVER  ORI11696
C             POINT IN F(X)                                             ORI11697
C      ESP=RELATIVE ERROR CRITERION                                     ORI11698
C      IERR=INDEX FOR PRINT OUT OF ERROR MESSAGE                        ORI11699
C      NOUT=OUTPUT DEVICE NUMBER                                        ORI11700
C                                                                       ORI11701
C                                                                       ORI11702
C                                                                       ORI11703
       DELX = XINC                                                      ORI11704
       Y1 = F(X1)                                                       ORI11705
       X1H = X1                                                         ORI11706
       Y1H = Y1                                                         ORI11707
       X2 = X1 + DELX                                                   ORI11708
       Y2 = F(X2)                                                       ORI11709
       XH = X1                                                          ORI11710
       IF (Y1 .EQ. 0.0    .OR. Y2 .EQ. 0.0   ) GO TO 8                  ORI11711
       IF ((Y1 .GT. 0.0    .AND. Y2 .LT. 0.0   ) .OR.                   ORI11712
      1    (Y1 .LT. 0.0    .AND. Y2 .GT. 0.0   )) GO TO 8               ORI11713
       IF ( ABS(Y2) .LT.  ABS(Y1)) GO TO 58                             ORI11714
       DELX = - DELX                                                    ORI11715
   55  DO 10 I=1,NTRIES                                                 ORI11716
       XH = X1                                                          ORI11717
       X2 = X1 + DELX                                                   ORI11718
       Y2 = F(X2)                                                       ORI11719
       IF (Y2 .EQ. 0.0  ) GO TO 8                                       ORI11720
       IF ((Y1 .GT. 0.0    .AND. Y2 .LT. 0.0   ) .OR.                   ORI11721
      1    (Y1 .LT. 0.0    .AND. Y2 .GT. 0.0   )) GO TO 8               ORI11722
       X1 = X2                                                          ORI11723
       Y1 = Y2                                                          ORI11724
   10  CONTINUE                                                         ORI11725
       WRITE (NOUT,7) NTRIES                                            ORI11726
    7  FORMAT(1H1,'***WARNING--FALSE--UNABLE TO FIND CROSSOVER POINT IN',ORI11727
      1I10,' TRIES FOR')                                                ORI11728
       GO TO (208),IERR                                                 ORI11729
    8  DO 20 J=1,25                                                     ORI11730
       XN = (X1*Y2 - X2*Y1)/(Y2 - Y1)                                   ORI11731
       IF ( ABS((XH - XN)/XN) .LT. ESP) GO TO 28                        ORI11732
       XH = XN                                                          ORI11733
       YN = F(XN)                                                       ORI11734
       IF ((Y1 .GT. 0.0    .AND. YN .GT. 0.0   ) .OR.                   ORI11735
      1    (Y1 .LT. 0.0    .AND. YN .LT. 0.0   )) GO TO 38               ORI11736
       Y2 = YN                                                          ORI11737
       X2 = XN                                                          ORI11738
       Y1 = Y1*0.5                                                      ORI11739
       GO TO 20                                                         ORI11740
```

```
   3E  Y1 = YN                                                          ORI11741
       X1 = XN                                                          ORI11742
       Y2 = Y2*0.5                                                      ORI11743
   2C  CONTINUE                                                         ORI11744
   28  XZERO = XN                                                       ORI11745
       RETURN                                                           ORI11746
  2CE  WRITE (NOUT,27)                                                  ORI11747
   27  FORMAT(1H ,'S.S. SHEATH GAP AND NODS TEMPERATURE DETERMINATION.') ORI11748
 1CCE  WRITE (NOUT,1007) X1H,Y1H,DELX,X1,Y1                             ORI11749
 1CC7  FORMAT(1H ,30HINITIAL INDEPENDENT VARIABLE =,E16.8,20X,          ORI11750
      1 28HINITIAL DEPENDENT VARIABLE =,E16.8/12H STEP SIZE =,E16.8/1H , ORI11751
      2 28HFINAL INDEPENDENT VARIABLE =,E16.8,20X,                      ORI11752
      3 26HFINAL DEPENDENT VARIABLE =,E16.8)                            ORI11753
        STOP                                                            ORI11754
        END                                                             ORI11755
```

```
       SUBROUTINE MAXMIN(Y,YC,EY,SY,NDP)                                ORI11756
C   OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77               ORI11757
       DIMENSION Y(NDP),YC(NDP)                                         ORI11758
       YMIN=1500.0                                                      ORI11759
       YMAX=300.0                                                       ORI11760
       DO 10 I=1,NDP                                                    ORI11761
       IF(Y(I).GT.YMAX) YMAX=Y(I)                                       ORI11762
       IF(YC(I).GT.YMAX) YMAX=YC(I)                                     ORI11763
       IF(Y(I).LT.YMIN) YMIN=Y(I)                                       ORI11764
       IF(YC(I).LT.YMIN) YMIN=YC(I)                                     ORI11765
    10 CONTINUE                                                         ORI11766
       IYMAX=IFIX(YMAX/100.0)*100                                       ORI11767
       IYMIN=IFIX(YMIN/100.0)*100                                       ORI11768
    18 IF(FLOAT(IYMAX+50).GT.YMAX) GO TO 28                             ORI11769
       IYMAX=IYMAX+50                                                   ORI11770
       GO TO 18                                                         ORI11771
    28 EY=FLOAT(IYMAX+50)                                               ORI11772
    38 IF(FLOAT(IYMIN+50).GT.YMIN) GO TO 48                             ORI11773
       IYMIN=IYMIN+50                                                   ORI11774
       GO TO 38                                                         ORI11775
    48 SY=FLOAT(IYMIN)                                                  ORI11776
       RETURN                                                           ORI11777
       END                                                              ORI11778
```

```
       SUBROUTINE PLOT(N,X,Y,SX,EX,INTELX,SY,EY,ITYPE,M,C,NUM,FX,FY,IORD)ORI11779
C   OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77               ORI11780
C      N = # OF (X,Y) DATA POINTS (0.LT.N.LE.650)                       ORI11781
C      X = ABSCISSA OF DATA POINT PAIRS                                 ORI11782
C      Y = ORDINATE OF DATA POINT PAIRS                                 ORI11783
C      SX = STARTING POINT FOR ABSCISSA AXIS                            ORI11784
C      EX = END POINT FOR ABSCISSA AXIS                                 ORI11785
C      INTELX = INTERVAL ON THE ABSCISSA AXIS                           ORI11786
C      SY = STARTING POINT FOR ORDINATE AXIS                            ORI11787
C      EY = END POINT FOR ORDINATE AXIS                                 ORI11788
C      ITYPE = TYPE OF CALCULATION DESIRED FOR OVERLAY                  ORI11789
C              OF (FX,FY) ON (X,Y)                                      ORI11790
C                 = 1  CALCULATED VIA FITTED EQUATION                   ORI11791
C                 = 2  INTERPOLATED FROM (FX,FY) TABLE                  ORI11792
C                 = 3  NO OVERLAY DESIRED                               ORI11793
C      M = # OF COEFFICIENTS (I.E. ORDER OF FIT) (0.LT.M.LE.20)         ORI11794
C      C = COEFFICIENTS OF FITTED EQUATION (.EQ.M+1)                    ORI11795
C      NUM = NUMBER OF DATA POINTS IN (FX,FY) TABLE (NUM.LE.1250)       ORI11796
C      FX = IN TABLE OF X,Y PAIRS, THE 'X' CORRESPONDING TO             ORI11797
C           FY IN (FX,FY)---------TO BE USED FOR INTERPOLATION          ORI11798
C      FY = IN TABLE OF X,Y PAIRS, THE 'Y' CORRESPONDING TO             ORI11799
C           FX IN (FX,FY)---------TO BE USED FOR INTERPOLATION          ORI11800
C      IORD = ORDER OF INTERPOLATION                                    ORI11801
       DIMENSION X(N),Y(N),C(21),LINE(129),STX(1250),STY(1250),FX(1250), ORI11802
      1    FY(1250)                                                     ORI11803
       REAL INTVX, INTVY, INTVL, INTVLX, INTELX                         ORI11804
       DATA IBLANK, IDOT, IPLUS, IAST, IX/1H ,1H.,1H+,1H*,1HX/          ORI11805
```

```
C  CHECKING INPUT                                                    ORI1180C
      ICHECK=0                                                       ORI11807
      IF(N.LE.0.OR.N.GT.650)ICHECK = 1                               ORI1180E
      IF(ITYPE.EQ.1.AND.(M.LE.0.OR.M.GT.20))ICHECK=4                 ORI1180S
      IF(SX.GE.EX) ICHECK = 67                                       ORI11810
      IF(INTELX.LE.0.0)GO TO 438                                     ORI11811
      IF((EX-SX)/INTELX.GT.1250.0) ICHECK = 678                      ORI11812
      GO TO 448                                                      ORI11813
  438 IF((EX-SX).GT.(10.*(EY-SY))) ICHECK = 79                       ORI11814
  448 IF(SY.GE.EY) ICHECK = 910                                      ORI11815
      IF(ICHECK.EQ.0) GO TO 178                                      ORI11816
      PRINT 37, ICHECK                                               ORI11817
   37 FORMAT (1H1,26HIMPROPER INPUT AT ARGUMENT,I3)                  ORI11818
      RETURN                                                         ORI11819
  178 IMOV = 1                                                       ORI11820
C  DETERMINING INTERVALS                                            ORI11821
      INTVX = EX-SX                                                  ORI11822
      INTVY = EY-SY                                                  ORI11823
      INTVL = INTVY/125.0                                            ORI11824
      INTVLX=INTELX                                                  ORI11825
      IF(INTVLX.LE.0.0)INTVLX=INTVL                                  ORI11826
C  PRINTING HEADING                                                 ORI11827
      PRINT 47,SY,EY,SX,EX,INTVL,INTVLX                              ORI11828
   47 FORMAT (1H ,12X,6HY FROM,1PE15.8,3H TO,E15.8,24H AS A FUNCTION OF ORI11829
     1X FROM,1PE15.8,3H TO,E15.8/22X,21H WITH Y INTERVAL SIZE,E15.8,25H ORI11830
     2AND WITH X INTERVAL SIZE,E15.8//)                              ORI11831
      IF(SX.GT.0.0.OR.EX.LT.0.0) PRINT 465,SX                        ORI11832
  465 FORMAT(1H ,35X,43HTHE Y AXIS HAS BEEN SHIFTED FROM 0.0 TO X =, ORI11833
     11PE16.8//)                                                     ORI11834
      IF(SY.GT.0.0.OR.EY.LT.0.0) PRINT 456,SY                        ORI11835
  456 FORMAT(1H ,35X,43HTHE X AXIS HAS BEEN SHIFTED FROM 0.0 TO Y =, ORI11836
     11PE16.8//)                                                     ORI11837
C  DETERMINING AXIS POSITION                                        ORI11838
      IXT = INTVX/INTVLX + 1.5                                       ORI11839
      JX = ABS(SX)/INTVLX + 1.5                                      ORI1184C
      JY = ABS(SY)/INTVL + 4.5                                       ORI11841
      IF(SY.GT.0.0.OR.EY.LT.0.0) JY=4                                ORI11842
      IF(SX.GT.0.0.OR.EX.LT.0.0) JX=1                                ORI11843
C  DETERMINING LINE DEFINITIONS                                     ORI11844
      XL = SX                                                        ORI11845
      DO 100 I12=1,IXT                                               ORI11846
C  BLANKING LINE AND SUPPRESSING SKIP OVER PAGE PERFORATION         ORI11847
      DO 60 I=2,129                                                  ORI11848
      LINE(I) = IBLANK                                               ORI11849
   6C CONTINUE                                                       ORI1185C
      LINE(1) = IAST                                                 ORI11851
C  GENERATING Y VALUES AND STORING X AND Y VALUES                   ORI11852
      STX(I12) = XL                                                  ORI11853
      GO TO (68,71,72),ITYPE                                         ORI11854
   6E M1= M+1                                                        ORI11855
      YL = 0.0                                                       ORI11856
      DO 70 II=1,M1                                                  ORI11857
      IF(XL.EQ.0.0.AND.II.EQ.1) YL = C(1)                            ORI1185E
      IF(XL.EQ.0.) GO TO 70                                          ORI1185S
      YL = C(II)*XL**(II-1) + YL                                     ORI11860
   7C CONTINUE                                                       ORI11861
      GO TO 78                                                       ORI11862
   71 CALL FINDS(XL,YL,FX,FY,NUM,IORD,IDT)                           ORI11863
      GO TO 78                                                       ORI11864
   72 YL = C.01*SY                                                   ORI11865
   78 CONTINUE                                                       ORI11866
      STY(I12) = YL                                                  ORI11867
C  PRODUCING SUBSCRIPT OF LINE                                      ORI1186E
      KKK = YL/INTVL + FLOAT(JY) + 0.5                               ORI1186S
      IF(SY.GT.0.0.OR.EY.LT.0.0)KKK=(YL-SY)/INTVL +FLOAT(JY) + 0.5   ORI11870
C  INPUTING AXES                                                    ORI11871
      LINE(JY) = IDOT                                                ORI11872
      IF(I12.NE.JX) GO TO 58                                         ORI11873
      DO 80 JM=4,129                                                 ORI11874
      LINE(JM) = IDOT                                                ORI11875
   8C CONTINUE                                                       ORI11876
C  ADDING PLUSES                                                    ORI11877
      DO 90 JK=JY,129,5                                              ORI11878
      LINE(JK) = IPLUS                                               ORI11879
   9C CONTINUE                                                       ORI1188C
      IPLST = JY - 4                                                 ORI11881
      IF(IPLST.LT.5) GO TO 58                                        ORI11882
      DO 110 JFK=5,IPLST,5                                           ORI11883
      KPL = JY - JFK                                                 ORI11884
      LINE(KPL) = IPLUS                                              ORI11885
  11C CONTINUE                                                       ORI11886
   58 IF(I12.NE.1) GO TO 320                                         ORI11887
      DO 300 MOLL=1,IXT                                              ORI11888
      IXIX = JX - 5*(1-MOLL)                                         ORI11889
      IF(IXIX.LT.5) GO TO 320                                        ORI1188C
  30C CONTINUE                                                       ORI11891
  320 IF(((I12-IXIX)-(I12-IXIX)/5*5).EQ.0) LINE(JY) = IPLUS          ORI11892
C  ADDING PLOTTED POINT                                             ORI11893
      IF(KKK.LT.4) GO TO 140                                         ORI11894
      IF(KKK.GT.129) GO TO 140                                       ORI11895
      LINE(KKK) = IX                                                 ORI11896
  14C CONTINUE                                                       ORI11897
```

```
C  ADDING INPUT DATA                                                    ORI11185E
      IF(IMOV.GT.N) GO TO 220                                           ORI11189
   19C IF(XL-X(IMOV))200,210,230                                        ORI11190C
   20C IF(XL-X(IMOV) + INTVLX/2.0)220,210,210                           ORI11191
   23C IF((XL-X(IMOV)).LT.INTVLX/2.0) GO TO 210                         ORI11192
      IMOV = IMOV + 1                                                   ORI11193
      IF(IMOV.GT.N) GO TO 220                                           ORI11194
      GO TO 190                                                         ORI11195
   21C KKKK = Y(IMOV)/INTVL + FLOAT(JY) + 0.5                           ORI11196
      IF( SY.GT.0.0.OR.EY.LT.0.0)KKKK=(Y(IMOV)-SY)/INTVL+FLOAT(JY)+0.5  ORI11197
      IMOV = IMOV + 1                                                   ORI11198
      IF(KKKK.LT.4) GO TO 220                                           ORI11199
      IF(KKKK.GT.129) GO TO 220                                         ORI11910
      LINE(KKKK) = IAST                                                 ORI11911
   22C PRINT 57, LINE                                                   ORI11912
    57 FORMAT (129A1)                                                   ORI11913
      XL = XL + INTVLX                                                  ORI11914
   10C CONTINUE                                                         ORI11915
      RETURN                                                            ORI11916
      END                                                               ORI11917
```

```
      SUBROUTINE FINDS(X0,FX0,X,Y,SIZE,ORDER,TEST)                      ORI11918
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                ORI11919
C                                                                       ORI11920
C                                                                       ORI11921
C                                                                       ORI11922
      INTEGER*4 SIZE,ORDER,TEST                                         ORI11923
C                                                                       ORI11924
      DIMENSION X(SIZE),Y(SIZE)                                         ORI11925
C                                                                       ORI11926
C                                                                       ORI11927
      NTERMS=ORDER + 1                                                  ORI11928
      NTE=NTERMS/2                                                      ORI11929
      TEST=0                                                            ORI11930
      DO 10 I=1,SIZE                                                    ORI11931
      IF(X0.LE.X(I)) GO TO 8                                            ORI11932
   10 CONTINUE                                                          ORI11933
      TEST=1                                                            ORI11934
      GO TO 58                                                          ORI11935
    8 IF(X0.NE.X(I)) GO TO 18                                           ORI11936
      FX0 = Y(I)                                                        ORI11937
      RETURN                                                            ORI11938
   18 IF(I.LE.NTE) TEST = -1                                            ORI11939
      IF(I.GT.SIZE-NTE) TEST = 1                                        ORI11940
      IF(TEST) 28,38,48                                                 ORI11941
   28 NSTART = 1                                                        ORI11942
      NSTOP = NTERMS                                                    ORI11943
      GO TO 68                                                          ORI11944
   48 IF(I.GT.SIZE-NTE+1) GO TO 58                                      ORI11945
      TEST = 0                                                          ORI11946
   58 NSTART = SIZE-ORDER                                               ORI11947
      NSTOP = SIZE                                                      ORI11948
      GO TO 68                                                          ORI11949
   38 NSTART = I-NTE                                                    ORI11950
      NSTOP = NSTART + ORDER                                            ORI11951
   68 FXC = 0.0                                                         ORI11952
      DO 20 I=NSTART,NSTOP                                              ORI11953
      PROD = 1.0                                                        ORI11954
      DO 30 J=NSTART,NSTOP                                              ORI11955
      IF(I.EQ.J) GO TO 30                                               ORI11956
      PROD = PROD*(X0-X(J))/(X(I)-X(J))                                 ORI11957
   30 CONTINUE                                                          ORI11958
   20 FXC = FX0 + PROD*Y(I)                                             ORI11959
      RETURN                                                            ORI11960
      END                                                               ORI11961
```

```
      SUBROUTINE SCAN
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77
C
C*****PREPARATION OF ENTRY NUMBER ARRAY (I.E. SCAN TABLE ENTRY WHICH
C     CORRESPONDS TO THE DESIRED TCS,TCM,TSI,TSO,EIE,EEE,ETC.)
      COMMON /CCDAS/ITCS(348),ICHTCS(348),ISUBCH(348),ITCM(106),
     1              ICHTCM(106),ICHEIE(49),ICHEEE(49),ICHBW1,ICHBW2,
     2              IRVOL(15,3),NTRY1(348),NTRY2(106),NTRY3(49),
     3              NTRY4(49),NBW1,NBW2,IC(1000),
     4              NTC(348),NCHTCS(348),NK,IRSLB(15,3),NSLAB
C
C-----THERMOCOUPLE SEARCH (SHEATH TC)
      DO 20 I=1,348
      IF(ICHTCS(I).LE.0)GO TO 20
      DO 10 J=1,500
      IF(ICHTCS(I).EQ.IC(J))NTRY1(I)=J
   10 CONTINUE
   20 CONTINUE
C
C-----THERMOCOUPLE SEARCH (MIDDLE TC)
      DO 40 I=1,106
      IF(ICHTCM(I).LE.0)GO TO 40
      DO 30 J=1,500
      IF(ICHTCM(I).EQ.IC(J))NTRY2(I)=J
   30 CONTINUE
   40 CONTINUE
C
C-----SHUNT SEARCH
      DO 60 I=1,49
      IF(ICHEIE(I).LE.0)GO TO 60
      DO 50 J=1,500
      IF(ICHEIE(I).EQ.IC(J))NTRY3(I)=J
   50 CONTINUE
   60 CONTINUE
C
C-----GENERATOR VOLTAGE SEARCH
      DO 70 I=1,49
      DO 70 J=1,500
      IF(ICHEEE(I).EQ.IC(J))NTRY4(I)=J
   70 CONTINUE
C
C-----BREAK WIRE SEARCH
      DO 80 J=1,500
      IF(ICHBW1.EQ.IC(J))NBW1=J
      IF(ICHBW2.EQ.IC(J))NBW2=J
   80 CONTINUE
C
C-----END OF SCAN TABLE SEARCH
      RETURN
      END
```

```
C*********************************************************************
C*********************************************************************
C*****************************          ******************************
C*****************************  OUTPUT  ******************************
C*****************************          ******************************
C*********************************************************************
C*********************************************************************
C
C     OUTPUT SUBROUTINE
C
      SUBROUTINE OUTPUT
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77
      COMMON /NODES/NMGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,
     1              NM,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),
     2              DLRMGO,DLRHTR,DLRCJ,DLRBN,DLRSS1,DLRSS2
      COMMON /INPUT/ITCNUM,KICK,HED(17),IS(6),TCSS(601),TCMM(601),
     1              QAVGG(601),TIMEE(601),TIMR(601),TBR(601),TSATR(601),
     2              PRESUR(601),QUALR(601),AMFR(601),HBR(601),
     3              SFLUXR(601),TSJRR(601),MODER(601),TRPEND,JRP
     4,             IRF,ICS7
      COMMON /SAVE/ T(40),HRGAP(4),DELT,HF,HEAT(40,40),AMGO,AHTR,ACU,
     1              ABN,ASS1,ASS2,RESIST(4),TSURF(9),TI,QTOT,Q(40),ZZ
     2              ,B(40),DELGAP(4),PFA,PFR(2),TCS,TB
      COMMON /OUT/  TO(40,12),TIME(12),HO(12),QO(12),TBO(12),SFLUX(12),
     1              TSURO(12),DELH,SUMCP,SUMQ,EQNRT,ERROR1,ERROR2,
     2              PSO(12),TSATO(12),HSATO(12),AMFO(12),QUALO(12),
     3              RHBO(12),RSFXO(12),RTSJRO(12),MODEO(12),NO,JO
     4             ,DELRO(12)
```

```
      COMMON /GAPCAL/GFB,GFI(3),TNSB,TND5B,TND5,TNS,QDPI,GPCAL,FEEB,     ORI12040
     1               TMAX,ICDE                                           ORI12041
      DIMENSION ZERO(3),TCL(15),SGV(7),ALPHA(2,5)                        ORI12042
      DATA ALPHA/'   F','    N','ORCE','JCLE','D CO','ATE ','NVEC','BOIL'ORI12043
     1          ,'TICN','ING '/                                          ORI12044
      DATA ZERO/3*0.0/                                                   ORI12045
C     THERMOCOUPLE POWER LEVELS                                          ORI12046
      DATA  TCL  /1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM,   ORI12047
     1           1HN,1HO/                                                ORI12048
C                                                                        ORI12049
C     PIN SHEATH GROOVE NUMBERS:                                         ORI12050
      DATA  SGV  /1HA,1HB,1HC,1HD,1HE,1HF,1HM/                           ORI12051
C                                                                        ORI12052
C  PIN AND CASE DESCRIPTION                                              ORI12053
      IROD=IFIX(FLOAT(ITCNUM-300000)/1000.0)                             ORI12054
      ISGV=IFIX(FLOAT(ITCNUM-300000-IROD*1000)/100.0)                    ORI12055
      ITCL=ITCNUM-300000-IROD*1000-ISGV*100                              ORI12056
      NBROD=IROD+300                                                     ORI12057
      ISECS=IFIX(FLOAT(IS(4))/4.0)                                       ORI12058
      WRITE(NOUT,7)ITCNUM,NBROD,SGV(ISGV),TCL(ITCL),IS(2),IS(3),ISECS    ORI12059
      WRITE(1   ,7)ITCNUM,NBROD,SGV(ISGV),TCL(ITCL),IS(2),IS(3),ISECS   ORI12060
      CALL DATE(IS,NCUT)                                                 ORI12061
      WRITE(NOUT,8)          (HED(I),I=1,17),NOD6,NMGO,NM,NOD2           ORI12062
      WRITE(1   ,8)          (HED(I),I=1,17),NOD6,NMGO,NM,NOD2           ORI12063
    7 FORMAT(1H1,I6,22(1H*),20H  CASE INFORMATION  ,28(1H*),//,          ORI12064
     1       T2,6(1H*),' THERMOCOUPLE NUMBER:  TE-',I3,2A1,T45,'TIME:',  ORI12065
     2       I3,':',I2,':',I2,6X,'DATE: ')                               ORI12066
    8 FORMAT(T2,6(1H*),17A4,                                             ORI12067
     1    //,T2,30HTOTAL NUMBER OF RADIAL NODES =,I3,/,                   ORI12068
     2       T7,38HMAGNESIUM OXIDE CORE NODES    1 THROUGH,I4,/,         ORI12069
     3       T7,27HINCONEL-600 HEATER NODES   ,I3,8H THROUGH,I4)         ORI12070
      IF(NCU.GT.0)WRITE(NOUT,17)NH,NOD3                                  ORI12071
      IF(NCU.GT.0)WRITE(1   ,17)NH,NOD3                                  ORI12072
   17 FORMAT(T7,27HCUPRO-NICKEL HEATER NODES   ,I3,8H THROUGH,I4)        ORI12073
      WRITE(NOUT,27)NC,NCD4,NB,NOD5,NS,NOD6,RHEAT(2),RHEAT(3)            ORI12074
      WRITE(1   ,27)NC,NCD4,NB,NOD5,NS,NOD6,RHEAT(2),RHEAT(3)           ORI12075
   27 FORMAT(T7,27HBORON NITRIDE NODES          ,I3,8H THROUGH,I4,/,     ORI12076
     1       T7,27HINNER S.S.SHEATH NODES       ,I3,8H THROUGH,I4,/,     ORI12077
     2       T7,27HOUTER S.S.SHEATH NODES       ,I3,8H THROUGH,I4,//,    ORI12078
     3       T2,28HOUTSIDE RADIUS OF MGO CORE =,E13.6,4H FT.,/,          ORI12079
     4       T2,33HOUTSIDE RADIUS OF INCONEL LAYER =,E13.6,4H FT.)       ORI12080
      IF(NCU.GT.0)WRITE(NOUT,37)RHEAT(4)                                 ORI12081
      IF(NCU.GT.0)WRITE(1   ,37)RHEAT(4)                                 ORI12082
   37 FORMAT(T2,38HOUTSIDE RADIUS OF CUPRO-NICKEL LAYER =,E13.6,4H FT.)  ORI12083
      WRITE(NOUT,47)(RHEAT(I),I=5,7),GPB,PFA,PFR(1),PFR(2)               ORI12084
      WRITE(1   ,47)(RHEAT(I),I=5,7),GPB,PFA,PFR(1),PFR(2)              ORI12085
   47 FORMAT(T2,33HOUTSIDE RADIUS OF BORON NITRIDE =,E13.6,4H FT.,/,     ORI12086
     1       T2,36HOUTSIDE RADIUS OF INNER S.S.SHEATH =,E13.6,4H FT.,/,  ORI12087
     2       T2,36HOUTSIDE RADIUS OF OUTER S.S.SHEATH =,E13.6,4H FT.,//,ORI12088
     3       T2,41HRADIAL GAP INFORMATION: (I.E. BIAS POINT),/,          ORI12089
     4       T7,41HGAP BETWEEN INNER AND OUTER S.S.SHEATHS = ,F8.4,' MIL'ORI12090
     5    ,//,T2,22HPOWER PEAKING FACTORS:,/,T7,7HAXIAL =,F9.6,/,       ORI12091
     6       T7,18HRADIAL (INCONEL) =,F9.6,/,T7,15HRADIAL (CU-NI)=,F9.6)ORI12092
      RETURN                                                             ORI12093
C  STEADY STATE LOCAL OPERATING CONDITIONS AND PIN TEMPERATURE PROFILE   ORI12094
C*****                                                                   ORI12095
      ENTRY OUTSS(NC,QAVG)                                               ORI12096
C*****                                                                   ORI12097
      HFR=HF*3600.0                                                      ORI12098
      WRITE(NOUT,57)ITCNUM,NBROD,SGV(ISGV),TCL(ITCL),IS(2),IS(3),ISECS   ORI12099
      WRITE(1   ,57)ITCNUM,NBROD,SGV(ISGV),TCL(ITCL),IS(2),IS(3),ISECS  ORI12100
      CALL DATE(IS,NCUT)                                                 ORI12101
      WRITE(NOUT,58)          (HED(I),I=1,17),QAVG,QTOT,HFR,TB           ORI12102
      WRITE(1   ,58)          (HED(I),I=1,17),QAVG,QTOT,HFR,TB           ORI12103
   57 FORMAT(1H1,I6,14(1H*),36H  STEADY STATE TEMPERATURE PROFILE  ,20(1HORI12104
     1*),//,T2,6(1H*),' THERMOCOUPLE NUMBER:  TE-',I3,2A1,T45,'TIME:',  ORI12105
     2       I3,':',I2,':',I2,6X,'DATE: ')                               ORI12106
   58 FORMAT(T2,6(1H*),17A4,                                             ORI12107
     1       //,T2,36HQ = AVERAGE HEAT GENERATION PER FT =,              ORI12108
     2       F10.6,11H BTU/SEC/FT,/,T2,24HQ*AXIAL PEAKING FACTOR =,F10.6,ORI12109
     3       11H BTU/SEC/FT,/,T2,31HHF = OUTSIDE FILM COEFFICIENT =,E15.8ORI12110
     4       ,22H BTU/(HR*FT**2*DEG F) ,/,                               ORI12111
     5       T2,31HTB = BULK COOLANT TEMPERATURE =,F8.2,6H DEG F.//,     ORI12112
     6       T2,24HPIN TEMPERATURE PROFILE:,/,                           ORI12113
     7       T24,27HNODE    TEMPERATURE (DEG F))                        ORI12114
      WRITE(NOUT,67)(I,T(I),I=1,NOD6)                                    ORI12115
      WRITE(1   ,67)(I,T(I),I=1,NOD6)                                    ORI12116
   67 FORMAT(24X,I3,9X,F8.2)                                             ORI12117
      WRITE(NOUT,69)SFLUX(1),TSURO(1),PSO(1),TSATO(1),(ALPHA(KD,I),I=1,5ORI12118
     1)                                                                  ORI12119
      WRITE(1   ,69)SFLUX(1),TSURO(1),PSO(1),TSATO(1),(ALPHA(KD,I),I=1ORI12120
     1,5)                                                                ORI12121
   69 FORMAT(//,T2,18HSURFACE HEAT FLUX=,E15.8,14H BTU/HR/FT**2 ,/,      ORI12122
     1       T2,20HSURFACE TEMPERATURE=,F8.2,6H DEG F.///,               ORI12123
     2       T2,9HPRESSURE=,F8.1,5H PSIA,/,                              ORI12124
     3       T2,47HSATURATION TEMPERATURE (AT THE ABOVE PRESSURE)=,F8.2,ORI12125
     4       6H DEG F.///,T2,'HEAT TRANSFER MODE AT THE SURFACE OF THE PORI12126
     5IN:',5A4)                                                          ORI12127
      WRITE(NOUT,77)ITCNUM,NBROD,SGV(ISGV),TCL(ITCL),IS(2),IS(3),ISECS,  ORI12128
     1              (HED(I),I=1,17)                                      ORI12129
   77 FORMAT(1H1,I6,20(1H*),21H  TRANSIENT RESULTS  ,29(1H*),//,         ORI12130
     1       T2,6(1H*),' THERMOCOUPLE NUMBER:  TE-',I3,2A1,T45,'TIME:',  ORI12131
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     2        I3,':',I2,':',I2,//,T2,6(1H*),17A4,                          ORI12132
     3    //,T2,28HTIME-TEMPERATURE-NODE TABLE:,/,                         ORI12133
     4       T7,21HTIME HAS UNITS OF SEC,/,                                ORI12134
     5       T7,30HTEMPERATURE HAS UNITS OF DEG F,/,                       ORI12135
     6       T7,25HG HAS UNITS OF BTU/SEC/FT,/,                            ORI12136
     7       T7,50HHB (BASED ON TB) HAS UNITS OF BTU/(HR*FT**2*DEG F),/,   ORI12137
     8       T7,35HBULK TEMPERATURE HAS UNITS OF DEG F,/,                  ORI12138
     9  T7,54HHSAT (BASED ON TSAT) HAS UNITS OF BTU/(HR*FT**2*DEG F),/,    ORI12139
     1       T7,26HPRESSURE HAS UNITS OF PSIA,/,                           ORI12140
     C       T7,41HSATURATION TEMPERATURE HAS UNITS OF DEG F,/,            ORI12141
     2       T7,46HSURFACE FLUX (S.F.) HAS UNITS OF BTU/HR/FT**2 ,/,       ORI12142
     3       T7,38HSURFACE TEMPERATURE HAS UNITS OF DEG F,/,               ORI12143
     4       T7,44HAVERAGE MASS FLUX HAS UNITS OF LBM/SEC/FT**2,/,         ORI12144
     5       T7,21HGAP HAS UNITS OF MILS,/)                                ORI12145
      RETURN                                                               ORI12146
C                                                                          ORI12147
C  TRANSIENT RESPONSE                                                      ORI12148
C*****                                                                     ORI12149
      ENTRY OUTTNS                                                         ORI12150
C*****                                                                     ORI12151
      GO TO (78,128),NC                                                    ORI12152
   78 WRITE(NOUT,87)(TIME(I),I=1,JO)                                       ORI12153
   87 FORMAT(//,T4,6HTIME--,12F10.4,/,T2,4HNODE)                           ORI12154
   88 DO 90 I=1,NOD6                                                       ORI12155
      WRITE(NOUT,97)I,(TO(I,J),J=1,JO)                                     ORI12156
   90 CONTINUE                                                             ORI12157
   97 FORMAT(1X,I3,5X,12F10.4)                                             ORI12158
      WRITE(NOUT,107)(GO(I),I=1,JO)                                        ORI12159
  107 FORMAT(1HO,3HG  ,5X,12F10.5)                                         ORI12160
      WRITE(NOUT,117)(TBO(I),I=1,JO)                                       ORI12161
  117 FORMAT(1X,3HTB ,5X,12F10.4)                                          ORI12162
      WRITE(NOUT,127)(HG(I),I=1,JO)                                        ORI12163
  127 FORMAT(1X,3HHB ,5X,12F10.1)                                          ORI12164
      WRITE(NOUT,131)(TSATO(I),I=1,JO)                                     ORI12165
  131 FORMAT(1X,4HTSAT,4X,12F10.1)                                         ORI12166
      WRITE(NOUT,129)(HSATO(I),I=1,JO)                                     ORI12167
  129 FORMAT(1X,4HHSAT,4X,12F10.1)                                         ORI12168
      WRITE(NOUT,133)(FSO(I),I=1,JO)                                       ORI12169
  133 FORMAT(1X,3HF  ,5X,12F10.1)                                          ORI12170
      WRITE(NOUT,147)(SFLUX(I),I=1,JO)                                     ORI12171
  147 FORMAT(1X,4HS.F.,4X,12F10.1)                                         ORI12172
      WRITE(NOUT,157)(TSURO(I),I=1,JO)                                     ORI12173
  157 FORMAT(1X,6HS.TEMP,2X,12F10.2)                                       ORI12174
      WRITE(NOUT,158)(AMFO(I),I=1,JO)                                      ORI12175
  158 FORMAT(1X,8HMASS-FLX,12F10.4)                                        ORI12176
      WRITE(NOUT,159)(QUALO(I),I=1,JO)                                     ORI12177
  159 FORMAT(1X,8HQUALITY ,12F10.5)                                        ORI12178
      WRITE(NOUT,161)(DELRO(I),I=1,JO)                                     ORI12179
  161 FORMAT(1X,3HGAP,5X,12F10.5)                                          ORI12180
      WRITE(NOUT,171)                                                      ORI12181
  171 FORMAT(1X,'***RELAP PREDICTIONS (STARRED)***')                       ORI12182
      WRITE(NOUT,172)(RHBO(I),I=1,JO)                                      ORI12183
  172 FORMAT(1X,3H*HB,5X,12F10.1)                                          ORI12184
      WRITE(NOUT,173)(RSFXO(I),I=1,JO)                                     ORI12185
  173 FORMAT(1X,5H*S.F.,3X,12F10.1)                                        ORI12186
      WRITE(NOUT,174)(RTSURO(I),I=1,JO)                                    ORI12187
  174 FORMAT(1X,7H*S.TEMP,1X,12F10.2)                                      ORI12188
      WRITE(NOUT,175)(MODEO(I),I=1,JO)                                     ORI12189
  175 FORMAT(1X,9H*H.T.MODE,I9,11I10)                                      ORI12190
      RETURN                                                               ORI12191
  128 WRITE(NOUT,137)(TIME(I),I=1,JO)                                      ORI12192
  137 FORMAT(1H1,T4,6HTIME--,12F10.4,/,T2,4HNODE)                          ORI12193
      GO TO 88                                                             ORI12194
C                                                                          ORI12195
C  FINAL ENERGY BALANCE OUTPUT                                             ORI12196
C*****                                                                     ORI12197
      ENTRY OUTFNL                                                         ORI12198
C*****                                                                     ORI12199
      WRITE(NOUT,167)ITCNUM,NBROD,SGV(ISGV),TCL(ITCL),IS(2),IS(3),ISECS    ORI12200
      WRITE(1      ,167)ITCNUM,NBROD,SGV(ISGV),TCL(ITCL),IS(2),IS(3),     ORI12201
     1                  ISECS                                              ORI12202
      CALL DATE(IS,NOUT)                                                   ORI12203
      WRITE(NOUT,168)        (HED(I),I=1,17),SUMCP,DELH,SUMQ,EQNRT,        ORI12204
     1                ERROR1,ERROR2                                       ORI12205
      WRITE(1      ,168)        (HED(I),I=1,17),SUMCP,DELH,SUMQ,EQNRT,    ORI12206
     1                ERROR1,ERROR2                                       ORI12207
  167 FORMAT(1H1,I6,21(1H*),18H  ENERGY BALANCE  ,31(1H*),//,              ORI12208
     1       T2,6(1H*),' THERMOCOUPLE NUMBER:  TE-',I3,2A1,T45,'TIME:',    ORI12209
     2       I3,':',I2,':',I2,6X,'DATE: ')                                 ORI12210
  168 FORMAT(T2,6(1H*),17A4,//,                                            ORI12211
     1  T2,39HCHANGE IN PIN INTERNAL ENERGY CONTENT =,F13.6,7H BTU/FT,/,    ORI12212
     2  T8,72HDETERMINED BY SUMMATION OF DELTA U'S OVER THE INTERVAL FROM  ORI12213
     3M T=0 TO TEND.,/,T2,39HCHANGE IN PIN INTERNAL ENERGY CONTENT =,      ORI12214
     4F13.6,7H BTU/FT,/,T8,53HDETERMINED BY DIFFERENCE IN PIN END POINT    ORI12215
     5ENTHALPIES.,/,T2,40HTOTAL HEAT INPUT = INTEGRAL OF QTOT*DT =,F13.6,  ORI12216
     67H BTU/FT,//,T2,54HINTEGRAL OF SURFACE FLUX VERSUS TIME CURVE *2.*PI ORI12217
     7*RO=,F13.6,7H BTU/FT,//,T2,42HPERCENTAGE ERROR IN OVERALL HEAT       ORI12218
     8 BALANCE =,F11.4,8H PERCENT,/,T2,45HERROR IN OVERALL HEAT BALANCE    ORI12219
     9(VIA METHOD 2)=,F11.4,8H PERCENT)                                    ORI12220
      RETURN                                                               ORI12221
C                                                                          ORI12222
C  TAPE OUTPUT-FILE NUMBER 1                                               ORI12223
```

```
C*****
      ENTRY OUTTAP(KO)
C*****
      GO TO(208,218),KO
  208 WRITE(9)ITCNUM,NOD6,(RBAR(I),I=1,NOD6),R(NOD6)
  218 WRITE(9)TIME(JO),(TO(I,JO),I=1,NOD6),QO(JO),TBO(JO),HO(JO),
     1          TSATO(JO),HSATO(JO),PSO(JO),SFLUX(JO),TSURO(JO),
     2          AMFO(JO),QUALO(JO),RHBO(JO),RSFXO(JO),RTSURO(JO),
     3          MODEO(JO),(ZERO(I),I=1,3)
      RETURN
      END
```

```
      SUBROUTINE DATE(JT,NOUT)
C   OAK RIDGE INVERSE CODE        VERSION 1.0        4-1-77
      DIMENSION JT(6),AMONTH(12),MONTH(12)
      DATA AMONTH/'JAN.','FEB.','MAR.','APR.','MAY','JUNE','JULY','AUG.'
     1,'SEP.','OCT.','NOV.','DEC.'/
      DATA MONTH/31,29,31,30,31,30,31,31,30,31,30,31/
      L=JT(1)
      I= 0
   10 I=I+1
      L=L-MONTH(I)
      IF(L)20,15,10
   15 AM=AMONTH(I)
      IDAY=MONTH(I)
      WRITE(NOUT,16) AM,IDAY
      WRITE(1,16) AM,IDAY
   16 FORMAT(1H+,T72,A4,I3,/)
      RETURN
   20 AM=AMONTH(I)
      IDAY=L+ MONTH(I)
      WRITE(NOUT,16) AM,IDAY
      WRITE(1,16) AM,IDAY
      RETURN
      END
```

```
C*********************************************************************
C*********************************************************************
C*****************************        ********************************
C*****************************  CARD  ********************************
C*****************************  INPUT ********************************
C*****************************        ********************************
C*********************************************************************
C*********************************************************************
C     CARD INPUT ROUTINE
C
C
      SUBROUTINE INPUTC
C   OAK RIDGE INVERSE CODE        VERSION 1.0        4-1-77
      COMMON /CODAS/ITCS(348),ICHTCS(348),ISJBCH(348),ITCM(106),
     1              ICHTCM(106),ICHEIE(49),ICHEEE(49),ICHBW1,ICHBW2,
     2              IRVOL(15,3),NTRY1(348),NTRY2(106),NTRY3(49),
     3              NTRY4(49),NBW1,NBW2,IC(1000),
     4              NTC(348),NCHTCS(348),NK,IRSLB(15,3),NSLAB
      COMMON /INPUT/ITCNUM,KICK,HED(17),IS(6),TCSS(601),TCMM(601),
     1              QAVGG(601),TIMEE(601),TIMR(601),TBR(601),TSATR(601),
     2              PRESUR(601),QUALR(601),AMFR(601),HBR(601),
     3              SFLUXR(601),TSURR(601),MODER(601),TRPEND,JRP
     4,             IRF,ICS7
      DIMENSION IBTCS(35),IGTCS(35),IGCH(35),IBTCM(35),IGTCM(35),
     1          IBEIE(49), ICS(6)
C
      NIN=5
C
C     READ HEADING FOR THIS RUN
      READ(NIN,3)HED
    3 FORMAT(10X,17A4)
```

```
C                                                                               ORI12285
      READ(NIN,7) ICS,ICS7,IRP                                                  ORI12290
    7 FORMAT(10X,8I5)                                                           ORI12291
C                                                                               ORI12292
C     READ BAD SHEATH TC NUMBERS AND ADJUST ICHTCS                              ORI12293
      IF(ICS(1).EQ.0)GO TO 28                                                   ORI12294
      READ(NIN,17)NBTCS,(IBTCS(I),I=1,NBTCS)                                    ORI12295
   17 FORMAT(10X,7I10)                                                          ORI12296
      DO 20 J=1,NBTCS                                                           ORI12297
      DO 20 I=1,348                                                             ORI12298
      IF(ITCS(I).EQ.IBTCS(J))ICHTCS(I)=-999                                     ORI12299
   20 CONTINUE                                                                  ORI12300
C                                                                               ORI12301
C     READ NEW 'GOOD' SHEATH TC NUMBERS AND THEIR CORRESPONDING SCAN CHAORI12302
   28 IF(ICS(2).EQ.0)GO TO 48                                                   ORI12303
      READ(NIN,37)NGTCS,(IGTCS(I),IGCH(I),I=1,NGTCS)                            ORI12304
   37 FORMAT(10X,7I10)                                                          ORI12305
      DO 40 J=1,NGTCS                                                           ORI12306
      DO 40 I=1,348                                                             ORI12307
      IF(ITCS(I).EQ.IGTCS(J))ICHTCS(I)=IGCH(J)                                  ORI12308
   40 CONTINUE                                                                  ORI12309
C                                                                               ORI12310
C     READ BAD MIDDLE TC NUMBERS AND ADJUST ICHTCM                              ORI12311
   48 IF(ICS(3).EQ.0)GO TO 68                                                   ORI12312
      READ(NIN,57)NBTCM,(IBTCM(I),I=1,NBTCM)                                    ORI12313
   57 FORMAT(10X,7I10)                                                          ORI12314
      DO 60 J=1,NBTCM                                                           ORI12315
      DO 60 I=1,106                                                             ORI12316
      IF(ITCM(I).EQ.IBTCM(J))ICHTCM(I)=-999                                     ORI12317
   60 CONTINUE                                                                  ORI12318
C                                                                               ORI12319
C     READ NEW 'GOOD' MIDDLE TC NO.S AND THEIR CORRESPONDING SCAN CHANNEORI12320
   68 IF(ICS(4).EQ.0)GO TO 128                                                  ORI12321
      READ(NIN,77)NGTCM,(IGTCM(I),IGCH(I),I=1,NGTCM)                            ORI12322
   77 FORMAT(10X,7I10)                                                          ORI12323
      DO 80 J=1,NGTCM                                                           ORI12324
      DO 80 I=1,106                                                             ORI12325
      IF(ITCM(I).EQ.IGTCM(J))ICHTCM(I)=IGCH(J)                                  ORI12326
   80 CONTINUE                                                                  ORI12327
C                                                                               ORI12328
C     READ BAD SHUNT CHANNELS                                                   ORI12329
  128 IF(ICS(5) .EQ.0)GO TO 148                                                 ORI12330
      READ(NIN,137)NBSCH,(IBEIE(I),I=1,NBSCH)                                   ORI12331
  137 FORMAT(10X,7I10)                                                          ORI12332
      DO 140 J=1,NBSCH                                                          ORI12333
      DO 140 I=1,49                                                             ORI12334
      IF(ICHEIE(I).EQ.IBEIE(J))ICHEIE(I)=-999                                   ORI12335
  140 CONTINUE                                                                  ORI12336
      DO 142 I=1,49                                                             ORI12337
      IF(ICHEIE(I).GT.0)GO TO 142                                               ORI12338
      DO 141 J=1,348                                                            ORI12339
      JROD=IFIX(FLOAT(ITCS(J)-300000)/1000.0)                                   ORI12340
      IF(JROD.EQ.I)ICHTCS(J)=-999                                               ORI12341
  141 CONTINUE                                                                  ORI12342
  142 CONTINUE                                                                  ORI12343
C                                                                               ORI12344
C     SET-UP NTC, NCHTCS ARRAYS (DEPENDING ON VALUE OF ICS(6))                  ORI12345
  148 CONTINUE                                                                  ORI12346
      IT=ICS(6)                                                                 ORI12347
      GO TO (158,168,178),IT                                                    ORI12348
C                                                                               ORI12349
C     FOR ICS(6)=1, ORINC CALCULATIONS ARE MADE FOR ALL 'GOOD' BUNDLE           ORI12350
C     T/C'S ON THE DATA SYSTEM                                                  ORI12351
  158 NK=348                                                                    ORI12352
      DO 160 I=1,348                                                            ORI12353
      NTC(I)=ITCS(I)                                                            ORI12354
  160 NCHTCS(I)=ICHTCS(I)                                                       ORI12355
      RETURN                                                                    ORI12356
C                                                                               ORI12357
C     FOR ICS(6)=2, ORINC CALCULATIONS ARE MADE FOR THE T/C'S BETWEEN           ORI12358
C     NTSRT AND NTEND IN THE ARRAY ITCS                                         ORI12359
  168 READ(NIN,167)NTSRT,NTEND                                                  ORI12360
  167 FORMAT(10X,2I10)                                                          ORI12361
      NK=0                                                                      ORI12362
      M=0                                                                       ORI12363
      DO 170 I=1,348                                                            ORI12364
      IF(ITCS(I).NE.NTSRT.AND.M.NE.1)GO TO 170                                  ORI12365
      NK=NK+1                                                                   ORI12366
      NTC(NK)=ITCS(I)                                                           ORI12367
      NCHTCS(NK)=ICHTCS(I)                                                      ORI12368
      M=1                                                                       ORI12369
      IF(ITCS(I).EQ.NTEND)M=0                                                   ORI12370
  170 CONTINUE                                                                  ORI12371
      RETURN                                                                    ORI12372
C                                                                               ORI12373
C     FOR ICS(6)=3, ORINC CALCULATIONS ARE MADE FOR THE T/C'S SPECIFIED         ORI12374
  178 READ(NIN,177)NK,(NTC(I),I=1,NK)                                           ORI12375
  177 FORMAT(10X,7I10)                                                          ORI12376
C     DETERMINE CHANNELS FOR THE NTC'S SPECIFIED                                ORI12377
      DO 180 I=1,NK                                                             ORI12378
      DO 180 J=1,348                                                            ORI12379
      IF(ITCS(J).EQ.NTC(I))NCHTCS(I)=ICHTCS(J)                                  ORI12380
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  18C CONTINUE                                                          ORI12381
      RETURN                                                            ORI12382
C                                                                       ORI12383
C     END OF MAIN CONTROL INPUT                                         ORI12384
      END                                                               ORI12385
C                                                                       ORI12386
C                                                                       ORI12387
C*****THIS ROUTINE READS THE RELAP-ORINC INTERFACE TAPE (NTAPE2) AND    ORI12388
C*****LOADS THE ENTIRE TRANSIENT DATA ON DISK (FILE 8); ENTRY INRELP    ORI12389
C*****RETRIEVES THE TRANSIENT DATA FROM DISK AND LOADS THE RELAP ARRAYS ORI12390
C*****REQUIRED BY MAIN                                                 ORI12391
C                                                                       ORI12392
      SUBROUTINE INPTRP                                                 ORI12393
C   OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77               ORI12394
C                                                                       ORI12395
C*****COMMON BLOCKS AND DIMENSIONS                                      ORI12396
      COMMON /CODAS/ITCS(348),ICHTCS(348),ISUBCH(348),ITCM(106),        ORI12397
     1               ICHTCM(106),ICHEIE(49),ICHEEE(49),ICHBW1,ICHBW2,   ORI12398
     2               IRVOL(15,3),NTRY1(348),NTRY2(106),NTRY3(49),       ORI12399
     3               NTRY4(49),NBW1,NBW2,IC(1000),                      ORI12400
     4               NTC(348),NCHTCS(348),NK,IRSLB(15,3),NSLAB          ORI12401
      COMMON /INPUT/ITCNUM,KICK,HED(17),IS(6),TCSS(601),TCMM(601),      ORI12402
     1               GAVGG(601),TIMEE(501),TIMR(601),TBR(601),TSATR(601),ORI12403
     2               PRESUR(601),QUALR(601),AMFR(601),HBR(601),         ORI12404
     3               SFLUXR(601),TSURR(601),MODER(601),TRPEND,JRP       ORI12405
     4,              KRF,ICS7                                           ORI12406
      COMMON /FSTOR/F(5000)                                             ORI12407
      DIMENSION SS(500),ARRAY(502),NVOL(50),IARRAY(502),AMODER(601)     ORI12408
      EQUIVALENCE (ARRAY(1),IARRAY(1)),(AMODER(1),MODER(1))             ORI12409
C                                                                       ORI12410
C*****SET-UP I/O DEVICES FOR INPUTTING AND STORING RELAP TRANSIENT CALC.ORI12411
      ISHSB=0                                                           ORI12412
      NOUT=6                                                            ORI12413
      NTAPE2=11                                                         ORI12414
      REWIND NTAPE2                                                     ORI12415
      IRP=1                                                             ORI12416
C                                                                       ORI12417
C*****LOAD STEADY STATE ARRAY                                           ORI12418
      J=1                                                               ORI12419
      READ(NTAPE2)ARRAY                                                 ORI12420
      TIMR(J)=ARRAY(1)                                                  ORI12421
      NSLBS=IARRAY(2)                                                   ORI12422
      DO 10 I=1,50                                                      ORI12423
   10 NVOL(I)=IARRAY(I+2)                                               ORI12424
      DO 20 I=1,500                                                     ORI12425
   20 SS(I)=ARRAY(I+2)                                                  ORI12426
C                                                                       ORI12427
C*****READ INTERFACE TAPE AND TRANSFER TO DISK UNTIL TAPE EOF IS REACHEDORI12428
      N=0                                                               ORI12429
   28 READ(NTAPE2,ERR=48,END=68)ARRAY                                   ORI12430
      IF(ABS(ARRAY(1)-(TIMR(J)+0.050)).GT.0.001)GO TO 28                ORI12431
      J=J+1                                                             ORI12432
      TIMR(J)=ARRAY(1)                                                  ORI12433
      NLBS=IARRAY(2)                                                    ORI12434
      IF(NSLBS.NE.NLBS)GO TO 58                                         ORI12435
      DO 30 I=3,502                                                     ORI12436
      N=N+1                                                             ORI12437
   30 F(N)=ARRAY(I)                                                     ORI12438
      IF(N.EQ.5000) GO TO 38                                            ORI12439
      GO TO 28                                                          ORI12440
   38 WRITE(8) F                                                        ORI12441
      IRP=IRP+1                                                         ORI12442
      IF(IRP.EQ.61)GO TO 78                                             ORI12443
      N=0                                                               ORI12444
      GO TO 28                                                          ORI12445
   48 WRITE(NOUT,47)                                                    ORI12446
   47 FORMAT(1H1,'****WARNING--INPTRP--ERROR ENCOUNTERED IN READING RELAPORI12447
     1 INTERFACE TAPE.',/,T22,'JOB TERMINATED.')                        ORI12448
      STOP                                                              ORI12449
   58 WRITE(NOUT,57)NSLBS,NLBS,TIMR(J),J                                ORI12450
   57 FORMAT(1H1,'****WARNING--INPTRP--DURING THE READ OF A RELAP INTERFAORI12451
     1CE TAPE, A FILE WAS',/,T22,'READ IN WHICH THE NO.OF SLABS DID NOT ORI12452
     2MATCH THE NO.OF SLABS FROM FILE ONE.',/,T22,'JOB TERMINATED.',/,  ORI12453
     3T22,'NSLBS=',I7,/,T22,'ARRAY(2)=',I7,/,T22,'TIME OF FILE=',F10.5, ORI12454
     4/,T22,'FILE NO.=',I7)                                             ORI12455
      STOP                                                              ORI12456
   68 WRITE(8) F                                                        ORI12457
      IRP=IRP+1                                                         ORI12458
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   7E  JRP=J                                                                ORI12458
       IF(KRP.EQ.0) KRF=JRP                                                 ORI12460
       TRPEND=TIMR(JRP)                                                     ORI12461
       REWIND NTAPE2                                                        ORI12462
       REWIND 8                                                             ORI12463
C                                                                           ORI12464
C*****CHECK TO SEE THAT B/D TIMES (TIMEE) AND RELAP INTERFACE TIMES (TIMORI12465
C*****ARE COMPATIBLE                                                       ORI12466
       DO 80 I=1,JRP                                                        ORI12467
       J=I                                                                  ORI12468
       IF(ABS(TIMEE(I)-TIMR(I)).GT.0.0010)GO TO 88                          ORI12469
   8C  CONTINUE                                                             ORI12470
       RETURN                                                               ORI12471
   88  WRITE(NOUT,87)TIMEE(J),TIMR(J)                                       ORI12472
   87  FORMAT(1H1,'***WARNING--INPTRP--RELAP AND BLOWDOWN TIMES ARE NOT COORI12473
     1MPATIBLE.',/,T22,'JOB TERMINATED.',/,T22,'TIME (B/D) =',F10.4,/,      ORI12474
     2T22,'TIME (RELAP) =',F10.4)                                           ORI12475
       STOP                                                                 ORI12476
C                                                                           ORI12477
C  ENTRY TO RETRIEVE THE NUMBER OF SLABS IN THE RELAP MODEL                 ORI12478
       ENTRY INPSLB(NIBBLE)                                                 ORI12479
       NIBBLE=NSLBS                                                         ORI12480
       RETURN                                                               ORI12481
C******                                                                     ORI12482
C*****FOR CALLS TO ENTRY INRELP, RELAP PREDICTIONS FOR VOLUME PRESSURE,     ORI12483
C*****VOLUME TEMPERATURE, VCL.AVERAGE QUALITY, SLAB SURFACE HEAT FLUX,      ORI12484
C*****HEAT TRANSFER COEFF., SLAB SURFACE TEMPERATURE, AVERAGE VOL.MASS      ORI12485
C*****FLUX, SATURATION TEMPERATURE, AND HEAT TRANSFER MODE AT THE SLAB      ORI12486
C*****SURFACE ARE RECOVERED FROM DISK STORAGE AND STORED IN THE APPROPRIORI12487
C*****ARRAYS AND RETURNED TO MAIN                                           ORI12488
C******                                                                     ORI12489
C                                                                           ORI12490
       ENTRY INRELP                                                         ORI12491
C                                                                           ORI12492
C*****DETERMINE PROPER VOLUME FOR THIS T/C                                  ORI12493
       IROD=IFIX(FLOAT(ITCNUM-300000)/1000.0)                               ORI12494
       ISGV=IFIX(FLOAT(ITCNUM-300000-IROD*1000)/100.0)                      ORI12495
       ITCL=ITCNUM-300000-IROD*1000-ISGV*100                                ORI12496
       DO 90 I=1,348                                                        ORI12497
       ISH=I                                                                ORI12498
       IF(ITCNUM.EQ.ITCS(I))GO TO 98                                        ORI12499
   9C  CONTINUE                                                             ORI12500
   98  NVOLUM=IRVOL(ITCL,ISUBCH(ISH))                                       ORI12501
       NSLAB=IRSLB(ITCL,ISUBCH(ISH))                                        ORI12502
       DO 100 I=1,NSLBS                                                     ORI12503
       ISH=I                                                                ORI12504
       IF(NVOL(I).EQ.NVOLUM)GO TO 108                                       ORI12505
  10C  CONTINUE                                                             ORI12506
       WRITE(NOUT,107)ITCNUM,NVOLUM,(I,NVOL(I),I=1,NSLBS)                   ORI12507
  107  FORMAT(1H1,'***WARNING--INRELP--RELAP VOLUME NUMBER ASSOCIATED WITORI12508
     1H T/C NUMBER',I10,/,T22,'WAS NOT FOUND IN NVOL ARRAY. JOB TERMINATORI12509
     2ED.',/,T22,'VOLUME NUMBER =',I5,/,(T22,'NVOL(',I3,')=',I5))         ORI12510
       STOP                                                                 ORI12511
  10E  CONTINUE                                                             ORI12512
       IF(ISHSB .EQ. ISH) GO TO 128                                         ORI12513
       ISHSB=ISH                                                            ORI12514
C                                                                           ORI12515
C*****LOAD TBR, PRESUR, QUALR, AMFR, HBR, SFLUXR, TSURR, AND MODER ARRAYORI12516
       J=1                                                                  ORI12517
       PRESUR(J)= SS(ISH+50)                                                ORI12518
       TBR(J)=    SS(ISH+100)                                               ORI12519
       QUALR(J)=  SS(ISH+150)                                               ORI12520
       SFLUXR(J)= SS(ISH+200)                                               ORI12521
       HBR(J)=    SS(ISH+250)                                               ORI12522
       TSURR(J)=  SS(ISH+300)                                               ORI12523
       AMFR(J)=   SS(ISH+350)                                               ORI12524
       TSATR(J)=  SS(ISH+400)                                               ORI12525
       AMODER(J)=  SS(ISH+450)                                              ORI12526
C-----SET IRP TO 1 AND START RETRIEVAL FROM DISK (FILE 8)                   ORI12527
       IRP=1                                                                ORI12528
  11E  READ(8) F                                                            ORI12529
       IRP=IRP+1                                                            ORI12530
       DO 120 I=1,10                                                        ORI12531
       J=J+1                                                                ORI12532
       IF(J.GT.JRP)GO TO 128                                                ORI12533
       K=(I-1)*500                                                          ORI12534
       PRESUR(J)=  F(ISH+K+50)                                              ORI12535
       TBR(J)=     F(ISH+K+100)                                             ORI12536
       QUALR(J)=   F(ISH+K+150)                                             ORI12537
       SFLUXR(J)=  F(ISH+K+200)                                             ORI12538
       HBR(J)=     F(ISH+K+250)                                             ORI12539
       TSURR(J)=   F(ISH+K+300)                                             ORI12540
       AMFR(J)=    F(ISH+K+350)                                             ORI12541
       TSATR(J)=   F(ISH+K+400)                                             ORI12542
       AMODER(J)=   F(ISH+K+450)                                            ORI12543
  12C  CONTINUE                                                             ORI12544
       GO TO 118                                                            ORI12545
  12E  CONTINUE                                                             ORI12546
       REWIND 8                                                             ORI12547
       RETURN                                                               ORI12548
C                                                                           ORI12549
C*****END OF LOADING                                                        ORI12550
       END                                                                  ORI12551
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C*****THIS ROUTINE (INCLUDES ENTRIES INPTBD AND INBD) READS THE BLOW-DOWORI12552
C*****TAPE (NTAPE1), DETERMINES THE INITIATION OF BLOWDOWN, LOADS THE   ORI12553
C*****NEXT 30 SECONDS OF THE BLOWDOWN PERIOD ON DISK; THEN RETRIEVES FROORI12554
C*****THE DISK THERMOCOUPLE AND POWER RESPONSES AND LOADS THE TCSS, TCMMORI12555
C*****AND QAVGG ARRAYS REQUIRED BY MAIN                                 ORI12556
C                                                                       ORI12557
      SUBROUTINE INPTBD                                                 ORI12558
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                ORI12559
C                                                                       ORI12560
C*****COMMON BLOCKS AND DIMENSIONS                                      ORI12561
      COMMON /CCDAS/ITCS(348),ICHTCS(348),ISUBCH(348),ITCM(106),        ORI12562
     1               ICHTCM(106),ICHEIE(49),ICHEEE(49),ICHBW1,ICHBW2,   ORI12563
     2               IRVOL(15,3),NTRY1(348),NTRY2(106),NTRY3(49),       ORI12564
     3               NTRY4(49),NBW1,NBW2,IC(1000),                      ORI12565
     4               NTC(348),NCHTCS(348),NK,IRSLB(15,3),NSLAB          ORI12566
      COMMON /INPUT/ITCNUM,KICK,HED(17),IS(6),TCSS(601),TCMM(601),      ORI12567
     1               QAVGG(601),TIMEE(601),TIMR(601),TBR(601),TSATR(601),ORI12568
     2               PRESUR(601),QUALR(601),AMFR(601),HBR(601),         ORI12569
     3               SFLUXR(601),TSURR(601),MODER(601),TRPEND,JRP       ORI12570
     4,              IRP,ICS7                                           ORI12571
      COMMON /PIN/  RHT(15,7),PFFR(15,2),TCL(15),SGV(7),HLENG(49)       ORI12572
      COMMON /FSTOR/F(5000)                                             ORI12573
      DIMENSION SUM(500),S(1000),SS(500),JT(6)                          ORI12574
C                                                                       ORI12575
C*****SET-UP I/O DEVICES FOR INPUTTING AND STORING B/D DATA             ORI12576
      NOUT=6                                                            ORI12577
      NTAPE1=10                                                         ORI12578
      REWIND NTAPE1                                                     ORI12579
      IBD=1                                                             ORI12580
C                                                                       ORI12581
C*****READ SCAN TABLE FROM B/D DATA TAPE AND SET-UP ENTRY NO. ARRAY     ORI12582
      READ(NTAPE1)IC,ID                                                 ORI12583
      CALL SCAN                                                         ORI12584
C                                                                       ORI12585
C*****ZERO SUMMATION ARRAY                                             ORI12586
      DO 10 I=1,500                                                     ORI12587
   10 SUM(I)=0.0                                                        ORI12588
      NSUM=0                                                            ORI12589
C                                                                       ORI12590
C*****FROM BEGINNING OF TAPE TO TRIP POINT DETERMINE MEANS FOR ALL ENTRIORI12591
   18 READ(NTAPE1,ERR=38,END=48)ID,JT,S                                 ORI12592
C-----CHECK BREAK WIRE CHANNELS FOR B/D                                 ORI12593
      IF(S(NBW1).GT.1.0.OR.S(NBW2).GT.1.0)GO TO 58                      ORI12594
      DO 20 I=1,500                                                     ORI12595
   20 SUM(I)=SUM(I)+S(I)                                                ORI12596
      NSUM=NSUM+1                                                       ORI12597
      IF(S(NBW1+500).GT.1.0.OR.S(NBW2+500).GT.1.0)GO TO 78              ORI12598
      DO 30 I=1,500                                                     ORI12599
   30 SUM(I)=SUM(I)+S(I+500)                                            ORI12600
      NSUM=NSUM+1                                                       ORI12601
      GO TO 18                                                          ORI12602
   38 WRITE(NOUT,37)                                                    ORI12603
   37 FORMAT(1H1,'****WARNING--INPTBD--ERROR ENCOUNTERED IN READING BLOW-ORI12604
     1DOWN DATA TAPE.',/,T22,'JOB TERMINATED. ***1***')                 ORI12605
      STOP                                                              ORI12606
   48 WRITE(NOUT,47)                                                    ORI12607
   47 FORMAT(1H1,'****WARNING--INPTBD--EOF ENCOUNTERED DURING SEARCH FOR ORI12608
     1TRIP POINT.',/,T22,'JCB TERMINATED.')                             ORI12609
      STOP                                                              ORI12610
C-----BREAK FOUND IN FIRST FILE (FIRST 500 ENTRIES)                     ORI12611
   58 DO 60 I=1,500                                                     ORI12612
   60 SS(I)=SUM(I)/FLOAT(NSUM)                                          ORI12613
      DO 70 I=1,6                                                       ORI12614
   70 IS(I)=JT(I)                                                       ORI12615
      N=0                                                               ORI12616
      GO TO 109                                                         ORI12617
C-----BREAK FOUND IN SECOND FILE (I.E.,SECOND 500 ENTRIES)              ORI12618
   78 DO 80 I=1,500                                                     ORI12619
   80 SS(I)=SUM(I)/FLOAT(NSUM)                                          ORI12620
      DO 90 I=1,6                                                       ORI12621
   90 IS(I)=JT(I)                                                       ORI12622
      N=0                                                               ORI12623
      DO 100 I=501,1000                                                 ORI12624
      N=N+1                                                             ORI12625
  100 F(N)=S(I)                                                         ORI12626
C                                                                       ORI12627
C*****READ BLOW-DOWN TAPE AND STORE FIRST 30 SECS OF B/D ON DISK        ORI12628
  108 READ(NTAPE1,ERR=138,END=148)ID,JT,S                               ORI12629
  109 DO 110 I=1,500                                                    ORI12630
      N=N+1                                                             ORI12631
  110 F(N)=S(I)                                                         ORI12632
      NDISK=2                                                           ORI12633
      IF(N.EQ.5000) GO TO 128                                           ORI12634
  118 DO 120 I=501,1000                                                 ORI12635
      N=N+1                                                             ORI12636
  120 F(N)=S(I)                                                         ORI12637
      NDISK=1                                                           ORI12638
      IF(N.EQ.5000) GO TO 128                                           ORI12639
      GO TO 108                                                         ORI12640
  128 WRITE(7) F                                                        ORI12641
      IBD=IBD + 1                                                       ORI12642
      IF(IBD.EQ.61)GO TO 158                                            ORI12643
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      N=0                                                                ORI12644
      GO TO(108,118),NDSK                                                ORI12645
  13E WRITE(NOUT,137)                                                    ORI12646
  137 FORMAT(1H1,'***WARNING--INPTBD--ERROR ENCOUNTERED IN READING BLOW-ORI12647
     1DOWN DATA TAPE.',/,T22,'JOB TERMINATED. ***2***')                  ORI12648
      STOP                                                               ORI12649
  14E WRITE(NOUT,147)                                                    ORI12650
  147 FORMAT(1H1,'***WARNING--INPTBD--EOF ENCOUNTERED DURING TRANSFER OFORI12651
     1 FIRST 30 SECONDS OF BD DATA FROM TAPE TO DISK.',/,T22,'JOB TERMINORI12652
     2ATED.')                                                            ORI12653
      STOP                                                               ORI12654
  15E CONTINUE                                                           ORI12655
      REWIND NTAPE1                                                      ORI12656
      REWIND 7                                                           ORI12657
C                                                                        ORI12658
C*****SET-UP TIME ARRAY                                                  ORI12659
      DO 16C I=1,601                                                     ORI12660
  16C TIMEE(I)=FLOAT(I-1)*0.05                                           ORI12661
      RETURN                                                             ORI12662
C                                                                        ORI12663
C******                                                                  ORI12664
C*****FOR CALLS TO ENTRY INBD, THE SHEATH T/C RESPONSE, MIDDLE T/C RESPOORI12665
C*****(IF ANY), ROD AMPERAGE, AND GENERATOR VOLTAGE DURING THE BLOW-DOWNORI12666
C*****TRANSIENT ARE RECOVERED FROM DISK STORAGE, STORED IN THE APPROPRIAORI12667
C*****ARRAYS AND SMOOTHED (THREE POINT SMOOTHING)                        ORI12668
C******                                                                  ORI12669
C                                                                        ORI12670
      ENTRY INBD                                                         ORI12671
C*****SET-UP ENTRY NUMBERS FOR THIS CALL                                 ORI12672
      IROD=IFIX(FLOAT(ITCNUM-300000)/1000.0)                             ORI12673
      ISGV=IFIX(FLOAT(ITCNUM-300000-IROD*1000)/100.0)                    ORI12674
      ITCL=ITCNUM-300000-IROD*1000-ISGV*100                              ORI12675
      ITCMO= 300000+IROD*1000+700+ITCL                                   ORI12676
C-----DETERMINE IF THERE IS A 'GOOD' MIDDLE T/C CORRESPONDING TO ITCNUM ORI12677
      DO 170 I=1,106                                                     ORI12678
      IM=I                                                               ORI12679
      IF(ITCMO.EQ.ITCM(I))GO TO 178                                      ORI12680
  17C CONTINUE                                                           ORI12681
      NTCM=0                                                             ORI12682
      GO TO 198                                                          ORI12683
  17E IF(ICHTCM(IM).GT.0)GO TO 188                                       ORI12684
      NTCM=0                                                             ORI12685
      GO TO 198                                                          ORI12686
  18E NTCM=NTRY2(IM)                                                     ORI12687
C-----DETERMINE THE SHEATH T/C ENTRY NUMBER                              ORI12688
  19E DO 200 I=1,348                                                     ORI12689
      ISH=I                                                              ORI12690
      IF(ITCNUM.EQ.ITCS(I))GO TO 208                                     ORI12691
  20C CONTINUE                                                           ORI12692
  20E NTCS=NTRY1(ISH)                                                    ORI12693
C-----SET THE ENTRY NUMBERS FOR THE SHUNT AMPERAGE AND GENERATOR VOLTAGEORI12694
      NEIE=NTRY3(IROD)                                                   ORI12695
      NEEE=NTRY4(IROD)                                                   ORI12696
C                                                                        ORI12697
C*****LOAD TCSS, TCMM, AND QAVGG ARRAYS                                  ORI12698
      J=1                                                                ORI12699
      TCSS(J)= SS(NTCS)                                                  ORI12700
      QAVGG(J)=SS(NEIE)*SS(NEEE)/1000.0*(3412.9/3600.0)/HLENG(IROD)      ORI12701
      IF(NTCM.NE.0)GO TO 218                                             ORI12702
      TCMM(J)=0.0                                                        ORI12703
      GO TO 228                                                          ORI12704
  21E TCMM(J)= SS(NTCM)                                                  ORI12705
  22E CONTINUE                                                           ORI12706
      IBD=1                                                              ORI12707
  23E READ(7)  F                                                         ORI12708
      IBD=IBD+ 1                                                         ORI12709
      DO 250 I=1,10                                                      ORI12710
      J=J+1                                                              ORI12711
      K=(I-1)*500                                                        ORI12712
      TCSS(J)= F(NTCS+K)                                                 ORI12713
      QAVGG(J)=F(NEIE+K)*F(NEEE+K)/1000.0*(3412.9/3600.0)/HLENG(IROD)    ORI12714
      IF(NTCM.NE.0)GO TO 248                                             ORI12715
      TCMM(J)=0.0                                                        ORI12716
      GO TO 250                                                          ORI12717
  24E TCMM(J)= F(NTCM+K)                                                 ORI12718
  25C CONTINUE                                                           ORI12719
      IF(IBD.NE.61)GO TO 238                                             ORI12720
C                                                                        ORI12721
C*****SMOOTH TCSS, TCMM, QAVGG DATA                                      ORI12722
      CALL SMOOTH(601,TCSS)                                              ORI12723
      CALL SMOOTH(601,TCMM)                                              ORI12724
      DO 260 I=1,601                                                     ORI12725
      IF(QAVGG(I).LE.0.001)QAVGG(I)=0.0                                  ORI12726
  26C CONTINUE                                                           ORI12727
      REWIND 7                                                           ORI12728
C                                                                        ORI12729
C*****END OF LOADING AND SMOOTHING, RETURN                               ORI12730
      RETURN                                                             ORI12731
      END                                                                ORI12732
```

```
      SUBROUTINE SMOOTH(N,Y)                                                ORI12733
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                    ORI12734
      DIMENSION Y(N),YS(1000)                                               ORI12735
      DO 5 I= 2,N                                                           ORI12736
      IF(ABS(Y(I-1)-Y(I)).GE.100.0) Y(I)= Y(I-1)                            ORI12737
    5 CONTINUE                                                              ORI12738
      YS(1)=Y(1)                                                            ORI12739
      NN=N-1                                                                ORI12740
      DO 10 I=2,NN                                                          ORI12741
   10 YS(I)=(Y(I-1)+Y(I)+Y(I+1))/3.0                                        ORI12742
      YS(N)=(Y(N-2)+Y(N-1)+Y(N))/3.0                                        ORI12743
      DO 20 I=1,N                                                           ORI12744
   20 Y(I)=YS(I)                                                            ORI12745
      RETURN                                                                ORI12746
      END                                                                   ORI12747
```

```
      SUBROUTINE CDT1                                                       ORI12748
C  OAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77                    ORI12749
      COMMON /COEFF/NTCS(348),NTCM(348),DAT(348,3),PFAX(348),KD4(348),      ORI12750
     1              CBNO(348,4),VR1(348),KD1(348),CMGO(348,5),VR2(348),    ORI12751
     2              KD2(348),GAPCF(348,3),GAPSD(348,3),VR3(348),KD3(348)   ORI12752
     3             ,GAPG(348),TNOD5(348),TNS(348),FEEBEE(348),ZERO(348,6)  ORI12753
     4             ,PRSS(348),TMAX(348)                                     ORI12754
      COMMON /INPUT/ITCNUM,KICK,HED(17),IS(6),TCSS(601),TCMM(601),          ORI12755
     1              QAVGG(601),TIMEE(601),TIMR(601),TBR(601),TSATR(601),    ORI12756
     2              PRESUR(601),QUALR(601),AMFR(601),HBR(601),              ORI12757
     3              SFLUXR(601),TSURR(601),MODER(601),TRPEND,JRP             ORI12758
     4,             IRP,ICS7                                                 ORI12759
      DIMENSION SGV(7),TCL(15),ALPHA4(2,6),                                 ORI12760
     1          ALPHA1(4,12),ALPHA2(4,11),ALPHA3(4,13)                      ORI12761
      DATA SGV/1HA,1HB,1HC,1HD,1HE,1HF,1HM/                                 ORI12762
      DATA TCL/1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,                 ORI12763
     1         1HL,1HM,1HN,1HO/                                             ORI12764
      DATA ALPHA4/'BY I','BY O','NDIV','RNL-',' RES','DWG ',                ORI12765
     1           'ISTA','76-3','NCE ','868 ','CAL.','/                    ORI12766
      DATA ALPHA1/'DETE','DETE','DETE','***C','RMIN','RMIN','RMIN',        ORI12767
     1            'OEFF','ED F','ED F','ED F','ICIE','OR T','OR T',       ORI12768
     2            'CR T','NTS ','HE A','HE S','HE B','NOT ',              ORI12769
     3            'BOVE','PECI','UNDL','LOAD',' SPE','FIC ','E   ',      ORI12770
     4            'ED F','CIFI','(T/C','    ','ER T','C IT',') PO',       ORI12771
     5            '    ','HE A','CS/I','WER ','    ','    ','BOVE','TCM ',ORI12772
     6            'LEVE','    ',' DAT','PAIR','L   ','    ','    ','E***'/ ORI12773
      DATA ALPHA2/'DETE','DETE','DETE','*COE','RMIN','RMIN','RMIN',        ORI12774
     1           'FFIC','ED F','ED F','ED B','IENT','OR T','OR T',        ORI12775
     2            'Y A ','S NC','HE A','HE S','PORO','T LO',              ORI12776
     3            'BOVE','PECI','SITY','ADED',' SPE','FIC ',' FIT',       ORI12777
     4            ' PER','CIFI','T/C ','    ','    ',' THE','C T/','LEVE',ORI12778
     5            '    ','    ',' ABC','C PA','L   ','    ','    ','VE D','IR  ',ORI12779
     6            '    ','    ','    ','ATE*'/                            ORI12780
      DATA ALPHA3/'DETE','DETE','DETE','****','RMIN','RMIN','RMIN',        ORI12781
     1          ' COE','ED F','ED F','ED B','FFIC','OR T','OR T','Y US',  ORI12782
     2          'IENT','HE A','HE S','ING ','S NO','BOVE','PECI','THE ',  ORI12783
     3          'T LC',' SHE','FIC ','BIAS',' ADED',' ATH ','T/C ',' GAP',ORI12784
     4          ' PER','T/C ','LEVE',' VAL',' THE','    ','L   ','UE A',  ORI12785
     5          ' ABC','    ','    ','S A ','VE D','    ','    ','MEAN',  ORI12786
     6          'ATE ','    ','    ',' GAP','****'/                        ORI12787
C                                                                           ORI12788
C-----INPUT DATA FROM COEFFICIENT DATA TAPE                                 ORI12789
      NTAPE3=12                                                             ORI12790
      REWIND NTAPE3                                                         ORI12791
      DO 10 I=1,348                                                         ORI12792
      READ(NTAPE3,END=148)NTCS(I),NTCM(I),(DAT(I,J),J=1,3)                  ORI12793
      READ(NTAPE3,END=148)PFAX(I),KD4(I)                                    ORI12794
      READ(NTAPE3,END=148)(CBNO(I,J),J=1,4),VR1(I),KD1(I)                   ORI12795
      READ(NTAPE3,END=148)(CMGO(I,J),J=1,5),VR2(I),KD2(I),PRSS(I)           ORI12796
      READ(NTAPE3,END=148)(GAPCF(I,J),J=1,3),(GAPSD(I,J),J=1,3),VR3(I),     ORI12797
     1 KD3(I),GAPG(I),TNOD5(I),TNS(I),FEEBEE(I),TMAX(I)                     ORI12798
      READ(NTAPE3,END=148)(ZERO(I,J),J=1,6)                                 ORI12799
   10 CONTINUE                                                              ORI12800
      REWIND NTAPE3                                                         ORI12801
      RETURN                                                                ORI12802
  148 WRITE(6,17)                                                           ORI12803
   17 FORMAT(1H1,'***WARNING--CDT1--ERROR ENCOUNTERED IN READING COEFFICORI12804
     1IENT DATA TAPE.'/,T20,'JOB TERMINATED.')                              ORI12805
      STOP                                                                  ORI12806
C                                                                           ORI12807
C*****                                                                      ORI12808
      ENTRY CDT                                                             ORI12809
C*****                                                                      ORI12810
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C                                                                       ORI12811
      NOUT=6                                                            ORI12812
C                                                                       ORI12813
      DO 200 J=1,348                                                    ORI12814
      I=J                                                               ORI12815
      IF(ITCNUM.EQ.NTCS(J)) GO TO 208                                   ORI12816
  200 CONTINUE                                                          ORI12817
  208 CONTINUE                                                          ORI12818
C                                                                       ORI12819
      NROD=IFIX(FLOAT(NTCS(I)-300000)/1000.0)                           ORI12820
      NSGV=IFIX(FLOAT(NTCS(I)-300000-NROD*1000)/100.0)                  ORI12821
      NTCL=NTCS(I)-300000-NROD*1000-NSGV*100                            ORI12822
      NBROD=NROD + 300                                                  ORI12823
C-----WRITE DATA FROM COEFFICIENT TAPE FOR ITCNUM                       ORI12824
      WRITE(NOUT,3)ITCNUM,HED                                           ORI12825
      WRITE(1,3) ITCNUM,HED                                             ORI12826
    3 FORMAT(1H1,I6,20(1H*),25H CALIBRATION INFORMATION ,25(1H*),///,    ORI12827
     1T2,6(1H*),17A4,/)                                                 ORI12828
      WRITE(NOUT,13) NEROD,SGV(NSGV),TCL(NTCL)                          ORI12829
      WRITE(1      ,13)NBROD,SGV(NSGV),TCL(NTCL)                        ORI12830
   13 FORMAT(T2,'***** THERMOCOUPLE NO. ',I3,'-',2A1,//)                ORI12831
      IF(NTCM(I).NE.0) GO TO 32                                         ORI12832
      WRITE(NOUT,23)                                                    ORI12833
      WRITE(1      ,23)                                                 ORI12834
   23 FORMAT('+',*****  MIDDLE T/C --- NONE',//)                       ORI12835
      GO TO 42                                                          ORI12836
   32 WRITE(NOUT,33) NEROD,SGV(7),TCL(NTCL)                             ORI12837
      WRITE(1      ,33)NBROD,SGV(7),TCL(NTCL)                           ORI12838
   33 FORMAT('+',*****  MIDDLE T/C --- ',I3,'-',2A1,//)                 ORI12839
   42 WRITE(NOUT,43)(DAT(I,J),J=1,3)                                    ORI12840
      WRITE(1      ,43)(DAT(I,J),J=1,3)                                 ORI12841
   43 FORMAT('+',*****  DATE OF LAST MODIFICATION : ',3A4,//)           ORI12842
      WRITE(NOUT,53) PFAX(I)                                            ORI12843
      WRITE(1      ,53)PFAX(I)                                          ORI12844
   53 FORMAT('+',*****  AXIAL POWER PEAKING FACTOR IS :  ',F7.4,/)      ORI12845
      WRITE(NOUT,63) (ALPHA4(KD4(I),J),J=1,6)                           ORI12846
      WRITE(1      ,63)(ALPHA4(KD4(I),J),J=1,6)                         ORI12847
   63 FORMAT('+',T7,'DETERMINED ',6A4,//)                               ORI12848
      WRITE(NOUT,73) (ALPHA1(KD1(I),J),J=1,12),(CBNO(I,J),J=1,4),VR1(I) ORI12849
      WRITE(1      ,73)(ALPHA1(KD1(I),J),J=1,12),(CBNO(I,J),J=1,4),VR1(I)ORI12850
   73 FORMAT('+',*****  CCEFFICIENTS FOR TEMPERATURE POLYNOMIAL FIT OF KORI12851
     1BN',/,T7,12A4,/,T7,'C(1)= ',E15.8,/,T7,'C(2)= ',E15.8,/,          ORI12852
     2  T7,'C(3)= ',E15.8,/,T7,'C(4)= ',E15.8,//,T7,                    ORI12853
     3  'VARIANCE OF FIT= ',E15.8,/,T7,'UNITS FOR KBN FIT :  BTU/(HR*FT*ORI12854
     4*2/FT*F)',//)                                                     ORI12855
      WRITE(NOUT,83) (ALPHA2(KD2(I),J),J=1,11),(CMGO(I,J),J=1,5)       ORI12856
      WRITE(1      ,83)(ALPHA2(KD2(I),J),J=1,11),(CMGO(I,J),J=1,5)     ORI12857
   83 FORMAT('+',*****  CCEFFIEIENTS FOR TEMPERATURE POLYNOMIAL FIT FOR ORI12858
     1KMGO',/,T7,11A4,/,T7,'C(1)= ',E15.8,/,T7,'C(2)= ',E15.8,/,T7,'C(3)ORI12859
     2= ',E15.8,/,T7,'C(4)= ',E15.8,/,T7,'C(5)= ',E15.8,//)             ORI12860
      WRITE(NOUT,93) VR2(I),PRSS(I)                                     ORI12861
      WRITE(1      ,93)VR2(I),PRSS(I)                                   ORI12862
   93 FORMAT('+',T7,'VARIANCE OF FIT= ',E15.8,/,T7,'UNITS FOR KMGO FIT :ORI12863
     1  BTU/(HR*FT**2/FT*F)',//,T7,'ACTUAL MGO POROSITY CALCULATED VIA MORI12864
     2ODIFIED',/,T15,'RUSSELL EQUATION :  ',E15.8,//)                   ORI12865
      WRITE(NOUT,103)(ALPHA3(KD3(I),J),J=1,13)                          ORI12866
      WRITE(1      ,103)(ALPHA3(KD3(I),J),J=1,13)                       ORI12867
  103 FORMAT('+',*****  CCEFFICIENTS FOR THE THERMAL EXPANSION GAP MODELORI12868
     1 FIT',/,T7,13A4,//)                                               ORI12869
      WRITE(NOUT,113)(GAPCF(I,J),GAPSD(I,J),J=1,3)                      ORI12870
      WRITE(1      ,113)(GAPCF(I,J),GAPSD(I,J),J=1,3)                   ORI12871
  113 FORMAT('+',T7,'C(1)= ',E15.8,4X,'SD= ',E15.8,/,T7,'C(2)= ',E15.8, ORI12872
     1 4X,'SD= ',E15.8,/,T7,'C(3)= ',E15.8,4X,'SD= ',E15.8,//)          ORI12873
      WRITE(NOUT,123) VR3(I),GAPO(I)                                    ORI12874
      WRITE(1      ,123)VR3(I),GAPO(I)                                  ORI12875
  123 FORMAT('+',T7,'VARIANCE OF FIT= ',E15.8,//,T7,'GAP CALCULATION AT ORI12876
     1THE BIAS POINT :',T53,F7.4,T63,'(MILS)',//)                       ORI12877
      WRITE(NOUT,133) TNODS(I),TNS(I),FEEBEE(I)                         ORI12878
      WRITE(1      ,133)TNODS(I),TNS(I),FEEBEE(I)                       ORI12879
  133 FORMAT('+',T7,'BIAS TEMP. INSIDE S.S.S. NODAL TEMP. :',T53,F7.1,  ORI12880
     1  T63,'DEG. F',/,T7,'BIAS TEMP. OUTSIDE S.S.S. NODAL TEMP. :',T53,ORI12881
     2 F7.1,T63,'DEG. F',/,T7,'BIAS FLUX : ',F10.1,'  BTU/HR/FT**2',//) ORI12882
      WRITE(NOUT,143) TMAX(I)                                           ORI12883
      WRITE(1      ,143)TMAX(I)                                         ORI12884
  143 FORMAT('+',T7,'THE MAXIMUM TEMPERATURE FOR WHICH THE ABOVE',/,T7, ORI12885
     1  'REGRESSION FIT IS APPLICABLE IS ',F8.2,' DEG. F')              ORI12886
      RETURN                                                            ORI12887
      END                                                               ORI12888
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      BLOCK DATA                                                        ORI12885
C  CAK RIDGE INVERSE CODE       VERSION 1.0       4-1-77               ORI12886
C                                                                       ORI12887
      LOGICAL SLAB                                                      ORI12888
      COMMON /NODES/NNGO,NHT,NCU,NBN,NSS1,NSS2,NOD2,NOD3,NOD4,NOD5,NOD6,ORI12889
     1              NN,NH,NC,NB,NS,NIN,NOUT,R(40),RBAR(40),RHEAT(7),   ORI12890
     2              DLRMGC,DLRHTR,DLRCJ,DLRBN,DLRSS1,DLRSS2            ORI12891
      COMMON /PIN/  RHT(15,7),PFFR(15,2),TCL(15),SGV(7),H_ENG(49)       ORI12892
      COMMON /CCDAS/ITCS(348),ICHTCS(348),ISJBCH(348),ITC4(106),        ORI12893
     1              ICHTC4(106),ICHEIE(49),ICHEEE(49),ICHBW1,ICHBW2,   ORI12894
     2              IRVOL(15,3),NTRY1(348),NTRY2(106),NTRY3(49),       ORI12895
     3              NTRY4(49),NBW1,NBW2,IC(1000),                      ORI12896
     4              NTC(348),NCHTCS(348),NK,IRSLB(15,3),NSLAB          ORI12897
      COMMON /FLUSH/ SLAB(50),PFAA(15)                                  ORI12898
      DIMENSION  ITC1(50),ITC2(50),ITC3(50),ITC4(49),ITC5(51),ITC6(48), ORI12899
     1           ITC7(50),ICH1(50),ICH2(50),ICH3(50),ICH4(49),ICH5(51), ORI12900
     2           ICH6(48),ICH7(50)                                      ORI12901
      EQUIVALENCE (ITCS(1),ITC1(1)),(ITCS(51),ITC2(1)),                 ORI12902
     1           (ITCS(101),ITC3(1)),(ITCS(151),ITC4(1)),               ORI12903
     2           (ITCS(200),ITC5(1)),(ITCS(251),ITC6(1)),               ORI12904
     3           (ITCS(299),ITC7(1)),(ICHTCS(1),ICH1(1)),               ORI12905
     4           (ICHTCS(51),ICH2(1)),(ICHTCS(101),ICH3(1)),            ORI12906
     5           (ICHTCS(151),ICH4(1)),(ICHTCS(200),ICH5(1)),           ORI12907
     6           (ICHTCS(251),ICH6(1)),(ICHTCS(299),ICH7(1))            ORI12908
C                                                                       ORI12909
C                                                                       ORI12910
C-----SECTION ONE OF THIS BLOCK DATA SUBPROGRAM CONTAINS INFORMATION     ORI12911
C      PERTINATE TO THE HEATER PIN (I.E., PIN RADIAL DIMENSIONS, PEAKINGORI12912
C     FACTORS--RADIAL, INITIAL PIN NODING                               ORI12913
C                                                                       ORI12914
C*****SECTION ONE                                                       ORI12915
C                                                                       ORI12916
C                                                                       ORI12917
C     RADIAL PEAKING FACTORS(CORRESPONDING TO TC POSITIONS A,B,C,D,E,   ORI12918
C                            F,G,H,I,J,K,L,M,N, AND O)                  ORI12919
      DATA  PFFR / 2*0.402283,0.573754,9*1.0,0.573754,2*0.402283,       ORI12920
     1             2*0.597717,0.426246,9*0.0,0.426246,2*0.597717/       ORI12921
C                                                                       ORI12922
C     PIN RADIAL DIMENSIONS (SIMILAR CORRESPONDENCE)                    ORI12923
      DATA  RHT  / 15*0.0,2*0.007457,0.007925,0.008408,0.008725,        ORI12924
     1             3*0.009067,2*0.008725,2*0.008408,0.007925,2*0.007467,ORI12925
     2                   2*0.009250,0.009708,9*0.010167,0.009708,       ORI12926
     3             2*0.009250,3*0.010157,9*0.0,3*0.010167,15*0.014333,  ORI12927
     4               15*0.016833,15*0.017667/                           ORI12928
C                                                                       ORI12929
C     PIN NODING                                                        ORI12930
      DATA NNGO,NHT,NCU,NBN,NSS1,NSS2/4,2,0,3,3,3/                      ORI12931
C                                                                       ORI12932
C                                                                       ORI12933
C     HEATER PIN TOTAL HEATED LENGTH (RODS 1 THRU 49)                   ORI12934
      DATA HLENG/      11.92708, 11.89063, 11.89063, 11.92188, 11.88803, ORI12935
     1       11.89583, 11.89323, 11.89323, 11.93749, 11.94271, 11.90104, ORI12936
     2       11.94271, 11.92448, 11.90886, 11.89063, 11.88021, 11.88541, ORI12937
     3       11.94010, 11.94792, 11.92448, 11.89323, 11.92710, 11.90104, ORI12938
     4       11.92708, 11.93489, 11.93229, 11.89583, 11.88542, 11.90365, ORI12939
     5       11.92188, 11.92188, 11.92448, 11.93750, 11.92968, 11.89323, ORI12940
     6       11.92188, 11.89844, 11.94271, 11.95573, 11.93491, 11.92448, ORI12941
     7       11.85679, 11.88542, 11.89843, 11.88803, 11.88803, 11.90105, ORI12942
     8       11.88542, 11.95573/                                        ORI12943
C-----SECTION TWO OF THIS BLOCK DATA SUBPROGRAM CONTAINS INFORMATION     ORI12944
C      INHERENT TO THE EXISTING THTF SYSTEM (5/31/76)---THAT IS, THE     ORI12945
C      BUNDLE 1 INSTRUMENTATION (SHEATH AND MIDDLE THERMOCOUPLES AND     ORI12946
C      THEIR ASSOCIATED CCDAS SCAN CHANNEL NUMBERS), AND THE INDIVIDUAL  ORI12947
C      ROD SHUNT AND VOLTAGE CCDAS SCAN CHANNEL NUMBERS                  ORI12948
C                                                                       ORI12949
C*****SECTION TWO                                                       ORI12950
C                                                                       ORI12951
C                                                                       ORI12952
C     THERMOCOUPLE POWER LEVELS                                         ORI12953
      DATA  TCL  /1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM,  ORI12954
     1            1HN,1HO/                                              ORI12955
C                                                                       ORI12956
C     PIN SHEATH GROOVE NUMBERS:                                        ORI12957
      DATA  SGV  /1HA,1HB,1HC,1HD,1HE,1HF,1HM/                          ORI12958
C                                                                       ORI12959
C     BUNDLE SHEATH THERMOCOUPLE NUMBERS (ITC1-7) AND CCDAS SCAN        ORI12960
C     CHANNEL NUMBERS (ICH1-7)                                          ORI12961
      DATA  ITC1 / 301104,  304104,  309104,  310104,  312104,  313104, ORI12962
     1             317104,  318104,  320104,  322104,  323104,  325104, ORI12963
     2             326104,  331104,  338104,  339104,  341104,  349104, ORI12964
     3             301105,  304105,  309105,  312105,  313105,  317105, ORI12965
     4             318105,  320105,  322105,  323105,  324105,  325105, ORI12966
     5             326105,  331105,  333105,  338105,  339105,  341105, ORI12967
     6             349105,  301206,  304206,  309206,  310206,  312206, ORI12968
     7             313206,  317206,  320206,  322206,  323206,  324206, ORI12969
     8             325206,  326206/                                     ORI12970
      DATA  ICH1 /    202.,     32.,     226.,     237.,      60.,      70., ORI12971
     1                255.,     84.,      94.,     323.,     333.,     352., ORI12972
     2                108.,    364.,     382.,     424.,     162.,     178., ORI12973
     3                203.,     33.,     227.,      61.,      71.,     314., ORI12974
     4                 85.,     95.,     324.,     334.,     343.,     353., ORI12975
     5                109.,    365.,     193.,     383.,     425.,     163., ORI12976
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6                179.      204.       34.      228.      239.       62. ORI12981
7                 72.      315.       96.      325.      335.      344. ORI12982
8                354.      110/                                         ORI12983
 DATA  ITC2 / 331206.   333206.   338206.   341206.   349206.   301207. ORI12984
1             304207.   309207.   310207.   312207.   313207.   317207. ORI12985
2             318207.   320207.   322207.   323207.   325207.   326207. ORI12986
3             331207.   333207.   338207.   339207.   341207.   345207. ORI12987
4             301308.   302108.   303108.   304308.   305108.   306108. ORI12988
5             307108.   308108.   309308.   310308.   311108.   312308. ORI12989
6             313308.   314108.   315108.   316108.   317308.   318308. ORI1298C
7             320308.   321108.   322308.   323308.   324308.   325308. ORI12991
8             326308.   327108/                                         ORI12992
 DATA  ICH2 /    366.      194.      416.      164.      180.      205. ORI12993
1                35.      229.      240.       63.       73.      316. ORI12994
2                87.       97.      326.      336.      355.      111. ORI12995
3               367.      195.      417.      427.      165.      181. ORI12996
4               206.      214.      218.       36.       44.       48. ORI12997
5                52.      222.      230.      241.       56.       64. ORI12998
6                74.       80.      247.      251.      317.       88. ORI12999
7                98.      104.      327.      337.      346.      356. ORI1300C
8               112.      118/                                         ORI13001
 DATA  ITC3 / 328108.   331308.   333308.   336108.   337108.   338308. ORI13002
1             339308.   340108.   341308.   342108.   343108.   344108. ORI13003
2             345108.   346108.   348108.   349308.   301309.   302109. ORI13004
3             303109.   304309.   305109.   306109.   307109.   308109. ORI13005
4             309309.   310309.   311109.   312309.   313309.   314109. ORI1300E
5             315109.   316109.   317309.   318309.   320309.   321109. ORI13007
6             322309.   323309.   324309.   325309.   326309.   327109. ORI1300E
7             328109.   331309.   333309.   336109.   337109.   338309. ORI13009
8             339309.   340109/                                         ORI1301C
 DATA  ICH3 /    122.      368.      196.      374.      378.      418. ORI13011
1                428.      126.      166.      172.      434.      438. ORI13012
2                442.      446.      188.      182.      207.      215. ORI13013
3                219.       37.       45.       49.       53.      223. ORI13014
4                231.      242.       57.       65.       75.       81. ORI13015
5                248.      252.      318.       89.       99.      105. ORI1301E
6                328.      338.      347.      357.      113.      119. ORI13017
7                123.      369.      197.      375.      379.      419. ORI1301E
8                429.      127/                                         ORI1301S
 DATA  ITC4 / 341309.   342109.   343109.   344109.   345109.   346109. ORI13020
1             348109.   349309.   301410.   302310.   303310.   304410. ORI13021
2             305310.   306310.   307310.   308310.   309410.   310410. ORI13022
3             311310.   312410.   313410.   314310.   316310.   317410. ORI13023
4             318410.   320410.   321310.   322410.   323410.   324410. ORI13024
5             325410.   326410.   327310.   328310.   331410.   333410. ORI13025
6             336310.   337310.   338410.   339410.   340310.   341410. ORI1302E
7             342310.   343310.   344310.             346310.   347310. ORI13027
8             349410.   301411/                                         ORI1302E
 DATA  ICH4 /    167.      173.      435.      439.      443.      447. ORI1302S
1                189.      183.      208.      216.      220.       38. ORI13030
2                 46.       50.       54.      224.      232.      243. ORI13031
3                 58.       66.       76.       82.      253.      319. ORI13032
4                 90.      100.      106.      329.      339.      348. ORI13033
5                358.      114.      120.      124.      370.      198. ORI13034
6                376.      380.      420.      430.      160.      168. ORI13035
7                174.      436.      440.                448.      176. ORI13036
8                184.      209/                                         ORI13037
 DATA  ITC5 / 304411.   309411.   310411.   312411.   313411.   317411. ORI1303E
1             318411.   320411.   322411.   323411.   324411.   325411. ORI1303S
2             326411.   331411.   333411.   338411.   339411.   341411. ORI1304C
3    345311.  349411.   301512.   302312.   303312.   304512.   305312. ORI13041
4             306312.   307312.   308312.   309512.   310512.   311312. ORI13042
5             312512.   313512.   315312.   316312.   317512.   318512. ORI13043
6             320512.   321312.   322512.   323512.   324512.   325512. ORI13044
7             326512.   327312.   328312.   331512.   333512.   336312. ORI13045
8             337312.   338512/                                         ORI13046
 DATA  ICH5 /    39.      233.      244.       67.       77.      320. ORI13047
1                91.      101.      330.      340.      349.      359. ORI1304E
2               115.      371.      199.      421.      431.      169. ORI1304S
3        444.   185.      210.      217.      221.       40.       47. ORI1305C
4                51.       55.      225.      234.      245.       59. ORI13051
5                68.       78.      250.      254.      321.       92. ORI13052
6               102.      107.      332.      341.      350.      360. ORI13053
7               116.      121.      125.      372.      200.      377. ORI13054
8               381.      422/                                         ORI13055
 DATA  ITC6 / 339512.   340312.   341512.   342312.   343312.   344312. ORI13056
1             345312.   346312.   347312.   348312.   349512.   301513. ORI13057
2             304513.   309513.   325513.   301614.   304614.   325614. ORI1305E
3             301615.   304615.   309615.   310515.   312515.   317515. ORI1305S
4             318515.   320515.   322515.   323515.   324515.   325615. ORI1306C
5             326515.   331515.   333515.   338515.   339515.   341515. ORI13061
6             349515.   324104.   309614.   333104.   310105.   318206. ORI13062
7             339206.   324207.   315310.   348310.   314312.   313515/ ORI13063
 DATA  ICH6 /    432.      161.      170.      175.      437.      441. ORI13064
1                445.      449.      177.      191.      186.      211. ORI13065
2                 41.      235.      361.      212.       42.      362. ORI1306E
3                213.       43.      236.      246.       69.      322. ORI13067
4                 93.      103.      331.      342.      351.      363. ORI1306E
5                117.      373.      201.      423.      433.      171. ORI13069
6                187.     -999.     -999.     -999.     -999.     -999. ORI1307C
7               -999.     -999.     -999.     -999.     -999.     -999/ ORI13071
```

```
      DATA   ITC7 / 329108.,  329109.,  329310.,  329312.,  330104.,  330105.,
     1              330206.,  330207.,  330308.,  330309.,  330410.,  330411.,
     2              330512.,  330515.,  332104.,  332105.,  332206.,  332207.,
     3              332308.,  332309.,  332410.,  332411.,  332512.,  332515.,
     4              334104.,  334105.,  334206.,  334207.,  334308.,  334309.,
     5              334410.,  334411.,  334512.,  334515.,  335108.,  335109.,
     6              335310.,  335312.,  319104.,  319105.,  319206.,  319207.,
     7              319308.,  319309.,  319410.,  319411.,  319512.,  319515.,
     8              347108.,  347109/
      DATA   ICH7 / 50*-499/
C
C     BUNDLE MIDDLE THERMOCOUPLE NUMBERS (ITCM) AND CCDAS SCAN CHANNEL
C     NUMBERS (ICHTCM)
      DATA   ITCM / 301705.,  301706.,  301707.,  301708.,  301710.,  302710.,
     1              303710.,  304705.,  304706.,  304707.,  304708.,  304710.,
     2              305710.,  306710.,  307710.,  308711.,  309705.,  309706.,
     3              309707.,  309708.,  309710.,  310707.,  310710.,  311710.,
     4              312707.,  312710.,  313707.,  313710.,  314710.,  315710.,
     5              316710.,  317707.,  317710.,  318705.,  318706.,  318707.,
     6              318708.,  318710.,  319707.,  319710.,  320707.,  320710.,
     7              321710.,  322705.,  322706.,  322707.,  322708.,  322710.,
     8              323707.,  323710.,  324707.,  324710.,  325705.,  325706.,
     9              325707.,  325708.,  325710.,  326705.,  326706.,  326707.,
     0              326708.,  326710.,  327710.,  328710.,  329710.,  330707.,
     1              330710.,  331705.,  331706.,  331707.,  331708.,  331710.,
     2              332707.,  332710.,  333707.,  333710.,  334707.,  334710.,
     3              335710.,  336710.,  337710.,  338705.,  338706.,  338707.,
     4              338708.,  338710.,  339705.,  339706.,  339707.,  339708.,
     5              339710.,  340710.,  341707.,  341710.,  342710.,  343710.,
     6              344710.,  345710.,  346710.,  347710.,  348710.,  349705.,
     7              349706.,  349707.,  349708.,  349710/
      DATA   ICHTCM /  456.,    455.,    457.,   -999.,    458.,   -999.,
     1                 83.,      0.,      0.,      0.,    190.,      0.,
     2               -999.,      0.,      0.,     79.,   -999.,   -999.,
     3                249.,      0.,      0.,    345.,    426.,   -999.,
     4                  0.,      0.,      0.,      0.,   -999.,      0.,
     5               -999.,    192.,    503.,    450.,   -999.,    452.,
     6               -999.,    453.,   -499.,   -499.,      0.,   -999.,
     7                  0.,    459.,    461.,    460.,    462.,    463.,
     8                 86.,    238.,      0.,    451.,   -999.,   -999.,
     9               -999.,   -999.,    454.,      0.,      0.,      0.,
     0               -999.,      0.,      0.,      0.,   -499.,   -499.,
     1               -499.,      0.,   -999.,   -999.,   -999.,   -999.,
     2               -499.,   -499.,   -999.,   -999.,   -499.,   -499.,
     3               -499.,      0.,      0.,      0.,      0.,      0.,
     4                  0.,      0.,      0.,      0.,      0.,      0.,
     5                  0.,      0.,   -999.,      0.,      0.,   -999.,
     6                  0.,   -999.,      0.,   -499.,   -999.,      0.,
     7                  0.,      0.,   -999.,     0/
C
C     INDIVIDUAL RCD SHUNT CHANNELS (ICHEIE)
      DATA   ICHEIE /  409.,    149.,    410.,    150.,    391.,      3.,
     1                 390.,    408.,    411.,    151.,      2.,    389.,
     2                 388.,      6.,    407.,    412.,    148.,      4.,
     3                   5.,    387.,      7.,    414.,    413.,    406.,
     4                 134.,    397.,    386.,    398.,    405.,    415.,
     5                 145.,    144.,    403.,    396.,    399.,    404.,
     6                 147.,    146.,    133.,    402.,    401.,    400.,
     7                 130.,    131.,    132.,    392.,    393.,    394.,
     8                 395/
C
C     INDIVIDUAL RCD VOLTAGE CHANNELS (ICHEEE)
      DATA   ICHEEE /  158.,    159.,    158.,    159.,    156.,    156.,
     1                 156.,    158.,    158.,    159.,    156.,    156.,
     2                 156.,    156.,    158.,    158.,    159.,    156.,
     3                 156.,    156.,    156.,    158.,    158.,    158.,
     4                 156.,    157.,    156.,    157.,    158.,    158.,
     5                 159.,    159.,    157.,    157.,    157.,    158.,
     6                 159.,    159.,    159.,    157.,    157.,    157.,
     7                 159.,    159.,    159.,    157.,    157.,    157.,
     8                 157/
C
C     BUNDLE PARAMETER (TC)-DESIGNATING WHICH SUBCHANNEL A TC SHOULD
C     BE ASSOCIATED WITH.(I.E.,ISUBCH=1-CENTRAL,=2-WALL,=3-CORNER)
      DATA ISUBCH/   2.    2. 7*1.    2. 7*1.    3.    3.    1. 6*1.    1.
     1    9*1.    3.    1.    1. 6*1.    1. 4*1.
     2                4*1.    2.    2.    1. 7*1.    2. 8*1.    1.    2.    2.
     3      2.    1.    1.    1.    2.    2. 5*1.    2.    2. 4*1.    1.    2.
     4    5*1.
     5                  2. 2*1.    1. 5*1.    1.    3.    2.    1.    1.    2.
     6      1.    2.    2.    2.    1.    2.    1.    3.    2. 5*1.    2.    2.
     7    4*1.    2.    2. 5*1.    2. 2*1.    2. 4*1.
     8                  1.    2.    2.    2.    2.    2.    2.    3.    2.
     9      2.    1.    1.    2.    3.    2. 5*1.    2. 4*1.    1.    2. 5*1.
     0      2. 2*1.    2. 5*1.    2.    3.    2.    2.    2.    1.    3.
     1                  2. 7*1.    2. 9*1.    2.    3.    3.    2.    2.    1.
     2      2.    1.    1.    2. 5*1.    2. 4*1.    2.    2. 5*1.    2. 2*1.
     3      2. 2*1.
     4                3*1.    2.    2.    2.    2.    2.    2.    2.    2.    3.
     5      2. 2*1.    3.    1.    1.    3.    1. 6*1.    2. 9*1.    3. 7*1.
     6      2.    2.    2.    1.
     7      2.    2.    2.    2.30*1.    2.    2.    2.    2.10*1.    2.    2/
```

```
C
C      BREAK-WIRE CCDAS CHANNEL NUMBERS                                  ORI13164
      DATA ICHBW1,ICHBW2/142,143/                                        ORI13165
C                                                                        ORI13166
C*****RELAP REF. VOLUMES (REFER TO RELAP TEST SECTION MODEL)---MODEL FOR ORI13167
C*****TESTS 101 THROUGH 105 HAS 27 HEATER SLABS (SLABS 1-25,44,AND 45),  ORI13168
C*****VOLUMES 7-15 REPRESENT CENTRAL CHANNELS, VOLUMES 16-24 REPRESENT   ORI13169
C*****WALL CHANNELS, VOLUMES 25-33 REPRESENT CORNER CHANNELS             ORI13170
C                                                                        ORI13171
      DATA IRVOL/    7.   7.   8.   9.  10.  11.  11.  12.  12.  13.     ORI13172
     1    13.  14.  15.  15.  15.                                        ORI13173
     2              16.  16.  17.  18.  19.  20.  20.  21.  21.  22.     ORI13174
     3    22.  23.  24.  24.  24.                                        ORI13175
     4              25.  25.  26.  27.  28.  29.  29.  30.  30.  31.     ORI13176
     5    31.  32.  33.  33.  33/                                        ORI13177
C                                                                        ORI13178
C*****SLABS 1-9 REPRESENT SLABS FACING CENTRAL CHANNELS,                 ORI13179
C*****SLABS 10-18 REPRESENT SLABS FACING WALL CHANNELS,                  ORI13180
C*****SLABS 19-25,44,45 REPRESENT SLABS FACING CORNER CHANNELS           ORI13181
      DATA IRSLB/    1.   1.   2.   3.   4.   5.   5.   5.   6.   6.   ORI13182
     1    7.   7.   8.   9.   9.                                         ORI13183
     2              10.  10.  11.  12.  13.  14.  14.  14.  15.  15.     ORI13184
     3    16.  16.  17.  18.  18.                                        ORI13185
     4              19.  19.  44.  20.  21.  22.  22.  22.  23.  23.     ORI13186
     5    24.  24.  25.  45.  45/                                        ORI13187
C                                                                        ORI13188
C*****LOGICAL VARIABLE FOR SLABS IN RELAP                                ORI13189
      DATA SLAB/25*.TRUE.,18*.FALSE.,2*.TRUE.,5*.FALSE./                 ORI13190
C*****AVERAGE (MEAN) AXIAL PEAKING FACTORS (PER T/C LEVEL)               ORI13191
      DATA PFAA/2*0.42081, 0.59566, 1.04775, 1.29236, 3* 1.67942,        ORI13192
     1          2* 1.29091, 2* 1.03735, 0.59143, 0.42068, 0.08/          ORI13193
      END                                                                ORI13194
                                                                         ORI13195
```

APPENDIX D

ORINC SUBROUTINE LIST AND ORINC MAIN LOGIC

This section consists of one table and one figure. Table D-1 contains a list of all subroutines, subprograms, and multiple subroutine entry points in ORINC along with a brief description of their function in the code. Figure D-1 is a flowchart (with clarifying comments) of the logic in the main driving routine. The logic flow in Fig. D-1 may be subdivided into six distinct areas: program set-up, individual problem set-up, steady-state calculations, transient calculations, final individual problem output, and program wrap-up. Program set-up and wrap-up are once-through sections. The other four stages are nested inside a main control loop with each pass through the loop evaluating one thermocouple throughout a transient.

Table D-1. ORINC subroutines and subprograms

Subroutine name	Description and/or comments
RADI	Sets up r and $\bar{r}$ arrays [via Eqs. (II.11) and (II.12)], given the pin geometry (RHEAT) and number of nodes per substrate; also calculates Δr^2 for each substrate and sets up element noding.
STEADY	Generates steady-state temperature profile in the pin given the power input (QDPI) and the sheath thermocouple response (TCS); also determines mode of heat transfer at the surface via a call to TSMIN
TSMIN	Determines mode of heat transfer based on minimum surface temperature (if nucleate boiling heat transfer coefficient is realistic, i.e., >0), then loads proper nodal temperatures, surface temperature, and heat transfer coefficient in the steady-state arrays
TRANS	Directs transient calculations: calculates radial heat generation for each node (loads Q array), calculates gap radiation heat-transfer coefficients, calls PROP which loads component physical properties, calls GAPTNS which calculates the sheath gap width, calls HEATR which loads the $\bar{H}_F$ matrix, calls BVECTR which loads the $\bar{B}_F$ vector, manipulates the forward matrices to form the $\bar{H}_I$ matrix [Eq. (II.63)] and the $\bar{B}_I$ vector [Eq. (II.70)], calls SOLVE which solves the system of equations, loads the $\bar{T}_I$ vector
HEATR	Loads the forward tridiagonal coefficient matrix $\bar{H}_F$ [Eq. (II.36)].
BVECTR	Loads the forward column vector of knowns $\bar{B}_F$ [Eq. (II.46)]
PROP	Determines pin component physical properties (i.e., density ρ, heat capacity Cp_i, and thermal conductivity k_i) and loads the C, K, and KGAP arrays
ENTHAL	Calculates total pin internal energy content given the pin radial temperature profile. (Summation of $\pi\Delta r_i^2 \rho_i H_i$)
ENERGY	Calculates the change in pin internal energy content for the present integration step from the 'previous time' nodal temperatures and the 'present time' nodal temperatures. {Summation of $\pi\Delta r_i^2 \rho_i Cp_i [T_i(t+\Delta t) - T_i(t)]$}

Table D-1. (Continued)

Subroutine name	Description and/or comments
GAP	Mathematical model of the thermo-mechanical behavior of the gap between the sheaths and the thermal transfer across the gap. Since the inside node temperature (TND5) is determined by the steady-state sheath thermocouple response, the solution of GAP(T) for GAP(TNS) = 0 (by subroutine FALSE) allows the calculation of the gap at the steady-state conditions just prior to blowdown
GAPTNS	Calculates the gap between the sheaths during the transient from the previous time nodal temperatures [i.e., T(NOD5) and T(NS)] using the linear thermo-mechanical gap model. (Appendix B, last section)
MNFLXO	Computes mean transient surface heat flux, surface temperature, and pin first node temperature for each heat slab in the RELAP core model for THTF bundle 1. A call to MNFLXO initiates the summation routines
MNFLX1 (multiple entry point in MNFLXO)	Computes sums of the surface heat flux, surface temperature, and pin first node temperature for each heat slab for each transient time step
MNFLX2 (multiple entry point in MNFLXO)	Computes means of the surface heat flux, surface temperature, and pin first node temperature for each heat slab for each transient time step
	Writes mean arrays to tape (unit 13) and to paper (or microfiche).
SOLVE	Solves a system of n equations with n unknowns by obtaining the inverse of the coefficient matrix of the system (i.e., $\overline{H}_I^{-1}$ via a call to INVERT) and then solving for the unknown column vector $\overline{T}_I$ by Eqs. (II.75) and (II.76).
INVERT	Inverts a matrix in its own space using the Gauss-Jordan method as arranged by H. Rutishauser with full pivoting
FALSE	Given a function of x, F(x), FALSE determines the value of x for which F(x) = 0 via the method of false position or *reguli falsi*
MAXMIN	Determines the maximum and minimum required for the plotting subroutine (PLOT)

Table D-1. (Continued)

Subroutine name	Description and/or comments
PLOT	The line plot routine (PLOT) plots y vs x on the normal computer output device (line printer or microfiche). The capability exists for overlaying (FX, FY) on (X, Y).
FINDS	This interpolation routine (any order) calculates the dependent variable value (FXO) given an (X, Y) table and the independent variable value (XO).
SCAN	Sets up the entry number arrays; i.e., given the CCDAS scan table (500 channels) SCAN determines the position (entry number) in the scan table for given channel numbers. The entry number arrays are "indexes" or "pointers."
OUTPUT	Primary output subroutine with multiple entry points. Outputs pin and case information: thermocouple number, time, date, noding, radial dimensions. (To the primary output device, unit 6, and to disk, file No. 1.)
OUTSS (multiple entry point in OUTPUT)	Outputs steady-state local operating conditions and steady-state pin temperature profile. (To the primary output device, unit 6, and to disk, file No. 1.)
OUTTNS (multiple entry point in OUTPUT)	Outputs results of transient (inverse) calculations to the normal computer output device (unit 6, line printer or microfiche).
OUTFNL (multiple entry point in OUTPUT)	Outputs results of the overall energy balance. (To the primary output device, unit 6, and to disk, file No. 1.)
OUTTAP (multiple entry point in OUTPUT)	Outputs results of transient (inverse) calculations to tape (file No. 1 of unit 9.)
DATE	Decodes CCDAS time code [JT(1)] into the month and date and outputs to unit 6.
INPUTO	Reads primary controls input (unit 5) and adjusts "base case" channel arrays to account for failed instruments and/or additional instruments, also creates the NTC and NCHTCS arrays (arrays which contain the thermocouple numbers and CCDAS channel numbers for which inverse calculations are to be made).
INPTRP	Reads the RELAP-ORINC interface tape (unit 11) and transfers entire transient data to temporary storage on disk (direct access device), file No. 8. Also loads the RELAP steady-state arrays.

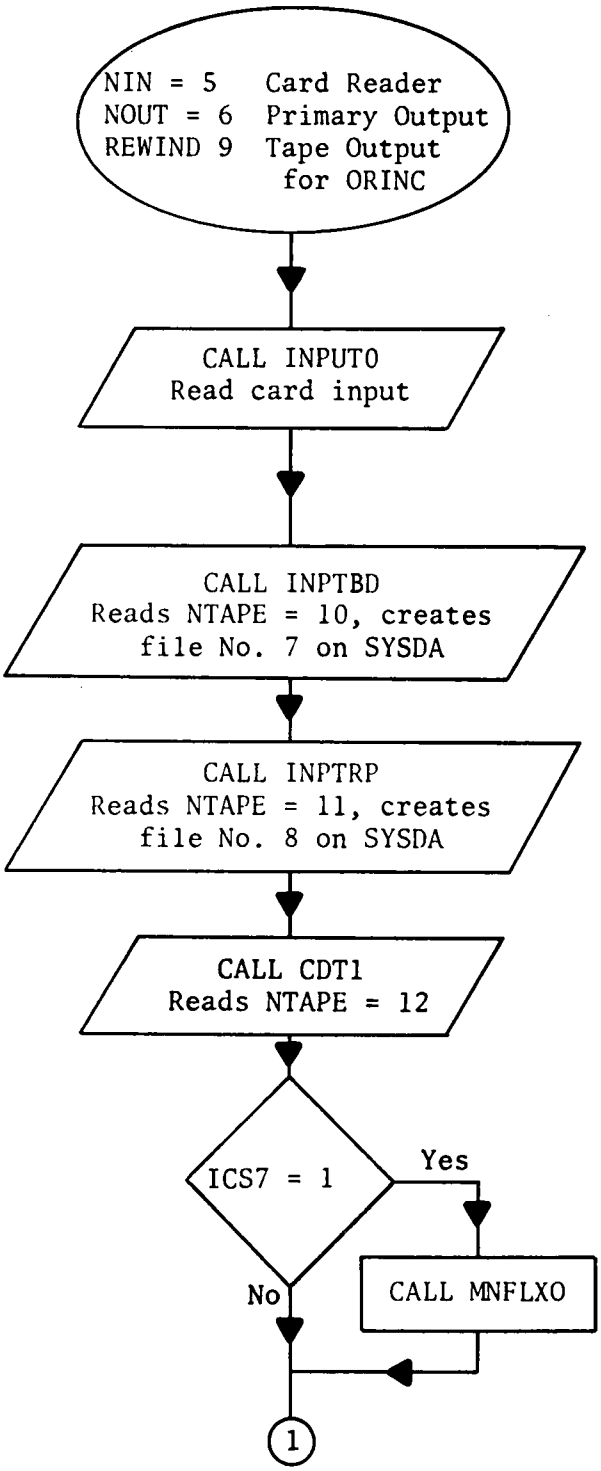
Table D-1. (Continued)

Subroutine name	Description and/or comments
INPSLB (multiple entry point in INPTRP)	Retrieves the number of slabs in the RELAP core model for output in MNFLX2.
INRELP (multiple entry point in INPTRP)	Retrieves RELAP predictions for volume pressure, volume temperature, volume average quality, slab surface heat flux, heat transfer coefficient, slab surface temperature, average volume mass flux, saturation temperature, and heat transfer mode at the slab surface from disk storage and loads the appropriate arrays for return to MAIN.
INPTBD	Reads the blowdown engineering units tape (unit 10), determines the initiation of blowdown, determines the steady-state conditions prior to blowdown (calculates the mean responses for approximately 15 sec before blowdown initiation), and transfers 30 sec of transient data to temporary storage on disk (direct access device) file No. 7.
INBD (multiple entry point in INPTBD)	Each call to INBD retrieves the following transient information from disk for the specified thermocouple (ITCNUM): the sheath thermocouple response, the middle thermocouple response (if any), rod amperage, and generator voltage. The linear heat rate is computed and loaded (QAVGG), the thermocouple responses are smoothed (via call to SMOOTH) and loaded (TCSS and TCMM).
SMOOTH	Three point smooths the Y array and returns the smoothed array in its own space. A 100.0 point discriminator (between time steps) is included.
CDT1	Reads the coefficient data tape (unit 12).
CDT (multiple entry point in CDT1)	Outputs the regression information for the specified thermocouple (ITCNUM) to disk (file No. 1) and the normal computer output device (unit 6, paper or microfiche).
BLOCK DATA	Initiates arrays and variables with information pertinent to THTF bundle 1 heaters, bundle 1 instrumentation, and the RELAP core model for bundle 1. Part one of the BLOCK DATA contains individual pin total heated lengths, initial pin noding, pin radial dimensions (as a function of thermocouple level), and pin radial power peaking factors (as a function of thermocouple level).

Table D-1. (Continued)

Subroutine name	Description and/or comments
BLOCK DATA	Part two of the BLOCK DATA contains the sheath thermocouple levels, groove numbers, the sheath thermocouple numbers and their corresponding CCDAS scan channel numbers, the middle thermocouple numbers and their corresponding CCDAS scan channel numbers, the individual rod shunt and voltage channels, the break-wire channel numbers, and a parameter which designates which subchannel flow the thermocouple is associated with. Part three of the BLOCK DATA contains information relative to the RELAP test section model for THTF blowdown tests 100 through 105: core reference volumes and slab numbers.

SET-UP STAGE: set-up of primary I-0 devices, input of main control parameters, read tape input, create temporary files on disk.



Set-up primary input-output devices.

Reads case heading, main control parameters, adjusts base-case CCDAS scan table, sets up NTC and NCHTCS arrays. (Thermocouple number array and the respective CCDAS channel number array)

Reads blowdown engineering units tape, determines initiation of blowdown, loads 30 sec of blowdown on disk.

Reads RELAP-ORINC interface tape, loads RELAP transient calculations on disk.

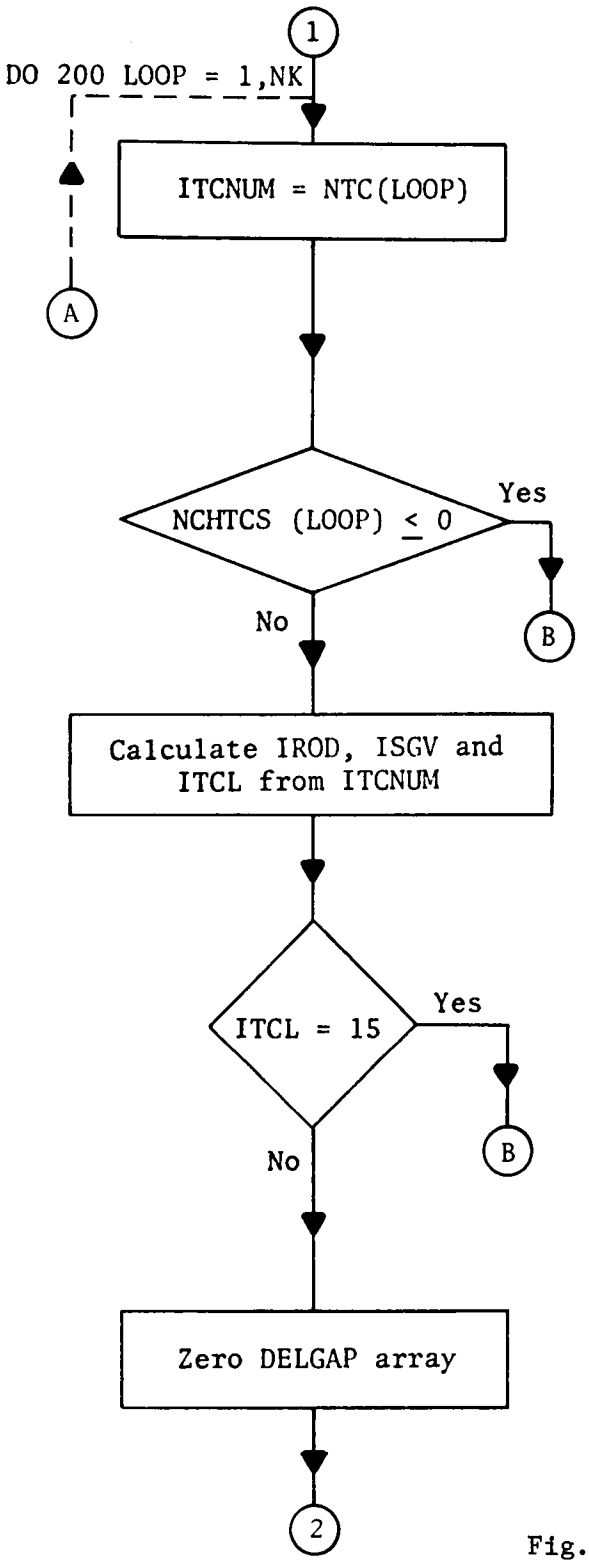
Reads coefficient data tape, loads regression and calibration arrays.

Check on control variable ICS7 (i.e., is creation of NTAPE = 13 desired?)

Initializes summation arrays.

Fig. D-1. Logic flow in ORINC Main.

Problem Set-Up: start of main control loop, load all pertinent information for one thermocouple (ITCNUM): load coefficient arrays, load transient data, load RELAP interface data.



Main control loop, NK thermocouples are evaluated.

Thermocouple number to be evaluated for this pass; ITCNUM is a six digit number where

3 — designates bundle T/C
level number
groove number
rod number

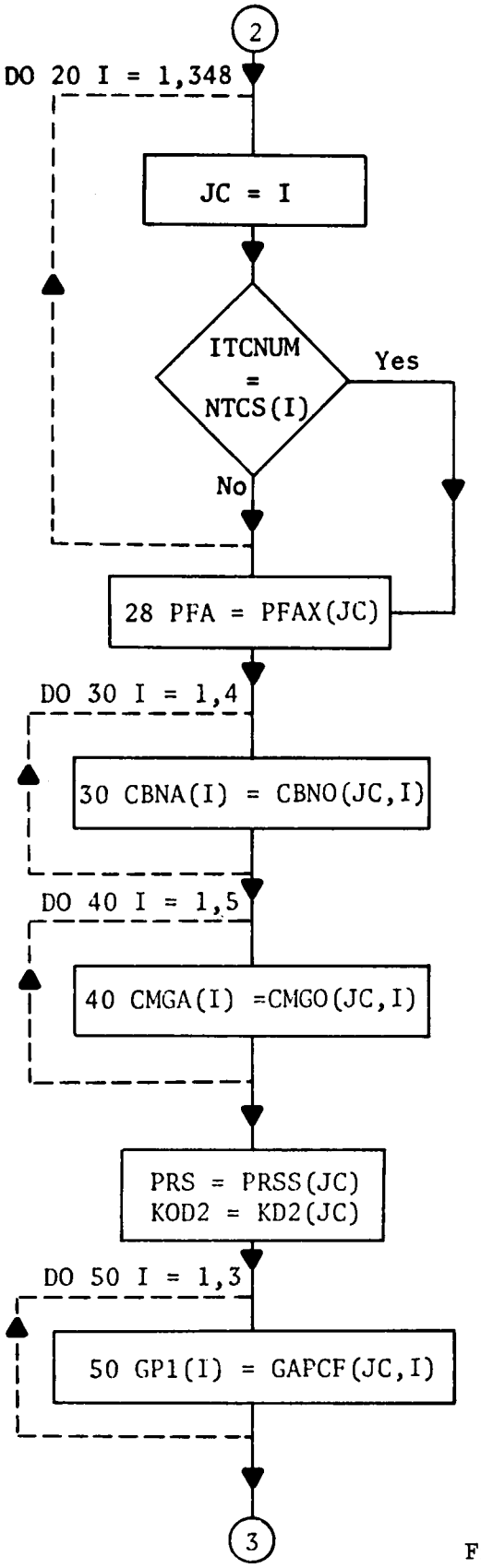
Check to see if the thermocouple is good for the blowdown that is being evaluated.

Break ITCNUM down into rod number, groove number and level number.

The INVERSE calculations are not applicable for '0' level thermocouples.

Zero the interface gap array.

Fig. D-1. (Continued)



Search coefficient data tape thermocouple number array (NTCS) for ITCNUM

Load axial peaking factor.

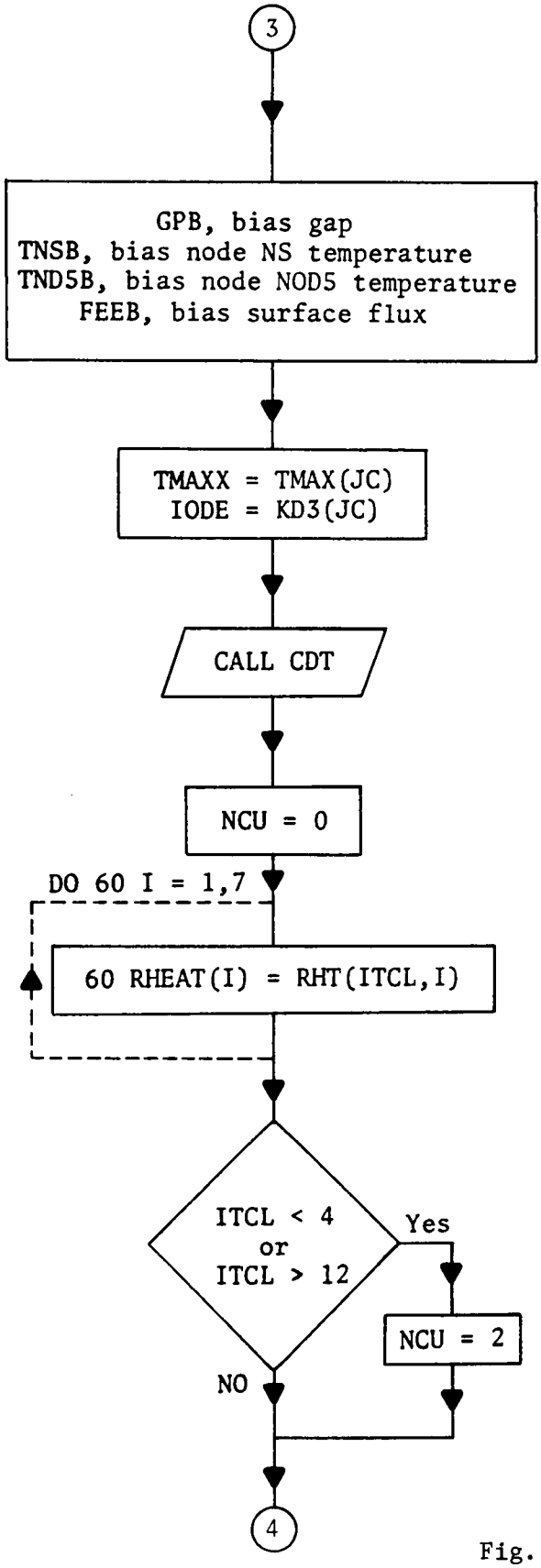
Load thermal conductivity coefficients for boron nitride.

Load thermal conductivity coefficients for magnesium oxide.

Load the porosity and the method (KOD2) by which the k_{MgO} is to be calculated.

Load regression coefficients for linear gap expansion model.

Fig. D-1. (Continued)



Load gap bias data

Load maximum temperature for which the GP1 are applicable and the method parameter (IODE) by which the gap is to be calculated.

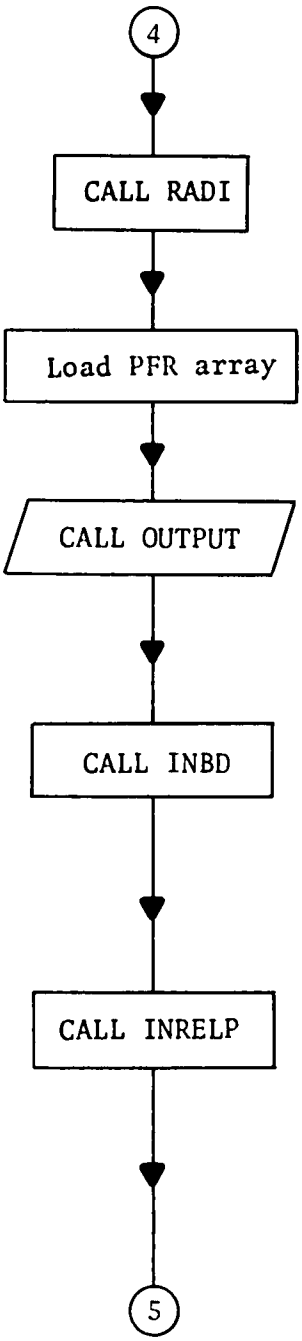
Output the calibration and regression coefficient arrays.

Initialize No. of nodes for Cupro-Nickel substrate at 0.

Load radii given the thermocouple level (ITCL).

Check to see if the thermocouple is on a level which has Cu-Ni oversleeve in the heater section, if so, set NCU = 2.

Fig. D-1. (Continued)



Set up R and RBAR arrays and pin element noding.

Load radial peaking factors given the level (ITCL).

Output information on pin noding, radial dimensions and peaking factors

Load blowdown input arrays:
TCSS - sheath T/C response;
QAVGG - linear heat input rate;
TCMM - middle T/C response, if any, otherwise zeros loaded;
TIMEE - time in seconds from blowdown

Load RELAP interface input arrays:
TIMR - time in seconds from blowdown;
TBR - bulk fluid temperature;
TSATR - saturation temperature;
PRESSUR - volume pressure;
QUALR - volume fluid quality;
AMFR - average volume mass flux;
HBR - heat transfer coefficient;
SFLUXR - surface heat flux;
TSURR - surface temperature;
MODER - mode of heat transfer at surface
TRPEND - time of last file on RELAP interface tape
JRP - number of files on RELAP interface tape

Fig. D-1. (Continued)

STEADY-STATE: adjust Δgap_4 at steady state, if necessary; calculate steady-state pin temperature profile and heat transfer coefficient; calculate steady-state pin internal energy content; zero $\bar{B}_I$ and $\bar{H}_I$; set-up output scratch matrices; calculate v; initialize transient counters.

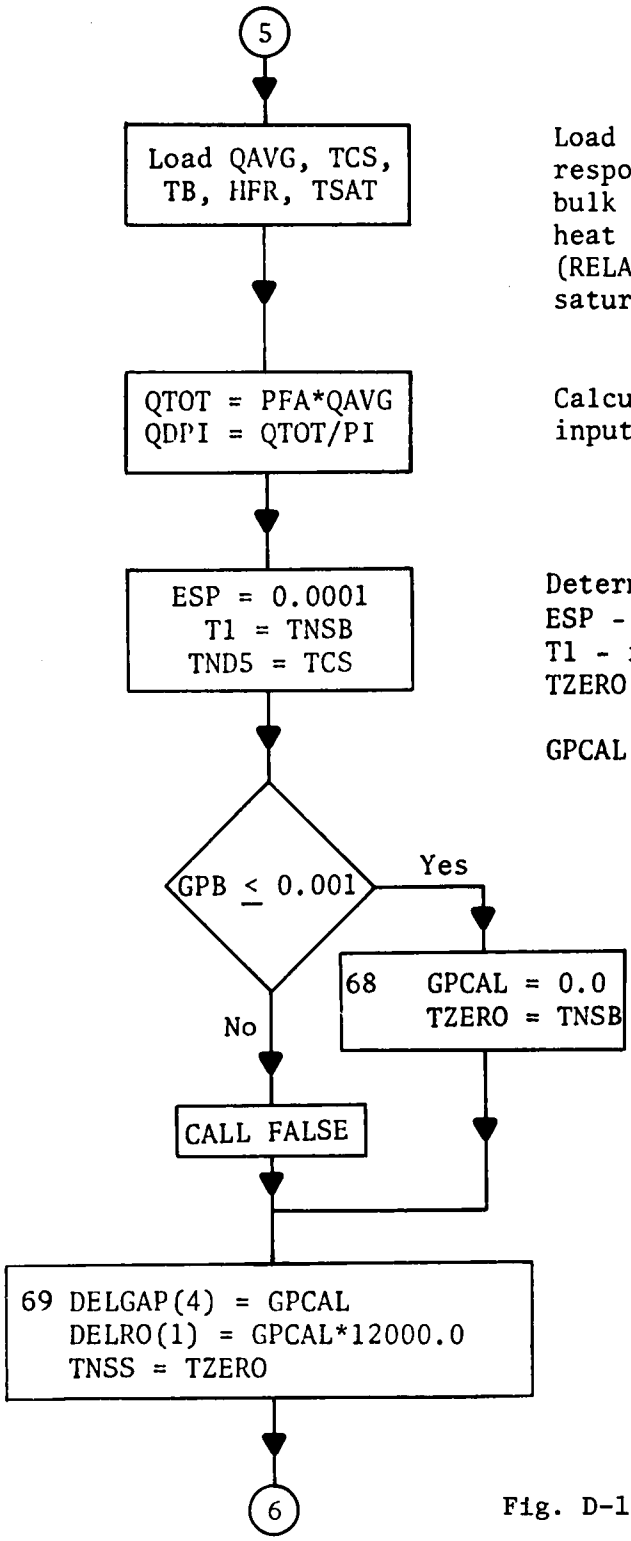
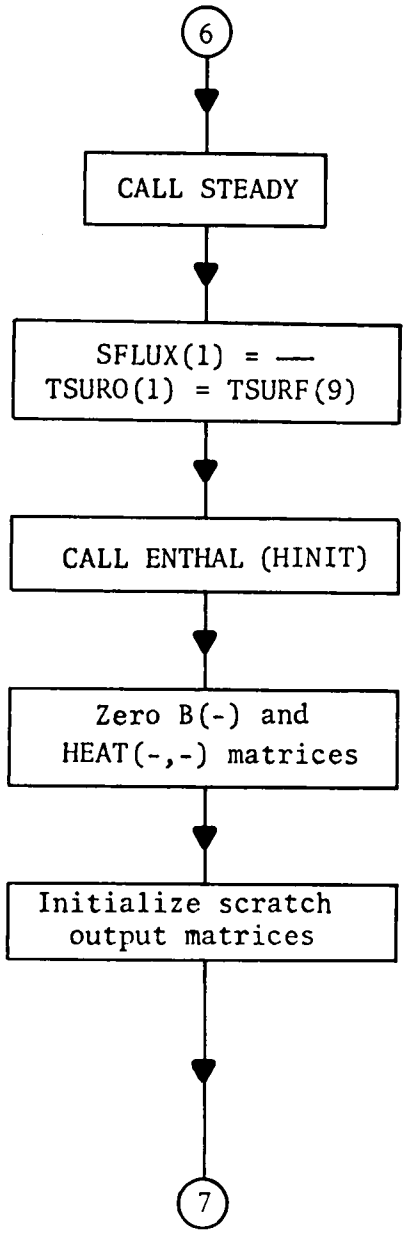


Fig. D-1. (Continued)



Determine steady-state temperature profile in pin

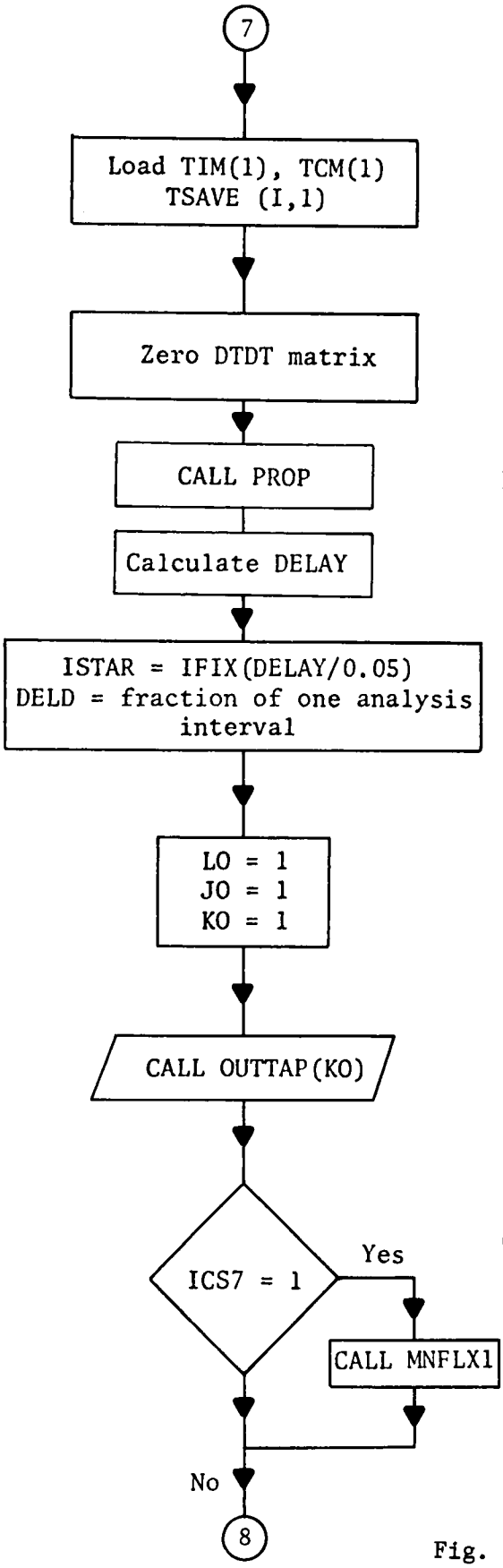
Calculate steady-state surface temperature and surface heat flux.

Determine pin initial internal energy content (HINIT)

Zero $\overline{B}_I$ and $\overline{H}_I$

Initialize scratch output matrices:
TIME (-)
TO(I,-) — pin s.s. nodal temperatures
HO(-) — heat transfer coefficient
QO(-) — local linear heat input rate
TBO(-) — fluid bulk averaged temperature (RELAP)
PSO(-) — fluid volume pressure (RELAP)
TSATO(-) — volume saturation temperature (RELAP)
HSATO(-) — heat transfer coefficient based on difference between TSURO and TSATO
AMFO(-) — average volume mass flux (RELAP)
QUALO(-) — average volume quality (RELAP)
RHBO(-) — heat transfer coefficient (RELAP)
RSFXO(-) — surface heat flux (RELAP)
RTSURO(-) — surface temperature (RELAP)
MODEO(-) — heat transfer mode at the surface (RELAP)

Fig. D-1. (Continued)



TCM — calculated center line temperature array
TIM(1), TSAVE(-,1) — time and pin node temperatures at time = t
TIM(2), TSAVEE(-,2) — time and pin node temperatures at time = t + Δt

(See Appendix B) Zero matrix for $\partial T/\partial t$ at $r = \bar{r}_1$

Determine physical properties for pin substrate nodal temperatures at steady state

Calculate time lag ($\bar{v}$, Appendix B)

Determine the time lag in terms of number of analysis intervals

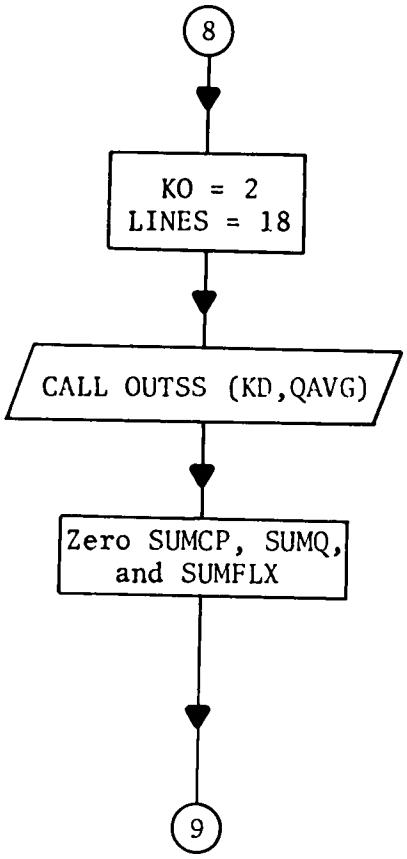
Initialize transient counters.

Output T/C number, number of nodes, and nodal radial dimensions to tape (file 1, unit = 9)

Check on control variable ICS7 (i.e., is creation of NTAPE = 13 desired?)

Summation call to mean flux routine

Fig. D-1. (Continued)



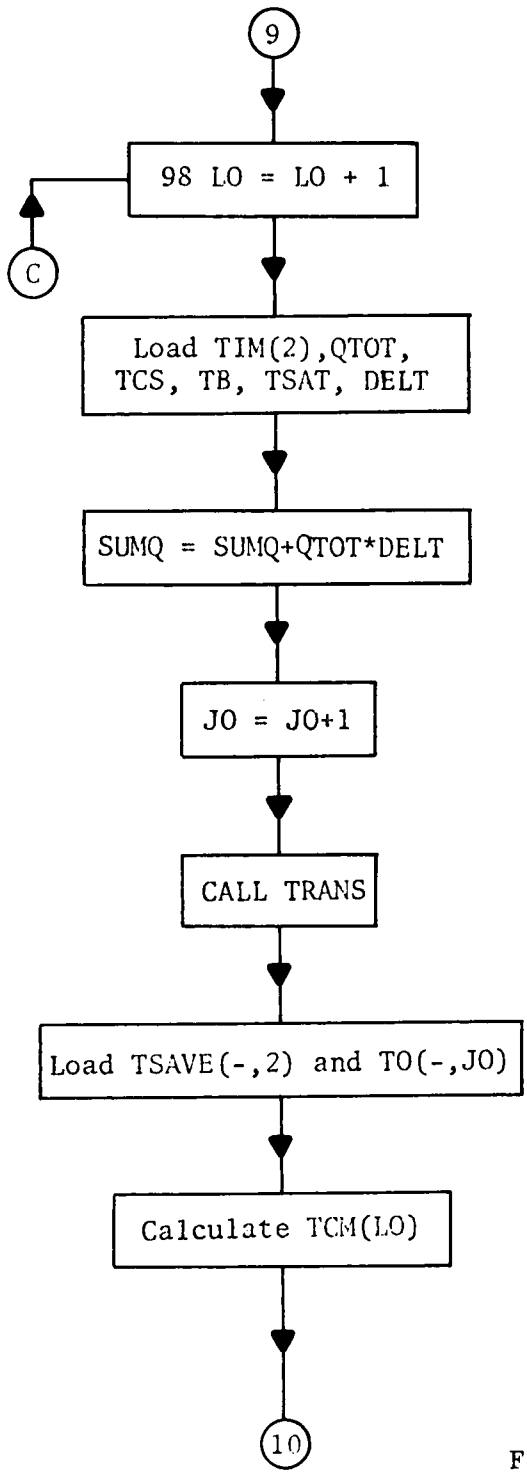
Initialize lines counter at 18 (includes No. of lines for headings for transient output)

Output the steady state local operating conditions and pin temperature profile and headings for transient output.

Zero summations for change in internal energy, heat input, and surface heat flux.

Fig. D-1. (Continued)

TRANSIENT CALCULATIONS: solves the inverse heat conduction problem for every analysis interval; outputs inverse results to tape (file 1, unit 9) every analysis interval; outputs scratch matrices to unit 6 every 12 analysis intervals; computes sums of change in internal energy, heat input and surface heat flux.



Increment LO - time step counter.

Load time for step LO, local linear heat input rate, sheath T/C response, bulk temperature (RELAP) saturation temperature (RELAP), Δt

Summate linear heat input.

Increment JO-scratch matrix counter

Solves the inverse heat conduction problem at $t+\Delta t$ (time step LO)

Calculated from TCM(LO-1) and DTDT(ISTAR)

Fig. D-1. (Continued)

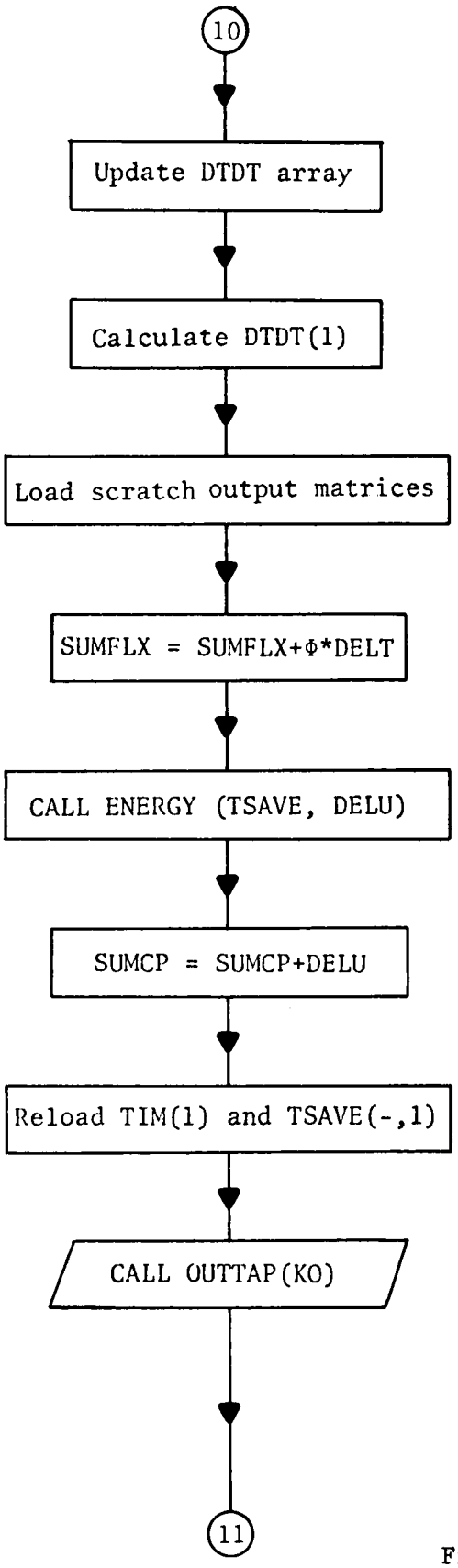
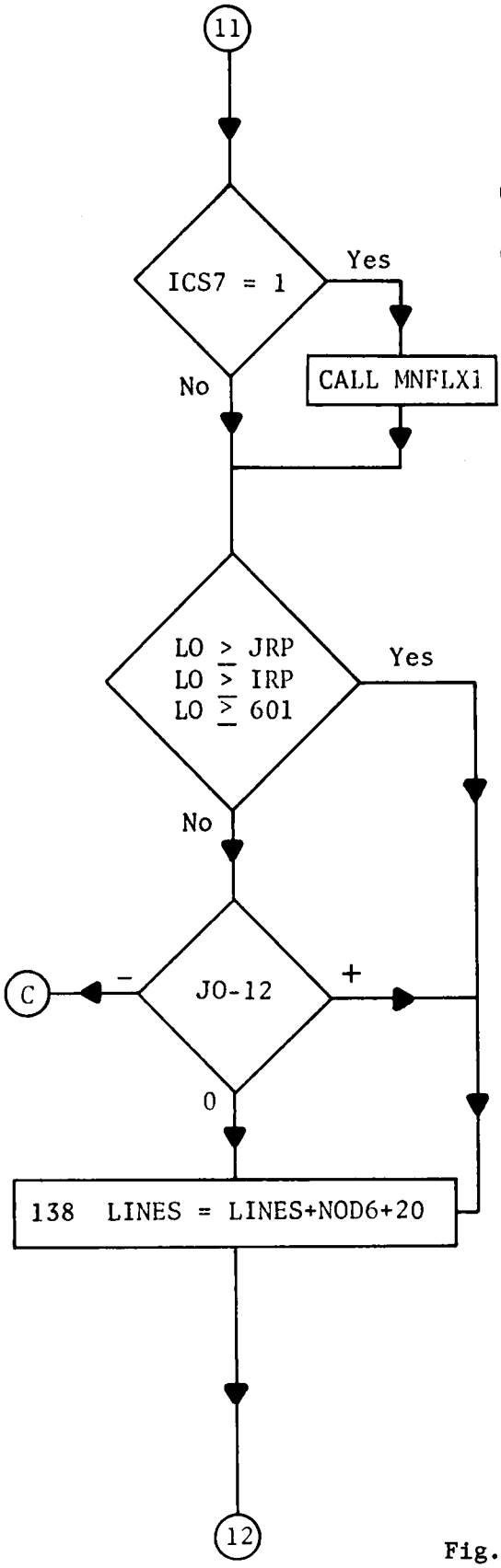


Fig. D-1. (Continued)



Check on control variable ICS7 (i.e., is creation of NTAPE = 13 desired?)

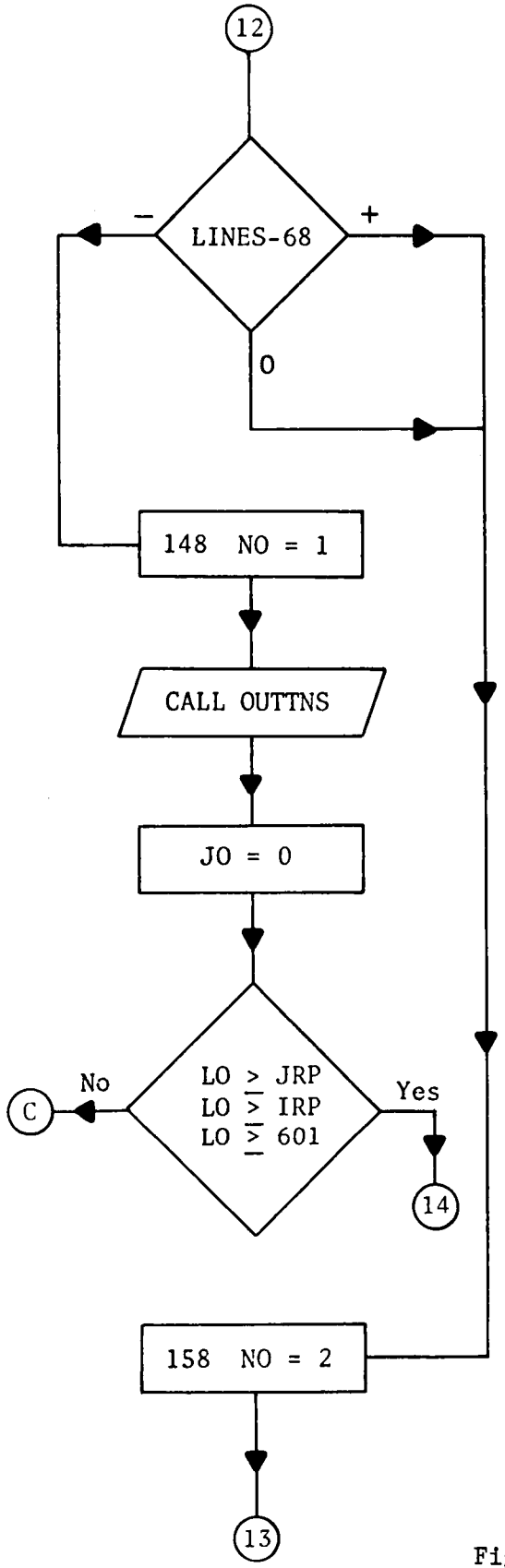
Summation call to MNFLX1.

Check on time step counter:
if ≥ JRP (No. of files on RELAP tape),
if ≥ IRP (time trip - input),
if ≥ 601 (30 seconds of blowdown data at a 50 msec acquisition rate), output

Check on scratch matrix counter: if equal to 12, output; if < 12, go to 98 and start the next transient time step calculation.

Increment lines counter by NOD6+20.

Fig. D-1. (Continued)



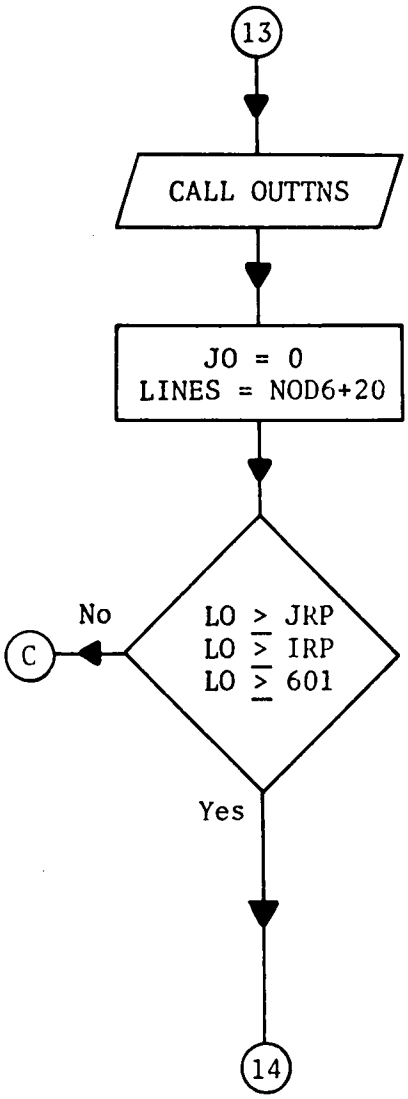
Check on LINES:
if <68, print on same page as the last call to OUTTNS;
if ≥68, skip to the top of the next page and call OUTTNS.

Output the scratch matrices to unit 6.

Zero the scratch matrix counter.

Check on time step counter:
if FALSE, return to 98 and start the next transient time step calculation;
if TRUE, kick out of transient loop

Fig. D-1. (Continued)



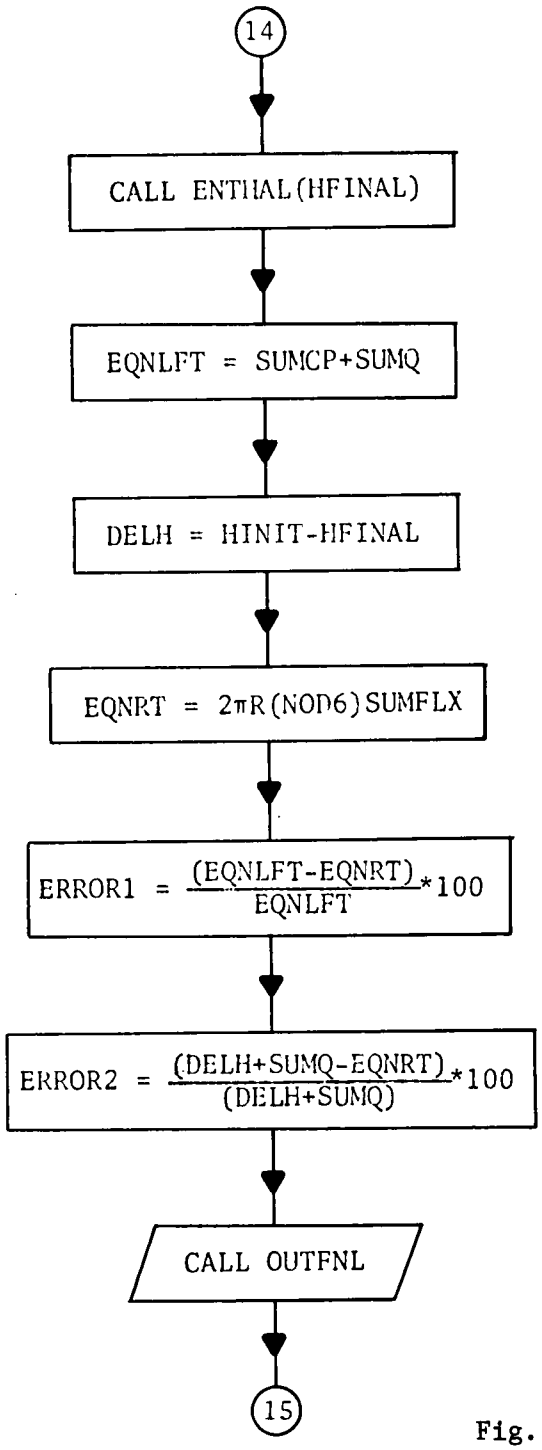
Output the scratch matrices to unit 6.

Zero the scratch matrix counter and initialize the line counter.

Check on time step counter - same as before

Fig. D-1. (Continued)

FINAL OUTPUT FOR ITCNUM: computes final pin internal energy content, computes error (by two methods) in overall heat balance, outputs heat balance calculations, checks for presence of middle thermocouple [if so, a line plot overlaying the calculated center line temperature (TCM) with the observed response (TCMM) is made].



Determines final pin internal energy content (HFINAL).

Sum of the linear heat input and change in internal energy (i.e., $\sum_{i=2}^{LO} QTOT_i * \Delta t_i + \sum_{i=2}^{LO} DELU_i$).

Change in end point internal energy content

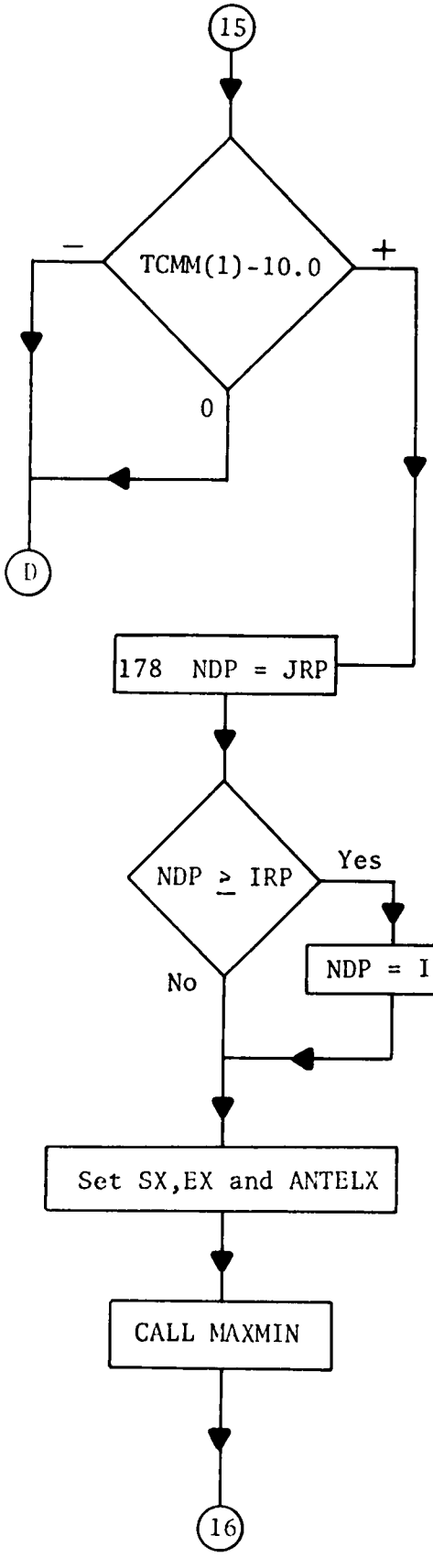
Total heat flow out of the pin for the transient interval studied.

Percent error in overall heat balance (method No. 1)

Percent error in overall heat balance (method No. 2)

Final energy balance output.

Fig. D-1. (Continued)



Check for presence of middle thermocouple — if there is no corresponding middle T/C for ITCNUM, zeros were loaded in the TCMM array

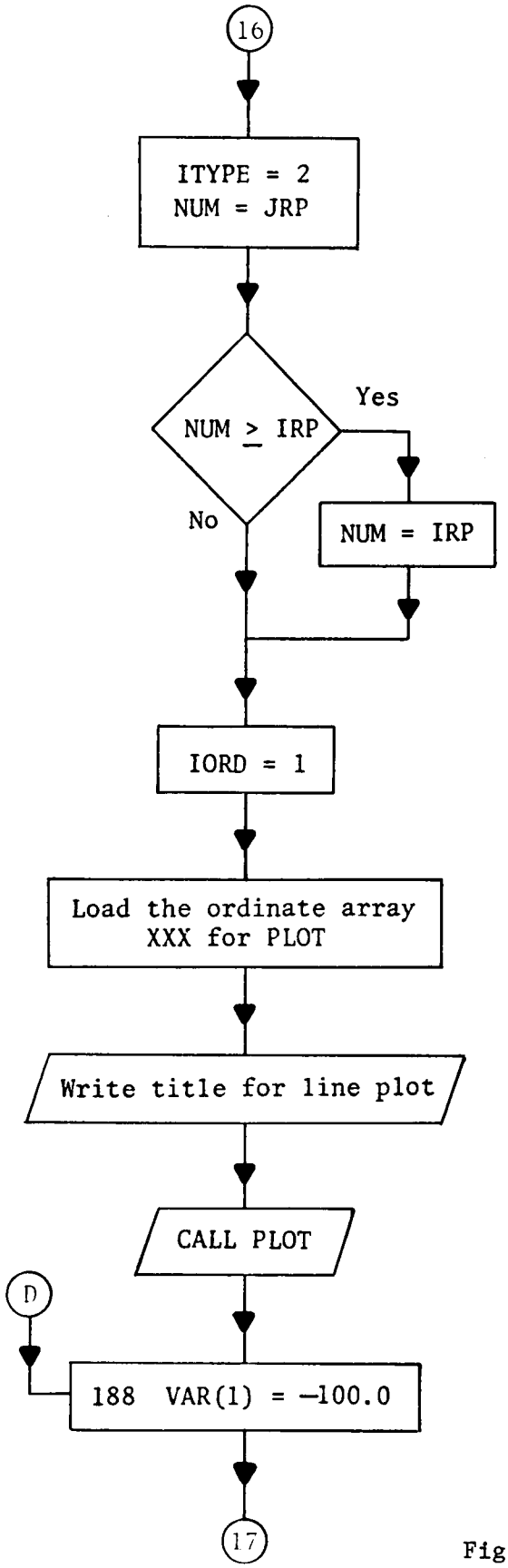
No. of data points in the TCM and TCMM arrays

Check to see if time trip (IRP) is less than the number of RELAP files (JRP) which is always ≤ 601 (the number of blowdown files loaded on disk).

Plotting parameters for PLOT.

Determine the maximum and minimum values in the TCM and TCMM arrays

Fig. D-1. (Continued)

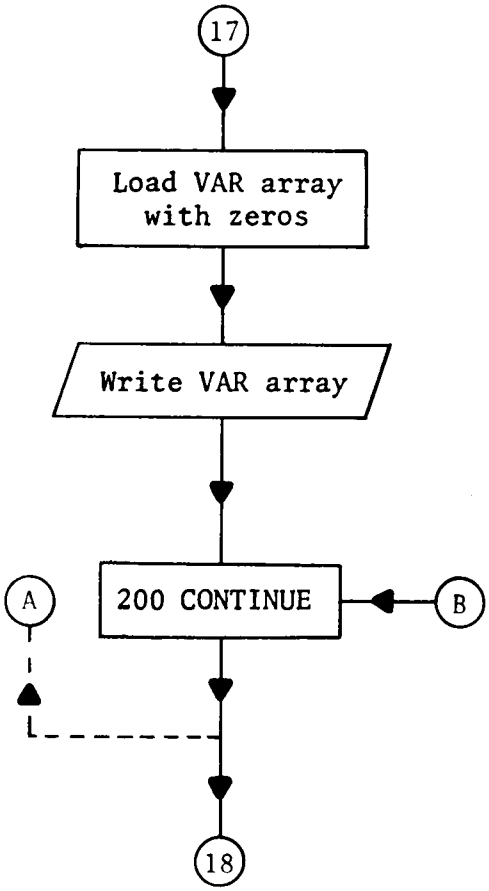


No. of data points in the TCM and TCMM arrays. ITYPE specifies the type calculation required for the overlay plot in PLOT.

If interpolation is required for the overlay, the order of interpolation.

Produces line plot overlay of TCM and TCMM versus TIME on unit 6.

Fig. D-1. (Continued)

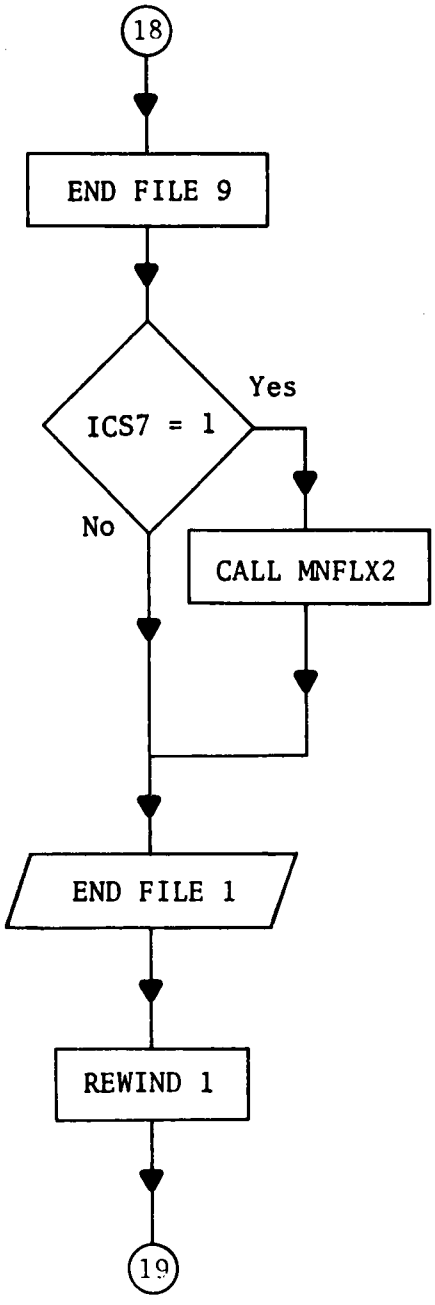


Loading VAR array.

Write VAR array to tape (file 1, unit 9) — denotes end of data for ITCNUM.

Fig. D-1. (Continued)

Wrap-up Stage: closes files on unit 9, retrieves case information from disk, computes mean fluxes.



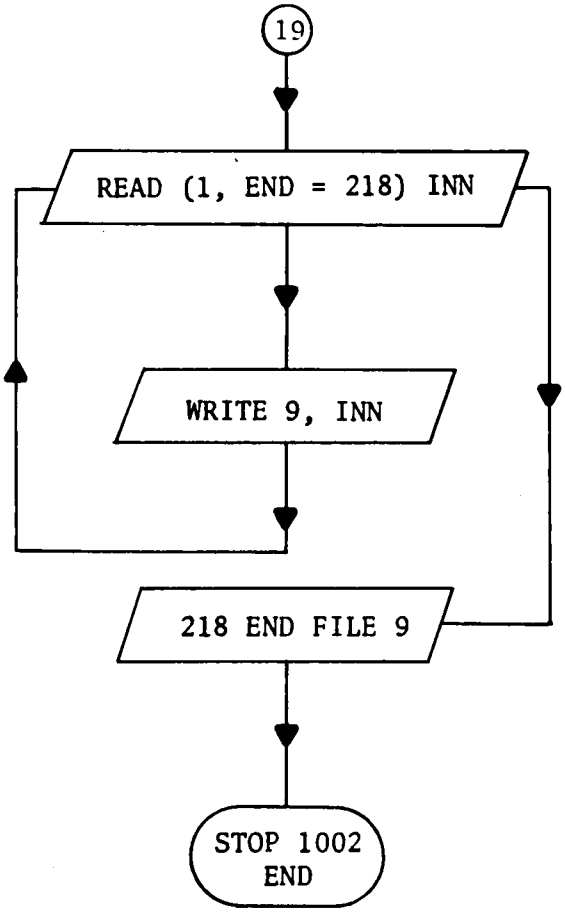
Writes EOF mark on unit 9 (i,e., closes out file 1 on unit 9).

Check on control variable ICS7 (i.e., is creation of NTAPE = 13 desired?)

Computes mean fluxes for each core heat slab in the RELAP core model for each transient time step. Writes results to tape (unit 13) and unit 6.

Writes EOF mark on unit 1 (direct access device-disk-contains all case information).

Fig. D-1. (Continued)



Retrieves case information from unit 1 until the end of file mark is encountered.

Writes case information to file 2 of unit 9.

Closes out file 2 on unit 9.

Finis.

Fig. D-1. (Continued)

APPENDIX E

EXAMPLES OF ORINC UNIT 6 OUTPUT

EXAMPLE NO.	DESCRIPTION	PAGE
1	THTF Blowdown Test 104 (Preliminary, BD104.BE.P1), Thermocouple No. TE-322AE	182
2	THTF Blowdown Test 104 (Preliminary, BD104.BE.P1), Thermocouple No. TE-318BG	203
3	THTF Blowdown Test 104 (Preliminary, BD104.BE.P1), Thermocouple No. TE-304CH	224
4	THTF Blowdown Test 104 (Preliminary, BD104.BE.P1), Thermocouple No. TE-301DJ	245

Example 1. THTF Blowdown Test 104 (Preliminary, BD104.BE.P1),
Thermocouple TE-322AE

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322105******************** CALIBRATION INFORMATION ************************

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

***** THERMOCOUPLE NO. 322-AE

***** MIDDLE T/C --- 322-ME

***** DATE OF LAST MODIFICATION : FEB. 17,1977

***** AXIAL POWER PEAKING FACTOR IS :   1.2887
      DETERMINED BY INDIV RESISTANCE CAL.

***** COEFFICIENTS FOR TEMPERATURE POLYNOMIAL FIT OF KBN
      DETERMINED FOR THE ABOVE SPECIFIC ITCS/ITCM PAIR
      C(1)=  0.19255920E 02
      C(2)= -0.64025931E-02
      C(3)=  0.39877744E-06
      C(4)=  0.43318349E-09

      VARIANCE OF FIT=  0.20306900E 02
      UNITS FOR KBN FIT :  BTU/(HR*FT**2/FT*F)

***** COEFFICIENTS FOR TEMPERATURE POLYNOMIAL FIT FOR KMGO
      DETERMINED FOR THE ABOVE SPECIFIC T/C PAIR
      C(1)=  0.80919914E 01
      C(2)= -0.11090215E-01
      C(3)=  0.75405496E-05
      C(4)= -0.23598552E-08
      C(5)=  0.30801392E-12

      VARIANCE OF FIT=  0.64749542E 02
      UNITS FOR KMGO FIT :  BTU/(HR*FT**2/FT*F)

      ACTUAL MGO POROSITY CALCULATED VIA MODIFIED
            RUSSELL EQUATION :   0.17787468E 00

***** COEFFICIENTS FOR THE THERMAL EXPANSION GAP MODEL FIT
      DETERMINED BY USING THE BIAS GAP VALUE AS A MEAN GAP

      C(1)=  0.0              SD=  0.0
      C(2)=  0.0              SD=  0.0
      C(3)=  0.0              SD=  0.0

      VARIANCE OF FIT=  0.0

      GAP CALCULATION AT THE BIAS POINT :          0.0341   (MILS)

      BIAS TEMP. INSIDE S.S.S. NODAL TEMP. :        722.7   DEG. F
      BIAS TEMP. OUTSIDE S.S.S. NODAL TEMP. :       657.7   DEG. F
      BIAS FLUX :   404005.8  BTU/HR/FT**2

      THE MAXIMUM TEMPERATURE FOR WHICH THE ABOVE
      REGRESSION FIT IS APPLICABLE IS     0.0  DEG. F
```

322105********** CASE INFORMATION **********

****** THERMOCOUPLE NUMBER: TE-322AE TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

TOTAL NUMBER OF RADIAL NODES = 15

MAGNESIUM OXIDE CORE NODES	1 THROUGH	4
INCONEL-600 HEATER NODES	5 THROUGH	6
BORON NITRIDE NODES	7 THROUGH	9
INNER S.S.SHEATH NODES	10 THROUGH	12
OUTER S.S.SHEATH NODES	13 THROUGH	15

CUTSIDE RADIUS OF MGO CORE = 0.872500E-02 FT.
OUTSIDE RADIUS OF INCONEL LAYER = 0.101670E-01 FT.
OUTSIDE RADIUS OF BORON NITRIDE = 0.143330E-01 FT.
CUTSIDE RADIUS OF INNER S.S.SHEATH = 0.168330E-01 FT.
OUTSIDE RADIUS OF OUTER S.S.SHEATH = 0.176670E-01 FT.

RADIAL GAP INFORMATION: (I.E. BIAS POINT)
GAP BETWEEN INNER AND OUTER S.S.SHEATHS = 0.0341 MILS

POWER PEAKING FACTORS:
AXIAL = 1.288719
RADIAL (INCONEL) = 1.000000
RADIAL (CU-NI)= 0.0

322105********** STEADY STATE TEMPERATURE PROFILE **********

****** THERMOCOUPLE NUMBER: TE-322AE TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

Q = AVERAGE HEAT GENERATION PER FT = 9.667375 BTU/SEC/FT
Q*AXIAL PEAKING FACTOR = 12.458530 BTU/SEC/FT
HF = OUTSIDE FILM COEFFICIENT = 0.71955742E 04 BTU/(HR*FT**2*DEG F)
TB = BULK COOLANT TEMPERATURE = 572.72 DEG F

PIN TEMPERATURE PROFILE:

NODE	TEMPERATURE (DEG F)
1	1024.73
2	1024.73
3	1024.73
4	1024.73
5	1024.73
6	1004.21
7	947.24
8	884.02
9	834.38
10	792.84
11	755.59
12	721.63
13	656.82
14	645.41
15	634.31

SURFACE HEAT FLUX= 0.40404256E 06 BTU/HR/FT**2
SURFACE TEMPERATURE= 628.87 DEG F

PRESSURE= 2341.7 PSIA
SATURATION TEMPERATURE (AT THE ABOVE PRESSURE)= 658.51 DEG F

HEAT TRANSFER MODE AT THE SURFACE OF THE PIN: FORCED CONVECTION

322105********** TRANSIENT RESULTS **********

****** THERMOCOUPLE NUMBER: TC-322AE TIME: 13:33:18

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

TIME-TEMPERATURE-NODE TABLE:
TIME HAS UNITS OF SEC
TEMPERATURE HAS UNITS OF DEG F
Q HAS UNITS OF BTU/SEC/FT
HB (BASED ON TB) HAS UNITS OF BTU/(HR*FT**2*DEG F)
BULK TEMPERATURE HAS UNITS OF DEG F
HSAT (BASED ON TSAT) HAS UNITS OF BTU/(HR*FT**2*DEG F)
PRESSURE HAS UNITS OF PSIA
SATURATION TEMPERATURE HAS UNITS OF DEG F
SURFACE FLUX (S.F.) HAS UNITS OF BTU/HR/FT**2
SURFACE TEMPERATURE HAS UNITS OF DEG F
AVERAGE MASS FLUX HAS UNITS OF LBM/SEC/FT**2
GAP HAS UNITS OF MILS

TIME--	0.0	0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500
NODE												
1	1024.7349	1024.7334	1024.7319	1024.7302	1024.7290	1024.7288	1024.7307	1024.7380	1024.7517	1024.7761	1024.8127	1024.8655
2	1024.7349	1024.7334	1024.7317	1024.7307	1024.7329	1024.7427	1024.7668	1024.8142	1024.8914	1025.0039	1025.1538	1025.3420
3	1024.7349	1024.7358	1024.7341	1024.7361	1024.7542	1024.8030	1024.9048	1025.0708	1025.3118	1025.6206	1025.9932	1026.4143
4	1024.7349	1024.7478	1024.7358	1024.7520	1024.8271	1024.9919	1025.3000	1025.7366	1026.3062	1026.9441	1027.6553	1028.3730
5	1024.7349	1024.7732	1024.7263	1024.7817	1024.9558	1025.2820	1025.8562	1026.5671	1027.4417	1028.3042	1029.2507	1030.1030
6	1004.2126	1004.2432	1004.2019	1004.2708	1004.4861	1004.8918	1005.5554	1006.3669	1007.3291	1008.2700	1009.2583	1010.1279
7	947.2422	947.2456	947.2317	947.3276	947.6392	948.2207	949.0493	950.0488	951.1382	952.2048	953.2080	954.0544
8	884.0190	883.9954	884.0022	884.1870	884.7158	885.6299	886.7612	888.0469	889.3081	890.4866	891.4565	892.1775
9	834.3799	834.3240	834.3608	834.6868	835.5229	836.8508	838.3018	839.8699	841.2524	842.4824	843.3394	843.8621
10	792.8420	792.7412	792.8333	793.3740	794.6433	796.4946	798.2739	800.1384	801.5823	802.8230	803.4795	803.7354
11	755.5901	755.4163	755.8184	756.4990	758.4001	760.9277	763.0039	765.1846	766.5737	767.7764	768.0813	767.9780
12	721.6270	721.3367	721.7478	723.1387	725.9204	729.2576	731.4822	733.9841	735.0959	736.2080	735.9299	735.3740
13	656.8223	656.3140	657.5027	660.4319	665.7122	670.9878	672.9724	676.2637	676.1418	677.0725	674.9390	673.3293
14	645.4092	644.8149	646.2014	649.4644	655.2700	660.8848	662.7051	666.1758	665.7078	666.6399	664.0679	662.2876
15	634.3066	633.6101	635.2571	638.9099	645.3145	651.2556	652.7859	656.4890	655.5513	656.5298	653.4089	651.4875
Q	12.45853	12.46942	12.45228	12.46151	12.46151	12.45228	12.46151	12.45228	12.46018	12.44306	12.46018	12.46018
TB	572.7200	575.1228	593.9583	614.7683	629.6624	630.1345	628.5176	628.0981	627.3538	626.8413	626.6548	627.5305
HB	7195.6	7712.9	11013.7	19943.8	32598.7	20867.5	18596.1	14783.6	16149.5	14942.4	18403.0	21385.6
TSAT	658.5	629.7	629.3	629.0	629.7	630.1	628.5	628.1	627.4	626.8	626.7	627.5
HSAT	-13630.5	-258498.8	620264.4	78432.2	32598.7	20867.5	18596.1	14783.6	16149.5	14942.4	18403.0	21385.6
P	2341.7	1915.5	1910.0	1905.6	1914.9	1921.4	1899.4	1893.7	1884.2	1876.8	1874.3	1886.1
S.F.	404042.6	408700.7	396145.4	379657.2	354900.6	344487.1	361503.2	350544.1	374190.0	369918.6	395360.7	398584.3
S.TEMP	628.87	628.11	629.93	633.80	640.55	646.64	647.96	651.81	650.56	651.60	648.14	646.17
MASS-FLX	742.5525	32.8161	525.6885	573.3679	706.3606	739.2546	546.0664	384.0720	398.3225	454.0791	454.0647	373.0400
QUALITY	0.0	0.0	0.0	0.0	0.00973	0.07176	0.15023	0.21029	0.24214	0.26308	0.28043	0.28418
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	6055.7	27296.3	41076.2	40262.4	41325.2	41341.5	40687.7	8093.6	1621.6	1401.6	1442.9	1271.7
*S.F.	412877.1	459763.8	422404.9	411720.9	423242.6	419295.1	423628.1	260073.1	119622.3	146372.9	172060.8	163427.4
*S.TEMP	640.90	646.59	639.51	638.79	639.95	640.32	638.96	660.29	701.14	731.28	745.91	755.92
*H.T.MODE	1	4	2	2	2	2	4	4	4	9	9	9

TIME--	0.6000	0.6500	0.7000	0.7500	0.8000	0.8500	0.9000	0.9500	1.0000	1.0500	1.1000	1.1500
NODE												
1	1024.9353	1025.0232	1025.1296	1025.2571	1025.4070	1025.5842	1025.7961	1026.0520	1026.3645	1026.7456	1027.2092	1027.7646
2	1025.5632	1025.8135	1026.1898	1026.3955	1026.7439	1027.1602	1027.6775	1028.3264	1029.1355	1030.1255	1031.3076	1032.6855
3	1026.8613	1027.3215	1027.7961	1028.3206	1028.9570	1029.7952	1030.9082	1032.3411	1034.1091	1036.2058	1038.6074	1041.2712
4	1029.0486	1029.6868	1030.3357	1031.1570	1032.3159	1034.0305	1036.3572	1039.2612	1042.6746	1046.5007	1050.6433	1054.9722
5	1030.8252	1031.4919	1032.2290	1033.3923	1035.1938	1037.9778	1041.5869	1045.8459	1050.6055	1055.6931	1060.9880	1066.2737
6	1010.8569	1011.5251	1012.3120	1013.6187	1015.7092	1018.8821	1022.9280	1027.6233	1032.7783	1038.2112	1043.7915	1049.3252
7	954.7610	955.4026	956.2983	957.9109	960.6301	964.5581	969.3918	974.8240	980.5803	986.4934	992.4114	998.2412
8	892.7747	893.3433	894.4854	896.8042	900.7852	906.1516	912.2898	918.7986	925.3311	931.7957	938.0242	944.0701
9	844.3245	844.8267	846.3975	849.7456	855.3877	862.4343	869.9009	877.3997	884.5498	891.4194	897.7961	903.9421
10	804.0728	804.5383	806.8315	811.6572	819.4998	828.4939	837.2969	845.7207	853.3552	860.5483	866.9617	873.1846
11	768.2322	768.7112	772.2446	779.2368	790.0732	801.2595	811.2800	820.4871	828.3774	835.7869	842.0532	848.3435
12	735.6521	736.2078	741.7634	751.7563	766.4607	779.7661	790.5676	800.2534	807.9985	815.4631	821.2661	827.6199
13	674.0786	674.9443	687.3908	705.3701	730.1338	746.8730	757.9131	767.9663	774.4812	781.9365	786.0613	792.8425
14	663.2012	664.1284	677.8403	697.8044	724.5667	741.6182	752.4861	762.5554	768.7146	776.1882	779.8875	786.8279
15	652.6572	653.6426	669.3186	691.1370	720.0771	737.1016	747.5891	757.6465	763.3291	770.8657	774.0232	781.2253
Q	12.45094	12.45094	12.44306	12.45094	12.43382	12.45094	12.45094	12.44171	12.44171	12.44171	12.45094	12.43382
TB	626.4170	624.0879	621.5520	620.8040	619.5569	617.7588	616.1692	615.0168	613.5505	613.8357	611.9167	609.9553
HB	18251.3	15684.1	6676.7	3239.4	1319.2	1263.2	1332.5	1239.0	1348.6	1256.9	1389.1	1223.1
TSAT	626.4	624.1	621.6	620.8	619.6	617.8	616.2	615.0	613.6	613.8	611.9	610.0
HSAT	18251.3	15684.1	6676.7	3239.4	1319.2	1263.2	1332.5	1239.0	1348.6	1256.9	1389.1	1223.1
P	1871.1	1840.2	1807.0	1797.3	1781.2	1758.2	1738.0	1723.5	1705.2	1708.8	1685.0	1661.0
S.F.	385056.2	383287.3	292834.3	218457.1	130350.7	148326.1	172157.8	173952.4	198568.0	194260.5	221270.8	206274.8
S.TEMP	647.51	648.53	665.41	688.24	718.36	735.18	745.37	755.41	760.79	768.39	771.21	778.60
MASS-FLX	432.3967	505.0437	465.4949	449.2795	480.7263	471.7012	445.8286	423.1553	413.7556	232.6629	204.6960	211.7186
QUALITY	0.28549	0.28660	0.28563	0.28414	0.28526	0.28775	0.29163	0.29745	0.30566	0.31657	0.33387	0.36121
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	1380.0	1550.8	1412.2	1356.0	1414.9	1383.4	1312.5	1263.7	1243.9	831.7	727.1	776.4
*S.F.	194269.4	224175.6	215877.6	217222.6	234195.3	236323.6	233340.3	232783.1	237058.9	168522.6	161145.4	180307.8
*S.TEMP	767.28	768.71	774.46	781.01	785.15	788.66	794.06	799.48	804.44	816.56	833.69	842.26
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	1.2000	1.2500	1.3000	1.3500	1.4000	1.4500	1.5000	1.5500	1.6000	1.6500	1.7000	1.7500
NODE												
1	1028.4231	1029.1926	1030.0789	1031.0864	1032.2166	1033.4700	1034.8433	1036.3333	1037.9329	1039.6360	1041.4351	1043.3223
2	1034.2556	1036.0103	1037.9390	1040.0271	1042.2595	1044.6160	1047.0769	1049.6179	1052.2202	1054.8684	1057.5505	1060.2581
3	1044.1646	1047.2512	1050.4966	1053.8662	1057.3188	1060.8159	1064.3118	1067.7808	1071.2000	1074.5601	1077.8730	1081.1450
4	1059.4668	1064.0576	1068.7002	1073.3438	1077.9075	1082.3445	1086.5767	1090.6240	1094.4763	1098.1702	1101.7959	1105.3479
5	1071.6746	1077.0413	1082.3594	1087.5601	1092.5078	1097.1931	1101.4883	1105.5522	1109.3455	1112.9814	1116.6580	1120.2402
6	1054.9314	1060.4775	1065.9485	1071.2649	1076.2834	1080.9827	1085.2544	1089.2771	1093.0435	1096.6755	1100.3635	1103.9817
7	1004.0366	1009.7412	1015.3311	1020.6948	1025.6758	1030.2178	1034.2925	1038.0872	1041.7078	1045.2654	1048.8545	1052.5334
8	949.9932	955.7590	961.3555	966.5845	971.2520	975.3179	978.8591	982.1926	985.5078	988.9036	992.4634	996.0881
9	909.9202	915.6741	921.2095	926.1833	930.3718	933.8132	936.7197	939.6099	942.6843	945.9932	949.5752	953.2178
10	879.2207	884.9580	890.4343	895.0710	898.6563	901.3811	903.6272	906.1868	909.1643	912.5195	916.2529	919.9722
11	854.4309	860.1162	865.5149	869.6467	872.4250	874.2954	875.8499	878.2468	881.3005	884.8467	888.8640	892.6846
12	833.6951	839.2163	844.4597	847.7705	849.4258	850.2534	851.0811	853.5632	856.8726	860.7329	865.1438	869.0027
13	798.7966	803.7673	808.0152	809.4502	808.1824	806.6450	806.1111	809.5950	813.8369	818.5994	824.0583	827.7517
14	792.7229	797.5527	802.3174	802.5601	800.6826	798.7024	797.9519	801.7529	806.1882	811.1262	816.7949	820.3918
15	787.0300	791.6860	796.3662	795.8818	793.3428	790.9263	790.0063	794.2656	798.9094	804.0381	809.9338	813.3696
Q	12.45094	12.45094	12.45094	12.45094	12.44306	12.45094	12.44306	12.46018	12.45228	12.44306	12.46018	12.44306
TB	609.1816	608.9900	608.2332	606.9800	606.0125	606.0676	605.1770	603.7092	602.6318	601.7876	600.7195	599.4822
HB	1211.5	1227.8	1211.6	1399.8	1568.9	1683.4	1708.4	1521.8	1433.5	1352.0	1260.2	1280.9
TSAT	609.2	609.0	608.2	607.0	606.0	606.1	605.2	603.7	602.6	601.8	600.7	599.5
HSAT	1211.5	1227.8	1211.6	1399.8	1568.9	1683.4	1708.4	1521.8	1433.5	1352.0	1260.2	1280.9
P	1651.6	1649.3	1640.2	1625.1	1613.6	1614.2	1603.6	1586.3	1573.7	1563.9	1551.5	1537.3
S.F.	212205.1	220884.6	224516.5	259835.5	288204.8	304715.6	309102.6	284527.4	276365.0	268860.3	259537.7	269629.8
S.TEMP	784.34	788.89	793.53	792.61	789.71	787.08	786.10	790.67	795.42	800.65	806.67	809.99
MASS-FLX	212.5870	210.6975	193.7590	180.0952	171.5875	126.6263	100.3062	84.1991	89.9094	89.3552	84.7270	84.6861
QUALITY	0.39664	0.43735	0.47846	0.51700	0.55334	0.58996	0.62297	0.65617	0.69423	0.74065	0.79249	0.84926
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	817.5	865.9	853.7	837.8	836.2	710.4	597.7	522.0	565.1	587.8	586.7	609.9
*S.F.	195510.9	210384.7	211662.7	212998.3	217490.1	190027.6	167447.6	153771.1	172086.1	182661.9	186224.3	197276.8
*S.TEMP	848.35	851.97	856.25	861.31	866.14	873.61	885.45	898.43	907.19	912.59	918.20	923.04
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	1.8000	1.8500	1.9000	1.9500	2.0000	2.0500	2.1000	2.1500	2.2000	2.2500	2.3000	2.3500
NODE												
1	1045.2908	1047.3347	1049.4475	1051.6240	1053.7930	1055.8540	1057.7061	1059.2661	1060.4768	1061.3035	1061.7334	1061.7703
2	1062.9883	1065.7378	1068.3046	1071.2908	1073.4348	1074.5466	1074.5269	1073.4534	1071.4902	1068.8303	1065.6536	1062.1191
3	1084.3916	1087.6167	1090.8281	1094.0396	1093.2505	1089.1353	1082.9448	1075.6929	1068.0659	1060.4883	1053.2002	1046.3176
4	1108.8933	1112.3962	1115.8967	1119.4231	1104.2092	1086.2039	1069.5305	1055.0425	1042.6912	1032.1553	1023.2356	1015.5161
5	1123.9082	1127.4790	1131.1040	1134.8013	1088.7654	1061.3813	1042.2627	1027.7595	1016.3157	1007.0608	999.4141	992.9492
6	1107.6824	1111.2966	1114.9634	1118.7112	1077.1541	1051.5637	1033.4556	1019.7378	1008.9800	1000.3276	993.2002	987.1738
7	1056.2131	1059.8538	1063.5251	1067.2979	1048.3401	1030.2888	1015.8979	1004.6284	995.7332	988.5571	982.6135	977.5266
8	999.7231	1003.3281	1006.9800	1010.7935	1004.6663	995.9592	988.0015	981.3420	975.9258	971.4023	967.4941	963.9524
9	956.8247	960.3909	964.0505	967.9688	967.5662	965.0142	962.4285	959.9653	957.8398	955.7998	953.7717	951.6140
10	923.5867	927.1487	930.8875	935.0212	937.7402	939.3513	941.0330	941.9614	942.5801	942.5557	942.0354	940.9399
11	896.3108	899.8906	903.7886	908.2678	913.2402	918.0630	923.3984	926.9780	929.8311	931.3174	931.9214	931.5447
12	872.5854	876.1675	880.2996	885.2578	892.4170	900.1252	908.9331	914.4365	919.1138	921.5896	922.9651	922.9651
13	831.1431	834.7559	839.6267	845.9211	858.2349	871.5544	887.2834	894.6616	902.2336	905.4080	907.6265	907.6194
14	823.7324	827.3535	832.3970	838.9753	852.4294	866.8005	883.8701	891.3035	899.4053	902.5593	904.8977	904.8137
15	816.6509	820.2874	825.5454	832.4558	847.2424	862.6665	881.1223	888.2935	896.9338	899.9023	902.3313	902.0947
Q	12.46018	12.44306	12.45094	12.46018	0.04832	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	598.3796	597.4302	616.8521	635.8396	651.8127	660.5007	667.6206	675.0261	683.9626	693.7253	701.4443	705.7700
HB	1268.2	1238.2	1273.5	1276.5	957.6	716.2	401.0	524.8	418.4	503.5	502.7	565.0
TSAT	598.4	597.4	596.2	595.0	594.8	593.4	592.0	591.1	590.6	589.8	588.5	587.7
HSAT	1268.2	1238.2	1157.4	1054.0	739.4	536.5	295.7	375.9	288.4	334.1	321.1	351.9
P	1524.7	1513.9	1500.7	1486.5	1484.9	1469.0	1453.4	1443.4	1438.4	1429.2	1416.0	1406.6
S.F.	272483.1	271731.8	261621.1	247057.8	184940.7	143521.2	85191.4	111203.5	88020.7	103185.8	100365.7	110168.1
S.TEMP	813.24	816.89	822.28	829.38	844.94	860.89	880.08	886.94	895.86	898.65	901.12	900.76
MASS-FLX	84.1456	83.2688	82.9724	86.2875	34.5206	24.7935	11.9955	32.4712	41.7591	28.6443	20.3015	30.5025
QUALITY	0.91306	0.98323	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	636.9	673.5	593.5	550.4	246.4	183.5	97.3	192.1	250.7	192.3	133.3	174.4
*S.F.	208798.9	223147.4	189690.3	171556.5	77437.1	59926.5	32842.4	65635.3	84159.4	63577.2	43810.5	57231.3
*S.TEMP	926.26	928.77	935.20	945.53	965.08	986.56	1005.02	1014.95	1017.90	1022.46	1029.82	1033.26
*H.T.MODE	9	9	8	8	8	8	8	8	8	8	8	8

TIME--	2.4000	2.4500	2.5000	2.5500	2.6000	2.6500	2.7000	2.7500	2.8000	2.8500	2.9000	2.9500
NODE												
1	1061.4292	1060.7344	1059.7146	1058.4004	1056.8235	1055.0154	1053.0044	1050.8188	1048.4836	1046.0208	1043.4509	1040.7932
2	1058.3567	1054.4644	1050.5178	1046.5679	1042.6521	1038.7930	1035.0046	1031.2939	1027.6643	1024.1162	1020.6494	1017.2615
3	1039.8828	1033.8928	1028.3198	1023.1279	1018.2766	1013.7258	1009.4395	1005.3826	1001.5298	997.8613	994.3574	991.0027
4	1008.7817	1002.8362	997.5171	992.7036	988.2971	984.2231	980.4185	976.8413	973.4653	970.2732	967.2456	964.3645
5	987.3547	982.4287	978.0068	973.9873	970.2769	966.8164	963.5481	960.4534	957.5232	954.7593	952.1318	949.6282
6	981.9431	977.3250	973.1599	969.3589	965.8350	962.5332	959.3997	956.4248	953.6082	950.9543	948.4277	946.0176
7	973.0408	969.0330	965.3623	961.9766	958.7949	955.7822	952.8882	950.1304	947.5190	945.0669	942.7197	940.4734
8	960.6484	957.5974	954.6748	951.9160	949.2356	946.6465	944.0908	941.6545	939.3582	937.2207	935.1331	933.1272
9	949.3528	947.1726	944.9004	942.7122	940.4661	938.2537	935.9822	933.8552	931.8694	930.0525	928.1943	926.4155
10	939.4763	938.0193	936.2344	934.5303	932.6111	930.7095	928.6438	926.8123	925.1228	923.6206	921.9312	920.3606
11	930.6389	929.7935	928.3162	927.0437	925.3301	923.6938	921.7471	920.2363	918.8394	917.6606	916.0540	914.6941
12	922.4150	922.1399	920.7644	919.9390	918.2886	916.9128	914.9871	913.8867	912.7859	911.9604	910.3093	909.2087
13	907.4333	908.3157	906.3752	906.8210	904.8716	904.0947	901.9287	901.9717	901.4031	901.3467	899.2026	898.8379
14	904.6868	905.8188	903.9236	904.4333	902.3557	901.7268	899.4709	899.7983	899.3066	899.4097	897.1050	896.9358
15	902.0259	903.4375	901.2944	902.1360	899.8513	899.4163	897.0195	897.7063	897.2634	897.5366	894.9998	895.0884
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	709.5271	714.4919	717.7949	719.9673	722.4253	724.1836	725.9236	727.8582	729.8030	731.7542	733.6936	735.4868
HB	563.0	502.2	598.7	506.1	591.3	539.4	601.2	494.5	498.7	455.6	550.7	468.2
TSAT	587.0	586.0	585.0	584.1	583.2	582.3	581.5	580.6	579.8	578.9	578.0	577.1
HSAT	343.1	298.2	346.2	289.1	330.3	297.2	324.9	264.2	262.3	236.4	279.3	234.4
P	1399.0	1388.5	1377.8	1368.6	1359.2	1350.4	1341.7	1332.7	1323.8	1315.0	1306.1	1297.2
S.F.	107638.7	94318.4	109062.4	91632.1	104172.7	93914.1	102125.4	83492.8	83018.8	75118.7	88235.4	74308.4
S.TEMP	900.72	902.30	899.98	901.03	898.59	898.28	895.78	896.69	896.26	896.63	893.93	894.19
MASS-FLX	32.2408	25.5824	25.7629	27.2751	26.0412	27.0832	27.0509	26.5287	26.5270	26.4233	26.0724	25.7435
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	197.9	163.4	156.0	165.2	158.9	161.7	162.6	159.0	158.1	157.3	155.2	153.0
*S.F.	64236.0	52496.6	49797.7	52451.4	50066.5	50649.6	50568.5	49100.5	48419.5	47779.3	46734.3	45709.8
*S.TEMP	1033.21	1034.76	1036.61	1036.97	1037.13	1037.08	1036.59	1036.19	1035.71	1035.12	1034.52	1033.93
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	3.0000	3.0500	3.1000	3.1500	3.2000	3.2500	3.3000	3.3500	3.4000	3.4500	3.5000	3.5500
NODE												
1	1038.0627	1035.2751	1032.4421	1029.5762	1026.6855	1023.7795	1020.8655	1017.9492	1015.0361	1012.1301	1009.2354	1006.3555
2	1013.9497	1010.7122	1007.5447	1004.4434	1001.4045	998.4241	995.4993	992.6265	989.8025	987.0247	984.2891	981.5911
3	987.7830	984.6841	981.6943	978.8020	975.9939	973.2620	970.5981	967.9971	965.4539	962.9617	960.5095	958.0828
4	961.6086	958.9646	956.4163	953.9487	951.5471	949.2041	946.9165	944.6809	942.4954	940.3425	938.1997	936.0291
5	947.2207	944.9028	942.6575	940.4668	938.3179	936.2083	934.1448	932.1257	930.1519	928.1836	926.1816	924.0891
6	943.6934	941.4534	939.2778	937.1492	935.0547	932.9968	930.9822	929.0127	927.0859	925.1533	923.1694	921.0688
7	938.2920	936.1863	934.1301	932.1021	930.0952	928.1221	926.1909	924.3027	922.4548	920.5737	918.6055	916.4675
8	931.1443	929.2329	927.3376	925.4419	923.5471	921.6899	919.8774	918.1052	916.3699	914.5317	912.5378	910.2747
9	924.6003	922.8745	921.1155	919.3259	917.5222	915.7742	914.0752	912.4148	910.7834	908.9385	906.8616	904.3870
10	918.6667	917.1189	915.4573	913.7412	912.0037	910.3606	908.7698	907.2104	905.6721	903.7468	901.5198	898.7351
11	913.0627	911.7095	910.3918	908.4182	906.7288	905.2017	903.7173	902.2515	900.7964	898.6787	896.2253	892.9932
12	907.5576	906.4568	904.8054	903.1541	901.5027	900.1265	898.7500	897.3735	895.9971	893.5190	890.7656	886.9104
13	896.8743	896.4993	894.3098	892.8938	891.3069	890.3367	889.1523	887.9338	886.6938	883.0127	879.5713	874.0293
14	894.8613	894.6729	892.3671	890.9712	889.3962	888.5225	887.3657	886.1760	884.9609	880.9775	877.4199	871.5007
15	892.8455	892.8982	890.6187	889.0581	887.4985	886.7383	885.6006	884.4365	883.2437	878.8794	875.2229	868.8616
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	737.1038	738.3354	739.1409	739.3486	739.3147	739.0989	738.6792	738.2217	737.8413	737.6379	737.7390	738.2351
HB	543.9	464.3	541.1	531.2	532.5	495.2	495.9	491.2	487.5	641.5	680.7	881.8
TSAT	576.2	575.4	574.5	573.7	572.9	572.1	571.3	570.5	569.7	568.9	568.0	567.2
HSAT	266.6	225.3	258.4	251.3	250.0	231.6	231.1	228.0	225.3	291.0	303.3	379.5
P	1288.2	1279.5	1271.1	1263.4	1255.6	1247.6	1239.8	1231.9	1224.0	1216.1	1208.2	1200.3
S.F.	84146.4	71354.1	81430.4	79008.9	78398.5	72670.6	72421.6	71388.6	70463.8	89900.6	92814.9	113957.6
S.TEMP	891.82	892.03	889.63	888.10	886.55	885.85	884.72	883.57	882.39	877.78	874.09	867.47
MASS-FLX	25.0829	25.1169	24.8616	25.0093	24.0862	22.9850	21.9921	20.7431	19.3629	17.9018	16.2756	14.5174
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	150.5	148.4	147.3	147.8	144.1	138.4	133.5	127.5	120.5	113.2	104.9	95.7
*S.F.	44646.4	43728.8	43100.3	43168.2	41979.8	40268.6	38829.9	37088.8	35089.6	32956.1	30544.8	27838.2
*S.TEMP	1033.33	1032.80	1032.11	1031.37	1030.64	1030.11	1029.65	1029.28	1029.02	1028.87	1028.86	1029.00
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	3.6000	3.6500	3.7000	3.7500	3.8000	3.8500	3.9000	3.9500	4.0000	4.0500	4.1000	4.1500
NODE												
1	1003.4910	1000.6436	997.8115	994.9937	992.1880	989.3911	986.5996	983.8101	981.0188	978.2229	975.4202	972.6082
2	978.9226	976.2744	973.6367	970.9993	968.3508	965.6846	962.9961	960.2800	957.5354	954.7620	951.9590	949.1282
3	955.6611	953.2231	950.7483	948.2217	945.6348	942.9856	940.2778	937.5156	934.7061	931.8533	928.9626	926.0381
4	933.7959	931.4631	929.0103	926.4304	923.7368	920.9495	918.0911	915.1758	912.2144	909.2180	906.1936	903.1416
5	921.8633	919.4619	916.8784	914.1316	911.2617	908.3105	905.3096	902.2656	899.1921	896.0974	892.9871	889.8552
6	918.8118	916.3555	913.6995	910.8757	907.9346	904.9214	901.8677	898.7786	895.6628	892.5310	889.3875	886.2229
7	914.1323	911.5562	908.7546	905.7917	902.7307	899.6248	896.4995	893.3467	890.1775	887.0007	883.8184	880.6143
8	907.7542	904.9255	901.8530	898.6589	895.4233	892.2004	888.9946	885.7671	882.5383	879.3164	876.0974	872.8469
9	901.6128	898.4565	895.0696	891.6440	888.2559	884.9470	881.6880	878.3940	875.1213	871.8684	868.6250	865.3271
10	895.6484	892.0903	888.3640	884.7305	881.2241	877.8662	874.5737	871.2092	867.9021	864.6238	861.3582	857.9973
11	889.5364	885.4768	881.3962	877.6030	874.0249	870.6614	867.3530	863.8950	860.5676	857.2688	853.9788	850.5242
12	883.0542	878.3713	873.9631	870.1052	866.5222	863.2144	859.9058	856.3210	853.0115	849.7017	846.3914	842.8044
13	869.4365	863.1900	858.3118	854.6001	851.1360	848.0579	844.7380	840.7710	837.6204	834.2795	830.9192	826.9382
14	866.8091	860.2310	855.3079	851.6653	848.2334	845.2117	841.8840	837.8259	834.7346	831.3831	828.0164	823.9443
15	864.1101	857.1438	852.2375	848.7021	845.3088	842.3560	839.0093	834.8413	831.8374	828.4678	825.0916	820.9087
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	739.0547	739.7585	740.3982	740.8914	741.2268	741.4089	741.4280	741.3035	741.0488	740.6650	740.4944	741.3647
HB	920.9	1141.0	1164.4	1148.3	1172.0	1173.7	1226.4	1338.9	1321.3	1379.6	1435.0	1596.9
TSAT	566.4	565.7	564.9	564.1	563.3	562.6	561.8	561.0	560.2	559.4	558.7	558.1
HSAT	384.3	455.7	449.3	431.2	428.7	419.6	427.5	452.4	436.8	445.0	450.2	476.7
P	1192.7	1185.7	1178.5	1171.2	1164.0	1156.8	1149.6	1142.4	1135.2	1127.9	1121.5	1116.2
S.F.	113879.8	132084.9	128389.8	122069.1	120242.5	116786.7	117887.7	123190.9	118022.4	119087.6	119268.2	124548.5
S.TEMP	862.71	855.52	850.66	847.20	843.82	840.91	837.55	833.31	830.37	826.99	823.61	819.36
MASS-FLX	13.0758	12.6044	12.0654	11.7767	11.6405	11.5223	11.4712	11.4274	11.4041	11.4084	11.1112	9.3902
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	87.0	84.0	80.8	78.8	77.8	77.0	76.5	76.2	75.8	75.7	74.7	67.5
*S.F.	25273.5	24336.8	23377.6	22744.5	22434.6	22165.2	22000.9	21887.1	21783.2	21750.5	21447.2	19327.6
*S.TEMP	1029.27	1029.43	1029.48	1029.47	1029.35	1029.18	1028.95	1028.67	1028.36	1028.01	1027.66	1027.51
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	4.2000	4.2500	4.3000	4.3500	4.4000	4.4500	4.5000	4.5500	4.6000	4.6500	4.7000	4.7500
NODE												
1	969.7861	966.9497	964.0986	961.2319	958.3494	955.4497	952.5325	949.5962	946.6340	943.6348	940.5781	937.4360
2	946.2698	943.3850	940.4749	937.5420	934.5884	931.6155	928.6206	925.5898	922.4893	919.2554	915.8059	912.0515
3	923.0820	920.0979	917.0916	914.0693	911.0344	907.9832	904.8982	901.7156	898.3054	894.4741	890.0254	884.8313
4	900.0632	896.9658	893.8645	890.7673	887.6719	884.5557	881.3472	877.8433	873.6702	868.4036	861.7778	853.8274
5	886.6970	883.5339	880.3911	877.2720	874.1563	870.9927	867.6311	863.6638	858.4243	851.3352	842.2922	831.7361
6	883.0303	879.8403	876.6799	873.5486	870.4175	867.2209	863.7727	859.5637	853.8032	845.8926	835.8523	824.3206
7	877.3784	874.1624	870.9949	867.8645	864.7219	861.4741	857.8557	853.1460	846.3206	836.8135	824.9746	811.8616
8	869.5569	866.3315	863.1899	860.0876	856.9351	853.5876	849.6077	843.8191	834.7993	822.2664	807.3972	792.0549
9	861.9817	858.7783	855.6946	852.6311	849.4546	845.9514	841.4338	834.0686	822.0300	805.7366	787.6047	770.3896
10	854.5837	851.4409	848.4390	845.4102	842.1699	838.4233	833.1130	823.4768	807.3452	786.4492	764.8972	746.3135
11	847.0264	844.0122	841.1194	838.1042	834.7336	830.6028	824.0857	811.0471	789.1648	762.5227	737.5015	718.4338
12	839.2166	836.4563	833.6956	830.6582	827.0679	822.3716	814.0793	796.0923	766.4329	733.1201	705.3086	687.4707
13	823.1714	821.2856	818.7615	815.5303	811.2405	804.9214	791.4829	759.2588	708.6758	659.9780	628.7671	618.1206
14	820.1550	818.4912	815.9915	812.7021	808.2512	801.5728	786.9685	751.5483	696.5859	645.2212	614.0786	605.5127
15	817.1055	815.7314	813.2244	809.8535	805.2087	798.1069	782.1064	742.8843	682.9854	629.1016	598.6873	592.9312
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	742.9492	744.9521	746.0762	747.8247	753.8232	765.3979	779.4712	795.0879	809.8274	815.3052	800.0037	767.4019
HB	1713.2	1581.6	1694.5	1908.8	2503.4	4665.8**********		-6745.3	-4416.9	-3422.0	-2854.7	-2537.6
TSAT	557.3	556.7	556.3	555.6	554.9	554.3	553.6	552.9	552.6	552.5	552.1	551.9
HSAT	481.7	426.1	435.9	457.4	501.4	595.7	927.7	2080.6	4837.9	9836.3	15501.1	13176.8
P	1109.5	1104.1	1099.8	1093.8	1087.7	1082.4	1076.8	1070.8	1067.4	1066.6	1063.1	1061.3
S.F.	124383.8	109775.1	111419.5	115635.6	124727.2	144169.4	209507.6	385033.4	594012.3	667298.5	597708.6	458635.4
S.TEMP	815.55	814.36	811.83	808.41	803.65	796.30	779.47	738.01	675.34	620.30	590.63	586.67
MASS-FLX	5.3187	1.9251	0.1865	1.5312	3.1408	5.3327	7.1826	10.6873	14.8688	22.1575	26.2749	31.0538
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	42.4	22.8	5.0	12.9	24.3	37.5	49.5	68.2	89.1	122.4	140.1	157.7
*S.F.	12087.3	6491.3	1425.9	3679.6	6799.4	10085.3	12514.6	16109.3	19596.5	25893.1	31366.7	39018.6
*S.TEMP	1028.20	1029.60	1031.24	1032.07	1032.07	1031.62	1031.05	1030.14	1028.98	1027.22	1025.14	1022.45
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	4.8000	4.8500	4.9000	4.9500	5.0000	5.0500	5.1000	5.1500	5.2000	5.2500	5.3000	5.3500
NODE												
1	934.1758	930.7615	927.1602	923.3425	919.2856	914.9753	910.4043	905.5720	900.4829	895.1499	889.5874	883.8142
2	907.9187	903.3625	898.3657	892.9438	887.1301	880.9714	874.5232	867.8420	860.9841	854.0005	846.9370	839.8335
3	878.8643	872.1885	864.9270	857.2241	849.2205	841.0417	832.7949	824.5676	816.4277	808.4238	800.5869	792.9348
4	844.8293	835.1558	825.1599	815.1125	805.1990	795.5439	786.2266	777.2966	768.7725	760.6526	752.9106	745.5178
5	820.3398	808.7109	797.2664	786.2344	775.7144	765.7627	756.3958	747.6147	739.3840	731.6580	724.3647	717.4553
6	812.1096	799.8707	788.0203	776.7285	766.0593	756.0481	746.6899	737.9736	729.8433	722.2410	715.0786	708.3035
7	798.5100	785.5845	773.3901	761.9973	751.3779	741.5330	732.4182	724.0042	716.2009	708.9326	702.0854	695.6125
8	777.4778	764.1302	752.0442	741.0271	730.9158	721.6895	713.2424	705.5320	698.4077	691.7817	685.4998	679.5500
9	755.2112	742.0732	730.5811	720.3003	710.9573	702.5703	694.9565	688.0867	681.7236	675.7964	670.0950	664.6863
10	731.2021	718.8225	708.3105	698.9963	690.5679	683.1694	676.4893	670.5549	664.9907	659.7881	654.6458	649.7842
11	704.3398	693.4150	684.3127	676.2017	668.8418	662.6416	657.0188	652.1624	647.4338	642.9983	638.3726	634.0916
12	675.7478	667.0862	659.8152	653.0994	646.9395	642.1770	637.6924	634.0471	630.1199	626.4712	622.2595	618.6082
13	614.2021	611.5867	608.6128	604.8743	601.3037	600.0715	597.9370	597.0916	594.5481	592.5532	588.8044	586.6563
14	603.2734	601.8045	599.9962	596.3687	593.2705	592.7498	591.0022	590.6951	588.3369	586.6545	582.9272	581.1021
15	592.5579	592.2395	590.7539	587.9910	585.3572	585.6187	584.2048	584.4729	582.2244	580.8684	577.0935	575.6467
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	726.9551	696.2903	680.9104	673.2656	668.4712	664.2974	659.8862	655.6111	651.2515	646.4395	639.2183	634.2302
HB	-2748.1	-3148.3	-3363.0	-3383.9	-3280.1	-3087.5	-3085.4	-2980.9	-3057.8	-3031.1	-3259.3	-3187.4
TSAT	551.6	551.3	551.1	550.8	550.5	550.2	549.9	549.4	549.0	548.5	548.1	547.6
HSAT	10757.0	9451.7	8995.2	9156.1	9232.9	7955.2	7872.7	6905.1	7291.5	7032.0	8126.8	7714.2
P	1059.3	1056.8	1054.5	1052.2	1049.8	1047.5	1044.4	1040.4	1036.7	1032.8	1029.2	1025.3
S.F.	383771.4	342348.4	317834.8	302596.9	285473.8	253675.7	243838.8	221114.3	220331.1	207400.7	211992.1	195313.8
S.TEMP	587.30	587.55	586.40	583.84	581.44	582.13	580.86	581.43	579.20	578.02	574.18	572.95
MASS-FLX	37.0354	40.4790	42.3744	44.0215	45.3427	46.7898	48.5401	49.3328	50.5342	51.3417	53.0552	54.2000
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	185.2	205.8	220.5	229.5	236.6	243.7	252.3	257.3	263.2	268.6	278.4	287.9
*S.F.	52508.5	64328.1	71749.9	75650.3	78220.3	80664.2	83636.6	85461.9	87591.0	89675.6	93773.3	97393.9
*S.TEMP	1018.45	1013.53	1008.56	1004.05	999.98	996.14	992.34	988.61	985.00	981.35	977.51	973.32
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	5.4000	5.4500	5.5000	5.5500	5.6000	5.6500	5.7000	5.7500	5.8000	5.8500	5.9000	5.9500
NODE												
1	877.8511	871.7195	865.4409	859.0383	852.5334	845.9482	839.3047	832.6213	825.9170	819.2095	812.5156	805.8496
2	832.7209	825.6270	818.5745	811.5835	804.6707	797.8489	791.1289	784.5183	778.0229	771.6487	765.4001	759.2813
3	785.4756	778.2178	771.1675	764.3289	757.7007	751.2786	745.0579	739.0317	733.1965	727.5469	722.0776	716.7859
4	738.4485	731.6956	725.2527	719.1069	713.2395	707.6274	702.2544	697.1045	692.1719	687.4453	682.9170	678.5786
5	710.8933	704.6838	698.8184	693.2698	688.0071	682.9954	678.2217	673.6665	669.3325	665.2026	661.2686	657.5234
6	701.8818	695.8286	690.1323	684.7583	679.6711	674.8313	670.2312	665.8486	661.6929	657.7400	653.9858	650.4204
7	689.4873	683.7510	678.3792	673.3252	668.5447	663.9963	659.6855	655.5820	651.7122	648.0376	644.5593	641.2683
8	673.9268	668.7256	663.8813	659.3257	655.0063	650.8831	646.9937	643.2869	639.8291	636.5298	633.4431	630.5259
9	659.5847	654.9629	650.6680	646.6125	642.7456	639.0320	635.5618	632.2354	629.1931	626.2690	623.5437	620.9851
10	645.2188	641.2407	637.5195	633.9697	630.5515	627.2378	624.2056	621.2544	618.6626	616.0950	613.7559	611.5645
11	630.1052	626.9097	623.7981	620.7690	617.8049	614.8923	612.3574	609.7791	607.7256	605.4976	603.5952	601.7974
12	615.2363	612.9878	610.4573	607.9258	605.3940	602.8611	600.8904	598.6379	597.2297	595.2578	593.8489	592.4399
13	584.6162	584.8308	583.2678	581.6868	579.9802	578.1694	577.6045	575.8176	576.1335	574.3364	574.1982	573.5422
14	579.2996	580.0217	578.3657	577.1489	575.5830	573.8945	573.6177	571.8689	572.5574	570.7161	570.8550	570.3101
15	574.0781	575.3826	573.9531	572.6992	571.2629	569.6899	569.7422	567.9797	569.1147	567.1418	567.6194	567.1589
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	630.2737	626.4106	622.3694	618.1165	613.4421	609.8430	604.6436	596.1917	589.9685	588.7395	585.6079	583.5525
HB	-3182.7	-3054.5	-3259.2	-3342.7	-3490.3	-3567.6	-3721.2	-4633.4	-5338.1	-5507.1	-5809.4	-6234.0
TSAT	547.2	546.8	546.3	545.9	545.4	544.9	544.3	543.8	543.3	542.8	542.3	541.7
HSAT	7700.7	6168.0	6513.9	6459.0	6511.8	6625.2	5825.3	6280.2	4986.1	5700.6	4780.0	4686.3
P	1021.7	1017.9	1014.2	1010.5	1006.4	1002.2	997.9	993.5	989.7	985.1	981.0	976.7
S.F.	187067.8	162724.4	165227.8	159163.2	154673.9	150680.3	136921.3	139667.4	120202.3	128749.9	113644.9	111850.0
S.TEMP	571.50	573.14	571.67	570.50	569.13	567.61	567.85	566.05	567.45	565.36	566.05	565.61
MASS-FLX	55.6045	56.7197	57.9038	59.0979	60.3751	57.9783	58.4206	58.8474	61.4489	60.1333	59.2920	58.6155
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	294.7	301.8	308.5	315.9	324.5	317.6	321.3	338.1	336.5	350.5	346.8	349.9
*S.F.	99687.4	102030.6	104292.2	106819.3	109846.3	107603.2	109192.0	116931.5	116552.2	120652.9	118904.9	119702.1
*S.TEMP	969.32	965.29	961.27	957.17	952.94	949.54	945.78	941.38	936.65	932.16	928.22	924.45
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	6.0000	6.0500	6.1000	6.1500	6.2000	6.2500	6.3000	6.3500	6.4000	6.4500	6.5000	6.5500
NODE												
1	799.2261	792.6577	786.1553	779.7295	773.3901	767.1431	760.9954	754.9531	749.0237	743.2156	737.5386	732.0042
2	753.2935	747.4397	741.7212	736.1372	730.6860	725.3635	720.1692	715.1055	710.1838	705.4219	700.8403	696.4568
3	711.6677	706.7180	701.9272	697.2859	692.7837	688.4102	684.1650	680.0657	676.1489	672.4563	669.0208	665.8594
4	674.4246	670.4417	666.6108	662.9131	659.3313	655.8535	652.5015	649.3374	646.4502	643.9045	641.7249	639.8906
5	653.9622	650.5601	647.2886	644.1245	641.0535	638.0637	635.2168	632.6345	630.4507	628.7207	627.4255	626.4880
6	647.0422	643.8176	640.7131	637.7075	634.7856	631.9375	629.2542	626.8865	624.9883	623.5928	622.6553	622.0664
7	638.1643	635.1970	632.3306	629.5442	626.8267	624.1709	621.7268	619.6946	618.2473	617.3660	616.9558	616.8545
8	627.7942	625.1594	622.5874	620.0679	617.5974	615.1726	613.0686	611.5552	610.8132	610.6909	611.0112	611.5325
9	618.6145	616.2781	613.9634	611.6758	609.4199	607.1956	605.4695	604.5645	604.6375	605.3225	606.3713	607.4539
10	609.5701	607.5078	605.4268	603.3521	601.2949	599.2576	598.0193	597.9114	599.0193	600.6255	602.4492	604.0566
11	600.2227	598.3950	596.5247	594.6514	592.7847	590.9265	590.4211	591.4585	593.9724	596.6365	599.2822	601.3247
12	591.3125	589.6208	587.9290	586.2368	584.5439	582.8511	583.4153	585.9539	590.1841	593.8486	597.2295	599.4827
13	573.4412	571.6868	570.3308	568.9807	567.6182	566.2402	570.1848	576.7944	585.3367	590.6104	595.2419	597.2512
14	570.4043	568.5825	567.2971	566.0093	564.7036	563.3782	568.0901	575.4846	584.8262	590.2520	595.0728	596.9443
15	567.4651	565.5085	564.3135	563.0825	561.8313	560.5591	566.2266	574.4775	584.6616	590.0974	595.0784	596.7153
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	579.4507	574.8318	572.6758	568.6511	564.6460	553.4353	543.8569	537.2866	536.6858	536.1289	535.5430	538.6611
HB	-7705.8	-10215.5	-10847.4	-14912.9	-24229.5	17624.3	2718.5	687.7	-140.8	-22.9	-107.2	106.4
TSAT	541.2	540.8	540.2	539.6	539.0	538.5	538.4	537.3	536.7	536.1	535.5	538.7
HSAT	4168.9	4779.4	4712.6	4756.2	4807.0	4874.6	2170.5	687.7	-140.8	-22.9	-107.2	106.4
P	972.6	968.8	964.1	959.6	954.9	950.4	950.0	941.3	936.5	932.2	927.6	952.1
S.F.	103390.4	110931.1	106755.4	104689.2	102727.0	100875.3	58600.7	25333.7	-6767.8	-12385.5	-6390.1	6167.4
S.TEMP	566.03	563.97	562.83	561.63	560.41	559.16	565.41	574.13	584.75	590.11	595.17	596.63
MASS-FLX	60.1586	61.6808	60.4270	60.2721	59.2686	59.9638	59.5647	57.5838	57.3335	55.9636	55.4841	54.6233
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.99475	0.99348	0.98519	0.99055	0.96963
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	356.8	354.8	360.9	362.5	363.8	375.5	581.8	529.7	662.6	581.8	842.6	355.3
*S.F.	121902.3	120600.0	122462.5	122895.2	123399.1	128948.8	205686.9	181286.8	216367.9	184125.2	252625.8	103322.8
*S.TEMP	920.72	916.74	912.49	908.52	904.46	900.14	891.54	879.61	863.33	852.73	835.46	826.67
*H.T.MODE	8	8	8	8	8	8	3	3	3	3	3	8

TIME--	6.6000	6.6500	6.7000	6.7500	6.8000	6.8500	6.9000	6.9500	7.0000	7.0500	7.1000	7.1500
NODE												
1	726.6245	721.4111	716.3740	711.5222	706.8611	702.3931	698.1191	694.0386	690.1475	686.4412	682.9131	679.5576
2	692.2871	688.3369	684.6074	681.0930	677.7844	674.6687	671.7319	668.9607	666.3423	663.8635	661.5120	659.2773
3	662.9700	660.3384	657.9407	655.7490	653.7349	651.8704	650.1335	648.5042	646.9666	645.5078	644.1157	642.7791
4	638.3589	637.0745	635.9856	635.0398	634.1973	633.4250	632.7029	632.0154	631.3530	630.7012	630.0552	629.4080
5	625.8306	625.3677	625.0376	624.7769	624.5522	624.3328	624.1145	623.8804	623.6340	623.3579	623.0547	622.7190
6	621.7358	621.5686	621.5024	621.4707	621.4458	621.3997	621.3391	621.2449	621.1262	620.9617	620.7603	620.5146
7	616.9639	617.1758	617.4375	617.6760	617.8828	618.0291	618.1465	618.2029	618.2251	618.1770	618.0837	617.9302
8	612.1748	612.8125	613.4277	613.9299	614.3567	614.6731	614.9595	615.1440	615.2942	615.3350	615.3325	615.2473
9	608.5601	609.5366	610.4265	611.1016	611.6804	612.0957	612.5066	612.7600	613.0012	613.0769	613.1328	613.0745
10	605.5942	606.8428	607.9585	608.7285	609.4170	609.8735	610.3977	610.6667	610.9875	611.0447	611.1477	611.0803
11	603.2563	604.6704	605.9597	606.7065	607.4734	607.8928	608.5481	608.7476	609.1616	609.1138	609.2771	609.1443
12	601.7351	603.1426	604.5500	605.1128	605.9568	606.2383	607.0823	607.0823	607.6448	607.3635	607.6448	607.3635
13	600.1165	601.0259	602.6611	602.3865	603.5405	603.2339	604.7615	603.8970	605.0654	603.8547	604.6841	603.7964
14	599.9460	600.7002	602.3997	601.9141	603.1709	602.7134	604.4233	603.3259	604.6697	603.2161	604.2104	603.1589
15	599.8865	600.4114	602.2051	601.4397	602.8589	602.1926	604.1553	602.7341	604.3345	602.5459	603.7874	602.5049
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	534.4099	533.8198	533.2869	532.6951	532.0369	531.5337	531.0869	530.4033	529.8176	529.2041	528.5549	527.9197
HB	-27.6	145.6	68.3	261.9	133.4	276.5	98.0	319.0	134.9	359.4	181.4	337.2
TSAT	534.4	533.8	533.3	532.7	532.0	531.5	531.1	530.4	529.8	529.2	528.6	527.9
HSAT	-27.6	145.6	68.3	261.9	133.4	276.5	98.0	319.0	134.9	359.4	181.4	337.2
P	918.8	914.3	910.2	905.6	900.6	896.8	893.4	888.3	883.9	879.3	874.4	869.7
S.F.	-1810.5	9677.2	4703.0	17943.0	9428.1	19464.0	7150.9	22974.6	10037.4	26231.4	13614.0	25032.3
S.TEMP	599.91	600.28	602.14	601.19	602.73	601.93	604.06	602.42	604.20	602.19	603.60	602.16
MASS-FLX	54.5808	53.7207	52.5600	52.0223	49.7620	50.0416	49.5159	47.6918	47.0538	46.2380	44.8848	44.6310
QUALITY	0.96243	0.96233	0.96075	0.98541	0.95181	0.98152	0.97566	0.98093	0.97395	0.97328	0.97093	0.96910
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	858.6	958.2	996.7	1304.7	325.9	1395.4	1905.5	1682.3	1727.5	1656.3	1820.4	1905.6
*S.F.	242315.3	260309.7	260912.8	325907.8	78263.5	316275.3	408622.1	337748.1	327654.8	297374.9	309186.2	305447.4
*S.TEMP	816.74	805.61	795.16	782.56	772.49	758.24	745.40	731.23	719.48	708.80	698.41	688.25
*H.T.MODE	4	4	4	3	8	3	3	3	3	3	3	3

TIME--	7.2000	7.2500	7.3000	7.3500	7.4000	7.4500	7.5000	7.5500	7.6000	7.6500	7.7000	7.7500
NODE												
1	676.3652	673.3298	670.4431	667.6963	665.0801	662.5784	660.1743	657.8467	655.5747	653.3384	651.1204	648.9072
2	657.1504	655.1216	653.1858	651.3306	649.5347	647.7637	645.9783	644.1426	642.2341	640.2434	638.1699	636.0215
3	641.4927	640.2539	639.0586	637.8831	636.6680	635.3335	633.8152	632.0869	630.1584	628.0620	625.8374	623.5237
4	628.7649	628.1284	627.4985	626.8030	625.8928	624.6177	622.9255	620.8738	618.5635	616.0942	613.5432	610.9702
5	622.3701	622.0132	621.6477	621.1116	620.1521	618.5828	616.4473	613.9331	611.2249	608.4473	605.6763	602.9668
6	620.2549	619.9849	619.7002	619.1772	618.1091	616.3110	613.9070	611.1575	608.2712	605.3713	602.5217	599.7720
7	617.7698	617.5957	617.4011	616.8337	615.5081	613.2705	610.4126	607.3135	604.1960	601.1582	598.2373	595.4717
8	615.1846	615.1035	614.9915	614.2256	612.3262	609.2683	605.7012	602.1558	598.8054	595.6682	592.7305	590.0190
9	613.0977	613.0837	613.0273	611.8872	609.1563	605.0635	600.7666	596.8770	593.4084	590.2649	587.3821	584.7893
10	611.2061	611.2427	611.2239	609.4177	605.4517	600.0049	594.9763	590.8872	587.4309	584.3726	581.6128	579.2114
11	609.4331	609.4875	609.4873	606.4453	600.5681	593.3162	587.7087	583.7305	580.4888	577.6384	575.0920	572.9900
12	607.9260	607.9260	607.9260	602.8586	594.4060	585.1057	579.4631	576.0740	573.2488	570.7051	568.4429	566.7458
13	605.3657	604.9402	604.9412	593.0964	577.7095	563.8770	560.1968	559.2451	557.5552	555.7644	554.2114	553.6270
14	604.9871	604.4172	604.4331	591.0098	574.3186	559.7720	556.7981	556.3638	554.8440	553.1782	551.7561	551.3958
15	604.6851	603.8926	603.9436	588.5229	570.4470	555.2822	553.3987	553.5579	552.1621	550.6138	549.3267	549.2214
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	527.3064	526.6711	526.0325	525.3975	524.7588	524.1167	523.4729	522.8267	522.1462	521.4834	520.8254	520.1099
HB	104.8	257.6	225.4	1758.6	3688.4	6184.2	4312.7	3347.9	3340.6	3297.1	3177.6	2719.7
TSAT	527.3	526.7	526.0	525.4	524.8	524.1	523.5	522.8	522.1	521.5	520.8	520.1
HSAT	104.8	257.6	225.4	1758.6	3688.4	6184.2	4312.7	3347.9	3340.6	3297.1	3177.6	2719.7
P	865.2	860.5	855.8	851.2	846.5	841.9	837.2	832.6	827.7	823.0	818.3	813.3
S.F.	8095.2	19824.2	17503.9	108413.6	160401.4	177553.4	121752.2	98299.2	95811.9	91825.6	86720.9	76278.4
S.TEMP	604.57	603.62	603.71	587.05	568.25	552.83	551.70	552.19	550.83	549.33	548.12	548.16
MASS-FLX	43.9321	42.9963	42.2590	41.5277	40.7342	39.9429	39.1522	38.3498	37.5406	36.5683	34.7149	32.8503
QUALITY	0.96712	0.96521	0.96323	0.96119	0.95913	0.95706	0.95497	0.95288	0.95086	0.94867	0.94544	0.94268
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	1999.8	2079.9	2164.1	2252.1	2338.1	2423.5	2508.4	2590.9	2674.6	2680.7	2585.5	2498.0
*S.F.	303211.9	298214.7	293179.3	288363.1	282972.7	277267.8	271382.2	265245.1	259453.8	248731.9	232813.4	219207.8
*S.TEMP	678.97	670.08	661.55	653.49	645.84	638.58	631.72	625.26	619.18	614.32	610.93	607.91
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	7.8000	7.8500	7.9000	7.9500	8.0000	8.0500	8.1000	8.1500	8.2000	8.2500	8.3000	8.3500
NODE												
1	646.6882	644.4583	642.2136	639.9539	637.6807	635.3977	633.1084	630.8159	628.5242	626.2361	623.9553	621.6853
2	633.8103	631.5513	629.2610	626.9553	624.6467	622.3467	620.0608	617.7913	615.5422	613.3157	611.1145	608.9429
3	621.1567	618.7686	616.3877	614.0344	611.7236	609.4578	607.2327	605.0439	602.8899	600.7749	598.7034	596.6797
4	608.4167	605.9194	603.5078	601.1929	598.9729	596.8250	594.7273	592.6689	590.6521	588.6914	586.7925	584.9604
5	600.3474	597.8511	595.4993	593.2844	591.1882	589.1560	587.1587	585.1951	583.2776	581.4348	579.6672	577.9805
6	597.1401	594.6621	592.3525	590.1917	588.1531	586.1663	584.2029	582.2710	580.3899	578.5959	576.8831	575.2568
7	592.8616	590.4463	588.2300	586.1707	584.2327	582.3123	580.3960	578.5103	576.6870	574.9731	573.3425	571.8091
8	587.4993	585.2329	583.1963	581.3066	579.5220	577.6782	575.8157	573.9927	572.2539	570.6675	569.1563	567.7561
9	582.4060	580.3411	578.3217	576.8169	575.1892	573.3889	571.5637	569.8042	568.1609	566.7253	565.3335	564.0754
10	577.0115	575.2227	573.0733	572.1699	570.7075	568.8945	567.0942	565.4099	563.8870	562.6499	561.3799	560.2917
11	571.0313	569.6455	568.4358	567.1409	565.8511	563.9045	562.1299	560.5549	559.2012	558.2520	557.0876	556.2253
12	565.0483	564.1995	563.3506	562.2183	561.0857	558.8201	557.1204	555.7039	554.5701	554.0032	552.8691	552.3020
13	552.4341	553.1243	552.9788	551.9966	551.1670	547.6118	546.3784	545.4338	544.8909	545.4031	543.9937	544.3333
14	550.2688	551.2861	551.2297	550.2434	549.4695	545.6008	544.5295	543.6765	543.2476	543.9795	542.4561	543.0107
15	548.1296	549.5425	549.3347	548.5093	547.7986	543.5149	542.7017	541.9434	541.6416	542.6272	540.9114	541.7488
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	519.4441	518.7844	518.0955	517.4031	516.7227	516.0642	515.3381	514.6191	513.8938	513.1658	512.4343	511.6982
HB	2759.9	1981.5	1940.5	2049.1	1962.6	2968.8	2451.9	2321.2	2093.6	1595.5	2022.6	1459.2
TSAT	519.4	518.8	518.1	517.4	516.7	516.1	515.3	514.6	513.9	513.2	512.4	511.7
HSAT	2759.9	1981.5	1940.5	2049.1	1962.6	2968.8	2451.9	2321.2	2093.6	1595.5	2022.6	1459.2
P	808.6	804.0	799.2	794.4	789.7	785.2	780.2	775.3	770.4	765.5	760.6	755.7
S.F.	76234.0	59305.5	59399.3	61968.3	59364.2	78251.0	64867.9	61429.0	56437.4	45978.5	56012.3	42970.2
S.TEMP	547.07	548.71	548.71	547.64	546.97	542.42	541.79	541.08	540.85	541.98	540.13	541.15
MASS-FLX	31.3843	29.5428	28.8450	27.4903	25.8280	24.2413	22.5148	21.2122	19.9642	18.7148	17.4411	16.1077
QUALITY	0.94186	0.94201	0.94241	0.94429	0.94800	0.95140	0.95329	0.95511	0.95705	0.95910	0.96126	0.96358
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	2409.3	2355.0	2295.3	2167.4	2095.0	1925.4	1746.3	1598.4	1459.2	1322.3	1187.2	1051.8
*S.F.	206878.9	198933.6	191442.6	179876.4	172906.4	159435.1	146343.6	136134.9	126434.9	116826.7	107224.8	97387.0
*S.TEMP	605.34	603.34	601.62	600.47	599.39	599.01	599.28	599.93	600.69	601.66	602.89	604.44
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	8.4000	8.4500	8.5000	8.5500	8.6000	8.6500	8.7000	8.7500	8.8000	8.8500	8.9000	8.9500
NODE												
1	619.4290	617.1897	614.9705	612.7744	610.6040	608.4607	606.3469	604.2634	602.2104	600.1902	598.2031	596.2483
2	606.8044	604.6997	602.6301	600.5974	598.6030	596.6460	594.7263	592.8418	590.9924	589.1777	587.3975	585.6499
3	594.7043	592.7749	590.8909	589.0537	587.2629	585.5139	583.8018	582.1240	580.4812	578.8723	577.2957	575.7476
4	583.1892	581.4663	579.7935	578.1750	576.6067	575.0750	573.5718	572.0967	570.6555	569.2468	567.8660	566.5046
5	576.3530	574.7664	573.2324	571.7615	570.3379	568.9360	567.5527	566.1951	564.8757	563.5859	562.3198	561.0598
6	573.6848	572.1482	570.6672	569.2546	567.8872	566.5295	565.1877	563.8713	562.5989	561.3525	560.1277	558.8999
7	570.3152	568.8452	567.4390	566.1113	564.8186	563.5151	562.2251	560.9636	559.7549	558.5652	557.3933	556.2021
8	566.3582	564.9675	563.6631	562.4526	561.2507	559.9990	558.7673	557.5735	556.4509	555.3264	554.2158	553.0544
9	562.7551	561.4312	560.2351	559.1484	558.0222	556.7974	555.6184	554.4910	553.4600	552.3867	551.3296	550.1768
10	559.0229	557.7531	556.6995	555.7581	554.6895	553.4592	552.3418	551.2900	550.3711	549.3333	548.3296	547.1555
11	554.9448	553.7371	552.8806	552.1204	551.0642	549.7725	548.7515	547.7944	547.0293	545.9849	545.0442	543.7905
12	550.8840	549.7495	549.1824	548.6147	547.4795	546.0605	545.2090	544.3569	543.7891	542.6531	541.8008	540.3804
13	542.1470	541.3162	541.0448	541.4539	539.8291	537.9885	537.8003	537.1516	537.1355	535.4844	534.9697	532.8848
14	540.6038	539.8745	540.3953	540.2485	538.4895	536.5725	536.5549	535.9250	536.0244	534.2268	533.8105	531.5579
15	539.0247	538.4512	539.2034	539.0769	537.1306	535.1328	535.3481	534.7131	534.9507	532.9456	532.6729	530.1926
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	510.9597	510.2190	509.4734	508.7241	508.0146	507.3279	506.6318	505.9336	505.2314	504.4563	503.7607	503.1094
HB	2145.8	1826.9	1392.3	1376.7	1750.7	1943.6	1483.0	1523.3	1268.5	1692.8	1406.4	1914.5
TSAT	511.0	510.2	509.5	508.7	508.0	507.3	506.6	505.9	505.2	504.5	503.8	503.1
HSAT	2145.8	1826.9	1392.3	1376.7	1750.7	1943.6	1483.0	1523.3	1268.5	1692.8	1406.4	1914.5
P	750.8	745.9	741.0	736.1	731.5	727.0	722.6	718.1	713.6	708.9	704.3	700.2
S.F.	58464.7	50290.3	40599.3	40996.4	49751.5	52605.4	41717.5	42922.6	37038.5	47041.2	39873.5	50491.4
S.TEMP	538.21	537.75	538.63	538.50	536.43	534.39	534.76	534.11	534.43	532.28	532.11	529.48
MASS-FLX	14.7500	13.3833	11.9971	10.4812	8.6361	7.4144	6.1937	4.9852	3.6785	2.8441	1.2305	0.7907
QUALITY	0.96600	0.96849	0.97107	0.97376	0.97673	0.97913	0.98156	0.98388	0.98617	0.98798	0.99047	0.99339
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	919.9	792.5	673.6	555.4	429.2	343.8	268.5	203.3	143.4	85.0	26.3	17.8
*S.F.	87576.4	77784.8	68264.3	58252.6	46754.9	38876.2	31434.1	24599.4	17920.9	11488.3	3504.2	2432.6
*S.TEMP	606.31	608.52	610.96	613.76	617.08	620.54	623.85	627.09	630.35	633.70	636.99	639.96
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	9.0000	9.0500	9.1000	9.1500	9.2000	9.2500	9.3000	9.3500	9.4000	9.4500	9.5000	9.5500
NODE												
1	594.3264	592.4363	590.5779	588.7505	586.9546	585.1897	583.4563	581.7551	580.0854	578.4473	576.8396	575.2610
2	583.9321	582.2427	580.5796	578.9441	577.3379	575.7634	574.2219	572.7129	571.2332	569.7795	568.3513	566.9456
3	574.2217	572.7156	571.2290	569.7695	568.3435	566.9563	565.6040	564.2798	562.9768	561.6921	560.4233	559.1719
4	565.1479	563.8008	562.4695	561.1768	559.9329	558.7388	557.5757	556.4253	555.2600	554.1404	553.0083	551.8894
5	559.7861	558.5200	557.2744	556.0898	554.9722	553.9082	552.8582	551.7991	550.7317	549.6636	548.6001	547.5532
6	557.6492	556.4094	555.1946	554.0581	552.9958	551.9861	550.9763	549.9451	548.9004	547.8552	546.8147	545.7954
7	554.9729	553.7664	552.5928	551.5308	550.5479	549.6133	548.6494	547.6436	546.6226	545.6030	544.5906	543.6067
8	551.8330	550.6702	549.5527	548.6091	547.7380	546.8970	545.9683	544.9729	543.9709	542.9783	541.9971	541.0610
9	548.9441	547.8347	546.7764	545.9814	545.2222	544.4658	543.5376	542.5310	541.5417	540.5745	539.6213	538.7373
10	545.8879	544.8630	543.8743	543.2930	542.6484	541.9712	540.9937	539.9531	538.9797	538.0410	537.1182	536.3020
11	542.4553	541.5947	540.8851	540.4509	539.8975	539.2866	538.1582	537.0613	536.1252	535.2258	534.3376	533.6233
12	538.9592	538.3909	537.5378	537.8223	537.2537	536.6848	535.2629	534.1252	533.2717	532.4180	531.5642	530.9949
13	531.2908	531.7969	530.8860	532.8574	531.7563	531.2688	528.7646	527.7102	527.1860	526.4199	525.6333	525.5156
14	529.9521	530.7148	529.7439	532.1025	530.7991	530.3472	527.5894	526.6025	526.1528	525.3933	524.6174	524.5994
15	528.5994	529.6951	528.6030	531.4543	529.8269	529.4399	526.3547	525.4956	525.1367	524.3728	523.6060	523.7114
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	502.2568	505.8306	521.6409	544.1860	584.3757	631.5386	679.6421	729.1270	764.6899	786.0122	795.8357	803.6597
HB	1907.3	1455.4	6407.7	-1459.3	-649.6	-311.7	-303.0	-193.1	-148.4	-138.5	-131.8	-109.1
TSAT	502.3	501.6	501.4	500.9	500.7	500.3	499.9	499.7	499.3	498.9	498.5	498.4
HSAT	1907.3	1234.2	1535.3	627.3	1248.8	1115.0	1811.4	1560.0	1406.1	1455.3	1460.5	1230.6
P	694.8	690.8	689.2	686.5	684.9	682.7	680.4	678.7	676.4	674.1	671.5	671.1
S.F.	48929.2	34033.4	40919.2	18970.1	35764.4	31963.2	46645.1	39427.7	35630.2	36299.9	35944.9	30581.9
S.TEMP	527.91	529.22	528.03	531.19	529.32	528.99	525.70	524.94	524.63	523.86	523.10	523.28
MASS-FLX	0.5175	0.0202	4.3966	5.5550	7.4572	9.4806	10.0326	13.4984	14.8616	15.3052	13.9231	20.9437
QUALITY	0.99492	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	18.7	5.0	47.3	42.2	58.0	64.1	66.8	79.7	86.9	88.5	83.7	110.7
*S.F.	2613.7	690.6	6070.2	4543.9	3951.2	1686.6	-1567.9	-5534.9	-9499.9	-11309.1	-11534.6	-16067.9
*S.TEMP	642.19	643.96	644.91	645.86	646.65	647.78	649.24	651.09	653.12	655.05	656.69	658.19
*H.T.MODE	3	8	8	8	8	8	8	8	8	8	8	8

TIME--	9.6000	9.6500	9.7000	9.7500	9.8000	9.8500	9.9000	9.9500	10.0000	10.0500	10.1000	10.1500
NODE												
1	573.7112	572.1897	570.6948	569.2278	567.7878	566.3760	564.9924	563.6367	562.3081	561.0066	559.7312	558.4800
2	565.5632	564.2043	562.8711	561.5637	560.2839	559.0317	557.8069	556.6096	555.4368	554.2856	553.1541	552.0393
3	557.9395	556.7285	555.5442	554.3887	553.2632	552.1672	551.0989	550.0535	549.0256	548.0098	547.0029	546.0044
4	550.7898	549.7192	548.6799	547.6768	546.7075	545.7664	544.8501	543.9453	543.0464	542.1418	541.2349	540.3286
5	546.5327	545.5508	544.6064	543.7031	542.8328	541.9885	541.1633	540.3337	539.4998	538.6428	537.7803	536.9185
6	544.8052	543.8606	542.9561	542.0950	541.2659	540.4597	539.6687	538.8635	538.0510	537.2036	536.3545	535.5066
7	542.6594	541.7683	540.9177	540.1147	539.3401	538.5811	537.8328	537.0520	536.2607	535.4170	534.5825	533.7517
8	540.1707	539.3555	538.5742	537.8484	537.1384	536.4333	535.7322	534.9624	534.1912	533.3306	532.5149	531.7034
9	537.9077	537.1760	536.4622	535.8132	535.1609	534.5002	533.8372	533.0571	532.3000	531.3994	530.6125	529.8179
10	535.5449	534.9194	534.2727	533.7148	533.1143	532.4932	531.8655	531.0410	530.3035	529.3235	528.5957	527.8140
11	532.9570	532.4805	531.8921	531.4541	530.8899	530.3000	529.7043	528.7683	528.0793	526.9380	526.3538	525.5659
12	530.4255	530.1409	529.5713	529.2866	528.7170	528.1475	527.5779	526.4382	525.8684	524.4434	524.1582	523.3030
13	525.1343	525.3948	524.6919	524.8765	524.1270	523.5955	523.0771	521.1973	521.1975	518.7058	519.6851	518.3582
14	524.2400	524.6145	523.8550	524.1497	523.3362	522.8186	522.3105	520.2571	520.4211	517.6626	518.9780	517.4893
15	523.3616	523.8726	523.0171	523.4575	522.5420	522.0496	521.5500	519.2744	519.6768	516.5532	518.3403	516.5945
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	801.6873	797.0525	786.6802	772.8855	759.0271	748.3477	740.6931	734.8271	730.3071	726.5906	723.3770	719.6609
HB	-110.6	-91.5	-113.7	-93.8	-120.8	-120.1	-122.6	-170.2	-119.6	-200.1	-96.4	-162.2
TSAT	497.8	497.4	497.0	496.6	496.1	495.7	495.2	494.8	494.3	493.9	493.5	493.2
HSAT	1228.2	959.3	1174.4	882.0	1100.0	1047.6	1038.2	1533.5	1010.0	1908.1	806.1	1438.1
P	667.4	665.0	662.6	659.9	657.3	654.6	652.0	649.2	646.6	643.9	641.7	639.7
S.F.	30835.1	25039.0	30031.3	23426.7	28609.5	27220.7	26913.4	36765.8	25244.6	42140.2	19801.0	33020.5
S.TEMP	522.93	523.52	522.59	523.13	522.14	521.67	521.17	518.75	519.32	515.96	518.06	516.13
MASS-FLX	19.1489	21.6087	22.4202	23.8378	25.1974	26.1049	26.7236	27.6931	27.3714	27.8410	28.4523	29.5816
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	103.2	113.3	117.7	123.2	129.4	132.9	135.1	139.2	137.6	140.0	141.8	146.3
*S.F.	-14675.1	-15457.1	-14893.5	-13842.3	-12329.3	-11196.5	-10422.1	-9698.2	-8967.4	-8592.1	-8192.8	-7898.2
*S.TEMP	659.90	661.27	662.51	663.40	664.04	664.51	664.92	665.27	665.60	665.91	666.20	666.50
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	10.2000	10.2500	10.3000	10.3500	10.4000	10.4500	10.5000	10.5500	10.6000	10.6500	10.7000	10.7500
NODE												
1	557.2512	556.0449	554.8599	553.6960	552.5518	551.4270	550.3201	549.2302	548.1563	547.0967	546.0508	545.0181
2	550.9414	549.8594	548.7944	547.7468	546.7144	545.6970	544.6909	543.6948	542.7080	541.7312	540.7639	539.8047
3	545.0164	544.0415	543.0815	542.1372	541.2058	540.2810	539.3579	538.4365	537.5205	536.6125	535.7107	534.8123
4	539.4324	538.5520	537.6892	536.8435	536.0002	535.1497	534.2849	533.4189	532.5605	531.7122	530.8672	530.0154
5	536.0732	535.2505	534.4475	533.6609	532.8618	532.0405	531.1924	530.3525	529.5261	528.7144	527.8987	527.0637
6	534.6821	533.8833	533.1052	532.3435	531.5549	530.7378	529.8887	529.0586	528.2451	527.4487	526.6421	525.8081
7	532.9565	532.1907	531.4453	530.7139	529.9321	529.1138	528.2559	527.4414	526.6475	525.8718	525.0737	524.2344
8	530.9509	530.2295	529.5244	528.8291	528.0352	527.2024	526.3218	525.5405	524.7737	524.0264	523.2285	522.3684
9	529.1187	528.4419	527.7737	527.1113	526.2776	525.4216	524.5083	523.7834	523.0430	522.3245	521.5112	520.6172
10	527.1914	526.5635	525.9321	525.3015	524.3811	523.4966	522.5356	521.9177	521.1968	520.5115	519.6560	518.7063
11	525.0735	524.4907	523.8933	523.2949	522.1897	521.2876	520.2529	519.8572	519.1201	518.4795	517.5239	516.4861
12	523.0178	522.4478	521.8774	521.3069	519.8806	519.0247	517.8831	517.8831	517.0269	516.4558	515.3137	514.1711
13	518.8176	518.1042	517.5852	517.0693	514.4998	514.0708	512.5476	514.0068	512.4053	512.1387	510.2891	508.9370
14	518.1372	517.3572	516.8538	516.3472	513.5125	513.2329	511.6067	513.4182	511.5798	511.4138	509.3879	508.0203
15	517.5024	516.6060	516.1279	515.6306	512.4570	512.4126	510.6392	512.9131	510.7173	510.7065	508.4451	507.0837
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	715.1501	710.1345	704.5188	697.8738	691.6248	686.0400	679.9990	673.6016	666.1970	653.1250	644.5898	639.2454
HB	-105.1	-139.2	-135.7	-138.7	-224.2	-162.7	-209.0	-90.8	-207.9	-170.6	-257.8	-255.1
TSAT	492.8	492.5	492.1	491.7	491.4	491.1	490.7	490.4	490.0	489.6	489.3	488.8
HSAT	852.7	1136.6	1082.9	1076.8	1966.4	1352.8	1826.7	653.3	1596.4	1170.8	1886.7	1905.1
P	637.7	635.7	633.6	631.5	629.4	627.6	625.4	623.4	621.1	618.9	617.3	614.8
S.F.	20799.1	27000.9	25614.7	25328.2	40294.1	28310.8	35508.9	14604.0	32417.1	24359.9	35224.9	33837.7
S.TEMP	517.21	516.22	515.77	515.27	511.89	512.01	510.14	512.71	510.26	510.36	507.94	506.60
MASS-FLX	30.7087	31.4148	32.3948	33.5978	34.6796	35.0123	36.8652	37.7274	37.6892	40.1529	43.3178	42.3826
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	150.9	153.7	156.5	162.1	166.3	167.9	175.5	177.9	180.3	188.1	187.2	195.5
*S.F.	-7398.8	-6789.6	-6046.8	-5029.3	-4271.1	-3371.6	-2540.2	-1450.2	-215.2	1924.9	3748.9	4890.9
*S.TEMP	666.77	666.98	667.11	667.16	667.14	667.06	666.95	666.76	666.49	666.01	665.35	664.72
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	10.8000	10.8500	10.9000	10.9500	11.0000	11.0500	11.1000	11.1500	11.2000	11.2500	11.3000	11.3500
NODE												
1	543.9971	542.9868	541.9866	540.9956	540.0137	539.0432	538.0867	537.1487	536.2336	535.3455	534.4885	533.6660
2	538.8518	537.9038	536.9583	536.0188	535.0908	534.1833	533.3057	532.4666	531.6726	530.9265	530.2292	529.5808
3	533.9121	533.0078	532.1016	531.2053	530.3362	529.5132	528.7517	528.0593	527.4382	526.8850	526.3906	525.9490
4	529.1492	528.2688	527.3867	526.5366	525.7534	525.0649	524.4829	524.0010	523.6133	523.2974	523.0356	522.8176
5	526.2024	525.3213	524.4495	523.6472	522.9573	522.4072	521.9937	521.6912	521.4863	521.3403	521.2300	521.1545
6	524.9404	524.0540	523.1865	522.4155	521.7842	521.3145	520.9915	520.7793	520.6626	520.5518	520.5442	520.5278
7	523.3528	522.4556	521.5984	520.8860	520.3528	520.0100	519.8218	519.7341	519.7366	519.7585	519.7861	519.8416
8	521.4578	520.5457	519.7139	519.1145	518.7461	518.5996	518.6016	518.6746	518.8276	518.9487	519.0520	519.1885
9	519.6687	518.7427	517.9568	517.5183	517.3501	517.4277	517.6265	517.8491	518.1472	518.3372	518.4958	518.7065
10	517.7063	516.7732	516.0698	515.8816	515.9802	516.3396	516.7595	517.1306	517.5879	517.8135	518.0149	518.3108
11	515.4163	514.4985	513.9548	514.1907	514.6523	515.3804	516.0413	516.5435	517.1877	517.3694	517.6060	518.0186
12	513.0283	512.1711	511.8855	512.7427	513.5999	514.7424	515.5991	516.1702	517.0269	517.6269	517.3123	517.8831
13	507.6470	507.0791	507.6438	510.4121	512.0476	514.1758	515.2454	515.7793	517.2244	516.3535	516.9065	517.9587
14	506.7090	506.2158	506.9634	510.1282	511.8513	514.1602	515.2273	515.7351	517.3101	516.2102	516.8596	518.0093
15	505.7537	505.3618	506.3308	509.9663	511.7231	514.2280	515.2468	515.7100	517.4492	516.0334	516.8381	518.1006
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	633.3782	602.6013	595.1987	599.1204	607.8367	600.8884	576.7332	544.8416	518.0776	507.9927	514.0215	499.5779
HB	-268.7	-305.0	-230.1	-12.4	-23.6	62.3	31.6	-10.0	13085.8	990.7	-83.4	-252.2
TSAT	488.2	487.9	487.5	487.0	486.6	486.2	485.7	485.3	484.8	484.8	483.1	483.7
HSAT	2016.0	1749.0	1106.9	48.4	90.5	-191.8	-65.7	9.6	-212.1	252.1	-7.0	-136.2
P	611.1	609.5	607.2	604.6	602.3	599.8	597.4	594.7	592.4	592.0	582.7	586.4
S.F.	34423.9	29782.9	20519.5	1108.6	2268.0	-5395.2	-1939.5	291.7	-6939.0	7855.6	-235.2	-4687.3
S.TEMP	505.26	504.94	506.04	509.95	511.69	514.30	515.27	515.71	517.55	515.92	516.84	518.17
MASS-FLX	37.8660	43.7496	44.5870	43.7525	43.2380	43.1884	42.8978	44.5030	46.0740	56.8358	31.8698	55.0892
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	187.4	205.5	212.7	217.9	209.2	205.1	204.9	220.8	234.4	278.7	206.2	225.2
*S.F.	5461.7	11480.0	13979.5	13802.9	10979.2	11876.5	15532.5	24298.9	30569.3	40073.2	28264.2	31456.0
*S.TEMP	664.15	662.96	661.39	660.26	659.90	659.56	658.55	656.44	653.62	650.46	648.08	647.08
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	11.4000	11.4500	11.5000	11.5500	11.6000	11.6500	11.7000	11.7500	11.8000	11.8500	11.9000	11.9500
NODE												
1	532.8796	532.1311	531.4216	530.7527	530.1235	529.5339	528.9834	528.4695	527.9512	527.5464	527.1323	526.7463
2	528.9792	528.4241	527.9136	527.4453	527.0166	526.6257	526.2673	525.9399	525.6389	525.3589	525.0974	524.8533
3	525.5571	525.2131	524.9111	524.6472	524.4175	524.2161	524.0369	523.8765	523.7275	523.5845	523.4446	523.3123
4	522.6467	522.5198	522.4260	522.3594	522.3167	522.2874	522.2651	522.2437	522.2153	522.1729	522.1191	522.0728
5	521.1250	521.1353	521.1685	521.2153	521.2808	521.3440	521.4006	521.4473	521.4724	521.4663	521.4443	521.4446
6	520.5613	520.6294	520.7141	520.8064	520.9160	521.0122	521.0964	521.1660	521.2048	521.2051	521.1921	521.2146
7	519.9551	520.0950	520.2397	520.3833	520.5454	520.6738	520.7859	520.8765	520.9236	520.9209	520.9141	520.9690
8	519.4026	519.6230	519.8286	520.0210	520.2417	520.3899	520.5227	520.6265	520.6648	520.6409	520.6387	520.7485
9	519.0247	519.3110	519.5610	519.7893	520.0652	520.2068	520.3518	520.4573	520.4697	520.4092	520.4172	520.6052
10	518.7588	519.0977	519.3796	519.6355	519.9771	520.0747	520.2319	520.3276	520.2886	520.1736	520.2104	520.5239
11	518.6465	519.0015	519.2949	519.5693	520.0056	519.9768	520.1663	520.2314	520.0950	519.9001	520.0173	520.5496
12	518.7393	519.0247	519.3101	519.5952	520.1660	519.8806	520.1660	520.1660	519.8806	519.5955	519.8806	520.7366
13	519.4329	519.2395	519.5083	519.8142	520.8191	519.5203	520.3345	520.0361	519.2871	518.8279	519.7822	521.6140
14	519.6008	519.2678	519.5520	519.8613	520.9646	519.4128	520.3923	520.0032	519.1616	518.6833	519.8015	521.8264
15	519.8223	519.2839	519.6040	519.9194	521.1448	519.2544	520.4836	519.9592	519.0107	518.5271	519.8599	522.1042
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	504.6780	483.5964	481.9180	481.4116	480.9099	480.3608	479.8064	479.2693	478.7146	478.1870	477.6323	477.0906
HB	-636.7	2.7	-58.2	-61.7	-191.5	200.9	-114.4	53.8	158.7	148.5	-86.3	-273.5
TSAT	483.0	483.6	481.9	481.4	480.9	480.4	479.8	479.3	478.7	478.2	477.6	477.1
HSAT	-263.0	2.7	-58.2	-61.7	-191.5	200.9	-114.4	53.8	158.7	148.5	-86.3	-273.5
P	582.1	585.6	576.5	573.7	571.0	568.1	565.1	562.3	559.3	556.5	553.6	550.8
S.F.	-9730.5	96.4	-2194.0	-2378.1	-7726.3	7792.4	-4660.3	2187.3	6379.7	5977.1	-3648.0	-12360.3
S.TEMP	519.96	519.28	519.64	519.95	521.25	519.14	520.55	519.93	518.92	518.44	519.91	522.28
MASS-FLX	44.8253	42.4930	44.7625	43.0932	43.5436	43.8080	43.4091	43.0852	43.2135	43.0065	43.2758	42.3739
QUALITY	1.00000	0.99021	0.98603	0.97822	0.97133	0.96231	0.95226	0.93763	0.90951	0.88536	0.86369	0.84399
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	222.3	234.3	999.0	1446.2	1990.5	2494.8	3012.5	3501.7	3628.9	3648.5	3707.2	3644.7
*S.F.	30846.7	37823.3	142790.7	177698.8	208138.4	219390.1	219698.7	214351.4	198106.3	184044.3	174594.6	162503.3
*S.TEMP	646.15	644.05	624.89	604.32	585.55	568.38	552.86	540.53	533.40	528.75	524.76	521.72
*H.T.MODE	8	8	3	3	3	3	3	3	3	3	3	3

TIME--	12.0000	12.0500	12.1000	12.1500	12.2000	12.2500	12.3000	12.3500	12.4000	12.4500	12.5000	12.5500
NODE												
1	526.3872	526.0527	525.7407	525.4517	525.1829	524.9329	524.7014	524.4873	524.2900	524.1077	523.9390	523.7825
2	524.6255	524.4133	524.2173	524.0352	523.8672	523.7124	523.5708	523.4421	523.3254	523.2178	523.1167	523.0195
3	523.1907	523.0796	522.9785	522.8855	522.8018	522.7278	522.6631	522.6096	522.5615	522.5139	522.4614	522.4050
4	522.0405	522.0144	521.9912	521.9705	521.9592	521.9539	521.9573	521.9700	521.9771	521.9700	521.9421	521.9050
5	521.4658	521.4851	521.5027	521.5181	521.5476	521.5796	521.6230	521.6738	521.7056	521.7051	521.6724	521.6379
6	521.2598	521.2947	521.3267	521.3550	521.4036	521.4490	521.5098	521.5762	521.6121	521.6077	521.5664	521.5330
7	521.0461	521.0959	521.1433	521.1848	521.2583	521.3179	521.4004	521.4866	521.5195	521.5007	521.4402	521.4094
8	520.8657	520.9199	520.9810	521.0330	521.1426	521.2109	521.3247	521.4307	521.4417	521.3884	521.2937	521.2771
9	520.7559	520.7954	520.8694	520.9268	521.0825	521.1458	521.2979	521.4177	521.3821	521.2822	521.1479	521.1660
10	520.6951	520.6890	520.7852	520.8428	521.0713	521.1025	521.3164	521.4404	521.3162	521.1543	520.9719	521.0667
11	520.6934	520.5813	520.7344	520.7791	521.1372	521.0703	521.4070	521.5039	521.2083	520.9719	520.7354	520.9998
12	520.7366	520.4512	520.7363	520.7363	521.3069	521.0217	521.5923	521.5923	521.0217	520.7366	520.4512	521.0217
13	520.8201	520.0234	520.9084	520.6516	521.9792	520.7539	522.2942	521.7625	520.3137	520.1035	519.7224	521.4041
14	520.8040	519.9229	520.9705	520.6279	522.1392	520.6646	522.4673	521.7708	520.1438	519.9912	519.5886	521.5293
15	520.7537	519.7959	521.0674	520.5933	522.3477	520.5269	522.6990	521.7561	519.9207	519.8767	519.4443	521.7205
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	476.5239	475.9919	475.4009	474.7124	474.0862	473.4275	472.7961	472.1511	471.5024	470.8208	470.1606	469.4937
HB	77.0	127.7	-107.5	38.6	-193.8	149.2	-213.2	34.2	205.8	81.5	111.9	-179.1
TSAT	476.5	476.0	475.4	474.7	474.1	473.4	472.8	472.2	471.5	470.8	470.2	469.5
HSAT	77.0	127.7	-107.5	38.6	-193.8	149.2	-213.2	34.2	205.8	81.5	111.9	-179.1
P	547.8	545.1	542.0	538.5	535.3	531.9	528.7	525.4	522.2	518.8	515.5	512.2
S.F.	3403.1	5585.0	-4914.8	1771.3	-9377.5	7012.4	-10672.8	1695.4	9934.9	3992.4	5504.3	-9376.3
S.TEMP	520.71	519.72	521.14	520.57	522.48	520.43	522.85	521.73	519.78	519.82	519.37	521.85
MASS-FLX	43.3881	42.5988	42.7971	42.1607	40.5437	40.7900	39.6996	39.1105	38.1085	37.1514	36.5135	35.5799
QUALITY	0.82418	0.80588	0.78822	0.77292	0.76055	0.74907	0.73920	0.73058	0.72329	0.71692	0.71153	0.70685
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	3723.0	3670.8	3691.4	3622.0	3535.0	3511.6	3449.4	3388.6	3313.7	3249.6	3197.3	3130.0
*S.F.	157431.9	147766.9	142087.1	135047.3	128143.0	123923.1	118322.3	113564.0	108677.8	104187.8	100547.1	96738.2
*S.TEMP	518.83	516.34	514.02	512.09	510.44	508.79	507.22	505.72	504.34	502.95	501.75	500.49
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	12.6000	12.6500	12.7000	12.7500	12.8000	12.8500	12.9000	12.9500	13.0000	13.0500	13.1000	13.1500
NODE												
1	523.6365	523.5000	523.3728	523.2551	523.1465	523.0466	522.9558	522.8728	522.7983	522.7314	522.6714	522.6179
2	522.9263	522.8386	522.7573	522.6841	522.6201	522.5647	522.5164	522.4744	522.4397	522.4102	522.3845	522.3616
3	522.3484	522.2971	522.2551	522.2246	522.2043	522.1914	522.1824	522.1790	522.1799	522.1819	522.1831	522.1814
4	521.8733	521.8560	521.8545	521.8711	521.8975	521.9243	521.9485	521.9775	522.0100	522.0364	522.0535	522.0627
5	521.6221	521.6309	521.6628	521.7173	521.7722	521.8188	521.8564	521.9048	521.9541	521.9875	522.0061	522.0142
6	521.5269	521.5496	521.5996	521.6724	521.7383	521.7905	521.8311	521.8892	521.9448	521.9768	521.9917	521.9968
7	521.4204	521.4670	521.5420	521.6411	521.7178	521.7722	521.8127	521.8857	521.9475	521.9734	521.9802	521.9797
8	521.3206	521.4038	521.5149	521.6477	521.7263	521.7751	521.8105	521.9097	521.9739	521.9800	521.9714	521.9634
9	521.2529	521.3772	521.5259	521.6926	521.7563	521.7920	521.8186	521.9583	522.0134	521.9861	521.9612	521.9465
10	521.2146	521.3882	521.5796	521.7839	521.8030	521.8186	521.8347	522.0444	522.0676	521.9851	521.9451	521.9277
11	521.2258	521.4578	521.6970	521.9431	521.8557	521.8499	521.8557	522.2007	522.1287	521.9558	521.9155	521.9028
12	521.3069	521.5923	521.8774	522.1626	521.8772	521.8772	521.8772	522.4478	522.1626	521.8774	521.8774	521.8774
13	521.6331	522.0249	522.1977	522.7600	521.7466	521.9287	521.9182	523.2695	522.0569	521.5515	521.8008	521.8247
14	521.6958	522.1111	522.4983	522.8733	521.6890	521.9426	521.9238	523.4556	521.9941	521.4797	521.7971	521.8174
15	521.7625	522.2090	522.6091	522.9958	521.5903	521.9673	521.9299	523.6912	521.8831	521.3914	521.8052	521.8113
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	468.7151	467.8328	466.9614	466.0598	465.1956	464.3091	463.4072	462.5046	461.5945	460.6775	459.7893	458.9382
HB	-44.6	-72.8	-77.9	-82.9	90.8	-22.6	-2.7	-167.6	101.0	60.2	-12.9	3.4
TSAT	468.7	467.8	467.0	466.1	465.2	464.3	463.4	462.5	461.6	460.7	459.8	458.9
HSAT	-44.6	-72.8	-77.9	-82.9	90.8	-22.6	-2.7	-167.6	101.0	60.2	-12.9	3.4
P	508.3	504.0	499.8	495.4	491.3	487.0	482.8	478.5	474.3	470.0	465.9	462.0
S.F.	-2370.0	-3963.0	-4339.8	-4725.3	5112.7	-1302.2	-156.1	-10280.4	6078.9	3652.0	-800.4	213.8
S.TEMP	521.80	522.26	522.67	523.06	521.52	521.99	521.93	523.84	521.80	521.34	521.82	521.81
MASS-FLX	35.3755	33.7587	32.3185	31.8353	30.2921	29.5830	28.3881	27.2527	26.1209	24.9376	23.6289	23.3158
QUALITY	0.70230	0.69924	0.69753	0.69647	0.69675	0.69748	0.69928	0.70204	0.70571	0.71031	0.71594	0.72158
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	3120.4	3023.7	2929.0	2873.3	2775.6	2734.5	2658.3	2581.3	2507.3	2428.6	2338.6	2309.5
*S.F.	94584.0	90422.6	87068.9	84674.6	81268.3	79423.6	76727.3	74250.6	71943.6	69632.8	67129.9	66109.8
*S.TEMP	499.20	497.92	496.86	495.72	494.65	493.53	492.45	491.45	490.47	489.53	488.67	487.73
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	13.2000	13.2500	13.3000	13.3500	13.4000	13.4500	13.5000	13.5500	13.6000	13.6500	13.7000	13.7500
NODE												
1	522.5701	522.5264	522.4863	522.4490	522.4146	522.3826	522.3525	522.3245	522.2986	522.2744	522.2512	522.2297
2	522.3401	522.3186	522.2961	522.2737	522.2522	522.2319	522.2131	522.1956	522.1787	522.1621	522.1465	522.1326
3	522.1760	522.1663	522.1509	522.1353	522.1213	522.1113	522.1023	522.0928	522.0815	522.0693	522.0586	522.0535
4	522.0610	522.0498	522.0322	522.0208	522.0149	522.0166	522.0154	522.0107	522.0015	521.9905	521.9863	521.9944
5	522.0061	521.9873	521.9639	521.9578	521.9602	521.9731	521.9734	521.9697	521.9563	521.9448	521.9487	521.9734
6	521.9839	521.9602	521.9333	521.9333	521.9407	521.9592	521.9583	521.9534	521.9360	521.9253	521.9355	521.9712
7	521.9565	521.9243	521.8933	521.9065	521.9207	521.9495	521.9412	521.9338	521.9106	521.9021	521.9236	521.9773
8	521.9214	521.8777	521.8420	521.8857	521.9067	521.9507	521.9216	521.9126	521.8774	521.8757	521.9199	522.0034
9	521.8799	521.8267	521.7900	521.8818	521.9016	521.9641	521.8962	521.8923	521.8391	521.8535	521.9299	522.0491
10	521.8220	521.7634	521.7310	521.9053	521.9028	521.9954	521.8540	521.8728	521.7881	521.8372	521.9617	522.1267
11	521.7283	521.6807	521.6604	521.9873	521.9026	522.0581	521.7629	521.8591	521.7085	521.8372	522.0349	522.2590
12	521.5923	521.5923	521.5923	522.1626	521.8774	522.1626	521.5923	521.8774	521.5923	521.8774	522.1626	522.4478
13	521.1536	521.4172	521.4565	522.8442	521.6558	522.5361	520.9155	522.0811	521.1921	522.1255	522.5806	522.9851
14	521.0566	521.3989	521.4358	523.0085	521.5759	522.6306	520.7437	522.1570	521.0920	522.2007	522.6670	523.0894
15	520.9363	521.3923	521.4167	523.2231	521.4475	522.7593	520.5107	522.2822	520.9595	522.3132	522.7668	523.2056
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	458.0654	457.1885	456.3083	455.4209	454.5273	453.6287	452.7236	451.8105	450.9614	450.1731	449.3525	448.5322
HB	83.5	-5.4	9.3	-142.1	98.8	-87.8	159.8	-91.8	89.0	-77.0	-54.8	-61.1
TSAT	458.1	457.2	456.3	455.4	454.5	453.6	452.7	451.8	451.0	450.2	449.4	448.5
HSAT	83.5	-5.4	9.3	-142.1	98.8	-87.8	159.8	-91.8	89.0	-77.0	-54.8	-61.1
P	458.0	454.1	450.1	446.2	442.2	438.2	434.3	430.3	426.7	423.3	419.8	416.3
S.F.	5245.3	-348.6	606.5	-9653.9	6601.1	-6077.7	10807.1	-6480.6	6221.8	-5556.2	-4028.8	-4564.3
S.TEMP	520.86	521.40	521.41	523.36	521.35	522.84	520.36	522.37	520.87	522.39	522.82	523.27
MASS-FLX	23.0733	22.6754	22.4373	22.1588	21.8893	21.6152	21.3254	21.0462	20.4039	20.6483	20.6421	20.4620
QUALITY	0.72712	0.73280	0.73841	0.74392	0.74926	0.75438	0.75924	0.76386	0.76853	0.77226	0.77529	0.77794
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	2308.1	2287.5	2279.0	2269.2	2258.2	2246.9	2233.4	2220.8	2182.5	2195.3	2213.5	2203.7
*S.F.	65354.3	64094.4	63137.3	62115.5	61101.6	60100.2	59080.8	58142.3	56594.8	56236.0	55701.2	54674.9
*S.TEMP	486.56	485.38	484.19	482.97	481.76	480.56	479.36	478.17	477.05	475.95	474.68	473.51
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	13.8000	13.8500	13.9000	13.9500	14.0000	14.0500	14.1000	14.1500	14.2000	14.2500	14.3000	14.3500
NODE												
1	522.2104	522.1929	522.1770	522.1628	522.1501	522.1384	522.1274	522.1165	522.1055	522.0942	522.0833	522.0720
2	522.1213	522.1133	522.1069	522.1013	522.0952	522.0881	522.0793	522.0691	522.0581	522.0466	522.0349	522.0220
3	522.0544	522.0591	522.0613	522.0598	522.0557	522.0491	522.0386	522.0249	522.0117	521.9990	521.9854	521.9685
4	522.0144	522.0327	522.0376	522.0337	522.0254	522.0156	521.9968	521.9766	521.9604	521.9495	521.9333	521.9082
5	522.0115	522.0352	522.0313	522.0178	522.0044	521.9924	521.9636	521.9387	521.9241	521.9177	521.8970	521.8604
6	522.0190	522.0410	522.0286	522.0090	521.9937	521.9817	521.9456	521.9197	521.9075	521.9043	521.8782	521.8345
7	522.0386	522.0527	522.0215	521.9946	521.9778	521.9666	521.9165	521.8921	521.8870	521.8892	521.8511	521.7954
8	522.0808	522.0703	522.0029	521.9709	521.9563	521.9475	521.8689	521.8562	521.8650	521.8750	521.8108	521.7368
9	522.1379	522.0816	522.9673	521.9417	521.9343	521.9294	521.8069	521.8230	521.8494	521.8665	521.7583	521.6665
10	522.2178	522.0747	522.9014	521.9075	521.9116	521.9111	521.7139	521.7969	521.8430	521.8638	521.6785	521.5745
11	522.3274	522.0200	522.7771	521.8752	521.8906	521.8926	521.5537	521.7993	521.8523	521.8679	521.5359	521.4473
12	522.4478	521.8774	522.5923	521.8774	521.8774	521.8774	521.3071	521.8774	521.8774	521.8774	521.3071	521.3071
13	522.6807	521.2556	522.0586	522.0498	521.8506	521.8464	520.4812	522.3706	521.9250	521.8933	520.5176	521.0320
14	522.7090	521.1008	522.9619	522.1160	521.8374	521.8403	520.2942	522.5210	521.9163	521.8950	520.3359	521.0051
15	522.7219	520.8938	522.8655	522.2197	521.8174	521.8364	520.0596	522.7463	521.8875	521.8970	520.1060	521.0029
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	447.7080	446.8767	446.0410	445.1995	444.3525	443.4998	442.6777	441.8643	441.0415	440.2231	439.3948	438.5686
HB	1.6	127.2	45.4	-68.4	15.7	1.7	133.6	-136.8	25.5	-0.7	126.0	-12.6
TSAT	447.7	446.9	446.0	445.2	444.4	443.5	442.7	441.9	441.0	440.2	439.4	438.6
HSAT	1.6	127.2	45.4	-68.4	15.7	1.7	133.6	-136.8	25.5	-0.7	126.0	-12.6
P	412.9	409.4	405.9	402.5	399.0	395.5	392.2	388.9	385.7	382.4	379.2	375.9
S.F.	120.9	9396.1	3398.3	-5273.3	1219.6	133.6	10322.0	-11084.5	2060.7	-59.8	10153.4	-1042.9
S.TEMP	522.72	520.76	520.82	522.29	521.80	521.83	519.91	522.90	521.86	521.90	519.96	521.02
MASS-FLX	20.3768	20.2563	20.1477	20.0414	19.9344	19.8297	19.5514	19.4818	19.6184	19.5315	19.5058	19.4017
QUALITY	0.78008	0.78174	0.78292	0.78363	0.78393	0.78384	0.78360	0.78291	0.78170	0.78024	0.77858	0.77673
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	2203.4	2200.2	2197.0	2194.1	2190.7	2187.2	2171.1	2185.5	2175.5	2183.3	2175.3	2181.9
*S.F.	53916.1	53118.7	52359.2	51631.5	50921.9	50238.2	49299.4	48915.1	48169.7	47646.3	46976.2	46466.8
*S.TEMP	472.34	471.19	470.04	468.90	467.77	466.64	465.54	464.39	463.31	462.21	461.11	460.03
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	14.4000	14.4500	14.5000	14.5500	14.6000	14.6500	14.7000	14.7500	14.8000	14.8500	14.9000	14.9500
NODE												
1	522.0601	522.0469	522.0325	522.0166	521.9988	521.9790	521.9578	521.9341	521.9087	521.8809	521.8491	521.8130
2	522.0068	521.9893	521.9688	521.9453	521.9185	521.8899	521.8589	521.8259	521.7898	521.7485	521.7002	521.6416
3	521.9475	521.9211	521.8899	521.8545	521.8169	521.7781	521.7385	521.6956	521.6460	521.5859	521.5112	521.4177
4	521.8760	521.8354	521.7891	521.7400	521.6912	521.6443	521.5972	521.5425	521.4719	521.3826	521.2666	521.1187
5	521.8171	521.7646	521.7058	521.6482	521.5938	521.5452	521.4924	521.4272	521.3350	521.2170	521.0601	520.8613
6	521.7861	521.7263	521.6624	521.6013	521.5464	521.4976	521.4417	521.3699	521.2639	521.1296	520.9492	520.7231
7	521.7400	521.6704	521.5996	521.5356	521.4805	521.4338	521.3738	521.2898	521.1609	521.0020	520.7847	520.5176
8	521.6746	521.5891	521.5110	521.4470	521.3953	521.3545	521.2839	521.1802	521.0112	520.8169	520.5408	520.2153
9	521.6025	521.4983	521.4160	521.3567	521.3118	521.2773	521.1909	521.0603	520.8406	520.6101	520.2625	519.8745
10	521.5164	521.3828	521.3032	521.2542	521.2202	521.1953	521.0784	520.9104	520.6167	520.3496	519.8999	519.4419
11	521.4116	521.2227	521.1638	521.1357	521.1182	521.1055	520.9268	520.7041	520.2949	519.9998	519.3870	518.8564
12	521.3071	521.0217	521.0217	521.0217	521.0217	521.0217	520.7366	520.4512	519.8806	519.5955	518.7393	518.1685
13	521.1008	520.4558	520.7427	520.7961	520.8320	520.8557	520.1931	519.7839	518.7268	518.6306	516.9551	516.4771
14	521.0698	520.3384	520.7058	520.7607	520.8015	520.8293	520.0786	519.6584	518.4961	518.4678	516.5994	516.1790
15	521.0420	520.1992	520.6853	520.7290	520.7744	520.8052	519.9412	519.5232	518.2324	518.3086	516.1873	515.8755
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	437.7314	436.8950	436.0496	435.2021	434.3552	433.5083	432.6597	431.8101	430.9521	430.0959	429.2251	428.3640
HB	10.8	70.2	1.6	12.2	10.2	9.2	66.4	59.3	122.7	61.1	193.7	123.9
TSAT	437.7	436.9	436.0	435.2	434.4	433.5	432.7	431.8	431.0	430.1	429.2	428.4
HSAT	10.8	70.2	1.6	12.2	10.2	9.2	66.4	59.3	122.7	61.1	193.7	123.9
P	372.7	369.5	366.2	363.0	359.8	356.6	353.4	350.3	347.1	344.0	340.9	337.8
S.F.	903.2	5843.1	135.0	1045.7	885.5	801.7	5791.6	5196.4	10686.8	5382.0	16796.8	10821.2
S.TEMP	521.03	520.12	520.68	520.71	520.76	520.79	519.86	519.45	518.08	518.23	515.95	515.72
MASS-FLX	19.3888	19.2915	19.2760	19.1845	19.0773	18.9194	18.7571	18.5246	18.3546	18.1051	17.9106	17.5702
QUALITY	0.77470	0.77251	0.77024	0.76786	0.76558	0.76332	0.76132	0.75951	0.75799	0.75678	0.75591	0.75549
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	2172.7	2179.7	2170.7	2177.5	2162.8	2160.6	2141.2	2135.5	2113.0	2105.6	2084.0	2073.2
*S.F.	45854.0	45354.8	44813.0	44322.5	43773.0	43127.8	42565.7	41985.0	41380.2	40899.3	40290.7	39861.8
*S.TEMP	458.94	457.87	456.79	455.73	454.66	453.64	452.62	451.64	450.66	449.69	448.73	447.76
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	15.0000	15.0500	15.1000	15.1500	15.2000	15.2500	15.3000	15.3500	15.4000	15.4500	15.5000	15.5500
NODE												
1	521.7708	521.7209	521.6628	521.5952	521.5161	521.4238	521.3147	521.1848	521.0283	520.8376	520.6018	520.3091
2	521.5708	521.4861	521.3865	521.2712	521.1367	520.9783	520.7874	520.5562	520.2710	519.9133	519.4592	518.8850
3	521.3013	521.1643	521.0081	520.8313	520.6235	520.3716	520.0623	519.6807	519.2014	518.5840	517.7854	516.7788
4	520.9346	520.7292	520.5051	520.2529	519.9463	519.5601	519.0786	518.4788	517.7122	516.6992	515.3782	513.7495
5	520.6172	520.3616	520.0908	519.7800	519.3848	518.8721	518.2349	517.4380	516.4036	515.0110	513.2012	511.0391
6	520.4463	520.1697	519.8782	519.5376	519.0901	518.5054	517.7822	516.8779	515.6914	514.0786	511.9937	509.5527
7	520.1929	519.8931	519.5759	519.1904	518.6606	517.9644	517.1152	516.0498	514.6296	512.6753	510.1799	507.3521
8	519.8218	519.5095	519.1599	518.7051	518.0398	517.1721	516.1414	514.8379	513.0564	510.5686	507.4712	504.1455
9	519.4060	519.1082	518.7214	518.1792	517.3423	516.2776	515.0532	513.4773	511.2644	508.1404	504.3823	500.5947
10	518.8796	518.6440	518.1968	517.5276	516.4443	515.1274	513.6741	511.7400	508.9363	504.9490	500.3806	496.1416
11	518.1655	518.1028	517.5234	516.6521	515.1831	513.5356	511.8071	509.3523	505.6616	500.4058	494.8232	490.2366
12	517.3123	517.5977	516.7412	515.5989	513.5996	511.5991	509.5981	506.4512	501.5820	494.7002	488.0979	483.5000
13	515.1252	516.7776	514.6936	512.8459	509.2896	506.5898	504.0471	498.8418	490.5935	479.2407	470.7168	467.2673
14	514.7131	516.7019	514.2773	512.3220	508.4460	505.6614	503.0361	497.3923	488.4736	476.2693	467.5366	464.4690
15	514.2622	516.7002	513.7896	511.7463	507.4915	504.6643	501.9629	495.7881	486.1023	472.9548	464.1414	461.6465
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	427.4810	426.5972	425.7236	424.8645	423.9988	423.1472	422.2937	421.4187	420.5334	419.6465	418.7505	417.8484
HB	202.3	-32.4	232.4	258.2	458.9	465.9	507.1	851.0	1445.3	2503.4	2882.2	2316.7
TSAT	427.5	426.6	425.7	424.9	424.0	423.1	422.3	421.4	420.5	419.6	418.8	417.8
HSAT	202.3	-32.4	232.4	258.2	458.9	465.9	507.1	851.0	1445.3	2503.4	2882.2	2316.7
P	334.6	331.5	328.4	325.4	322.4	319.5	316.5	313.6	310.6	307.6	304.6	301.6
S.F.	17504.3	-2923.2	20395.8	22351.4	38064.7	37729.1	40113.0	62526.7	92849.8	128823.0	125595.7	98166.8
S.TEMP	514.01	516.74	513.50	511.43	506.95	504.13	501.39	494.90	484.77	471.10	462.33	460.22
MASS-FLX	17.2669	17.3512	16.8653	16.6648	16.6591	16.2704	16.1415	16.1020	15.7988	15.6029	15.3856	15.1721
QUALITY	0.75545	0.75548	0.75627	0.75728	0.75840	0.76002	0.76176	0.76362	0.76597	0.76855	0.77140	0.77450
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	2044.8	2050.6	2015.1	2014.0	2001.8	1986.8	1966.6	1970.2	1947.0	1933.9	1920.0	1905.7
*S.F.	39172.9	39150.2	38352.0	38133.5	37773.6	37297.5	36805.0	36726.5	36216.7	35913.9	35600.4	35298.7
*S.TEMP	446.81	445.87	444.92	443.96	443.04	442.08	441.18	440.24	439.31	438.40	437.47	436.55
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	15.6000	15.6500	15.7000	15.7500	15.8000	15.8500	15.9000	15.9500	16.0000	16.0500	16.1000	16.1500
NODE												
1	519.9451	519.4978	518.9597	518.3252	517.5916	516.7615	515.8391	514.8291	513.7405	512.5808	511.3574	510.0796
2	518.1750	517.3267	516.3452	515.2427	514.0352	512.7397	511.3733	509.9514	508.4883	506.9944	505.4800	503.9507
3	515.5691	514.1851	512.6648	511.0413	509.3496	507.6174	505.8672	504.1157	502.3760	500.6543	498.9541	497.2754
4	511.8843	509.8694	507.7773	505.6543	503.5393	501.4614	499.4392	497.4771	495.5801	493.7458	491.9666	490.2275
5	508.6770	506.2463	503.8232	501.4387	499.1296	496.9177	494.8079	492.7920	490.8708	489.0303	487.2546	485.5203
6	506.9595	504.3555	501.8064	499.3281	496.9580	494.7119	492.5864	490.5669	488.6528	486.8232	485.0593	483.3306
7	504.4729	501.6824	499.0132	496.4539	494.0466	491.7971	489.6870	487.6921	485.8125	484.0178	482.2830	480.5728
8	500.9724	498.0376	495.3015	492.7085	490.3262	488.1350	486.0952	484.1694	482.3691	480.6416	478.9604	477.2791
9	497.2358	494.2600	491.5313	488.9553	486.6565	484.5701	482.6311	480.7957	479.0957	477.4436	475.8203	474.1624
10	492.7231	489.8123	487.1563	484.6370	482.4927	480.5637	478.7605	477.0383	475.4709	473.9023	472.3411	470.6953
11	487.0310	484.3533	481.8530	479.4329	477.5679	475.8677	474.2417	472.6592	471.2761	469.7898	468.2913	466.6262
12	480.9106	478.6069	476.3022	473.9963	472.5544	471.1121	469.6689	468.2256	467.0706	465.6260	464.1809	462.4465
13	467.1194	465.7390	463.8181	461.7310	461.6580	460.7302	459.6489	458.4797	457.9558	456.4141	455.0706	453.0149
14	464.8491	463.5759	461.7007	459.6448	459.8713	458.9983	457.9714	456.8440	456.4470	454.8530	453.5339	451.4001
15	462.6626	461.4360	459.5818	457.5503	458.1489	457.2891	456.3086	455.2190	454.9722	453.2839	451.9980	449.7600
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	416.9719	416.1157	415.2432	414.3674	413.4832	412.5935	411.6963	410.7925	409.8813	408.9629	408.0640	407.1787
HB	1621.6	1662.4	1699.9	1730.7	1303.1	1333.5	1302.0	1280.8	1121.9	1256.1	1228.4	1381.3
TSAT	417.0	416.1	415.2	414.4	413.5	412.6	411.7	410.8	409.9	409.0	408.1	407.2
HSAT	1621.6	1662.4	1699.9	1730.7	1303.1	1333.5	1302.0	1280.8	1121.9	1256.1	1228.4	1381.3
P	298.8	296.0	293.2	290.4	287.6	284.8	281.9	279.1	276.3	273.5	270.8	268.1
S.F.	72386.6	73564.2	73553.9	72900.6	57122.6	58466.1	57006.9	55858.1	49772.2	54671.6	53019.3	57653.6
S.TEMP	461.61	460.37	458.51	456.49	457.32	456.44	455.48	454.41	454.25	452.49	451.22	448.92
MASS-FLX	14.8689	14.8235	14.6384	14.4636	14.2882	14.1022	13.9359	13.7654	13.5989	13.4327	13.2052	13.1490
QUALITY	0.77794	0.78132	0.78486	0.78859	0.79247	0.79653	0.80070	0.80501	0.80945	0.81402	0.81881	0.82349
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)												
*HB	1883.5	1882.2	1873.6	1862.1	1852.0	1838.7	1828.7	1817.7	1807.0	1796.2	1779.0	1777.0
*S.F.	34852.1	34728.8	34457.2	34176.6	33932.3	33658.6	33448.1	33232.1	33033.1	32842.6	32539.0	32467.3
*S.TEMP	435.65	434.74	433.81	432.90	431.98	431.08	430.17	429.26	428.34	427.43	426.53	425.63
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	16.2000	16.2500	16.3000	16.3500	16.4000	16.4500	16.5000	16.5500	16.6000	16.6500	16.7000	16.7500
NODE												
1	508.7544	507.3894	505.9897	504.5608	503.1077	501.6340	500.1421	498.6326	497.1074	495.5669	494.0110	492.4434
2	502.4116	500.8659	499.3181	497.7661	496.2119	494.6538	493.0906	491.5178	489.9326	488.3352	486.7273	485.1196
3	495.6157	493.9761	492.3538	490.7439	489.1428	487.5432	485.9402	484.3240	482.6907	481.0437	479.3965	477.7771
4	488.5273	486.8616	485.2251	483.6040	481.9912	480.3730	478.7429	477.0857	475.4009	473.7058	472.0398	470.4607
5	483.8284	482.1760	480.5549	478.9399	477.3284	475.6963	474.0439	472.3474	470.6172	468.8914	467.2383	465.7424
6	481.6477	480.0049	478.3936	476.7778	475.1628	473.5176	471.8472	470.1216	468.3621	466.6208	464.9839	463.5527
7	478.9121	477.2917	475.6982	474.0833	472.4678	470.8027	469.1096	467.3413	465.5444	463.7935	462.2014	460.8904
8	475.6606	474.0786	472.5161	470.8958	469.2820	467.5820	465.8596	464.0259	462.1858	460.4443	458.9551	457.8604
9	472.5969	471.0559	469.5249	467.8850	466.2744	464.5232	462.7715	460.8555	458.9800	457.2751	455.9407	455.1304
10	469.2046	467.7080	466.2092	464.5176	462.9172	461.0762	459.2942	457.2507	455.3506	453.7258	452.6411	452.2502
11	465.2622	463.8071	462.3376	460.5256	458.9648	456.9470	455.1514	452.8865	451.0071	449.5564	448.9104	449.1848
12	461.2896	459.8430	458.3960	456.3691	454.9211	452.6025	450.8630	448.2527	446.5110	445.3501	445.3501	446.5112
13	452.6228	451.0134	449.6069	446.7839	445.9126	442.4456	441.1675	437.3154	436.3779	436.1599	438.1858	441.8616
14	451.1958	449.5144	448.1230	445.1191	444.4143	440.6653	439.5435	435.3965	434.6982	434.6619	437.1003	441.2456
15	449.8059	448.0029	446.6357	443.3984	442.9382	438.8047	437.9312	433.3870	433.0464	433.2100	436.1379	440.7988
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	406.2783	405.3733	404.4602	403.5396	402.6125	401.6772	400.7346	399.7837	398.6689	397.2627	396.1917	395.1194
HB	1084.1	1260.4	1239.8	1575.9	1257.7	1853.7	1504.3	2222.2	1646.6	1362.5	719.9	203.0
TSAT	406.3	405.4	404.5	403.5	402.6	401.7	400.7	399.8	398.7	397.3	396.2	395.1
HSAT	1084.1	1260.4	1239.8	1575.9	1257.7	1853.7	1504.3	2222.2	1646.6	1362.5	719.9	203.0
P	265.4	262.8	260.1	257.4	254.7	252.0	249.3	246.7	243.5	239.6	236.7	233.8
S.F.	46452.7	52758.6	51359.5	61397.3	49799.5	67003.5	54746.4	72312.5	55266.4	48016.5	28455.7	9246.0
S.TEMP	449.13	447.23	445.89	442.50	442.21	437.82	437.13	432.32	432.23	432.50	435.72	440.66
MASS-FLX	12.9954	12.8516	12.7140	12.5606	12.4191	12.2762	12.1325	11.9902	10.7320	4.4094	1.0244	1.5517
QUALITY	0.82827	0.83316	0.83813	0.84322	0.84840	0.85369	0.85910	0.86463	0.87191	0.88837	0.89885	0.92244
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	1768.5	1757.7	1749.1	1738.1	1727.3	1716.7	1705.3	1693.7	1626.1	948.8	62.6	320.3
*S.F.	32277.2	32080.7	31930.2	31754.1	31598.8	31454.4	31311.2	31176.2	30246.4	19721.3	1633.9	9103.4
*S.TEMP	424.71	423.81	422.90	421.99	421.09	420.19	419.28	418.38	417.53	418.23	422.35	423.67
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	16.8000	16.8500	16.9000	16.9500	17.0000	17.0500	17.1000	17.1500	17.2000	17.2500	17.3000	17.3500
NODE												
1	490.8677	489.2913	487.7224	486.1692	484.6367	483.1257	481.6367	480.1677	478.7188	477.2898	475.8833	474.5037
2	483.5259	481.9644	480.4487	478.9822	477.5591	476.1665	474.7932	473.4331	472.0864	470.7629	469.4739	468.2314
3	476.2178	474.7458	473.3687	472.0662	470.8030	469.5454	468.2786	467.0068	465.7490	464.5332	463.3870	462.3235
4	469.0220	467.7478	466.6089	465.5303	464.4321	463.2764	462.0706	460.8523	459.6768	458.5981	457.6533	456.8325
5	464.4653	463.4075	462.4834	461.5579	460.5259	459.3762	458.1621	456.9617	455.8569	454.9150	454.1663	453.5532
6	462.3845	461.4575	460.6467	459.7791	458.7458	457.5698	456.3359	455.1428	454.0854	453.2324	452.6038	452.1028
7	459.9021	459.1724	458.5088	457.6890	456.6172	455.3804	454.1125	452.9382	451.9644	451.2551	450.8069	450.4546
8	457.1614	456.7139	456.2170	455.3892	454.1921	452.8398	451.5293	450.4080	449.5854	449.1079	448.9250	448.7498
9	454.7734	454.6221	454.2454	453.3179	451.9167	450.4294	449.0974	448.0718	447.4541	447.2581	447.3689	447.3376
10	452.3508	452.5437	452.2219	451.0466	449.3162	447.6721	446.3604	445.5107	445.2036	445.3967	445.8787	445.9495
11	449.9204	450.4958	450.0518	448.3293	446.0693	444.2944	443.1165	442.6045	442.8013	443.5645	444.5254	444.5576
12	447.9624	448.8333	447.9622	445.3491	442.4448	440.7017	439.8296	439.8296	440.7014	442.1545	443.6074	443.3169
13	444.9365	446.0410	443.2307	437.7415	433.3420	432.3738	432.6616	434.2402	437.0210	440.2285	442.6707	440.6458
14	444.5610	445.6299	442.3596	436.3032	431.7021	430.9888	431.5125	433.3958	436.5295	440.0369	442.6104	440.1375
15	444.3176	445.2705	441.3979	434.6921	429.9478	429.6226	430.4187	432.6458	436.1682	439.9788	442.6455	439.5576
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	394.0608	392.8596	396.0151	407.5991	419.8606	425.9944	427.0549	427.7295	428.5308	429.2476	429.6208	430.3618
HB	77.2	207.4	819.8	2357.5	6994.7	15470.8	12412.5	4834.9	1034.9	-244.8	-333.5	2603.6
TSAT	394.1	392.9	391.5	390.4	389.0	387.7	385.8	383.4	381.0	378.3	375.6	373.2
HSAT	77.2	207.4	745.5	1421.8	1600.7	1107.7	799.7	453.9	141.4	-42.7	-65.1	349.6
P	231.0	227.8	224.4	221.3	217.9	214.5	209.7	204.0	198.1	191.8	185.7	180.4
S.F.	3873.2	10838.7	36762.4	61737.5	63973.6	45705.9	35292.1	22188.0	7785.5	-2636.3	-4364.6	23061.7
S.TEMP	444.26	445.11	440.86	433.79	429.01	428.95	429.90	432.32	436.05	440.02	442.71	439.22
MASS-FLX	4.0460	6.4821	11.3682	15.0541	19.0740	22.8220	27.7830	34.8479	41.3717	46.9014	51.5937	54.5806
QUALITY	0.97019	0.99573	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	509.3	136.5	61.7	78.0	94.0	108.3	124.3	149.3	171.6	189.7	207.2	213.8
*S.F.	14621.6	4263.2	1958.6	1739.1	934.8	354.8	255.9	289.4	248.5	216.2	162.6	21.5
*S.TEMP	422.98	424.31	426.00	427.04	427.84	428.54	429.09	429.50	429.82	430.09	430.34	430.55
*H.T.MODE	3	3	8	8	8	8	8	8	8	8	8	8

TIME--	17.4000	17.4500	17.5000	17.5500	17.6000	17.6500	17.7000	17.7500	17.8000	17.8500	17.9000	17.9500
NODE												
1	473.1563	471.8428	470.5649	469.3188	468.1013	466.9087	465.7385	464.5906	463.4651	462.3640	461.2925	460.2546
2	467.0408	465.8960	464.7864	463.6973	462.6196	461.5498	460.4897	459.4465	458.4302	457.4502	456.5161	455.6350
3	461.3313	460.3787	459.4324	458.4714	457.4917	456.5034	455.5244	454.5747	453.6743	452.8389	452.0779	451.3933
4	456.0776	455.3127	454.4866	453.5891	452.6487	451.7036	450.7939	449.9509	449.2012	448.5574	448.0203	447.5813
5	452.9622	452.2813	451.4678	450.5503	449.5964	448.6682	447.8179	447.0754	446.4675	445.9941	445.6436	445.3936
6	451.5811	450.9124	450.0732	449.1226	448.1543	447.2368	446.4268	445.7473	445.2249	444.8506	444.6033	444.4514
7	450.0012	449.3105	448.4045	447.3936	446.4058	445.5125	444.7715	444.1904	443.7954	443.4517	443.4260	
8	448.3262	447.5330	446.4880	445.3828	444.3855	443.5496	442.9285	442.4973	442.2898	442.2422	442.3120	442.4353
9	446.8689	445.8899	444.6641	443.4680	442.4929	441.7480	441.2825	441.0237	441.0283	441.1753	441.4192	441.6775
10	445.3174	444.0178	442.5476	441.2693	440.3755	439.7810	439.5435	439.5095	439.7930	440.1699	440.6106	441.0044
11	443.5161	441.6577	439.8777	438.5806	437.9023	437.5647	437.6836	437.9495	438.6287	439.2720	439.9368	440.4536
12	441.5730	438.9565	436.9209	435.7571	435.4661	435.4661	436.0481	436.6301	437.7937	438.6663	439.5388	440.1201
13	436.5815	431.8875	429.6877	429.3342	430.3713	431.2361	433.1179	434.3391	436.8416	437.9937	439.2847	439.8125
14	435.6228	430.5686	428.4353	428.2825	429.5869	430.5862	432.7146	434.0146	436.7815	437.9282	439.2908	439.7825
15	434.5313	429.1089	427.1460	427.2598	428.8757	429.9927	432.4031	433.7490	436.8242	437.9072	439.3479	439.7717
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	430.1982	430.1467	429.8027	431.7043	431.8230	431.5989	431.1582	430.7397	430.0474	429.5081	428.9829	428.2786
HB	11421.2	-29773.9	-13570.9	-6825.0	-6620.3	-9762.7	6579.6	2489.0	-743.7	-69.0	-346.2	-12.7
TSAT	370.4	367.7	365.0	363.8	362.8	361.2	359.6	358.0	356.4	354.7	353.0	351.3
HSAT	667.8	908.1	733.6	535.5	328.9	267.5	102.7	95.5	-63.3	-7.0	-41.7	-1.7
P	174.3	168.6	163.0	160.5	158.5	155.4	152.3	149.2	146.2	143.0	139.9	136.9
S.F.	42383.2	54990.2	45079.5	33733.6	21625.7	18319.4	7466.4	7225.2	-5096.0	-580.4	-3606.7	-146.0
S.TEMP	433.91	428.30	420.48	426.76	428.56	429.72	432.29	433.64	436.90	437.92	439.40	439.77
MASS-FLX	57.4907	59.7514	61.6383	57.2470	51.3117	48.0753	44.6042	41.2163	37.5988	33.7143	29.5296	24.7981
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	223.0	229.3	233.7	223.4	202.1	190.7	179.6	169.7	156.8	142.4	127.8	113.5
*S.F.	100.8	166.9	208.3	-91.5	-133.9	-54.5	29.5	93.8	218.0	282.1	318.9	358.1
*S.TEMP	430.73	430.87	430.98	431.10	431.26	431.37	431.45	431.50	431.54	431.56	431.59	431.60
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	18.0000	18.0500	18.1000	18.1500	18.2000	18.2500	18.3000	18.3500	18.4000	18.4500	18.5000	18.5500
NODE												
1	459.2546	458.2959	457.3813	456.5120	455.6875	454.9094	454.1768	453.4885	452.8440	452.2419	451.6804	451.1575
2	454.8108	454.0430	453.3284	452.6646	452.0479	451.4763	450.9475	450.4597	450.0107	449.5964	449.2151	448.8638
3	450.7832	450.2363	449.7419	449.2925	448.8833	448.5132	448.1807	447.8835	447.6167	447.3745	447.1553	446.9553
4	447.2197	446.9133	446.6409	446.3992	446.1873	446.0081	445.8606	445.7402	445.6392	445.5481	445.4688	445.3965
5	445.2102	445.0608	444.9221	444.8040	444.7097	444.6477	444.6140	444.6016	444.5947	444.5842	444.5833	444.5786
6	444.3550	444.2759	444.1941	444.1304	444.0894	444.0815	444.1001	444.1362	444.1694	444.1904	444.2234	444.2456
7	443.4343	443.4338	443.4102	443.4080	443.4280	443.4858	443.5654	443.6555	443.7310	443.7820	443.8538	443.9011
8	442.5557	442.6272	442.6516	442.7156	442.8020	442.9355	443.0808	443.2273	443.3372	443.4087	443.5247	443.5881
9	441.8860	442.0015	442.0510	442.1802	442.3242	442.5320	442.7334	442.9250	443.0525	443.1294	443.2935	443.3555
10	441.2869	441.4199	441.4763	441.6904	441.8958	442.1934	442.4482	442.6814	442.8081	442.8770	443.1116	443.1443
11	440.7727	440.8718	440.9089	441.2642	441.5293	441.9504	442.2449	442.5129	442.6021	442.6426	443.0068	442.9399
12	440.4109	440.4109	440.4109	440.9924	441.2830	441.8643	442.1548	442.4456	442.4456	442.4456	443.0266	442.7361
13	439.8643	439.4834	439.4084	440.8086	440.9680	442.0520	442.1533	442.4900	442.1292	442.0488	443.4275	442.1445
14	439.7781	439.3198	439.2441	440.8311	440.9233	442.1235	442.1572	442.5107	442.0642	441.9814	443.5439	442.0012
15	439.6953	439.1453	439.0833	440.9106	440.8843	442.2366	442.1628	442.5432	441.9866	441.9141	443.7144	441.8071
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	427.1943	425.7520	425.4551	424.8667	483.1694	573.3796	579.0037	571.4351	551.6714	530.7415	523.6860	519.0659
HB	229.7	487.5	402.6	-300.6	-32.0	41.0	0.6	11.9	-29.9	-26.3	97.8	-113.4
TSAT	349.5	347.7	346.6	345.9	345.1	344.4	343.5	343.1	342.1	341.3	340.6	339.8
HSAT	31.7	70.9	59.0	-50.9	14.1	-54.9	-0.9	-15.5	32.9	23.3	-75.7	86.1
P	133.7	130.6	128.8	127.5	126.3	125.2	123.7	122.9	121.4	120.1	119.0	117.7
S.F.	2862.1	6482.8	5454.9	-4843.9	1353.2	-5372.1	-84.1	-1537.5	3281.5	2337.9	-7811.2	8774.8
S.TEMP	439.65	439.05	439.00	440.98	440.86	442.32	442.16	442.57	441.94	441.88	443.83	441.68
MASS-FLX	19.2543	12.1569	5.7998	1.3868	4.0321	8.0387	9.4238	12.5192	14.0716	15.6456	17.0018	17.9879
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	94.0	68.4	37.9	16.9	22.4	42.2	50.1	59.0	69.0	74.9	80.7	83.3
*S.F.	394.2	378.7	239.7	112.5	-644.5	-5419.9	-7369.3	-8109.4	-8216.5	-7304.6	-7078.3	-6944.7
*S.TEMP	431.61	431.63	431.67	431.72	431.83	432.65	433.86	434.69	435.51	435.94	436.25	436.55
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	18.6000	18.6500	18.7000	18.7500	18.8000	18.8500	18.9000	18.9500	19.0000	19.0500	19.1000	19.1500
NODE												
1	450.6711	450.2190	449.7991	449.4102	449.0491	448.7148	448.4045	448.1160	447.8481	447.5977	447.3643	447.1475
2	448.5398	448.2407	447.9639	447.7087	447.4736	447.2554	447.0513	446.8599	446.6792	446.5095	446.3511	446.2036
3	446.7717	446.6023	446.4478	446.3064	446.1763	446.0522	445.9333	445.8171	445.7065	445.6011	445.5029	445.4136
4	445.3301	445.2671	445.2151	445.1697	445.1252	445.0740	445.0188	444.9570	444.8999	444.8462	444.7976	444.7595
5	444.5740	444.5664	444.5723	444.5791	444.5771	444.5559	444.5288	444.4905	444.4622	444.4355	444.4160	444.4111
6	444.2656	444.2795	444.3127	444.3401	444.3535	444.3406	444.3235	444.2915	444.2776	444.2629	444.2563	444.2686
7	443.9465	443.9817	444.0474	444.0955	444.1223	444.1113	444.1035	444.0752	444.0806	444.0774	444.0869	444.1206
8	443.6567	443.7087	443.8169	443.8784	443.9099	443.8882	443.8901	443.8589	443.8936	443.8994	443.9280	443.9919
9	443.4431	443.5049	443.6621	443.7214	443.7488	443.7036	443.7202	443.6765	443.7537	443.7583	443.8083	443.9060
10	443.2581	443.3225	443.3532	443.5837	443.5989	443.5107	443.5586	443.4866	443.6377	443.6216	443.7051	443.8486
11	443.1082	443.1580	443.5217	443.4541	443.4507	443.2830	443.4104	443.2673	443.5715	443.4761	443.6282	443.8396
12	443.0266	443.0266	443.6077	443.3171	443.3171	443.0266	443.3171	443.0266	443.6074	443.3169	443.6074	443.8979
13	443.0422	442.7615	444.1416	442.8591	443.0469	442.3303	443.3101	442.3608	444.0408	442.8145	443.7463	444.1936
14	443.0786	442.7085	444.2786	442.7380	443.0107	442.1914	443.3452	442.2183	444.1736	442.6882	443.8030	444.2590
15	443.1528	442.6445	444.4697	442.5649	442.9858	442.0276	443.4224	442.0400	444.3733	442.5129	443.8994	444.3384
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	516.3308	515.8794	515.3804	514.9597	513.5566	512.5134	512.5039	513.4895	515.0540	517.1589	521.5642	522.8782
HB	55.9	-37.7	120.6	-111.3	-4.7	-93.9	61.2	-106.4	134.0	-108.4	62.6	40.5
TSAT	339.3	338.9	338.5	338.1	337.6	337.3	336.8	336.4	335.9	335.5	335.7	336.0
HSAT	-39.3	26.6	-80.5	77.3	3.1	63.3	-39.6	72.1	-87.1	75.8	-44.9	-29.3
P	116.9	116.3	115.7	115.0	114.3	113.7	113.1	112.4	111.8	111.1	111.4	111.8
S.F.	-4086.0	2759.5	-8538.5	8070.2	331.4	6625.8	-4224.3	7610.7	-9456.1	8103.4	-4857.3	-3177.1
S.TEMP	443.21	442.60	444.59	442.45	442.98	441.93	443.48	441.93	444.51	442.39	443.97	444.38
MASS-FLX	18.1964	17.7545	17.1199	16.0962	15.0688	14.0077	12.7075	11.3609	9.8358	8.0676	6.9388	7.5697
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	85.6	83.8	81.0	77.7	73.7	69.0	63.7	58.8	52.4	44.4	39.1	41.6
*S.F.	-6827.1	-6633.5	-6327.5	-6025.4	-5621.3	-5167.3	-4768.2	-4451.7	-4045.3	-3530.9	-3259.6	-3537.5
*S.TEMP	436.83	437.07	437.28	437.43	437.55	437.62	437.66	437.68	437.68	437.66	437.60	437.66
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	19.2000	19.2500	19.3000	19.3500	19.4000	19.4500	19.5000	19.5500	19.6000	19.6500	19.7000	19.7500
NODE												
1	446.9451	446.7578	446.5854	446.4268	446.2825	446.1516	446.0334	445.9268	445.8308	445.7444	445.6648	445.5918
2	446.0681	445.9458	445.8376	445.7424	445.6589	445.5862	445.5234	445.4690	445.4199	445.3730	445.3264	445.2795
3	445.3372	445.2766	445.2310	445.1960	445.1697	445.1492	445.1357	445.1250	445.1116	445.0891	445.0579	445.0249
4	444.7412	444.7461	444.7637	444.7839	444.8064	444.8303	444.8589	444.8816	444.8884	444.8694	444.8362	444.8103
5	444.4358	444.4893	444.5469	444.5952	444.6445	444.6917	444.7441	444.7791	444.7842	444.7476	444.7039	444.6865
6	444.3167	444.3967	444.4714	444.5300	444.5891	444.6453	444.7090	444.7451	444.7424	444.6895	444.6399	444.6321
7	444.2036	444.3193	444.4099	444.4751	444.5447	444.6099	444.6875	444.7178	444.6982	444.6160	444.5608	444.5718
8	444.1243	444.2847	444.3828	444.4451	444.5264	444.5989	444.6931	444.7021	444.6489	444.5181	444.4656	444.5193
9	444.0969	444.3015	444.3882	444.4385	444.5339	444.6099	444.7239	444.6921	444.5952	444.4028	444.3752	444.4917
10	444.1228	444.3738	444.4170	444.4458	444.5676	444.6416	444.7852	444.6741	444.5168	444.2378	444.2788	444.4968
11	444.2437	444.5339	444.4614	444.4624	444.6438	444.6992	444.8967	444.6167	444.3818	443.9727	444.1943	444.5774
12	444.4788	444.7693	444.4790	444.4790	444.7693	444.7693	445.0596	444.4788	444.1885	443.6077	444.1885	444.7693
13	445.3096	445.4197	444.3323	444.5107	445.2007	444.9080	445.5652	443.8389	443.6184	442.5127	444.5376	445.5154
14	445.4861	445.5286	444.2673	444.5227	445.2966	444.9192	445.6709	443.6716	443.5183	442.2935	444.6699	445.6726
15	445.7017	445.6372	444.1604	444.5437	445.4175	444.9180	445.8020	443.4375	443.4165	442.0388	444.8838	445.8616
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	522.0464	520.5693	518.9102	517.1921	515.7136	513.7607	510.2747	505.6765	502.2959	501.1921	500.0610	498.3384
HB	115.7	47.0	-71.7	16.1	72.3	-9.8	84.1	-170.9	-58.4	-171.6	191.8	142.7
TSAT	336.3	336.6	336.9	337.1	337.4	337.7	338.0	338.3	338.1	337.8	337.5	337.2
HSAT	-80.5	-32.3	50.1	-10.9	-47.0	6.3	-50.2	101.5	32.7	97.7	-98.1	-68.7
P	112.3	112.7	113.1	113.5	114.0	114.4	114.9	115.3	115.1	114.6	114.2	113.7
S.F.	-8818.1	-3521.8	5307.5	-1167.4	-5078.5	672.2	-5417.4	10663.2	3441.8	10173.4	-10552.3	-7472.5
S.TEMP	445.83	445.69	444.08	444.56	445.49	444.91	445.88	443.28	443.37	441.89	445.04	445.97
MASS-FLX	8.1354	8.7572	9.3247	10.0632	10.5452	10.9980	11.4578	11.8600	12.5062	12.2024	12.0506	11.9589
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410	0.03410
***RELAP	PREDICTIONS	(STARRED)***										
*HB	44.4	47.2	49.7	52.8	54.7	56.8	58.4	60.0	63.2	61.6	60.9	60.4
*S.F.	-3746.8	-3904.7	-4014.8	-4170.1	-4234.3	-4276.7	-4201.4	-4042.7	-4048.5	-3838.3	-3725.8	-3589.3
*S.TEMP	437.77	437.92	438.07	438.24	438.40	438.56	438.71	438.82	438.93	439.02	439.10	439.17
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	19.8000	19.8500	19.9000	19.9500	20.0000
1	445.5242	445.4624	445.4058	445.3547	445.3088
2	445.2358	445.1975	445.1648	445.1379	445.1152
3	445.0002	444.9851	444.9780	444.9739	444.9724
4	444.8076	444.8237	444.8440	444.8606	444.8765
5	444.7122	444.7578	444.7944	444.8179	444.8420
6	444.6792	444.7402	444.7820	444.8054	444.8328
7	444.6553	444.7358	444.7786	444.7979	444.8296
8	444.6616	444.7607	444.7903	444.7971	444.8372
9	444.7063	444.8079	444.8074	444.7988	444.8547
10	444.8086	444.8811	444.8242	444.7981	444.8870
11	445.0208	444.9810	444.8210	444.7878	444.9507
12	445.3501	445.0596	444.7693	444.7693	445.0596
13	446.3699	445.0344	444.4832	444.7302	445.4558
14	446.5667	444.9800	444.4158	444.7327	445.5479
15	446.7905	444.8713	444.3311	444.7480	445.6663
Q	0.0	0.0	0.0	0.0	0.0
TB	495.3445	492.6504	490.0681	487.5845	485.4363
HB	177.0	-124.3	-75.9	23.2	127.2
TSAT	336.9	336.6	336.3	336.0	335.7
HSAT	-77.9	55.0	32.2	-9.1	-45.9
P	113.2	112.8	112.3	111.8	111.4
S.F.	-8573.6	5947.7	3477.5	-994.9	-5049.5
S.TEMP	446.92	444.78	444.28	444.76	445.74
MASS-FLX	11.7144	11.5489	11.3315	11.1058	10.9061
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.03410	0.03410	0.03410	0.03410	0.03410
RELAP PREDICTIONS (STARRED)					
*HB	59.4	58.7	57.7	56.9	56.3
*S.F.	-3332.1	-3153.7	-2934.9	-2753.6	-2626.5
*S.TEMP	439.22	439.24	439.26	439.27	439.28
*H.T.MODE	8	8	8	8	8

322105********** ENERGY BALANCE **********

****** THERMOCOUPLE NUMBER: TE-322AE TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

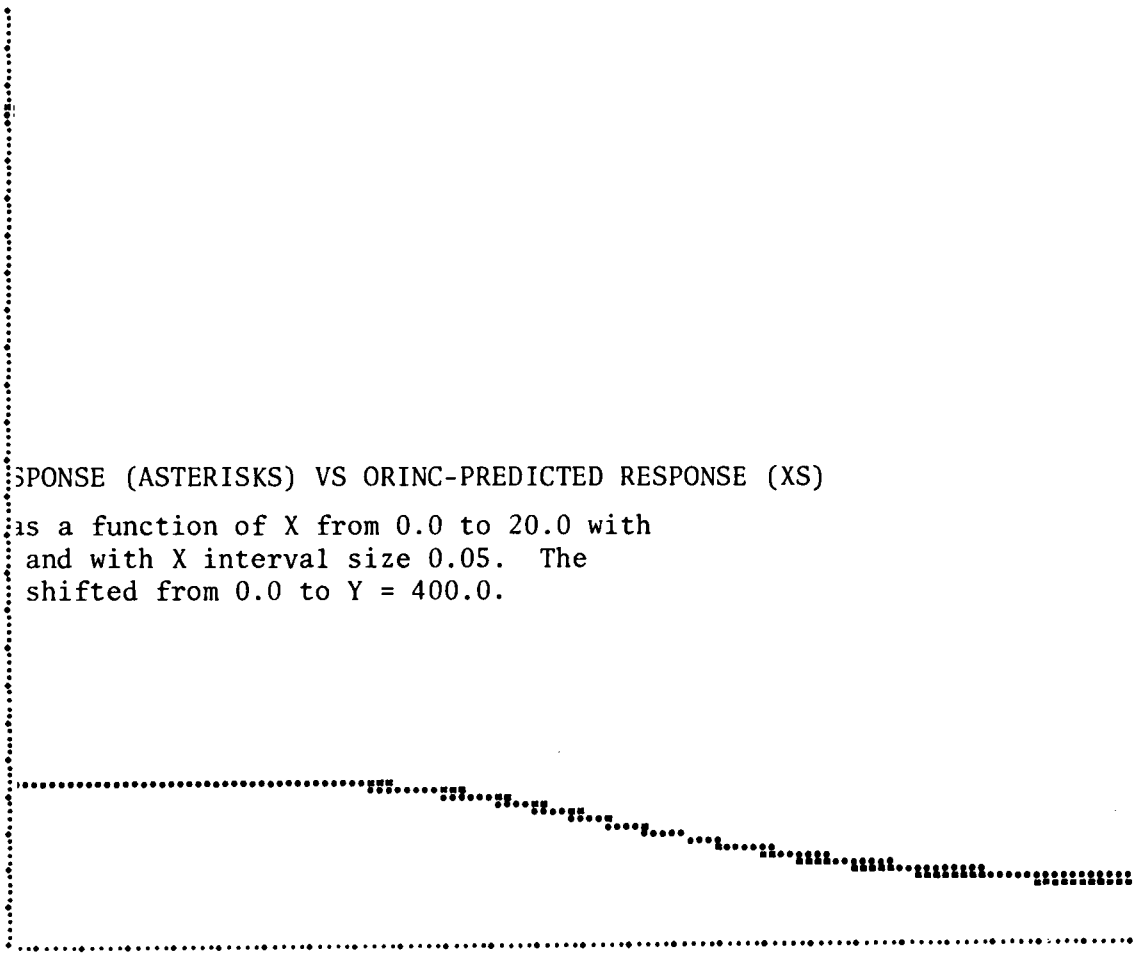
CHANGE IN PIN INTERNAL ENERGY CONTENT = 23.693939 BTU/FT
DETERMINED BY SUMMATION OF DELTA U'S OVER THE INTERVAL FROM T=0 TO TEND.
CHANGE IN PIN INTERNAL ENERGY CONTENT = 23.661026 BTU/FT
DETERMINED BY DIFFERENCE IN PIN END POINT ENTHALPIES.
TOTAL HEAT INPUT = INTEGRAL OF QTOT*DT = 24.281754 BTU/FT

INTEGRAL OF SURFACE FLUX VERSUS TIME CURVE *2.0*PI*RO= 47.954315 BTU/FT

PERCENTAGE ERROR IN OVERALL HEAT BALANCE = 0.0446 PERCENT
ERROR IN OVERALL HEAT BALANCE (VIA METHOD 2)= 0.0241 PERCENT

SPONSE (ASTERISKS) VS ORINC-PREDICTED RESPONSE (XS)

as a function of X from 0.0 to 20.0 with
and with X interval size 0.05. The
shifted from 0.0 to Y = 400.0.



Example 2. THTF Blowdown Test 104 (Preliminary, BD104.BE.P1), Thermocouple TE-318BG

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318207******************** CALIBRATION INFORMATION ************************

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

***** THERMOCOUPLE NO. 318-BG

***** MIDDLE T/C --- 318-MG

***** DATE OF LAST MODIFICATION : FEB. 17,1977

***** AXIAL POWER PEAKING FACTOR IS :   1.6659
      DETERMINED BY INDIV RESISTANCE CAL.

***** COEFFICIENTS FOR TEMPERATURE POLYNOMIAL FIT OF KBN
      DETERMINED FOR THE ABOVE SPECIFIC ITCS/ITCM PAIR
      C(1)=   0.22228317E 02
      C(2)= -0.75014196E-02
      C(3)=   0.38024659E-07
      C(4)=   0.5893665EE-09

      VARIANCE OF FIT=  0.14253893E 02
      UNITS FOR KBN FIT :  BTU/(HR*FT**2/FT*F)

***** COEFFIEIENTS FOR TEMPERATURE POLYNOMIAL FIT FOR KMGO
      DETERMINED FOR THE ABOVE SPECIFIC T/C PAIR
      C(1)=   0.72101288E 01
      C(2)= -0.10450333E-01
      C(3)=   0.79769443E-05
      C(4)= -0.29365270E-08
      C(5)=   0.45424298E-12

      VARIANCE OF FIT=  0.43312866E 03
      UNITS FOR KMGO FIT :  BTU/(HR*FT**2/FT*F)

      ACTUAL MGO POROSITY CALCULATED VIA MODIFIED
           RUSSELL EQUATION :   0.18648702E 00

***** COEFFICIENTS FOR THE THERMAL EXPANSION GAP MODEL FIT
      DETERMINED FOR THE ABOVE SHEATH T/C

      C(1)=   0.33019318E 02     SD=   0.98535595E 01
      C(2)= -0.34422360E-01      SD=   0.14225680E-01
      C(3)=   0.14774037E-04     SD=   0.70639717E-05

      VARIANCE OF FIT=  0.57968035E-04

      GAP CALCULATION AT THE BIAS POINT :            0.0553   (MILS)

      BIAS TEMP. INSIDE S.S.S. NODAL TEMP. :          817.2   DEG. F
      BIAS TEMP. OUTSIDE S.S.S. NODAL TEMP. :         701.4   DEG. F
      BIAS FLUX :   533145.6  BTU/HR/FT**2

      THE MAXIMUM TEMPERATURE FOR WHICH THE ABOVE
      REGRESSION FIT IS APPLICABLE IS   817.17 DEG. F
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318207********** CASE INFORMATION **********

****** THERMOCOUPLE NUMBER: TE-318BG TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

TOTAL NUMBER OF RADIAL NODES = 15

MAGNESIUM OXIDE CORE NODES	1	THROUGH	4
INCONEL-600 HEATER NODES	5	THROUGH	6
BORON NITRIDE NODES	7	THROUGH	9
INNER S.S.SHEATH NODES	10	THROUGH	12
OUTER S.S.SHEATH NODES	13	THROUGH	15

CUTSIDE RADIUS OF MGO CORE = 0.906700E-02 FT.
OUTSIDE RADIUS OF INCONEL LAYER = 0.101670E-01 FT.
CUTSIDE RADIUS OF BORON NITRIDE = 0.143330E-01 FT.
CUTSIDE RADIUS OF INNER S.S.SHEATH = 0.168330E-01 FT.
OUTSIDE RADIUS OF OUTER S.S.SHEATH = 0.176670E-01 FT.

RADIAL GAP INFORMATION: (I.E. BIAS POINT)
GAP BETWEEN INNER AND OUTER S.S.SHEATHS = 0.0553 MILS

POWER PEAKING FACTORS:
AXIAL = 1.665879
RADIAL (INCONEL) = 1.000000
RADIAL (CU-NI)= 0.0

318207********** STEADY STATE TEMPERATURE PROFILE **********

****** THERMOCOUPLE NUMBER: TE-318BG TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

Q = AVERAGE HEAT GENERATION PER FT = 9.877511 BTU/SEC/FT
Q*AXIAL PEAKING FACTOR = 16.454727 BTU/SEC/FT
HF = OUTSIDE FILM COEFFICIENT = 0.11408825E 06 BTU/(HR*FT**2*DEG F)
TB = BULK COOLANT TEMPERATURE = 597.23 DEG F

PIN TEMPERATURE PROFILE:

NODE	TEMPERATURE (DEG F)
1	1180.47
2	1180.47
3	1180.47
4	1180.47
5	1180.47
6	1161.45
7	1095.88
8	1017.79
9	956.90
10	905.26
11	858.05
12	814.88
13	699.25
14	684.42
15	669.98

SURFACE HEAT FLUX= 0.53364325E 06 BTU/HR/FT**2
SURFACE TEMPERATURE= 662.91 DEG F

PRESSURE= 2337.2 PSIA
SATURATION TEMPERATURE (AT THE ABOVE PRESSURE)= 658.24 DEG F

HEAT TRANSFER MODE AT THE SURFACE OF THE PIN: NUCLEATE BOILING

318207********** TRANSIENT RESULTS **********

****** THERMOCOUPLE NUMBER: TC-318BG TIME: 13:33:18

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

TIME-TEMPERATURE-NODE TABLE:
TIME HAS UNITS OF SEC
TEMPERATURE HAS UNITS OF DEG F
Q HAS UNITS OF BTU/SEC/FT
HB (BASED ON TB) HAS UNITS OF BTU/(HR*FT**2*DEG F)
BULK TEMPERATURE HAS UNITS OF DEG F
HSAT (BASED ON TSAT) HAS UNITS OF BTU/(HR*FT**2*DEG F)
PRESSURE HAS UNITS OF PSIA
SATURATION TEMPERATURE HAS UNITS OF DEG F
SURFACE FLUX (S.F.) HAS UNITS OF BTU/HR/FT**2
SURFACE TEMPERATURE HAS UNITS OF DEG F
AVERAGE MASS FLUX HAS UNITS OF LBM/SEC/FT**2
GAP HAS UNITS OF MILS

TIME--	0.0	0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500
NODE												
1	1180.4722	1180.4697	1180.4668	1180.4636	1180.4600	1180.4539	1180.4434	1180.4275	1180.4036	1180.3706	1180.3279	1180.2764
2	1180.4722	1180.4690	1180.4641	1180.4556	1180.4377	1180.4043	1180.3479	1180.2649	1180.1516	1180.0107	1179.8511	1179.6946
3	1180.4722	1180.4636	1180.4492	1180.4126	1180.3345	1180.1982	1179.9885	1179.7139	1179.3648	1179.0276	1178.7036	1178.5164
4	1180.4722	1180.4399	1180.3943	1180.2527	1179.9739	1179.5457	1178.9534	1178.3013	1177.6182	1177.0073	1176.7019	1177.0222
5	1180.4722	1180.3857	1180.3066	1179.9753	1179.4031	1178.6245	1177.6250	1176.7305	1175.8542	1175.2527	1175.4312	1176.9229
6	1161.4534	1161.3589	1161.2505	1160.8801	1160.2439	1159.3809	1158.3250	1157.3779	1156.4873	1155.9092	1156.2280	1158.0259
7	1095.8821	1095.7729	1095.5691	1095.1096	1094.3215	1093.2646	1092.1445	1091.1091	1090.2517	1089.7942	1090.5356	1093.1472
8	1017.7920	1017.6101	1017.2449	1016.5522	1015.4258	1014.0161	1012.8074	1011.7297	1011.0200	1010.9243	1012.7878	1017.3059
9	956.9048	956.5945	956.0322	955.0344	953.4790	951.6936	950.5037	949.4468	948.9571	949.4199	952.9146	959.9299
10	905.2571	904.7366	903.9187	902.5083	900.3860	898.1750	897.1616	896.1445	896.0945	897.2354	903.1316	913.4924
11	858.0500	857.1733	856.0161	854.0264	851.1328	848.4631	847.9485	846.9504	847.5530	849.7314	859.3567	874.2964
12	814.8789	813.4260	811.8704	809.1050	805.2339	802.1919	802.7449	801.6384	803.2979	806.8923	822.0879	842.7920
13	699.2451	695.5605	693.0342	687.5110	680.6467	677.6428	683.9348	679.9312	687.3076	694.8989	733.6238	771.6287
14	684.4226	680.2608	677.6167	671.5938	664.2161	661.2737	668.6172	664.0911	672.4844	680.8013	723.7019	764.2820
15	669.9849	665.2297	662.3073	655.8799	647.9480	645.2163	653.9377	648.5024	658.3301	667.3584	715.5166	758.5225
Q	16.45473	16.44675	16.46910	16.45723	16.45723	16.46910	16.44675	16.46910	16.45723	16.45723	16.45723	16.44536
TB	597.2317	603.5637	616.2478	628.9021	629.8120	630.8357	628.7839	628.3586	627.6816	627.2026	627.0391	627.6384
HB	114088.3	10362.8	14453.8	30652.5	60610.0	91538.1	29059.4	46661.7	21204.0	14325.8	2829.3	1255.2
TSAT	658.2	629.7	629.7	628.9	629.8	630.8	628.8	628.4	627.7	627.2	627.0	627.6
HSAT	114093.4	20042.3	22138.2	30652.5	60610.0	91538.1	29059.4	46661.7	21204.0	14325.8	2829.3	1255.2
P	2337.2	1916.3	1915.9	1904.6	1917.0	1930.9	1903.0	1897.2	1888.1	1881.6	1879.5	1887.5
S.F.	533643.3	561865.2	580955.8	587516.2	607979.4	591801.8	526197.3	579295.3	506307.2	483096.5	241272.4	161649.1
S.TEMP	662.91	657.78	655.06	648.07	639.84	637.30	646.89	640.77	651.56	660.92	712.32	756.42
MASS-FLX	742.5525	10.7608	459.1338	509.7434	360.0901	412.7217	362.8401	290.1663	374.0044	429.6301	445.6406	400.2319
QUALITY	0.0	0.0	0.0	0.00003	0.04106	0.09500	0.16403	0.21226	0.23953	0.25893	0.26670	0.26128
GAP	0.05528	0.05528	0.05498	0.05483	0.05443	0.05399	0.05395	0.05474	0.05434	0.05513	0.05569	0.05900
RELAP PRECICTIONS (STARRED)												
*HB	64313.2	8637.5	48336.3	46930.9	47180.7	48066.2	12650.3	2957.2	1147.2	1319.2	1386.5	1242.2
*S.F.	524929.9	185175.4	577192.5	562913.4	550866.1	557951.9	393252.4	237615.5	156606.4	216795.0	247865.6	233632.3
*S.TEMP	666.40	651.21	641.79	640.26	641.45	642.51	659.90	708.78	764.17	791.54	805.82	815.58
*H.T.MODE	2	4	2	2	2	2	4	4	9	9	9	9

TIME--	0.6000	0.6500	0.7000	0.7500	0.8000	0.8500	0.9000	0.9500	1.0000	1.0500	1.1000	1.1500
NODE												
1	1180.2190	1180.1643	1180.1235	1180.1113	1180.1448	1180.2417	1180.4211	1180.7014	1181.0584	1181.6274	1182.2996	1183.1260
2	1179.5789	1179.5544	1179.0743	1179.9907	1180.5483	1181.3826	1182.5149	1183.9561	1185.7053	1187.7549	1190.0947	1192.7100
3	1178.6082	1179.1189	1180.1543	1181.7695	1183.9858	1186.7849	1190.1248	1193.9397	1198.1621	1202.7393	1207.6201	1212.7700
4	1178.3247	1180.8015	1184.4675	1189.1848	1194.8381	1201.2271	1208.1619	1215.4482	1222.9634	1230.6804	1238.5168	1246.4932
5	1180.2307	1185.3201	1191.8914	1199.5017	1208.0132	1217.0190	1226.2886	1235.5603	1244.8008	1254.1399	1263.3960	1272.7778
6	1161.7944	1167.4292	1174.3610	1182.7156	1191.7163	1201.1526	1210.7903	1220.3721	1229.8826	1239.4541	1248.9460	1258.5447
7	1098.0269	1104.8552	1113.0979	1122.2700	1132.0830	1142.1626	1152.2947	1162.2422	1172.0503	1181.8201	1191.5818	1201.3914
8	1024.6172	1033.7810	1043.9761	1054.7329	1065.7358	1076.6089	1087.2480	1097.4263	1107.4121	1117.2954	1127.2776	1137.2668
9	970.1946	981.8728	993.9751	1006.1829	1018.2156	1029.6641	1040.6174	1050.8049	1060.8691	1070.8181	1081.0325	1091.1816
10	927.4575	941.9077	955.9485	969.5981	982.6184	994.5300	1005.7449	1015.8391	1026.0698	1036.1741	1046.8042	1057.2012
11	892.9326	910.2397	926.0811	941.0674	954.9272	967.0503	978.4102	988.2004	998.7288	1009.0430	1020.3044	1030.9583
12	866.7915	886.3555	903.4265	919.3865	933.6899	945.5142	956.7854	965.8562	976.8499	987.2927	999.3845	1010.1025
13	812.2358	833.6812	852.3872	870.2007	884.5161	893.6604	904.3181	909.8611	924.0764	934.2461	950.0405	959.7007
14	807.1545	828.3049	847.0889	865.0906	879.2776	887.9146	898.5313	903.4595	918.2830	928.3152	944.7214	954.0791
15	803.6606	823.7952	842.5723	860.7302	874.6675	882.6279	893.2725	897.4099	913.1514	922.8923	940.1006	948.9336
Q	16.44536	16.44536	16.44536	16.42302	16.43349	16.43349	16.43349	16.42162	16.41115	16.43349	16.41115	16.42162
TB	626.8821	624.5212	621.9387	621.1951	620.0125	618.1807	616.5784	615.3987	613.9341	613.8536	612.0508	610.0916
HB	428.6	756.5	697.8	625.0	653.7	767.2	718.6	853.4	627.7	676.0	507.7	591.9
TSAT	626.9	624.5	621.9	621.2	620.0	618.2	616.6	615.4	613.9	613.9	612.1	610.1
HSAT	428.6	756.5	697.8	625.0	653.7	767.2	718.6	853.4	627.7	676.0	507.7	591.9
P	1877.3	1845.9	1812.0	1802.3	1787.0	1763.5	1743.2	1728.3	1710.0	1709.5	1686.7	1662.7
S.F.	75351.1	149328.6	152639.6	148562.8	165153.6	200999.9	197107.3	238201.9	186405.3	207192.8	165534.1	199143.6
S.TEMP	802.70	821.92	840.67	858.89	872.64	880.17	890.87	894.52	910.89	920.40	938.11	946.56
MASS-FLX	420.4333	496.2314	462.9072	446.7666	472.7065	461.2659	434.6104	410.2717	398.0786	212.3235	171.3579	177.6697
QUALITY	0.26169	0.26125	0.25998	0.25896	0.26045	0.26285	0.26704	0.27318	0.28134	0.29356	0.31569	0.34855
GAP	0.06122	0.06345	0.06373	0.06399	0.06425	0.06430	0.06416	0.06401	0.06347	0.06409	0.06413	0.06457
***RELAP	PREDICTIONS	(STARRED)***										
*HB	1282.9	1455.1	1336.8	1285.9	1325.5	1286.8	1216.9	1169.2	1141.9	734.9	601.3	650.2
*S.F.	261618.4	301116.5	289371.6	289202.1	306945.5	306427.6	300625.3	298660.1	301386.8	206089.8	185624.9	211233.1
*S.TEMP	830.88	831.53	838.43	846.11	851.65	856.40	863.73	871.10	878.19	894.42	920.87	935.06
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	1.2000	1.2500	1.3000	1.3500	1.4000	1.4500	1.5000	1.5500	1.6000	1.6500	1.7000	1.7500
NODE												
1	1184.1143	1185.2710	1186.6021	1188.1094	1189.7937	1191.6563	1193.6963	1195.9102	1198.2971	1200.8523	1203.5720	1206.4521
2	1195.5872	1198.7109	1202.9667	1205.6379	1209.4097	1213.3687	1217.5017	1221.7949	1226.2366	1230.8123	1235.5107	1240.3230
3	1218.1550	1223.7495	1229.5208	1235.4451	1241.5059	1247.6843	1253.9648	1260.3262	1266.7473	1273.2161	1279.7229	1286.2651
4	1254.5718	1262.7302	1270.9116	1279.1133	1287.3452	1295.5774	1303.8062	1311.9741	1320.0615	1328.0791	1336.0454	1343.9788
5	1282.1438	1291.5032	1300.7322	1309.9226	1319.1157	1328.2100	1337.2495	1346.0789	1354.7371	1363.2920	1371.7869	1380.2468
6	1268.1082	1277.6433	1287.0378	1296.3826	1305.7200	1314.9570	1324.1145	1333.0496	1341.7927	1350.4360	1359.0220	1367.5647
7	1211.1233	1220.7778	1230.2927	1239.7417	1249.1550	1258.4912	1267.6680	1276.6160	1285.3240	1293.9617	1302.5583	1311.0808
8	1147.0605	1156.7175	1166.2063	1175.6519	1185.0442	1194.3679	1203.3865	1212.1311	1220.5747	1229.0828	1237.5867	1245.9590
9	1100.9590	1110.5796	1119.9941	1129.4368	1138.8069	1148.1079	1156.8853	1165.3687	1173.4875	1181.9407	1190.3826	1198.5923
10	1066.9744	1076.6421	1086.0515	1095.6250	1105.0742	1114.4524	1122.9751	1131.2583	1139.1011	1147.7273	1156.2214	1164.3257
11	1040.6477	1050.4258	1059.8542	1069.6870	1079.2664	1088.7859	1096.9319	1105.0627	1112.6292	1121.7173	1130.3062	1138.2930
12	1019.4468	1029.3418	1038.6885	1048.8613	1058.4866	1068.1138	1075.5422	1083.5234	1090.6809	1100.5942	1109.1343	1116.8494
13	967.0986	978.0410	986.7246	998.5525	1007.8872	1017.7832	1021.7698	1030.0105	1035.5037	1049.7783	1056.8408	1063.4897
14	961.1587	972.2988	980.8342	992.9465	1002.1697	1012.1169	1015.4717	1023.8433	1029.0361	1044.1140	1050.8115	1057.2786
15	955.6272	967.0923	975.3955	987.9019	996.9216	1006.9409	1009.4692	1018.1272	1022.9302	1039.1011	1045.1770	1051.4587
Q	16.42302	16.43349	16.42302	16.42302	16.43349	16.42302	16.43349	16.42302	16.42302	16.42302	16.42302	16.43349
TB	609.3411	609.1477	608.3828	607.1287	606.1621	606.1372	605.2087	603.7473	602.6853	601.8362	600.7664	599.5352
HB	635.8	560.8	587.3	509.3	532.8	510.1	619.3	555.4	601.8	437.1	523.6	533.0
TSAT	609.3	609.1	608.4	607.1	606.2	606.1	605.2	603.7	602.7	601.8	600.8	599.5
HSAT	635.8	560.8	587.3	509.3	532.8	510.1	619.3	555.4	601.8	437.1	523.6	533.0
P	1653.6	1651.2	1642.0	1626.9	1615.3	1615.0	1604.0	1586.8	1574.3	1564.4	1552.1	1537.9
S.F.	218528.8	199405.6	214049.7	192775.1	206889.6	203225.6	248576.0	228683.6	251153.6	190166.5	231290.8	239416.2
S.TEMP	953.03	964.73	972.87	985.63	994.50	1004.57	1006.58	1015.47	1020.02	1036.90	1042.52	1048.71
MASS-FLX	184.8804	185.9746	171.6065	161.1350	156.1841	113.6468	85.7892	70.2507	76.2698	75.7259	71.3272	71.7362
QUALITY	0.38483	0.42188	0.45719	0.48982	0.52080	0.55355	0.58433	0.61787	0.65623	0.70154	0.75107	0.80453
GAP	0.06461	0.06426	0.06450	0.06454	0.06458	0.06481	0.06466	0.06430	0.06433	0.06417	0.06498	0.06463
***RELAP	PREDICTIONS	(STARRED)***										
*HB	704.6	751.1	736.6	723.7	729.7	612.6	492.3	421.1	464.5	482.4	478.7	499.7
*S.F.	235710.3	255060.0	254986.5	256584.8	264167.3	227773.8	191685.1	172550.9	196804.6	208673.4	211551.7	225101.8
*S.TEMP	943.88	948.73	954.64	961.75	968.23	978.01	994.73	1013.63	1026.44	1034.48	1042.79	1050.07
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	1.8000	1.8500	1.9000	1.9500	2.0000	2.0500	2.1000	2.1500	2.2000	2.2500	2.3000	2.3500
NODE												
1	1209.4871	1212.6709	1215.9988	1219.4648	1223.0215	1226.5984	1230.1179	1233.5081	1236.7095	1239.6785	1242.3838	1244.8083
2	1245.2388	1250.2493	1255.3450	1260.5186	1265.2349	1269.1223	1272.0220	1273.9302	1274.9338	1275.1606	1274.7476	1273.8293
3	1292.8318	1299.4124	1305.9954	1312.5815	1315.2075	1314.2695	1310.8718	1306.0007	1300.3782	1294.4807	1288.6038	1282.9185
4	1351.8367	1359.6067	1367.2830	1374.9009	1359.8916	1340.9541	1323.1545	1307.6819	1294.5671	1283.4956	1274.1033	1266.0688
5	1388.5242	1396.6492	1404.6265	1412.5791	1352.9656	1320.3611	1298.7930	1283.0249	1270.8740	1261.1392	1253.1243	1246.3901
6	1375.9167	1384.1011	1392.1309	1400.1426	1345.5525	1314.5352	1293.7407	1278.5459	1266.8740	1257.5339	1249.8486	1243.3899
7	1319.4116	1327.5315	1335.4907	1343.4563	1318.9363	1296.7380	1279.8203	1267.0081	1257.0391	1248.9653	1242.2634	1236.5876
8	1254.0718	1261.9094	1269.6116	1277.4473	1271.1929	1261.5938	1252.7322	1245.3445	1239.1758	1233.7864	1229.1069	1224.9990
9	1206.4304	1213.9355	1221.3899	1229.1970	1230.8301	1229.4829	1227.2537	1224.8020	1222.1877	1219.2759	1216.5220	1213.9177
10	1171.9185	1179.1421	1186.4751	1194.4731	1200.1370	1204.1267	1206.7075	1207.9907	1208.0662	1206.9670	1205.7566	1204.3694
11	1145.6145	1152.5745	1159.9167	1168.3462	1176.6997	1184.5969	1190.7090	1194.6646	1196.5801	1196.6099	1196.6196	1196.1697
12	1123.7417	1130.3604	1137.8083	1146.9180	1157.6897	1169.0188	1177.8674	1183.6772	1186.7212	1187.2747	1188.3823	1188.6589
13	1068.6472	1074.4136	1082.8057	1094.9402	1113.3386	1134.3259	1148.5842	1157.1663	1161.2524	1161.3979	1166.0144	1167.6492
14	1062.1655	1067.8086	1076.3943	1089.0244	1108.5803	1130.8477	1145.5898	1154.3389	1158.4150	1158.3882	1163.5549	1165.2695
15	1056.0383	1061.5850	1070.4446	1083.6846	1104.5823	1128.1785	1143.1499	1151.8728	1155.7981	1155.4800	1161.3408	1163.0149
Q	16.42302	16.42302	16.42302	16.43349	0.04740	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	598.4329	597.4661	596.3242	608.2871	622.2966	629.5186	635.4766	637.7815	642.7527	652.0583	658.9065	658.6653
HB	562.1	561.3	515.5	447.5	300.5	169.3	171.2	188.8	216.1	257.8	179.9	194.1
TSAT	598.4	597.5	596.3	595.0	594.8	593.4	592.0	591.1	590.6	589.8	588.5	587.7
HSAT	562.1	561.3	515.5	435.3	284.2	157.8	157.7	173.0	196.2	229.4	157.8	170.1
P	1525.3	1514.3	1501.4	1487.3	1485.0	1468.9	1453.3	1443.6	1438.6	1429.2	1416.0	1406.8
S.F.	255562.4	258862.9	242991.6	211666.8	144414.9	84263.8	86750.9	96852.4	110621.0	129435.2	90229.6	97676.4
S.TEMP	1053.11	1058.62	1067.67	1081.28	1102.95	1127.23	1142.18	1150.80	1154.57	1154.05	1160.34	1161.94
MASS-FLX	72.0197	72.7241	72.9979	79.2067	30.8836	19.6705	8.7965	30.8260	39.1776	25.0899	18.2113	29.8162
QUALITY	0.86422	0.92795	0.98823	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06466	0.06430	0.06432	0.06455	0.06497	0.06580	0.06720	0.06782	0.06823	0.06844	0.06844	0.06884
RELAP PREDICTIONS (STARRED)												
*HB	523.8	561.5	576.3	577.3	257.6	167.5	80.2	200.5	266.2	192.8	130.0	187.8
*S.F.	239148.6	259019.8	268522.7	265401.7	120190.8	81843.2	40854.5	104152.1	137360.5	98872.6	66948.8	97409.6
*S.TEMP	1055.05	1058.76	1062.34	1066.63	1087.82	1117.77	1144.46	1156.88	1157.42	1162.69	1173.69	1177.42
*H.T.MODE	9	9	9	8	8	8	8	8	8	8	8	8

TIME--	2.4000	2.4500	2.5000	2.5500	2.6000	2.6500	2.7000	2.7500	2.8000	2.8500	2.9000	2.9500
NODE												
1	1246.9434	1248.7900	1250.3550	1251.6477	1252.6829	1253.4744	1254.0364	1254.3857	1254.5364	1254.5027	1254.2988	1253.9373
2	1272.5215	1270.9241	1269.1152	1267.1575	1265.0972	1262.9668	1260.7903	1258.5847	1256.3608	1254.1257	1251.8833	1249.6377
3	1277.5164	1272.4307	1267.6584	1263.1770	1258.9539	1254.9536	1251.1445	1247.5002	1243.9546	1240.6060	1237.3230	1234.1333
4	1259.1340	1253.0459	1247.0057	1242.6492	1238.0554	1233.7351	1229.6357	1225.7185	1221.9402	1218.2781	1214.7449	1211.3162
5	1240.6470	1235.5420	1230.8916	1226.5349	1222.3860	1218.3823	1214.5308	1210.8027	1207.1438	1203.5635	1200.1411	1196.7903
6	1237.8809	1232.9509	1228.4338	1224.1731	1220.0916	1216.1365	1212.3247	1208.6267	1204.9844	1201.4175	1198.0205	1194.6816
7	1231.7200	1227.2441	1223.0657	1219.0437	1215.1335	1211.3008	1207.5989	1203.9883	1200.3975	1196.8777	1193.5681	1190.2705
8	1221.3940	1217.7087	1214.1243	1210.4927	1206.8630	1203.2334	1199.7485	1196.3032	1192.7935	1189.3794	1186.2993	1183.0669
9	1211.5442	1208.4519	1205.3879	1202.0508	1198.6462	1195.1819	1191.9375	1188.6436	1185.1733	1181.8862	1179.1399	1175.8940
10	1203.0305	1200.1445	1197.4902	1194.2820	1191.0256	1187.6638	1184.6790	1181.4822	1177.9758	1174.8479	1172.5466	1169.1133
11	1195.6846	1192.5071	1190.2483	1186.9766	1183.8184	1180.5005	1177.8313	1174.6440	1171.0098	1168.1150	1166.4199	1162.4900
12	1188.9358	1184.7842	1183.1235	1179.5261	1176.4841	1173.1646	1170.9521	1167.6355	1163.7656	1161.2778	1160.4490	1155.4775
13	1170.0427	1159.7278	1161.8225	1155.7258	1153.5496	1149.9585	1149.8965	1145.2935	1140.3665	1140.0872	1142.8835	1131.7007
14	1167.9338	1156.5188	1159.4089	1152.7825	1150.8123	1147.1631	1147.4478	1142.5654	1137.5027	1137.6245	1140.9500	1128.6194
15	1165.9800	1153.0540	1157.1650	1149.7283	1148.1035	1144.3210	1145.0920	1139.7729	1134.5698	1135.2393	1139.1792	1125.2544
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	660.7651	665.4280	667.2693	668.5454	670.8047	672.1626	674.0364	676.2876	678.3538	680.3689	682.2783	683.8689
HB	164.3	353.2	191.8	303.5	256.3	276.5	219.2	282.3	299.5	228.8	158.9	380.4
TSAT	587.0	586.0	585.0	584.1	583.2	582.3	581.5	580.6	579.8	578.9	578.0	577.1
HSAT	143.3	303.5	164.2	258.1	216.4	232.2	183.1	233.9	246.1	187.0	129.4	306.1
P	1399.1	1388.5	1377.9	1368.6	1359.2	1350.5	1341.8	1332.8	1323.9	1315.1	1306.2	1297.3
S.F.	82864.9	171548.9	93775.0	145551.4	121980.8	130139.0	103001.8	130450.9	136189.8	103809.8	72484.1	167199.6
S.TEMP	1165.07	1151.17	1156.13	1148.12	1146.75	1142.88	1143.95	1138.33	1133.06	1134.08	1138.37	1123.40
MASS-FLX	30.4905	23.7299	24.6488	26.0847	24.8519	26.0654	25.9021	25.3837	25.4346	25.3441	25.0257	24.7617
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06903	0.06942	0.06843	0.06901	0.06860	0.06879	0.06858	0.06896	0.06875	0.06854	0.06892	0.06950
RELAP PREDICTIONS (STARRED)												
*HB	207.3	164.6	161.4	171.9	163.4	168.0	167.5	163.0	162.0	160.8	158.3	156.1
*S.F.	106866.8	84371.4	82748.9	87892.8	83103.1	85135.6	84390.6	81605.0	80564.1	79475.1	77735.1	76203.6
*S.TEMP	1175.38	1177.26	1179.65	1179.38	1179.13	1178.51	1177.30	1176.38	1175.37	1174.18	1173.02	1171.87
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	3.0000	3.0500	3.1000	3.1500	3.2000	3.2500	3.3000	3.3500	3.4000	3.4500	3.5000	3.5500
NODE												
1	1253.4299	1252.7871	1252.0186	1251.1335	1250.1396	1249.0435	1247.8516	1246.5691	1245.2000	1243.7502	1242.2227	1240.6208
2	1247.3896	1245.1355	1242.8735	1240.6008	1238.3140	1236.0098	1233.6851	1231.3369	1228.9617	1226.5576	1224.1235	1221.6567
3	1231.0159	1227.9480	1224.9133	1221.9011	1218.9070	1215.9197	1212.9302	1209.9302	1206.9185	1203.8938	1200.8508	1197.7834
4	1207.9338	1204.5430	1201.1477	1197.7595	1194.3850	1190.9971	1187.5820	1184.1372	1180.6775	1177.2144	1173.7241	1170.1907
5	1193.3801	1189.8525	1186.3130	1182.7935	1179.2954	1175.7324	1172.1116	1168.4497	1164.7554	1161.1597	1157.4553	1153.6753
6	1191.2581	1187.6968	1184.1335	1180.5952	1177.0791	1173.4832	1169.8250	1166.1274	1162.4441	1158.7837	1155.0400	1151.2148
7	1186.8145	1183.1755	1179.5784	1176.0212	1172.4866	1168.8257	1165.1011	1161.3398	1157.6199	1153.9304	1150.1123	1146.2039
8	1179.4907	1175.6624	1172.0562	1168.5066	1164.9678	1161.1670	1157.3345	1153.4861	1149.7529	1146.0527	1142.0825	1138.0349
9	1172.0745	1167.9871	1164.4761	1160.9592	1157.4268	1153.4026	1149.4744	1145.5537	1141.8633	1138.1719	1133.9688	1129.7817
10	1164.8979	1160.5076	1157.2646	1153.7654	1150.2275	1145.8508	1141.8726	1137.8909	1134.3071	1130.6167	1126.0457	1121.7458
11	1157.7075	1153.0027	1150.3118	1146.7439	1143.1807	1138.2520	1134.3381	1130.2942	1126.9080	1123.1775	1118.0239	1113.6970
12	1149.9534	1144.9834	1143.3271	1139.4636	1135.8770	1130.0840	1126.4985	1122.3623	1119.3301	1115.4709	1109.4092	1105.2764
13	1123.8528	1118.5598	1122.3506	1115.8081	1112.3855	1102.4978	1101.6218	1096.7532	1095.5388	1090.6245	1080.2695	1078.2742
14	1120.5764	1115.3245	1120.0376	1112.8799	1109.5679	1098.9912	1098.7109	1093.6338	1092.7498	1087.6035	1076.5774	1075.0823
15	1117.1553	1112.0273	1117.9436	1109.8213	1106.7393	1095.2734	1095.8779	1090.4534	1090.0208	1084.5154	1072.6563	1071.9421
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	685.2668	685.8110	685.9431	685.3210	684.6699	683.7747	682.6472	681.5798	680.6680	680.0315	679.8413	680.1917
HB	374.2	355.7	193.2	342.3	303.2	433.6	296.2	356.7	290.9	350.1	474.6	348.7
TSAT	576.2	575.4	574.5	573.7	572.9	572.1	571.3	570.5	569.7	568.9	568.0	567.2
HSAT	298.5	282.3	153.5	270.8	239.6	340.7	233.2	280.3	228.7	274.4	369.0	270.4
P	1288.2	1279.5	1271.2	1263.5	1255.7	1247.7	1239.8	1231.9	1224.0	1216.1	1208.2	1200.3
S.F.	160953.4	151005.0	83271.4	144741.6	127546.9	177553.4	121998.6	145268.9	118687.8	141070.4	185427.5	136077.9
S.TEMP	1115.36	1110.34	1117.01	1108.20	1105.31	1093.28	1094.50	1088.81	1088.68	1082.92	1070.56	1070.39
MASS-FLX	24.0610	24.3423	24.1977	24.4573	23.5022	22.4472	21.4779	20.2049	18.7975	17.2513	15.5975	13.7723
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06851	0.06829	0.06808	0.06885	0.06863	0.06843	0.06802	0.06820	0.06818	0.06836	0.06834	0.06774
***RELAP	PREDICTIONS	(STARRED)***										
*HB	152.7	152.3	151.4	153.3	149.1	143.3	138.4	131.9	124.2	116.0	106.6	96.1
*S.F.	74172.6	73692.9	73023.1	73769.7	71626.0	68815.6	66491.1	63388.6	59792.2	55891.3	51392.7	46337.3
*S.TEMP	1170.70	1169.62	1168.25	1166.70	1165.25	1164.20	1163.28	1162.54	1162.07	1161.84	1161.89	1162.26
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	3.6000	3.6500	3.7000	3.7500	3.8000	3.8500	3.9000	3.9500	4.0000	4.0500	4.1000	4.1500
NODE												
1	1238.9473	1237.2048	1235.3953	1233.5205	1231.5811	1229.5767	1227.5083	1225.3755	1223.1785	1220.9172	1218.5891	1216.1870
2	1219.1541	1216.6135	1214.0322	1211.4045	1208.7231	1205.9846	1203.1853	1200.3247	1197.4031	1194.4155	1191.3367	1188.1079
3	1194.6855	1191.5513	1188.3687	1185.1201	1181.7917	1178.3811	1174.8975	1171.3499	1167.7463	1164.0488	1160.1113	1155.6489
4	1166.6057	1162.9651	1159.2273	1155.3418	1151.3142	1147.1799	1143.0012	1138.7947	1134.5686	1130.0837	1124.7122	1117.5151
5	1149.8254	1145.9021	1141.8035	1137.4443	1132.9302	1128.3533	1123.8416	1119.3398	1114.8462	1109.6687	1102.3950	1091.3679
6	1147.3179	1143.3450	1139.1748	1134.7197	1130.1199	1125.4709	1120.9155	1116.3679	1111.8313	1106.4802	1098.7173	1086.7612
7	1142.2227	1138.1602	1133.8403	1129.1782	1124.4180	1119.6514	1115.0537	1110.4441	1105.8521	1100.0688	1091.0479	1076.7815
8	1133.9231	1129.7185	1125.0906	1120.0090	1115.0171	1110.1184	1105.5737	1100.8982	1096.2605	1089.3481	1077.1511	1057.4500
9	1125.5422	1121.1885	1116.1396	1110.5393	1105.4075	1100.4495	1096.1033	1091.3242	1086.6729	1077.9175	1061.0117	1033.9558
10	1117.3782	1112.8584	1107.2261	1101.0093	1095.9131	1090.9570	1086.9678	1081.9485	1077.3196	1065.6680	1042.1526	1005.5962
11	1109.1897	1104.4709	1097.9971	1091.0647	1086.3142	1081.3848	1077.9751	1072.4277	1067.9177	1051.6460	1018.7795	969.7827
12	1100.5933	1095.6370	1087.9280	1080.2202	1076.3674	1071.4148	1068.9387	1062.3369	1058.2114	1034.5691	988.6616	923.7495
13	1072.6052	1066.7278	1053.4280	1043.8035	1045.4097	1039.2925	1041.3943	1028.4285	1027.5642	967.5950	872.0981	759.4753
14	1069.1868	1063.1987	1049.0049	1039.2334	1041.8452	1035.3745	1038.2729	1024.1045	1023.9705	957.8992	854.6799	733.8240
15	1065.6914	1059.5933	1044.2734	1034.4980	1038.4702	1031.3762	1035.3364	1019.4661	1020.4854	946.3587	834.4163	704.8113
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	680.7842	681.0352	681.2986	681.3308	681.1729	680.8760	680.4209	679.8589	679.1929	678.4331	677.9304	679.2695
HB	414.3	432.7	619.3	612.6	387.5	515.0	336.6	647.1	428.9	2237.8	6780.7	142648.4
TSAT	566.4	565.7	564.9	564.1	563.3	562.6	561.8	561.0	560.2	559.4	558.7	558.1
HSAT	319.1	331.2	468.1	459.2	291.0	384.5	252.1	478.4	317.6	1537.3	3718.4	10083.7
P	1192.7	1185.7	1178.5	1171.2	1164.0	1156.8	1149.6	1142.4	1135.2	1127.9	1121.5	1116.1
S.F.	158721.8	162980.3	223216.1	214847.9	137823.5	179448.1	119016.1	218117.5	145649.0	584507.9	981840.2	1314936.0
S.TEMP	1063.89	1057.74	1041.72	1032.03	1036.88	1029.31	1033.96	1016.95	1018.80	939.63	822.73	688.49
MASS-FLX	12.4021	11.9607	11.4136	11.1643	11.0478	10.9458	10.9136	10.8772	10.8690	10.8807	10.6388	8.6545
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06792	0.06789	0.06768	0.06687	0.06665	0.06741	0.06719	0.06777	0.06677	0.06733	0.06257	0.05579
***RELAP	PREDICTIONS	(STARRED)***										
*HB	86.9	84.1	80.5	78.6	77.7	76.9	76.5	76.2	75.9	75.8	75.0	65.9
*S.F.	41889.6	40548.4	38826.7	37874.1	37455.9	37058.5	36865.1	36708.4	36580.3	36549.1	36163.2	31690.2
*S.TEMP	1162.88	1163.22	1163.36	1163.38	1163.19	1162.89	1162.48	1161.99	1161.45	1160.84	1160.22	1160.01
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	4.2000	4.2500	4.3000	4.3500	4.4000	4.4500	4.5000	4.5500	4.6000	4.6500	4.7000	4.7500
NODE												
1	1213.6973	1211.0974	1208.3560	1205.4368	1202.2993	1198.9060	1195.2180	1191.2031	1186.8364	1182.0972	1176.9719	1171.4529
2	1184.6321	1180.7864	1176.4485	1171.5146	1165.9170	1159.6238	1152.6350	1144.9778	1136.6995	1127.8606	1118.5278	1108.7722
3	1150.3076	1143.7842	1135.9146	1126.6975	1116.2542	1104.7786	1092.4841	1079.5796	1066.2627	1052.7041	1039.0464	1025.4038
4	1107.7249	1095.1450	1080.1545	1063.4465	1045.7395	1027.6282	1009.5198	991.6929	974.3643	957.6587	941.6221	926.2847
5	1075.9373	1056.8418	1035.3547	1013.5203	991.7136	970.6667	950.5627	931.4949	913.5823	896.7810	880.9878	866.1685
6	1070.0762	1049.6616	1027.2070	1004.2539	981.7712	960.2429	939.7930	920.4885	902.4441	885.5803	869.7666	854.9722
7	1057.1931	1034.0349	1009.4810	985.1799	961.9446	940.0732	919.5115	900.2678	882.4531	865.8921	850.4075	835.9863
8	1031.7852	1003.7744	976.3374	950.9014	927.6252	906.3044	886.5017	868.1890	851.5139	836.0627	821.6082	808.2373
9	1001.1909	968.6328	939.3984	914.0603	891.7441	871.7229	853.1853	836.2395	821.1255	807.0435	793.8013	781.6799
10	964.9192	928.4221	898.5166	874.2888	853.5532	835.1943	818.0554	802.6499	789.3455	776.6765	764.6650	753.9080
11	920.3906	881.0359	851.9998	830.1123	811.5850	795.2341	779.5449	765.9197	754.8174	743.5461	732.7817	723.6135
12	865.9382	826.4990	801.0757	783.3657	767.8472	753.9766	739.8164	728.4207	720.0771	710.0532	700.5791	693.3340
13	694.8870	666.7549	656.4717	650.9502	642.1965	634.4773	622.9661	619.2871	619.2744	610.0466	604.2964	603.7637
14	667.9436	642.6411	635.7056	632.6987	625.1863	618.5725	607.4634	605.1187	606.5374	597.2876	592.1580	592.7075
15	639.3291	618.1475	615.1516	614.7686	608.3306	602.8313	591.9641	591.2271	594.1772	584.5430	580.1604	581.9668
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	682.2871	686.0571	688.2327	694.5254	708.5454	731.2786	759.5784	794.2678	834.6743	876.8357	907.3147	919.1575
HB	-19954.7	-11496.2	-8997.4	-7328.8	-5685.0	-4213.6	-3253.7	-2372.5	-1777.6	-1567.0	-1300.0	-1109.0
TSAT	557.3	556.7	556.2	555.6	554.9	554.3	553.6	552.9	552.5	552.4	552.0	551.8
HSAT	17347.5	18832.8	15356.5	12878.6	13695.0	14089.1	18680.0	15821.3	12298.1	18215.2	19536.2	15248.3
P	1109.4	1104.1	1099.7	1093.7	1087.6	1082.3	1076.7	1070.7	1067.2	1066.4	1062.9	1061.1
S.F.	1159519.0	923169.7	748790.0	649031.2	617330.4	574135.9	570688.4	497898.4	438177.1	468071.9	433048.8	379755.5
S.TEMP	624.18	605.76	605.01	605.97	599.96	595.02	584.18	584.41	588.17	578.14	574.21	576.74
MASS-FLX	4.3142	1.1321	0.8615	2.8554	5.1585	7.6980	9.7879	13.3247	17.1156	23.9423	26.9027	30.5689
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04950	0.04839	0.04945	0.05115	0.05256	0.05324	0.05384	0.05391	0.05478	0.05584	0.05572	0.05605
***RELAP	PREDICTIONS	(STARRED)***										
*HB	36.4	17.0	9.6	23.0	38.4	52.4	64.3	82.0	100.2	130.0	143.8	158.2
*S.F.	17467.6	8123.7	4606.8	10924.7	17708.1	23018.4	26234.0	30391.3	32958.6	37064.7	36130.4	37604.0
*S.TEMP	1161.53	1164.31	1167.06	1167.74	1166.99	1165.65	1164.33	1162.70	1161.06	1159.06	1157.53	1156.15
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	4.8000	4.8500	4.9000	4.9500	5.0000	5.0500	5.1000	5.1500	5.2000	5.2500	5.3000	5.3500
NODE												
1	1165.5398	1159.2373	1152.3547	1145.5042	1138.1038	1130.3730	1122.3333	1114.0078	1105.4231	1096.6035	1087.5757	1078.3647
2	1098.6650	1088.2756	1077.6709	1066.9111	1056.0481	1045.1306	1034.2036	1023.3069	1012.4761	1001.7385	991.1155	980.6223
3	1011.8757	998.5464	985.4741	972.6941	960.2319	948.1121	936.3601	924.9919	914.0098	903.4006	893.1453	883.2227
4	911.6831	897.8438	884.7183	872.2334	860.3706	849.1274	838.5173	828.5049	819.0347	810.0178	801.3999	793.1355
5	852.3496	839.5125	827.4688	816.0808	805.3823	795.3833	786.1169	777.4656	769.3301	761.5542	754.1182	746.9766
6	841.2300	828.5132	816.5908	805.3218	794.7661	784.9365	775.8689	767.4182	759.4766	751.8687	744.5964	737.6079
7	822.6875	810.4543	798.9636	788.0859	777.9561	768.5808	760.0068	752.0154	744.4973	737.2407	730.3081	723.6306
8	796.0693	784.9634	774.3843	764.3025	755.0537	746.5779	738.9526	731.7683	724.9648	718.2515	711.8711	705.6819
9	770.8542	761.0283	751.3701	742.1084	733.8518	726.3589	719.7747	713.3821	707.2771	701.0317	695.2039	689.4714
10	744.6011	736.1641	727.3259	718.8660	711.7625	705.3518	699.9580	694.3184	688.9116	683.0266	677.8032	672.4949
11	716.1365	709.2415	700.9941	693.3591	687.7561	682.5801	678.6431	673.6282	668.9480	663.2251	658.7795	653.8320
12	688.0334	682.7290	674.6318	667.9253	664.2915	660.3760	658.1377	653.3801	649.4602	643.5776	640.2153	635.4492
13	604.9949	603.3918	592.7588	590.1912	594.3086	592.8499	596.6311	589.9309	589.1318	580.7664	583.0459	576.9268
14	594.9714	593.8372	582.0677	580.8303	586.1760	584.9441	589.6609	582.4409	582.1873	573.3091	576.5769	570.0925
15	585.2991	584.5056	572.4663	571.6611	578.4583	577.2190	583.0544	574.9150	575.4282	565.7546	570.4070	563.2300
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	910.4165	888.8379	867.8442	853.2283	843.7104	836.7766	830.5757	825.1924	819.8677	814.5281	807.9626	800.8184
HB	-1031.0	-1079.4	-1258.5	-1139.2	-985.1	-1047.3	-906.4	-1093.4	-964.4	-1107.6	-881.9	-1043.9
TSAT	551.6	551.3	551.0	550.8	550.5	550.2	549.8	549.4	548.9	548.5	548.0	547.6
HSAT	11713.1	11645.4	23294.0	19865.8	10891.8	11877.9	7550.7	12781.9	10294.7	20837.4	10911.7	20665.3
P	1059.0	1056.4	1054.2	1051.8	1049.4	1047.1	1043.9	1039.9	1036.2	1032.3	1028.7	1024.8
S.F.	340029.6	333433.9	378265.4	325893.7	264895.1	275804.9	227199.3	277820.1	238919.3	279829.2	212101.3	251656.6
S.TEMP	580.62	579.93	567.27	567.16	574.80	573.42	579.92	571.09	572.13	561.89	567.47	559.75
MASS-FLX	35.6966	39.0863	41.6306	43.4784	45.0080	46.5377	48.3855	49.2194	50.3832	51.1864	52.7075	54.0126
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.05691	0.05778	0.05824	0.05764	0.05812	0.05927	0.05957	0.06047	0.06006	0.06047	0.05993	0.06079
***RELAP	PREDICTIONS	(STARRED)***										
*HB	179.4	192.2	203.0	211.7	218.4	224.6	231.8	235.7	239.5	242.9	247.2	253.1
*S.F.	43146.6	49572.3	56172.8	61212.5	64671.5	67408.3	70292.5	72055.5	73766.3	75406.4	77514.2	80417.5
*S.TEMP	1154.14	1151.47	1148.24	1144.80	1141.45	1138.23	1135.06	1131.94	1128.96	1125.98	1123.00	1119.76
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	5.4000	5.4500	5.5000	5.5500	5.6000	5.6500	5.7000	5.7500	5.8000	5.8500	5.9000	5.9500
NODE												
1	1068.9958	1059.4927	1049.8787	1040.1765	1030.4082	1020.5942	1010.7563	1000.9143	991.0859	981.2676	971.5356	961.8452
2	970.2712	960.0706	950.0273	940.1516	930.4526	920.9402	911.6221	902.5007	893.5737	884.8425	876.3037	867.9551
3	873.6128	864.3037	855.2913	846.5796	838.1775	830.0864	822.2935	814.7717	807.4988	800.4641	793.6563	787.0593
4	785.1978	777.5837	770.3098	763.4041	756.8813	750.7214	744.8552	739.2156	733.7710	728.5471	723.5247	718.6702
5	740.1292	733.6023	727.4453	721.7114	716.3979	711.4377	706.6882	702.0637	697.5776	693.3323	689.2520	685.2883
6	730.9146	724.5491	718.5730	713.0422	707.9473	703.2019	698.6392	694.1772	689.8477	685.7786	681.8628	678.0515
7	717.2476	711.2063	705.3835	700.4426	695.7495	691.3816	687.1284	682.9292	678.8555	675.0891	671.4397	667.8672
8	699.7974	694.2837	689.2461	684.7490	680.6943	676.8857	673.0342	669.1587	665.4307	662.1274	658.8259	655.5559
9	684.0854	679.1135	674.0941	670.8804	667.4717	664.1853	660.6414	657.0190	653.6133	650.8088	647.7866	644.7690
10	667.6494	663.2813	659.5840	656.5737	653.8787	651.1096	647.7688	644.3499	641.2588	639.1331	636.3042	633.5171
11	649.6436	646.0071	643.2297	641.2322	639.3428	637.0559	633.7161	630.4583	627.8708	626.6294	623.7668	621.2144
12	632.0828	629.2781	627.5942	626.7522	625.6296	623.6641	620.0120	616.9226	614.9556	614.9556	611.5815	609.3318
13	577.3813	577.1511	579.4719	582.5466	583.2217	581.2793	575.1274	573.2822	574.0764	579.4619	571.0630	571.1230
14	571.1943	571.2839	574.1804	577.7610	578.5847	576.5762	570.0012	568.4167	569.6265	575.7903	566.4009	566.9680
15	565.2224	565.5908	569.1450	573.2424	574.1165	571.9414	564.7966	563.6389	565.3508	572.4443	561.5493	562.9546
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	795.0313	789.9636	785.0313	779.9402	774.4170	770.9326	765.9956	757.9016	750.2849	745.1506	741.5986	738.2598
HB	-894.2	-882.4	-793.9	-740.4	-776.1	-828.7	-946.8	-864.4	-794.7	-626.9	-1013.9	-787.5
TSAT	547.1	546.7	546.2	545.8	545.3	544.8	544.3	543.7	543.3	542.7	542.2	541.7
HSAT	13689.5	12426.8	8449.3	6105.9	5894.9	6712.4	10805.3	9685.6	7415.8	3868.2	11021.4	7214.4
P	1021.1	1017.3	1013.6	1009.8	1005.8	1001.6	997.3	992.9	989.0	984.4	980.3	976.1
S.F.	208082.9	200445.4	173296.3	154617.2	157129.8	166808.3	193020.0	169959.6	148607.8	109213.3	185147.3	139574.4
S.TEMP	562.34	562.81	566.74	571.10	571.95	569.64	562.13	561.28	563.29	570.93	558.99	561.02
MASS-FLX	55.4391	56.5908	57.7557	58.9245	60.1972	57.8850	58.1923	58.9303	60.7089	60.4886	59.5219	59.2232
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06046	0.06101	0.06137	0.06200	0.06261	0.06289	0.06285	0.06238	0.06252	0.06295	0.06383	0.06294
***RELAP	PREDICTIONS	(STARRED)***										
*HB	257.8	262.8	267.1	271.6	276.6	269.3	269.8	274.3	276.6	282.1	278.7	279.1
*S.F.	82615.7	84707.9	86541.8	88449.9	90657.7	88561.1	89222.4	91863.4	93883.4	96427.2	95462.1	95690.0
*S.TEMP	1116.55	1113.27	1110.00	1106.70	1103.32	1100.64	1097.76	1094.70	1091.16	1087.64	1084.54	1081.61
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	6.0000	6.0500	6.1000	6.1500	6.2000	6.2500	6.3000	6.3500	6.4000	6.4500	6.5000	6.5500
NODE												
1	952.2283	942.6963	933.2607	923.9280	914.7063	905.6021	896.6221	887.7710	879.0549	870.4783	862.0481	853.7712
2	859.7908	851.8035	843.9856	836.3308	828.8352	821.4954	814.3093	807.2773	800.4016	793.6887	787.1504	780.7996
3	780.6504	774.4070	768.3157	762.3708	756.5718	750.9185	745.4111	740.0554	734.8606	729.8525	725.0635	720.5220
4	713.9319	709.2844	704.7363	700.3027	695.9995	691.8306	687.7949	683.9207	680.2295	676.7981	673.6897	670.9233
5	681.3521	677.4482	673.6321	669.9346	666.3789	662.9565	659.6619	656.5613	653.6741	651.1599	649.0762	647.3940
6	674.2402	670.4539	666.7600	663.1938	659.7759	656.4922	653.3374	650.3940	647.6768	645.3787	643.5447	642.1262
7	664.2422	660.6348	657.1375	653.7817	650.5859	647.5222	644.5862	641.8960	639.4495	637.5110	636.0854	635.0818
8	652.1265	648.7334	645.5037	642.4419	639.5569	636.7903	634.1470	631.8289	629.7700	628.4109	627.6150	627.2117
9	641.4492	638.2397	635.2744	632.4988	629.9153	627.4211	625.0486	623.1245	621.4502	620.7573	620.6277	620.8169
10	630.2041	627.1897	624.5371	622.0806	619.8337	617.6204	615.5352	614.1138	612.8787	613.1079	613.7852	614.6416
11	617.7209	614.9883	612.7615	610.6836	608.8396	606.9138	605.1570	604.4619	603.7317	605.3865	607.0381	608.6362
12	605.3938	603.1421	601.4536	599.7642	598.3560	596.6665	595.2578	595.5393	595.2578	598.9189	601.4529	603.7056
13	564.0986	565.0398	565.3472	564.6851	564.7881	563.4917	563.4038	568.2026	568.5840	582.1570	586.1470	590.1963
14	559.3777	560.9208	561.4492	560.8848	561.1887	559.8955	559.9968	565.4631	565.7830	580.8840	584.7126	588.9519
15	554.5291	556.9888	557.6877	557.1792	557.7102	556.3618	556.6934	562.9998	563.0776	580.1824	583.4583	587.8958
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	733.3076	729.4922	725.6973	721.6921	717.4629	710.6589	698.0679	693.6643	691.3494	689.1184	686.9277	687.7175
HB	-999.8	-775.4	-773.2	-786.8	-753.3	-806.5	-808.5	-597.8	-734.3	-32.6	-388.7	-319.4
TSAT	541.2	540.7	540.1	539.5	538.9	538.4	537.8	537.2	536.6	536.1	535.5	534.8
HSAT	16687.4	9363.8	8328.7	8267.8	7124.0	7744.2	6704.7	3191.6	3787.7	80.6	852.8	608.3
P	971.9	968.0	963.4	958.9	954.2	949.6	945.5	940.6	936.0	931.6	927.0	921.7
S.F.	181255.6	135226.9	131323.8	130871.6	121611.3	125855.8	115598.4	78762.9	95161.8	3552.8	40431.7	32028.4
S.TEMP	552.01	555.11	555.86	555.36	556.02	554.61	555.09	561.90	561.76	580.13	582.90	587.46
MASS-FLX	60.4022	61.0815	60.4535	60.1763	59.2219	59.0032	59.6851	57.5655	58.0356	55.4589	55.6454	49.9046
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06328	0.06269	0.06319	0.06349	0.06364	0.06386	0.06390	0.06410	0.06488	0.06498	0.06666	0.06691
***RELAP	PREDICTIONS	(STARRED)***										
*HB	280.2	279.7	281.6	280.3	278.1	276.1	274.3	275.5	279.6	269.7	267.9	267.4
*S.F.	96535.6	96519.1	97441.6	97251.2	96874.4	96985.9	98659.8	100058.2	101410.6	97912.6	96942.1	97015.6
*S.TEMP	1078.65	1075.58	1072.44	1069.51	1066.59	1063.87	1060.92	1057.40	1054.42	1051.79	1049.16	1046.80
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	6.6000	6.6500	6.7000	6.7500	6.8000	6.8500	6.9000	6.9500	7.0000	7.0500	7.1000	7.1500
NODE												
1	845.6567	837.7139	829.9509	822.3794	815.0076	807.8442	800.8967	794.1702	787.6699	781.3982	775.3572	769.5474
2	774.6519	768.7205	763.0190	757.5576	752.3396	747.3643	742.6282	738.1243	733.8455	729.7844	725.9331	722.2827
3	716.2429	712.2424	708.5286	705.1003	701.9348	699.0132	696.3132	693.8125	691.4985	689.3613	687.3877	685.5549
4	668.4902	666.4016	664.6487	663.1987	661.9646	660.9224	660.0344	659.2744	658.6409	658.1396	657.7427	657.3955
5	646.0615	645.1133	644.3110	644.1841	643.9663	643.8928	643.9080	643.9973	644.1880	644.4595	644.8618	645.1812
6	641.0586	640.3914	640.0713	640.0149	640.0254	640.1760	640.3960	640.6775	641.0574	641.5596	642.0945	642.5535
7	634.4182	634.1829	634.2854	634.6216	634.9373	635.4006	635.8953	636.4333	637.0750	637.8416	638.6033	639.2295
8	627.1050	627.4880	628.1648	629.0042	629.6377	630.4863	631.2859	632.1123	633.0691	634.1641	635.1638	635.9185
9	621.2395	622.2581	623.4780	624.7654	625.5920	626.8113	627.8391	628.9038	630.1506	631.5486	632.7100	633.4954
10	615.6477	617.4553	619.2634	621.0090	621.8943	623.5869	624.7842	626.0925	627.6738	629.4106	630.6638	631.3728
11	610.2878	613.1689	615.5793	617.7720	618.4331	620.8765	622.0820	623.6753	625.6885	627.8220	629.0085	629.4600
12	605.9563	610.1743	612.9875	615.5173	615.5173	619.1704	620.0132	621.9792	624.5059	627.0327	627.8750	627.8750
13	594.3386	604.6660	607.3721	610.7168	606.1501	617.2202	614.1638	618.4316	623.1353	626.9229	625.0344	622.7852
14	593.2949	604.4744	606.9021	610.3501	605.0396	617.4197	613.4646	618.2241	623.1663	627.0479	624.6802	622.1907
15	592.4348	604.6792	606.5303	610.1157	603.7771	618.0435	612.6497	618.1892	623.3665	627.3035	624.2561	621.5269
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	672.6287	668.1575	666.4297	669.8625	676.8660	669.9233	672.2966	671.5229	671.0576	669.5935	668.2000	666.4678
HB	-309.7	357.7	-183.1	-65.6	-721.7	783.4	-600.5	106.6	289.3	336.8	-433.7	-604.3
TSAT	534.4	533.8	533.2	532.6	532.0	531.5	530.9	530.4	529.8	529.2	528.5	527.9
HSAT	432.0	-317.3	150.3	50.7	750.0	-461.6	444.6	-64.6	-146.5	-144.2	200.8	293.6
P	918.3	913.7	909.6	905.1	900.4	896.3	892.2	887.7	883.2	878.9	873.9	869.3
S.F.	24943.5	-22597.7	10994.2	3924.6	53267.6	-40211.1	36110.3	-5678.5	-13741.0	-14178.3	19171.0	27382.2
S.TEMP	592.09	604.99	606.38	610.06	603.05	618.59	612.16	618.27	623.55	627.49	624.00	621.16
MASS-FLX	54.2948	54.0596	52.7426	53.0820	47.2810	50.4327	50.3941	48.3242	47.3741	46.4290	45.1991	44.9471
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06723	0.06754	0.06853	0.06853	0.06868	0.06798	0.06912	0.06854	0.06890	0.06923	0.06945	0.06904
RELAP PREDICTIONS (STARRED)												
*HB	262.2	265.3	258.4	250.7	251.9	239.9	233.6	232.9	231.5	231.0	224.5	224.0
*S.F.	96990.2	98795.2	96054.7	92084.1	91376.7	87217.8	83746.4	83096.6	82516.0	82306.2	79918.1	79724.7
*S.TEMP	1044.04	1041.03	1038.50	1036.76	1035.05	1033.26	1031.36	1029.53	1027.69	1026.00	1024.26	1022.57
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	7.2000	7.2500	7.3000	7.3500	7.4000	7.4500	7.5000	7.5500	7.6000	7.6500	7.7000	7.7500
NODE												
1	763.9670	758.6138	753.4839	748.5725	743.8745	739.3848	735.0967	731.0032	727.0945	723.3577	719.7761	716.3293
2	718.8196	715.5313	712.4063	709.4365	706.6157	703.9363	701.3882	698.9565	696.6165	694.3325	692.0581	689.7490
3	683.8362	682.2153	680.6851	679.2473	677.8994	676.6316	675.4231	674.2351	673.0034	671.6348	670.0376	668.1628
4	657.0483	656.7163	656.4155	656.1711	655.9773	655.8008	655.5884	655.2441	654.6135	653.4973	651.7825	649.5212
5	645.4036	645.6213	645.8645	646.1765	646.5159	646.8130	646.9805	646.8530	646.1782	644.6655	642.2837	639.2971
6	642.8872	643.2249	643.5896	644.0310	644.4905	644.8848	645.1196	645.0027	644.2488	642.5432	639.9028	636.6760
7	639.6865	640.1787	640.7041	641.3252	641.9414	642.4524	642.7473	642.5872	641.6282	639.5203	636.3965	632.7700
8	636.4436	637.1123	637.8208	638.6689	639.4500	640.0461	640.3245	639.9487	638.4761	635.5144	631.5042	627.2734
9	634.0068	634.8591	635.7263	636.7969	637.6890	638.2993	638.4707	637.7292	635.5215	631.4382	626.4146	621.6433
10	631.7942	632.9219	633.9478	635.2922	636.2424	636.7864	636.7292	635.3730	632.0352	626.3293	620.0479	614.8152
11	629.6936	631.3357	632.4890	634.2168	635.0957	635.4377	634.9502	632.5422	627.4011	619.2588	611.4951	606.1243
12	627.8750	630.4004	631.5227	633.7671	634.3279	634.3279	633.2061	629.2773	621.6543	610.4512	601.4514	596.6665
13	622.0562	629.8242	629.4893	634.4736	632.3921	630.7632	626.5564	615.1279	596.5127	572.5464	562.5422	563.4370
14	621.4385	630.0447	629.2717	634.7229	632.1228	630.3457	625.7297	613.2737	593.2415	567.6858	557.9675	559.8657
15	620.8142	630.5571	629.0354	635.1538	631.7717	629.8789	624.7693	611.0469	589.3728	562.0776	553.1868	556.4666
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	664.9211	663.2988	661.5857	659.8784	658.1692	656.4446	654.7795	653.1252	651.4067	650.0806	648.6677	646.9326
HB	-527.2	950.0	-320.5	954.9	-637.5	-719.5	-1348.1	-2252.6	-2585.6	-2564.1	-1832.1	-1251.1
TSAT	527.3	526.6	526.0	525.4	524.7	524.1	523.5	522.8	522.1	521.5	520.8	520.1
HSAT	251.2	-294.3	101.8	-211.7	158.9	182.9	409.0	1124.8	2558.1	6253.1	6006.8	3314.2
P	864.7	860.1	855.4	850.8	846.2	841.5	836.9	832.3	827.4	822.7	818.1	813.0
S.F.	23421.9	-30709.3	10478.3	-23308.6	16972.6	19301.5	41206.9	97761.4	166232.3	233871.6	179493.8	115194.1
S.TEMP	620.50	630.97	628.89	635.47	631.54	629.62	624.21	609.73	587.11	558.87	550.70	554.86
MASS-FLX	44.2149	43.2645	42.5238	41.7841	40.9830	40.1889	39.3977	38.5958	37.8307	36.8114	34.8626	33.0547
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06870	0.06859	0.06939	0.06918	0.06960	0.06920	0.06897	0.06851	0.06735	0.06558	0.06335	0.06303
RELAP PREDICTIONS (STARRED)												
*HB	220.7	216.9	214.1	211.1	207.9	204.7	201.5	198.2	194.7	190.3	181.9	174.8
*S.F.	78528.6	77184.2	76207.8	75175.7	74051.0	72949.1	71846.6	70719.6	69551.9	67986.4	65020.9	62642.7
*S.TEMP	1020.95	1019.30	1017.68	1016.09	1014.54	1013.02	1011.53	1010.08	1008.67	1007.44	1006.38	1005.31
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	7.8000	7.8500	7.9000	7.9500	8.0000	8.0500	8.1000	8.1500	8.2000	8.2500	8.3000	8.3500
NODE												
1	712.9949	709.7502	706.5752	703.4504	700.3606	697.2927	694.2373	691.1860	688.1345	685.0796	682.0186	678.9529
2	687.3726	684.9075	682.3467	679.6921	676.9512	674.1343	671.2534	668.3213	665.3496	662.3491	659.3342	656.3179
3	666.0115	663.6201	661.0276	658.2827	655.4221	652.4824	649.4919	646.4700	643.4343	640.4006	637.3948	634.4407
4	646.8557	643.9500	640.8765	637.7322	634.5459	631.3706	628.2170	625.0925	622.0146	618.9946	616.0891	613.3230
5	636.0022	632.6401	629.1975	625.8196	622.4619	619.2031	616.0103	612.8767	609.8337	606.8816	604.1367	601.5923
6	633.1956	629.7144	626.1687	622.7344	619.3279	616.0505	612.8445	609.7048	606.6677	603.7319	601.0378	598.5593
7	629.0156	625.3884	621.7080	618.2280	614.7717	611.4993	608.2966	605.1663	602.1609	599.2673	596.6848	594.3291
8	623.1914	619.4644	615.8313	612.1858	608.6948	605.5027	602.3359	599.2510	596.3308	593.5308	591.1814	589.0417
9	617.3477	613.6514	609.6694	606.3669	602.8381	599.7998	596.6716	593.6482	590.8455	588.1565	586.1230	584.2166
10	610.4387	606.9329	602.7175	599.7388	596.1025	593.3452	590.2236	587.2842	584.6528	582.0989	580.5559	578.9111
11	601.9358	598.9043	594.2036	591.9583	587.9841	585.7996	582.5562	579.7551	577.3570	575.0015	574.2981	572.8862
12	593.0024	590.7478	585.1072	584.2607	579.4626	578.3330	574.6619	572.1177	570.1394	567.8772	568.4429	567.0288
13	562.0422	563.3511	551.4182	559.6848	548.1721	554.1250	546.3496	545.8567	545.5383	543.3062	550.5859	547.0156
14	558.6809	560.4873	547.4348	557.3618	544.4792	551.7698	543.1082	543.0715	542.9448	540.6609	548.9849	544.8281
15	555.3796	557.7742	543.1118	555.4585	540.4473	549.7415	539.6636	540.3704	540.4253	538.0142	547.7273	542.5615
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	645.9287	645.4150	645.0925	645.4543	646.8140	648.9932	650.9814	652.6812	654.3037	655.9641	657.7598	659.7207
HB	-1272.7	-1038.0	-1629.6	-564.9	-1474.4	-592.4	-1176.0	-821.4	-762.6	-798.6	-288.3	-723.5
TSAT	519.4	518.8	518.1	517.4	516.7	516.1	515.3	514.6	513.9	513.2	512.5	511.7
HSAT	3419.6	2448.3	7507.1	1372.5	7450.6	1805.5	5925.9	3819.9	3471.3	4053.8	914.5	2888.1
P	808.4	803.8	799.0	794.2	789.5	785.0	780.1	775.2	770.3	765.4	760.5	755.6
S.F.	117318.2	92305.9	170041.6	51244.7	160117.6	59293.5	133088.9	93326.9	87783.8	95260.9	31853.0	85630.8
S.TEMP	553.75	556.49	540.75	554.74	538.22	548.91	537.81	539.06	539.20	536.68	547.28	541.37
MASS-FLX	31.6784	29.9826	29.3168	27.9640	26.4308	24.7906	23.0706	21.7498	20.5017	19.2531	17.9843	16.6571
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06390	0.06422	0.06478	0.06363	0.06518	0.06394	0.06515	0.06439	0.06471	0.06497	0.06495	0.06613
RELAP PREDICTIONS (STARRED)												
*HB	168.2	164.2	159.5	150.7	145.6	136.8	129.0	122.4	116.3	110.2	104.1	97.6
*S.F.	60258.4	58863.1	57081.8	53805.8	51802.4	48313.9	45304.5	42757.6	40461.6	38165.6	35853.5	33454.4
*S.TEMP	1004.34	1003.55	1002.90	1002.45	1002.08	1001.89	1001.78	1001.78	1001.79	1001.84	1001.94	1002.11
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	8.4000	8.4500	8.5000	8.5500	8.6000	8.6500	8.7000	8.7500	8.8000	8.8500	8.9000	8.9500
NODE												
1	675.8850	672.8169	669.7529	666.6968	663.6516	660.6213	657.6074	654.6128	651.6394	648.6890	645.7629	642.8647
2	653.3140	650.3352	647.3867	644.4722	641.5923	638.7476	635.9375	633.1611	630.4163	627.7053	625.0317	622.4026
3	631.5562	628.7471	626.0037	623.3157	620.6741	618.0769	615.5210	613.0000	610.5115	608.0645	605.6750	603.3586
4	610.7012	608.1980	605.7612	603.3647	601.0027	598.6863	596.4067	594.1470	591.9124	589.7473	587.6853	585.7480
5	599.2275	596.9731	594.7339	592.5032	590.2952	588.1431	586.0186	583.8899	581.7905	579.8127	577.9907	576.3364
6	596.2666	594.0742	591.8748	589.6748	587.4968	585.3828	583.2903	581.1851	579.1130	577.1877	575.4375	573.8647
7	592.1626	590.0691	587.9226	585.7661	583.6348	581.5825	579.5383	577.4629	575.4353	573.6042	571.9734	570.5334
8	587.0789	585.1204	583.0154	580.9053	578.8354	576.8799	574.8933	572.8423	570.8816	569.2205	567.7864	566.5547
9	582.4673	580.6179	578.5059	576.4326	574.4236	572.5791	570.6306	568.5823	566.7007	565.2593	564.0464	563.0371
10	577.4133	575.6416	573.4465	571.4165	569.4829	567.7903	565.8479	563.7712	562.0115	560.9080	559.9761	559.2432
11	571.6941	569.9072	567.4800	565.5464	563.7190	562.2612	560.2380	558.0825	556.5520	556.0183	555.4346	555.0549
12	566.1799	564.1995	561.3682	559.6694	557.9705	556.8367	554.5696	552.3020	551.1677	551.4512	551.1677	551.1677
13	547.8655	544.1443	539.2817	539.4727	538.0881	538.5171	534.2932	531.7803	532.9773	537.1624	537.1809	538.6802
14	546.0051	541.9441	536.8215	537.3821	535.9849	536.6426	532.0588	529.5681	531.1428	535.8479	535.7588	537.4653
15	544.2434	539.6682	534.2549	535.3762	533.8970	534.8486	529.7305	527.3352	529.4204	534.7422	534.3787	536.3484
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	661.8396	664.1245	666.5554	669.2473	672.5054	675.5649	678.9460	682.4944	686.0854	689.2937	692.7290	695.4736
HB	-501.6	-677.5	-719.4	-507.2	-533.1	-432.2	-580.2	-514.5	-362.8	-205.5	-304.7	-228.1
TSAT	511.0	510.2	509.5	508.7	508.0	507.4	506.7	506.0	505.3	504.5	503.8	503.1
HSAT	1831.6	3014.8	4106.5	2664.4	3000.7	2297.5	3995.3	3972.3	2445.9	1069.7	1619.0	1113.3
P	750.7	745.9	741.0	736.1	731.5	727.0	722.5	718.1	713.6	708.9	704.2	700.2
S.F.	59404.0	85130.6	96139.7	68387.1	74451.1	61194.9	87286.3	80415.1	57131.9	31852.9	48450.3	36407.9
S.TEMP	543.41	538.48	532.91	534.42	532.85	533.99	528.50	526.20	528.62	534.29	533.70	535.84
MASS-FLX	15.3057	13.9384	12.5629	11.0546	9.1884	7.9511	6.7199	5.5066	4.1972	3.3009	1.6464	0.4115
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06573	0.06602	0.06569	0.06529	0.06559	0.06563	0.06589	0.06552	0.06543	0.06585	0.06656	0.06660
RELAP PREDICTIONS (STARRED)												
*HB	90.9	84.0	77.2	69.6	60.1	53.0	46.3	39.6	32.2	23.7	10.5	5.0
*S.F.	31002.8	28492.2	26024.9	23311.9	19983.7	17504.8	15171.6	12861.3	10364.5	7570.7	3328.0	1579.2
*S.TEMP	1002.36	1002.70	1003.12	1003.64	1004.33	1005.14	1005.92	1006.74	1007.62	1008.64	1009.77	1010.94
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	9.0000	9.0500	9.1000	9.1500	9.2000	9.2500	9.3000	9.3500	9.4000	9.4500	9.5000	9.5500
NODE												
1	639.9968	637.1636	634.3662	631.6079	628.8899	626.2131	623.5786	620.9871	618.4387	615.9338	613.4722	611.0544
2	619.8242	617.2991	614.8281	612.4084	610.0356	607.7078	605.4258	603.1885	600.9934	598.8386	596.7266	594.6614
3	601.1194	598.9551	596.8528	594.7930	592.7708	590.7876	588.8518	586.9565	585.0945	583.2659	581.4807	579.7605
4	583.9148	582.1616	580.4453	578.7227	577.0190	575.3560	573.7583	572.1821	570.6165	569.0823	567.6118	566.2639
5	574.7764	573.2749	571.7585	570.1748	568.6274	567.1375	565.7483	564.3289	562.9004	561.5210	560.2458	559.1733
6	572.3762	570.9385	569.4639	567.8999	566.3901	564.9448	563.6150	562.2251	560.8264	559.4868	558.2686	557.2861
7	569.1511	567.8027	566.3752	564.8247	563.3735	561.9956	560.7593	559.3992	558.0374	556.7588	555.6316	554.8003
8	565.3057	564.0642	562.6616	561.0835	559.7305	558.4495	557.3613	555.9915	554.6680	553.4841	552.5051	551.9331
9	561.8896	560.7354	559.3088	557.6614	556.4497	555.2666	554.3491	552.8945	551.6155	550.5457	549.7415	549.4863
10	558.1584	557.0884	555.5605	553.7820	552.8281	551.7495	551.0747	549.3875	548.1985	547.2993	546.7417	546.9553
11	553.9158	552.9358	551.1467	549.1431	548.7349	547.7222	547.4355	545.1611	544.2332	543.6086	543.4236	544.3867
12	549.7495	548.8984	546.6279	544.3564	544.9241	543.7878	544.0718	540.6643	540.3801	540.0959	540.3804	542.3687
13	534.9214	535.1194	529.6843	526.8352	533.3003	529.9573	533.5168	522.7444	527.7742	528.4688	530.8105	537.7808
14	533.2842	533.7222	527.9912	524.9307	532.3467	528.4382	532.5767	520.5457	526.6694	527.3179	529.9307	537.5762
15	531.5491	532.3848	525.9536	522.9780	531.6863	526.8286	531.8130	517.9895	525.8154	526.2283	529.1721	537.6475
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	696.5220	700.2012	709.8870	722.7036	744.0547	767.3350	791.3198	814.6692	830.6716	839.2319	842.8232	839.9275
HB	-399.5	-269.7	-425.1	-355.3	-57.3	-256.3	-78.4	-354.6	-65.2	-118.8	-72.2	42.8
TSAT	502.3	501.6	501.4	501.0	500.7	500.3	500.0	499.7	499.3	498.9	498.5	498.5
HSAT	2339.2	1508.6	3351.0	3393.3	395.3	2413.6	644.7	6281.4	758.3	1391.6	746.7	-328.1
P	694.9	690.8	689.2	686.6	684.9	682.7	680.4	678.7	676.4	674.1	671.5	671.2
S.F.	66273.3	45427.1	78665.6	71323.3	12186.1	61864.3	20357.2	105742.7	19890.8	37262.9	22670.9	-12920.6
S.TEMP	530.62	531.75	524.85	521.97	531.51	525.96	531.53	516.50	525.53	525.70	528.85	537.83
MASS-FLX	1.0583	0.4253	2.9732	4.0580	5.6965	7.7591	8.6380	12.3319	14.1257	14.8627	13.6449	20.8317
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06688	0.06644	0.06662	0.06606	0.06587	0.06697	0.06655	0.06715	0.06576	0.06674	0.06691	0.06729
***RELAP	PREDICTIONS	(STARRED)***										
*HB	11.8	5.0	26.0	24.9	39.5	48.5	55.3	70.7	81.7	85.4	82.0	111.6
*S.F.	3718.7	1561.1	7945.2	7269.1	10687.8	12040.0	12304.8	14049.8	14644.5	14552.6	13590.9	18623.9
*S.TEMP	1011.75	1012.41	1012.26	1012.17	1011.45	1010.86	1010.28	1009.45	1008.89	1008.44	1008.15	1007.77
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	9.6000	9.6500	9.7000	9.7500	9.8000	9.8500	9.9000	9.9500	10.0000	10.0500	10.1000	10.1500
NODE												
1	608.6824	606.3572	604.0796	601.8496	599.6675	597.5330	595.4465	593.4072	591.4148	589.4673	587.5632	585.7007
2	592.6470	590.6855	588.7727	586.9055	585.0840	583.3086	581.5789	579.8906	578.2400	576.6238	575.0371	573.4756
3	578.1079	576.5117	574.9502	573.4236	571.9424	570.5061	569.1099	567.7390	566.3928	565.0576	563.7305	562.4082
4	564.9976	563.7671	562.5134	561.2893	560.1318	559.0188	557.9297	556.8250	555.7319	554.6096	553.4717	552.3206
5	558.1494	557.1104	555.9675	554.9004	553.9451	553.0117	552.0781	551.0725	550.0996	549.0425	547.9724	546.8823
6	556.3254	555.3293	554.1970	553.1763	552.2825	551.3948	550.4966	549.5056	548.5649	547.5110	546.4536	545.3740
7	553.9211	552.9739	551.8350	550.8894	550.0940	549.2639	548.4094	547.4216	546.5293	545.4626	544.4221	543.3530
8	551.1233	550.2046	548.9944	548.1943	547.5525	546.7708	545.9546	544.9263	544.1167	542.9785	541.9663	540.8982
9	548.6675	547.7422	546.3962	545.8240	545.3477	544.5674	543.7725	542.6541	541.9709	540.6860	539.7310	538.6499
10	545.9731	545.0112	543.4131	543.2795	542.9958	542.1338	541.3555	540.0574	539.6184	538.0227	537.2134	536.0835
11	542.8289	541.8347	539.7561	540.5752	540.4429	539.2986	538.5652	536.9016	537.0085	534.6946	534.3027	533.0129
12	539.5256	538.6729	535.8315	538.3906	538.1062	536.3992	535.8308	533.5547	534.6529	530.9541	531.5635	529.8560
13	525.8943	527.6389	520.3235	533.8726	530.1719	525.2639	526.4089	520.4065	528.3323	515.1890	523.3147	517.8774
14	524.1042	526.5862	518.4929	533.9106	529.2478	523.9697	525.5017	518.8699	527.9795	513.1365	522.7751	516.4792
15	521.8962	525.6531	516.4336	534.4954	528.1892	522.5310	524.6780	517.1462	527.9619	510.6240	522.5938	514.9036
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	834.3450	822.7925	805.6060	786.9619	771.8052	761.1768	753.3423	747.1326	742.4390	738.0903	733.8005	728.6406
HB	-306.9	-92.9	-284.7	168.0	-182.4	-237.5	-112.9	-298.4	59.1	-473.4	39.9	-297.9
TSAT	497.8	497.4	497.1	496.6	496.2	495.7	495.3	494.8	494.4	493.9	493.5	493.2
HSAT	4241.1	993.7	4537.6	-1098.8	1418.8	2185.9	890.6	3226.7	-374.6	7136.6	-288.8	3075.1
P	667.5	665.2	662.8	660.0	657.4	654.8	652.2	649.5	646.8	644.1	641.9	640.0
S.F.	96295.4	27639.2	82657.0	-42304.3	44555.9	56870.9	25857.7	68912.4	-12655.4	108411.4	-8428.1	63945.4
S.TEMP	520.55	525.26	513.27	535.09	527.56	521.73	524.31	516.17	528.14	509.10	522.71	514.00
MASS-FLX	19.1883	21.9293	22.8458	24.3148	25.5086	26.2775	26.8410	27.7007	27.3818	27.8484	28.5189	29.6685
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06821	0.06654	0.06701	0.06614	0.06818	0.06758	0.06697	0.06727	0.06655	0.06782	0.06602	0.06745
***RELAP	PREDICTIONS	(STARRED)***										
*HB	103.6	114.0	118.1	123.5	129.7	133.1	135.2	139.2	137.6	140.0	141.7	146.3
*S.F.	17693.5	20699.1	23051.2	26244.3	29719.5	31659.6	32860.0	34644.2	34640.6	35590.5	36428.9	38097.3
*S.TEMP	1006.80	1005.81	1004.46	1002.97	1001.24	999.47	997.80	996.15	994.63	993.17	991.75	990.20
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	10.2000	10.2500	10.3000	10.3500	10.4000	10.4500	10.5000	10.5500	10.6000	10.6500	10.7000	10.7500
NODE												
1	583.8774	582.0913	580.3416	578.6265	576.9458	575.2993	573.6853	572.1016	570.5461	569.0178	567.5164	566.0410
2	571.9382	570.4253	568.9380	567.4783	566.0464	564.6411	563.2583	561.8928	560.5420	559.2073	557.8948	556.6079
3	561.0977	559.8059	558.5400	557.2998	556.0867	554.8931	553.7053	552.5105	551.3125	550.1333	548.9897	547.8826
4	551.1873	550.0852	549.0215	547.9841	546.9751	545.9646	544.9185	543.8267	542.7239	541.6907	540.7346	539.8250
5	545.8433	544.8518	543.9109	542.9841	542.0913	541.1577	540.1423	539.0530	537.9827	537.0742	536.2710	535.4897
6	544.3635	543.4045	542.4988	541.5994	540.7385	539.8171	538.7974	537.6978	536.6355	535.7786	535.0269	534.2795
7	542.3884	541.4783	540.6250	539.7620	538.9475	538.0330	536.9927	535.8679	534.8232	534.0618	533.3896	532.6860
8	540.0190	539.1787	538.3987	537.5710	536.8218	535.8801	534.7791	533.6006	532.6011	532.0347	531.4756	530.8066
9	537.8884	537.1145	536.4109	535.5979	534.9221	533.9080	532.7153	531.4739	530.5588	530.2634	529.7969	529.1262
10	535.5276	534.8164	534.2087	533.3801	532.8159	531.6357	530.3010	528.9819	528.2393	528.3655	527.9663	527.2393
11	532.8657	532.1677	531.6938	530.7734	530.4160	528.8508	527.3145	525.9175	525.5500	526.4631	525.9011	525.0098
12	530.4255	529.5713	529.2866	528.1475	528.1475	525.8677	524.1572	522.7327	523.0178	525.0132	523.8728	522.7319
13	523.0786	520.2446	521.1716	518.4548	520.7629	513.8464	512.2126	510.9753	515.0732	522.2700	516.0242	514.1360
14	522.5308	519.2102	520.3933	517.3870	520.1084	512.3948	510.9509	509.7471	514.4258	522.2615	515.0227	513.2114
15	522.2134	518.0913	519.6807	516.2458	519.5701	510.7156	509.6785	508.5159	513.9653	522.5305	513.7976	512.2515
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	722.7920	716.3992	708.9368	700.8281	693.7424	687.5039	679.5471	671.7224	662.1382	644.4434	632.1643	632.7810
HB	-9.8	-219.9	-119.5	-235.6	-82.9	-387.4	-264.3	-267.2	-61.7	162.6	-445.7	-288.9
TSAT	492.9	492.5	492.2	491.8	491.4	491.1	490.8	490.4	490.0	489.6	489.4	488.9
HSAT	66.7	1752.6	832.6	1831.1	517.9	3701.6	2465.2	2504.2	384.4	-596.2	2243.7	1531.5
P	637.9	635.9	633.9	631.8	629.7	628.0	625.8	623.8	621.5	619.3	617.9	615.3
S.F.	1956.4	43745.5	22645.8	43626.6	14457.1	68859.5	45065.8	43767.2	9156.9	-19781.4	53094.4	34963.6
S.TEMP	522.19	517.47	519.36	515.63	519.37	509.74	509.04	507.89	513.83	522.81	513.05	511.76
MASS-FLX	30.7914	31.5635	32.6272	33.7682	34.8305	35.0966	37.0241	38.0041	38.0624	40.8341	45.1368	41.9313
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06674	0.06761	0.06722	0.06745	0.06714	0.06758	0.06668	0.06667	0.06670	0.06743	0.06842	0.06746
***RELAP	PREDICTIONS	(STARRED)***										
*HB	150.9	153.7	156.5	162.2	166.3	167.9	175.8	178.3	180.8	186.4	187.7	198.6
*S.F.	39980.2	41342.4	42925.6	45692.9	47515.1	48675.9	51902.9	53583.0	55536.6	59859.2	61204.8	65563.0
*S.TEMP	988.49	986.71	984.88	982.88	980.76	978.64	976.42	974.07	971.63	968.84	966.01	963.43
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	10.8000	10.8500	10.9000	10.9500	11.0000	11.0500	11.1000	11.1500	11.2000	11.2500	11.3000	11.3500
NODE												
1	564.5920	563.1687	561.7710	560.3989	559.0535	557.7356	556.4482	555.1958	553.9822	552.8118	551.6863	550.6057
2	555.3462	554.1064	552.8884	551.6948	550.5310	549.4045	548.3252	547.3037	546.3489	545.4609	544.6301	543.8411
3	546.7976	545.7258	544.6709	543.6479	542.6716	541.7615	540.9363	540.2146	539.5984	539.0613	538.5535	538.0393
4	538.9067	537.9739	537.0647	536.2207	535.4661	534.8372	534.3564	534.0437	533.8706	533.7236	533.4907	533.1448
5	534.6345	533.7510	532.9246	532.2188	531.6416	531.2463	531.0496	531.0679	531.2112	531.2583	531.0676	530.6931
6	533.4290	532.5527	531.7542	531.0977	530.5820	530.2700	530.1716	530.3020	530.5430	530.6279	530.4172	530.0117
7	531.8257	530.9551	530.2029	529.6292	529.2114	529.0325	529.0869	529.3909	529.7676	529.8745	529.5930	529.1184
8	529.8838	529.0159	528.3525	527.9248	527.6594	527.6963	527.9873	528.5515	529.0928	529.1328	528.6489	528.0398
9	528.0864	527.2358	526.6973	526.4485	526.3477	526.6377	527.1860	528.0308	528.6968	528.5500	527.7659	527.0156
10	525.9802	525.1973	524.8696	524.8804	524.9871	525.6399	526.5181	527.7290	528.4746	527.9189	526.6570	525.7729
11	523.3386	522.7876	522.8357	523.2351	523.5923	524.8127	526.1155	527.8240	528.4939	527.0671	525.0625	524.1660
12	520.4512	520.4512	521.0217	521.8774	522.4478	524.4431	526.1528	528.4324	528.7170	525.8665	523.0166	522.4470
13	508.7373	512.8530	515.0489	518.2749	519.2449	525.2366	528.0122	532.7690	529.7498	518.9588	513.4590	516.2727
14	507.3711	512.2429	515.2178	518.0146	518.9661	525.5344	528.2942	533.3657	529.7397	517.9348	512.3066	515.7598
15	505.8401	511.8235	514.9065	517.8625	518.7288	526.0554	528.6667	534.1238	529.6016	516.4844	510.9900	515.3848
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	614.3127	585.2900	583.8147	599.1086	601.9143	582.9619	548.6565	513.9753	485.9963	493.8467	507.9263	545.0974
HB	-553.8	-95.9	-100.6	-20.0	-85.4	477.8	814.2	-1600.2	238.3	3059.1	22425.7	-251.9
TSAT	488.2	488.0	487.6	487.1	486.7	486.3	485.8	485.3	484.9	484.9	482.9	490.3
HSAT	3618.9	297.2	255.1	53.0	222.9	-672.2	-373.6	-669.7	232.6	2168.7	1907.7	300.6
P	611.5	610.0	607.7	605.0	602.8	600.3	597.9	595.2	592.9	592.9	581.9	623.0
S.F.	60551.0	7052.5	6942.3	1627.6	7115.6	-27006.4	-16090.2	-32984.6	10355.9	66391.3	52144.1	7512.9
S.TEMP	504.98	511.72	514.81	517.84	518.63	526.44	528.89	534.59	529.46	515.55	510.25	515.28
MASS-FLX	40.4889	44.4141	44.3821	41.4377	42.3818	44.5766	45.2395	47.0118	48.5905	49.5979	44.7542	45.9685
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06729	0.06667	0.06746	0.06789	0.06824	0.06831	0.06908	0.06928	0.06974	0.06914	0.06765	0.06713
***RELAP	PREDICTIONS	(STARRED)***										
*HB	188.5	211.5	214.7	212.7	210.2	209.5	214.9	238.3	257.0	267.5	215.4	826.4
*S.F.	63446.6	78044.4	79131.2	76076.0	73039.9	75526.3	82750.9	100054.7	112338.1	112048.3	85604.9	341764.3
*S.TEMP	960.57	956.41	952.19	949.10	947.11	944.77	941.20	935.48	928.49	916.82	910.09	896.97
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	3

TIME--	11.4000	11.4500	11.5000	11.5500	11.6000	11.6500	11.7000	11.7500	11.8000	11.8500	11.9000	11.9500
NODE												
1	549.5684	548.5725	547.6165	546.7002	545.8237	544.9856	544.1858	543.4229	542.6563	542.0042	541.3445	540.7151
2	543.0837	542.3562	541.6597	540.9963	540.3696	539.7786	539.2207	538.6938	538.1970	537.7244	537.2698	536.8296
3	537.5222	537.0188	536.5479	536.1152	535.7268	535.3696	535.0359	534.7239	534.4314	534.1436	533.8462	533.5464
4	532.7813	532.4539	532.1987	531.9961	531.8572	531.7195	531.5796	531.4526	531.3384	531.1602	530.9712	530.7573
5	530.3818	530.1646	530.0667	530.0139	530.0396	529.9983	529.9429	529.9080	529.8828	529.7424	529.5244	529.3457
6	529.7214	529.5442	529.5024	529.4937	529.5723	529.5474	529.5120	529.5027	529.5020	529.3516	529.1216	528.9563
7	528.8716	528.7625	528.8096	528.8594	529.0166	528.9951	528.9827	529.0088	529.0391	528.8525	528.5957	528.4568
8	527.9133	527.9194	528.1108	528.2219	528.4951	528.4182	528.4329	528.5073	528.5713	528.2759	527.9668	527.8955
9	527.1138	527.2468	527.6033	527.7419	528.1511	527.9363	527.9973	528.1267	528.2146	527.7363	527.3823	527.4280
10	526.3276	526.5994	527.1831	527.2915	527.9121	527.3894	527.5713	527.7749	527.8762	527.0593	526.6934	526.9646
11	525.6895	526.0115	526.9399	526.8547	527.8716	526.6367	527.1853	527.4736	527.5549	526.0701	525.8445	526.5701
12	525.5825	525.5825	527.0063	526.4368	528.1472	525.5833	527.0068	527.2917	527.2917	524.7280	525.0129	526.4380
13	528.3750	524.1504	528.6638	524.4678	530.7791	519.4673	527.8464	526.9758	526.4192	517.7041	522.5774	527.4390
14	529.0974	523.8562	528.9917	524.1226	531.2703	518.4587	528.2373	526.9116	526.3135	516.6948	522.5134	527.7156
15	530.2693	523.3870	529.4907	523.6155	531.9976	517.0295	528.9634	526.8047	526.1897	515.3767	522.6587	528.1675
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	485.0237	482.4258	482.0254	481.5110	481.0144	480.4692	479.9158	479.3806	478.8203	478.2932	477.7390	477.1958
HB	-1273.0	609.7	-518.7	593.8	-689.5	1911.6	-799.9	134.8	106.3	1625.2	-308.9	-437.0
TSAT	483.3	482.4	482.0	481.5	481.0	480.5	479.9	479.4	478.8	478.3	477.7	477.2
HSAT	-1227.2	609.7	-518.7	593.8	-689.5	1911.6	-799.9	134.8	106.3	1625.2	-308.9	-437.0
P	584.0	579.2	577.0	574.3	571.6	568.7	565.7	562.9	559.9	557.1	554.2	551.3
S.F.	-58656.9	24762.4	-24800.9	24795.4	-35499.0	68057.0	-39683.5	6378.3	5025.5	58918.8	-13935.5	-22411.0
S.TEMP	531.10	523.04	529.84	523.27	532.50	516.07	529.53	526.71	526.12	514.55	522.86	528.48
MASS-FLX	44.6144	46.7351	46.7729	44.4303	44.4220	44.6144	44.2099	43.9434	44.1382	43.8517	43.9597	43.1491
QUALITY	1.00000	0.92366	0.86992	0.83381	0.80873	0.78929	0.77301	0.75840	0.74410	0.73075	0.71763	0.70536
GAP	0.06775	0.06945	0.06867	0.06925	0.06857	0.06943	0.06778	0.06910	0.06887	0.06878	0.06761	0.06847
***RELAP	PREDICTIONS	(STARRED)***										
*HB	410.2	233.3	230.7	217.6	211.2	207.9	202.5	196.8	196.6	191.5	188.9	182.4
*S.F.	170111.1	97333.8	96293.8	90753.4	88012.8	86547.7	84106.6	81578.3	81276.5	78996.0	77747.9	74936.4
*S.TEMP	897.62	899.77	899.46	898.68	897.90	896.78	895.37	894.00	892.39	890.99	889.46	888.03
*H.T.MODE	3	9	9	9	9	9	9	9	9	9	9	9

TIME--	12.0000	12.0500	12.1000	12.1500	12.2000	12.2500	12.3000	12.3500	12.4000	12.4500	12.5000	12.5500
NODE												
1	540.1140	539.5398	538.9927	538.4731	537.9819	537.5188	537.0830	536.6729	536.2869	535.9236	535.5808	535.2573
2	536.4053	536.0012	535.6235	535.2769	534.9624	534.6741	534.4075	534.1577	533.9211	533.6958	533.4819	533.2810
3	533.2600	533.0017	532.7893	532.6245	532.4961	532.3774	532.2617	532.1418	532.0190	531.8992	531.7869	531.6841
4	530.5876	530.4856	530.4773	530.5298	530.5986	530.6140	530.6001	530.5603	530.5085	530.4634	530.4319	530.4153
5	529.2668	529.2927	529.4578	529.6599	529.8291	529.8557	529.8621	529.8330	529.8000	529.7961	529.8115	529.8464
6	528.9141	528.9861	529.2146	529.4604	529.6516	529.6624	529.6711	529.6404	529.6118	529.6223	529.6531	529.7029
7	528.4785	528.6250	528.9551	529.2559	529.4661	529.4292	529.4402	529.4011	529.3782	529.4124	529.4651	529.5361
8	528.0359	528.3008	528.7969	529.1440	529.3438	529.1758	529.2056	529.1416	529.1296	529.2070	529.2881	529.3875
9	527.7197	528.1121	528.8018	529.1472	529.2993	528.9292	529.0256	528.9170	528.9275	529.0635	529.1687	529.2954
10	527.4773	528.0264	528.9927	529.2437	529.2957	528.5786	528.8694	528.6592	528.7253	528.9543	529.0759	529.2361
11	527.3967	528.1228	529.5215	529.4299	529.3093	527.9670	528.8040	528.3174	528.5354	528.9172	529.0198	529.2285
12	527.5779	528.4321	530.4250	529.5703	529.2854	527.0076	529.0017	527.8623	528.4321	529.0015	529.0015	529.2861
13	529.3320	530.3254	535.4470	529.1646	528.9150	521.5305	531.6479	525.1890	528.6631	529.8557	528.9395	529.7627
14	529.5728	530.5457	536.1243	528.8962	528.8699	520.7219	532.2822	524.6926	528.8135	529.9836	528.8994	529.8394
15	529.8711	530.7937	536.9775	528.3804	528.8254	519.6523	533.3054	523.9431	529.1060	530.1482	528.8237	529.9478
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	476.6304	476.0942	475.5020	474.8123	474.1755	473.5208	472.8826	472.2358	471.5837	470.8977	470.2366	469.5662
HB	-233.2	-178.0	-600.6	536.4	18.4	1064.5	-852.2	733.2	-284.6	-118.1	73.1	-84.9
TSAT	476.6	476.1	475.5	474.8	474.2	473.5	472.9	472.2	471.6	470.9	470.2	469.6
HSAT	-233.2	-178.0	-600.6	536.4	18.4	1064.5	-852.2	733.2	-284.6	-118.1	73.1	-84.9
P	548.4	545.6	542.5	539.0	535.7	532.4	529.1	525.9	522.6	519.1	515.9	512.5
S.F.	-12456.2	-9760.3	-37235.3	28521.0	1003.0	48382.8	-52120.8	37526.7	-16437.0	-7007.3	4277.9	-5132.8
S.TEMP	530.05	530.93	537.50	527.98	528.81	518.97	534.04	523.42	529.34	530.25	528.76	530.02
MASS-FLX	44.2705	43.4638	43.5415	42.7076	40.9968	41.1098	39.9719	39.2602	38.1814	37.1181	36.4591	35.4326
QUALITY	0.69249	0.68032	0.66816	0.65732	0.64859	0.64085	0.63443	0.62875	0.62402	0.61991	0.61644	0.61352
GAP	0.06912	0.06926	0.06929	0.06988	0.06889	0.06889	0.06793	0.06944	0.06845	0.06899	0.06911	0.06894
***RELAP	PREDICTIONS	(STARRED)***										
*HB	183.5	178.6	177.1	171.0	165.3	162.4	158.4	154.2	149.6	145.5	142.1	138.1
*S.F.	75194.8	73009.4	72251.1	69681.9	67245.9	66037.6	64311.5	62547.8	60663.1	58938.0	57544.0	55878.1
*S.TEMP	886.54	885.02	883.55	882.30	881.22	880.16	879.07	878.03	877.05	876.08	875.25	874.40
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	12.6000	12.6500	12.7000	12.7500	12.8000	12.8500	12.9000	12.9500	13.0000	13.0500	13.1000	13.1500
NODE												
1	534.9534	534.6675	534.3984	534.1455	533.9082	533.6851	533.4744	533.2756	533.0881	532.9102	532.7410	532.5781
2	533.0930	532.9177	532.7549	532.6030	532.4604	532.3250	532.1931	532.0667	531.9463	531.8286	531.7100	531.5898
3	531.5930	531.5132	531.4419	531.3743	531.3062	531.2344	531.1577	531.0842	531.0132	530.9324	530.8372	530.7324
4	530.4148	530.4185	530.4250	530.4207	530.4023	530.3655	530.3152	530.2849	530.2498	530.1741	530.0662	529.9517
5	529.8992	529.9436	529.9863	530.0012	529.9902	529.9531	529.9014	529.9077	529.8860	529.7747	529.6328	529.5083
6	529.7720	529.8262	529.8782	529.8938	529.8821	529.8418	529.7874	529.8108	529.7883	529.6560	529.5020	529.3770
7	529.6274	529.6919	529.7546	529.7656	529.7490	529.7002	529.6401	529.6965	529.6658	529.4919	529.3193	529.1978
8	529.5088	529.5740	529.6479	529.6372	529.6052	529.5361	529.4680	529.5969	529.5288	529.2639	529.0720	528.9719
9	529.4460	529.4976	529.5825	529.5317	529.4814	529.3875	529.3132	529.5522	529.4016	529.0117	528.8237	528.7651
10	529.4236	529.4338	529.5393	529.4116	529.3428	529.2112	529.1357	529.5713	529.2319	528.6506	528.5217	528.5393
11	529.4629	529.3704	529.5295	529.2415	529.1733	528.9810	528.9236	529.7393	528.9385	528.0740	528.1597	528.3081
12	529.5708	529.2856	529.5706	529.0012	529.0012	528.7166	528.7166	530.1406	528.4312	527.2922	527.8616	528.1467
13	530.2153	528.7151	529.9924	527.6267	528.4314	527.5527	528.0305	532.9058	525.0049	523.5740	527.4502	527.8984
14	530.2942	528.6052	530.0793	527.4058	528.4043	527.4055	527.9795	533.3555	524.3828	523.1545	527.5520	527.8904
15	530.3877	528.4375	530.2168	527.0972	528.4136	527.2290	527.9521	533.9817	523.4629	522.7053	527.8064	527.8948
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	468.7866	467.8970	467.0220	466.1199	465.2500	464.3616	463.4558	462.5505	461.6372	460.7173	459.8257	458.9763
HB	-61.4	135.5	-110.0	239.1	-31.0	121.0	1.2	-405.3	733.8	266.9	-221.0	-3.9
TSAT	468.8	467.9	467.0	466.1	465.3	464.4	463.5	462.6	461.6	460.7	459.8	459.0
HSAT	-61.4	135.5	-110.0	239.1	-31.0	121.0	1.2	-405.3	733.8	266.9	-221.0	-3.9
P	508.7	504.3	500.1	495.7	491.5	487.3	483.0	478.7	474.5	470.2	466.1	462.2
S.F.	-3784.1	8186.0	-6963.5	14532.7	-1956.6	7593.5	80.3	-29116.3	44902.1	16482.3	-15070.4	-268.0
S.TEMP	530.44	528.32	530.31	526.89	528.44	527.12	527.95	534.39	522.83	522.47	528.02	527.90
MASS-FLX	35.1192	33.3368	32.0315	31.2440	29.6422	28.8420	27.5687	26.3691	25.1713	23.9276	22.6090	22.3163
QUALITY	0.61088	0.60921	0.60837	0.60824	0.60920	0.61071	0.61307	0.61618	0.62001	0.62460	0.62995	0.63555
GAP	0.06904	0.06908	0.06885	0.06903	0.06870	0.06886	0.06874	0.06882	0.06846	0.06832	0.06826	0.06888
***RELAP	PREDICTIONS	(STARRED)***										
*HB	136.3	130.6	125.5	122.0	116.9	114.4	110.3	106.4	102.7	98.8	94.7	93.4
*S.F.	55162.5	52853.6	50813.5	49447.0	47414.2	46423.9	44824.6	43285.8	41815.0	40297.7	38662.1	38190.3
*S.TEMP	873.54	872.73	872.14	871.56	871.00	870.43	869.89	869.42	868.98	868.59	868.25	867.86
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	13.2000	13.2500	13.3000	13.3500	13.4000	13.4500	13.5000	13.5500	13.6000	13.6500	13.7000	13.7500
NODE												
1	532.4207	532.2671	532.1145	531.9622	531.8081	531.6519	531.4934	531.3333	531.1711	531.0066	530.8398	530.6707
2	531.4661	531.3359	531.1938	531.0393	530.8735	530.7041	530.5334	530.3623	530.1890	530.0115	529.8298	529.6472
3	530.6172	530.4783	530.3057	530.1096	529.9067	529.7175	529.5381	529.3601	529.1746	528.9783	528.7751	528.5854
4	529.8206	529.6270	529.3667	529.0940	528.8562	528.6794	528.5139	528.3335	528.1257	527.8958	527.6660	527.4956
5	529.3557	529.0820	528.7234	528.4070	528.1838	528.0684	527.9177	527.7249	527.4802	527.2173	526.9758	526.8667
6	529.2151	528.9055	528.5100	528.1877	527.9802	527.8940	527.7432	527.5413	527.2810	527.0066	526.7646	526.6885
7	529.0188	528.6418	528.1877	527.8701	527.7004	527.6685	527.5083	527.2866	526.9978	526.7078	526.4702	526.4604
8	528.7571	528.2446	527.7046	527.4377	527.3542	527.4255	527.2122	526.9500	526.6096	526.3022	526.0874	526.2217
9	528.4907	527.7910	527.1750	527.0215	527.0554	527.2505	526.9194	526.6113	526.2095	525.8970	525.7251	526.0667
10	528.1467	527.1416	526.4705	526.5566	526.7615	527.1250	526.5322	526.1843	525.6946	525.4009	525.3101	526.0010
11	527.6519	526.1174	525.5020	526.0974	526.5220	527.1172	525.9238	525.6165	524.9863	524.7793	524.8428	526.1667
12	527.0071	524.7285	524.4434	525.8679	526.4377	527.2930	525.0132	525.0132	524.1580	524.1580	524.4429	526.7219
13	523.7192	517.8618	520.5873	526.5452	526.7329	528.7417	519.6697	523.0322	520.5581	522.1082	523.4092	530.8606
14	523.2432	516.9709	520.4170	526.8262	526.7698	528.9561	518.8162	522.9580	520.1143	521.9631	523.3550	531.5408
15	522.6184	515.8838	520.2791	527.3264	526.8018	529.2427	517.6313	523.0349	519.5830	521.8875	523.3533	532.4888
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	458.1033	457.2261	456.3462	455.4587	454.5654	453.6667	452.7617	451.8486	450.9976	450.2126	449.3918	448.5718
HB	438.8	790.1	-9.6	-359.0	-6.8	-170.3	863.7	-130.0	331.1	-3.3	-23.2	-520.7
TSAT	458.1	457.2	456.3	455.5	454.6	453.7	452.8	451.8	451.0	450.2	449.4	448.6
HSAT	438.8	790.1	-9.6	-359.0	-6.8	-170.3	863.7	-130.0	331.1	-3.3	-23.2	-520.7
P	458.2	454.2	450.3	446.3	442.4	438.4	434.5	430.5	426.8	423.5	420.0	416.5
S.F.	28132.9	45834.6	-616.8	-25929.8	-491.8	-12903.6	55357.5	-9272.1	22602.2	-238.8	-1719.7	-44016.4
S.TEMP	522.22	515.24	520.29	527.69	526.81	529.42	516.85	523.17	519.26	521.89	523.38	533.11
MASS-FLX	22.0573	21.6789	21.4666	21.2169	20.9834	20.7442	20.4861	20.2414	19.6768	19.9931	20.0048	19.8718
QUALITY	0.64146	0.64754	0.65354	0.65938	0.66498	0.67029	0.67531	0.68003	0.68464	0.68861	0.69215	0.69524
GAP	0.06890	0.06834	0.06765	0.06823	0.06906	0.06899	0.06920	0.06794	0.06856	0.06825	0.06854	0.06874
***RELAP	PREDICTIONS	(STARRED)***										
*HB	93.2	92.3	91.9	91.5	91.1	90.7	90.1	89.5	88.0	88.8	89.4	89.1
*S.F.	38112.0	37764.2	37640.1	37489.1	37321.1	37139.8	36911.4	36687.9	36077.9	36403.0	36661.0	36495.3
*S.TEMP	867.26	866.60	865.89	865.13	864.35	863.55	862.74	861.94	861.16	860.37	859.43	858.52
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	13.8000	13.8500	13.9000	13.9500	14.0000	14.0500	14.1000	14.1500	14.2000	14.2500	14.3000	14.3500
NODE												
1	530.5007	530.3335	530.1707	530.0134	529.8618	529.7139	529.5674	529.4194	529.2686	529.1135	528.9548	528.7910
2	529.4744	529.3208	529.1665	529.0649	528.9463	528.8208	528.6821	528.5273	528.3584	528.1799	527.9956	527.8049
3	528.4402	528.3491	528.2900	528.2268	528.1331	527.9998	527.8240	527.6147	527.3538	527.1748	526.9597	526.7354
4	527.4600	527.5220	527.5774	527.5435	527.4065	527.1870	526.8989	526.5872	526.3074	526.0667	525.8381	525.5728
5	526.9990	527.2153	527.3149	527.2141	526.9666	526.6362	526.2375	525.8604	525.5828	525.3657	525.1438	524.8276
6	526.8960	527.1636	527.2595	527.1150	526.8196	526.4500	526.0134	525.6213	525.3579	525.1548	524.9333	524.5918
7	526.8037	527.1433	527.2068	526.9719	526.5947	526.1658	525.6731	525.2700	525.0432	524.8665	524.6433	524.2520
8	526.8210	527.2334	527.1733	526.7461	526.2375	525.7300	525.1587	524.7737	524.6440	524.5115	524.2710	523.7729
9	526.9941	527.4153	527.1309	526.4529	525.8176	525.2478	524.5967	524.2754	524.2908	524.1926	523.9092	523.2585
10	527.4204	527.7141	527.0112	525.9719	525.2197	524.6042	523.8499	523.6821	523.9358	523.8418	523.4656	522.5603
11	528.3508	528.1272	526.6465	525.1133	524.3354	523.7175	522.8074	523.0005	523.6479	523.4407	522.8706	521.5173
12	529.8560	528.4309	525.8667	523.8730	523.3027	522.7324	521.5923	522.4475	523.5881	523.0176	522.1624	520.1660
13	538.0681	527.9856	520.6924	517.8030	519.3457	518.9167	516.4453	521.4905	524.5442	521.0310	518.9568	513.6951
14	539.1292	527.5750	519.9182	517.0955	519.0085	518.5237	515.8450	521.5808	524.7493	520.7085	518.5664	512.8647
15	540.4236	526.7690	518.8962	516.3098	518.7520	518.1255	515.1704	521.8713	525.0608	520.2537	518.1118	511.8574
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	447.7480	446.9170	446.0815	445.2405	444.3938	443.5415	442.7188	441.9045	441.0857	440.2666	439.4399	438.6125
HB	-586.0	566.7	624.1	428.7	79.2	194.8	373.5	-227.5	-174.4	271.8	233.8	583.7
TSAT	447.7	446.9	446.1	445.2	444.4	443.5	442.7	441.9	441.1	440.3	439.4	438.6
HSAT	-586.0	566.7	624.1	428.7	79.2	194.8	373.5	-227.5	-174.4	271.8	233.8	583.7
P	413.0	409.6	406.1	402.6	399.2	395.7	392.4	389.1	385.8	382.6	379.3	376.1
S.F.	-54755.9	44897.8	45049.3	30285.2	5883.2	14487.1	26920.2	-18251.7	-14684.7	21661.1	18330.4	42401.1
S.TEMP	541.19	526.14	518.26	515.88	518.67	517.92	514.79	522.13	525.27	519.95	517.85	511.26
MASS-FLX	19.8244	19.7393	19.6644	19.5871	19.5055	19.4226	19.1844	19.1324	19.2833	19.2227	19.2001	19.1162
QUALITY	0.69777	0.69978	0.70131	0.70238	0.70305	0.70337	0.70348	0.70326	0.70264	0.70180	0.70072	0.69947
GAP	0.06970	0.07046	0.06887	0.06797	0.06780	0.06818	0.06820	0.06794	0.06874	0.06910	0.06856	0.06832
***RELAP	PREDICTIONS	(STARRED)***										
*HB	89.0	88.8	88.5	88.2	87.8	87.4	86.5	86.8	86.1	85.9	85.4	85.1
*S.F.	36465.5	36362.6	36244.2	36109.6	35948.7	35770.0	35400.2	35520.4	35253.2	35169.0	34933.9	34804.5
*S.TEMP	857.62	856.72	855.82	854.93	854.04	853.17	852.32	851.43	850.58	849.70	848.84	847.99
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	14.4000	14.4500	14.5000	14.5500	14.6000	14.6500	14.7000	14.7500	14.8000	14.8500	14.9000	14.9500
NODE												
1	528.6218	528.4465	528.2644	528.0737	527.8726	527.6555	527.4153	527.1421	526.8250	526.4526	526.0176	525.5137
2	527.6040	527.3916	527.1658	526.9248	526.6582	526.3467	525.9658	525.4912	524.9053	524.2019	523.3862	522.4690
3	526.4885	526.2224	525.9351	525.6235	525.2458	524.7527	524.0928	523.2349	522.1782	520.9563	519.6145	518.1934
4	525.2498	524.9094	524.5396	524.1331	523.5466	522.7021	521.5190	520.0107	518.2444	516.3540	514.4290	512.5222
5	524.4192	524.0320	523.5991	523.1187	522.2815	521.0530	519.3411	517.2600	514.9570	512.6650	510.4573	508.3574
6	524.1492	523.7522	523.2979	522.7913	521.8416	520.4624	518.5479	516.2671	513.7920	511.3931	509.1184	506.9773
7	523.7524	523.3508	522.8601	522.3145	521.1599	519.5293	517.2871	514.7095	511.9968	509.4832	507.1494	504.9824
8	523.1777	522.8054	522.2478	521.6440	520.0776	518.0334	515.2549	512.2644	509.2683	506.7058	504.3738	502.2375
9	522.5608	522.2710	521.6111	520.9485	518.8003	516.3005	512.9014	509.5281	506.3064	503.8203	501.5518	499.4919
10	521.7451	521.6489	520.7852	520.0620	516.9211	513.8608	509.5854	505.8242	502.4089	500.1941	498.0459	496.1177
11	520.6089	520.9609	519.6216	518.8816	513.8711	510.2437	504.6245	500.6216	497.1128	495.5906	493.5901	491.8745
12	519.3098	520.4504	518.1658	517.5947	509.5938	505.8740	498.4319	494.7024	491.2603	490.9734	488.9612	487.5244
13	514.1863	519.9187	511.0283	512.8025	487.4570	488.3140	471.1042	472.4163	469.1565	475.9407	471.9199	472.0134
14	513.6970	520.0771	510.0029	512.3916	484.3394	486.5369	467.6946	470.1394	466.7673	474.6475	470.0552	470.4478
15	513.2515	520.4570	508.6531	512.0786	480.3223	484.8931	463.7161	468.0190	464.3303	473.6780	468.0845	468.9456
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	437.7778	436.9402	436.0969	435.2480	434.4031	433.5544	432.7070	431.8550	430.9983	430.1401	429.2698	428.4065
HB	180.6	-261.5	852.3	85.5	4080.7	992.8	5611.9	1880.9	2702.4	494.0	1945.5	1247.1
TSAT	437.8	436.9	436.1	435.2	434.4	433.6	432.7	431.9	431.0	430.1	429.3	428.4
HSAT	180.6	-261.5	852.3	85.5	4080.7	992.8	5611.9	1880.9	2702.4	494.0	1945.5	1247.1
P	372.9	369.6	366.4	363.2	360.0	356.8	353.6	350.5	347.3	344.2	341.0	337.9
S.F.	13597.0	-21918.5	61104.5	6562.9	177123.9	50249.2	161035.6	66214.4	86684.9	21356.4	73452.1	49658.2
S.TEMP	513.06	520.77	507.79	511.99	477.81	484.17	461.40	467.06	463.07	473.37	467.02	468.23
MASS-FLX	19.0995	19.0193	18.9953	18.9170	18.7990	18.6443	18.4623	18.2276	18.0339	17.7764	17.5629	17.2040
QUALITY	0.69802	0.69647	0.69481	0.69310	0.69141	0.68980	0.68835	0.68713	0.68613	0.68545	0.68505	0.68505
GAP	0.06768	0.06793	0.06880	0.06753	0.06797	0.06446	0.06534	0.06317	0.06416	0.06414	0.06563	0.06517
***RELAP	PREDICTIONS	(STARRED)***										
*HB	84.4	84.1	83.4	83.0	82.1	81.4	80.2	79.4	78.1	77.3	76.0	75.1
*S.F.	34536.8	34394.2	34120.0	33963.7	33591.7	33306.6	32844.6	32504.6	32011.2	31663.2	31146.9	30821.9
*S.TEMP	847.14	846.30	845.47	844.64	843.83	843.05	842.29	841.56	840.85	840.16	839.49	838.80
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	15.0000	15.0500	15.1000	15.1500	15.2000	15.2500	15.3000	15.3500	15.4000	15.4500	15.5000	15.5500
NODE												
1	524.9392	524.2922	523.5757	522.7927	521.9458	521.0381	520.0715	519.0505	517.9783	516.8594	515.6985	514.5002
2	521.4653	520.3904	519.2583	518.0784	516.8538	515.5850	514.2776	512.9365	511.5691	510.1836	508.7830	507.3723
3	516.7180	515.2219	513.7188	512.2056	510.6675	509.0994	507.5125	505.9214	504.3425	502.7795	501.2258	499.6880
4	510.6372	508.8267	507.0747	505.3271	503.5427	501.7253	499.9246	498.1694	496.4824	494.8430	493.2153	491.6313
5	506.3135	504.4338	502.6250	500.7803	498.8579	496.9038	495.0266	493.2415	491.5674	489.9373	488.2878	486.7219
6	504.8958	503.0159	501.1975	499.3188	497.3457	495.3474	493.4565	491.6714	490.0120	488.3860	486.7256	485.1719
7	502.8662	501.0198	499.2024	497.2747	495.2288	493.1755	491.2859	489.5193	487.8997	486.2856	484.6082	483.0879
8	500.1062	498.3831	496.5776	494.5676	492.4116	490.3032	488.4702	486.7646	485.2336	483.6362	481.9226	480.4885
9	497.3511	495.8328	494.0166	491.8894	489.6089	487.4697	485.7539	484.1301	482.7151	481.1145	479.3433	478.0496
10	493.9436	492.7996	490.8923	488.5596	486.1077	483.9719	482.4861	480.9702	479.7278	478.0742	476.1973	475.1726
11	489.5781	489.1819	486.9150	484.2146	481.5356	479.5081	478.4880	477.0752	476.1099	474.2561	472.1873	471.7415
12	484.9387	485.8015	482.6355	479.4688	476.5908	474.8608	474.5725	473.1313	472.5542	470.2458	467.9368	468.5139
13	467.3071	475.7288	465.3755	460.9480	457.7686	458.1194	461.5730	458.7715	460.3816	454.7490	451.7671	458.5940
14	465.3547	475.0212	463.2788	458.9106	455.7385	456.4338	460.3916	457.2351	459.2212	452.9983	450.0322	457.8499
15	463.2810	474.6831	460.8262	456.7786	453.6587	454.8274	459.3882	455.6318	458.1682	451.0779	448.2444	457.4116
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	427.5229	426.6409	425.7654	424.9050	424.0417	423.1875	422.3357	421.4612	420.5754	419.6885	418.7922	417.8899
HB	2218.5	-50.4	2967.5	2490.0	2578.6	1699.4	767.6	1752.4	868.9	2408.6	2217.3	91.6
TSAT	427.5	426.6	425.8	424.9	424.0	423.2	422.3	421.5	420.6	419.7	418.8	417.9
HSAT	2218.5	-50.4	2967.5	2490.0	2578.6	1699.4	767.6	1752.4	868.9	2408.6	2217.3	91.6
P	334.8	331.6	328.5	325.5	322.5	319.6	316.7	313.7	310.7	307.7	304.8	301.8
S.F.	76861.6	-2421.3	99770.3	76593.7	73608.1	52469.9	28127.7	58393.3	32255.8	73043.8	63257.9	3613.9
S.TEMP	462.17	474.72	459.39	455.67	452.59	454.06	458.98	454.78	457.70	450.02	447.32	457.36
MASS-FLX	16.8828	16.9399	16.4564	16.2438	16.2260	15.8327	15.7011	15.6365	15.3291	15.1254	14.8999	14.6797
QUALITY	0.68540	0.68586	0.68691	0.68819	0.68962	0.69149	0.69347	0.69559	0.69804	0.70065	0.70348	0.70653
GAP	0.06548	0.06499	0.06661	0.06503	0.06471	0.06459	0.06502	0.06583	0.06552	0.06599	0.06522	0.06504
***RELAP	PREDICTIONS	(STARRED)***										
*HB	73.6	73.4	71.7	71.4	70.6	69.8	68.8	68.6	67.5	66.8	66.1	65.4
*S.F.	30218.2	30163.4	29485.0	29351.8	29049.6	28728.4	28347.1	28286.2	27850.5	27578.2	27290.5	27008.1
*S.TEMP	838.16	837.52	836.88	836.24	835.62	834.97	834.35	833.71	833.08	832.47	831.86	831.26
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	15.6000	15.6500	15.7000	15.7500	15.8000	15.8500	15.9000	15.9500	16.0000	16.0500	16.1000	16.1500
NODE												
1	513.2690	512.0093	510.7273	509.4282	508.1167	506.7954	505.4700	504.1438	502.8208	501.5027	500.1897	498.8799
2	505.9578	504.5483	503.1484	501.7617	500.3884	499.0305	497.6924	496.3784	495.0874	493.8132	492.5439	491.2722
3	498.1814	496.7197	495.3025	493.9175	492.5623	491.2393	489.9602	488.7292	487.5288	486.3303	485.1050	483.8525
4	490.1321	488.7292	487.3904	486.0764	484.7939	483.5618	482.4102	481.3293	480.2505	479.1067	477.8677	476.5789
5	485.2993	484.0051	482.7578	481.4961	480.2722	479.1235	478.0979	477.1421	476.1194	474.9458	473.6201	472.2727
6	483.7861	482.5361	481.3174	480.0659	478.8608	477.7424	476.7664	475.8523	474.8345	473.6309	472.2595	470.8906
7	481.7734	480.5979	479.4187	478.1750	477.0012	475.9341	475.0386	474.1843	473.1582	471.8909	470.4399	469.0476
8	479.3127	478.2583	477.1196	475.8660	474.7463	473.7649	473.0068	472.2271	471.1384	469.7317	468.1448	466.7490
9	477.0505	476.1233	474.9961	473.7053	472.6633	471.7859	471.1926	470.4678	469.2524	467.6555	465.9158	464.5652
10	474.4329	473.6565	472.4878	471.1150	470.2175	469.4902	469.1440	468.4407	466.9651	465.0691	463.1304	461.9268
11	471.3770	470.7480	469.4001	467.8672	467.2871	466.7786	466.8279	466.0249	464.0024	461.6379	459.4692	458.6748
12	468.5139	467.9360	466.2039	464.4700	464.4700	464.1812	464.7593	463.6028	460.7102	457.8169	455.5007	455.5007
13	459.0708	458.0525	453.8943	451.5630	455.2393	455.2878	458.5056	454.3499	446.8445	442.3694	440.1987	445.1267
14	458.1548	457.0396	452.5215	450.1919	454.4556	454.4133	458.0090	453.2915	445.1995	440.6616	438.5852	444.2725
15	457.2788	456.0183	451.0310	448.7788	453.8501	453.5662	457.6587	452.0957	443.3157	438.8418	436.9468	443.6501
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	417.0127	416.1584	415.2847	414.4087	413.5244	412.6348	411.7375	410.8335	409.9224	409.0039	408.1042	407.2200
HB	742.0	909.8	1604.4	1486.0	351.9	709.8	148.8	1154.4	2280.0	2287.9	2028.4	348.6
TSAT	417.0	416.2	415.3	414.4	413.5	412.6	411.7	410.8	409.9	409.0	408.1	407.2
HSAT	742.0	909.8	1604.4	1486.0	351.9	709.8	148.8	1154.4	2280.0	2287.9	2028.4	348.6
P	298.9	296.1	293.3	290.5	287.7	284.9	282.1	279.3	276.5	273.6	270.9	268.3
S.F.	29557.5	35791.4	56043.2	49988.8	14119.4	28755.9	6818.3	46845.2	73685.3	66052.9	56812.2	12635.1
S.TEMP	456.85	455.50	450.21	448.05	453.64	453.15	457.56	451.41	442.24	437.87	436.11	443.46
MASS-FLX	14.3911	14.3488	14.1560	13.9805	13.8048	13.6207	13.4542	13.2846	13.1185	12.9528	12.7413	12.6887
QUALITY	0.70986	0.71321	0.71677	0.72044	0.72421	0.72810	0.73208	0.73616	0.74035	0.74466	0.74913	0.75358
GAP	0.06643	0.06654	0.06643	0.06587	0.06571	0.06653	0.06661	0.06718	0.06652	0.06544	0.06505	0.06503
***RELAP	PREDICTIONS	(STARRED)***										
*HB	64.4	64.3	63.8	63.3	62.8	62.2	61.7	61.2	60.7	60.2	59.6	59.5
*S.F.	26642.3	26592.7	26400.2	26202.5	26013.6	25785.0	25606.6	25418.1	25237.7	25058.2	24813.2	24791.4
*S.TEMP	830.67	830.07	829.44	828.83	828.21	827.61	827.01	826.40	825.80	825.21	824.62	824.02
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	16.2000	16.2500	16.3000	16.3500	16.4000	16.4500	16.5000	16.5500	16.6000	16.6500	16.7000	16.7500
NODE												
1	497.5728	496.2688	494.9656	493.6646	492.3655	491.0686	489.7749	488.4832	487.1956	485.9119	484.6335	483.3611
2	489.9961	488.7170	487.4377	486.1616	484.8889	483.6201	482.3547	481.0930	479.8386	478.5942	477.3596	476.1345
3	482.5847	481.3147	480.0544	478.8059	477.5662	476.3271	475.0896	473.8630	472.6533	471.4607	470.2815	469.1106
4	475.2903	474.0278	472.8037	471.5999	470.4023	469.1868	467.9753	466.7969	465.6528	464.5300	463.4150	462.3000
5	470.9768	469.7393	468.5647	467.3977	466.2241	465.0059	463.8093	462.6804	461.5945	460.5195	459.4404	458.3496
6	469.5969	468.3723	467.2175	466.0601	464.8904	463.6628	462.4712	461.3633	460.2571	459.2356	458.1641	457.0776
7	467.7688	466.5713	465.4514	464.3066	463.1404	461.8938	460.7146	459.6455	458.6096	457.5657	456.5027	455.4199
8	465.5222	464.3779	463.3191	462.1802	461.0122	459.7231	458.5781	457.5830	456.5898	455.5620	454.5017	453.4170
9	463.4224	462.3420	461.3530	460.1997	459.0227	457.6702	456.5881	455.6897	454.7312	453.7080	452.6428	451.5508
10	460.9246	459.9263	459.0339	457.8215	456.6284	455.1624	454.2161	453.4651	452.5276	451.4915	450.4089	449.3018
11	457.8926	456.9829	456.2295	454.8433	453.6379	451.9539	451.3318	450.8074	448.7419	448.8267	447.6235	446.4902
12	454.9211	454.0518	453.4724	451.7327	450.5725	448.5430	448.5430	448.2527	447.0918	445.9307	444.7693	443.6074
13	444.4980	443.4619	443.7756	439.6528	439.2693	435.2102	439.3689	439.4651	436.8071	435.4304	434.1206	432.8579
14	443.4458	442.3792	442.8286	438.3086	438.1372	433.7400	438.6121	438.6057	435.6990	434.3440	433.0225	431.7524
15	442.3977	441.2915	441.9282	436.8440	437.0337	432.1560	438.0562	437.7742	434.5205	433.2429	431.9114	430.6353
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	406.3193	405.4146	404.5015	403.5808	402.6538	401.7185	400.7756	399.8250	398.6953	397.2422	396.1746	395.1096
HB	1025.7	1063.5	790.0	1692.2	1077.3	1977.6	306.2	745.8	1224.4	1074.9	1093.9	1103.2
TSAT	406.3	405.4	404.5	403.6	402.7	401.7	400.8	399.8	398.7	397.2	396.2	395.1
HSAT	1025.7	1063.5	790.0	1692.2	1077.3	1977.6	306.2	745.8	1224.4	1074.9	1093.9	1103.2
P	265.6	262.9	260.2	257.5	254.8	252.1	249.5	246.8	243.6	239.6	236.7	233.8
S.F.	36458.0	37570.2	29229.8	54926.9	36461.6	58492.1	11364.8	27997.5	43089.0	38096.2	38472.8	38563.7
S.TEMP	441.86	440.74	441.50	436.04	436.50	431.30	437.89	437.36	433.89	432.68	431.34	430.07
MASS-FLX	12.5354	12.3956	12.2610	12.1105	11.9723	11.8313	11.6896	11.5487	10.0562	3.6065	1.4157	2.6014
QUALITY	0.75816	0.76279	0.76747	0.77223	0.77707	0.78200	0.78703	0.79218	0.79894	0.81109	0.81916	0.83619
GAP	0.06616	0.06615	0.06609	0.06629	0.06572	0.06588	0.06538	0.06636	0.06643	0.06608	0.06601	0.06595
***RELAP	PREDICTIONS	(STARRED)***										
*HB	59.1	58.7	58.4	58.0	57.6	57.2	56.8	56.4	53.5	28.8	7.8	17.4
*S.F.	24654.0	24501.5	24378.9	24226.6	24085.1	23946.2	23803.4	23662.9	22453.2	12140.5	3333.5	7459.1
*S.TEMP	823.41	822.80	822.20	821.60	821.01	820.42	819.83	819.24	818.73	819.65	822.35	823.27
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	7	9

TIME--	16.8000	16.8500	16.9000	16.9500	17.0000	17.0500	17.1000	17.1500	17.2000	17.2500	17.3000	17.3500
NODE												
1	482.0945	480.8340	479.5784	478.3293	477.0879	475.8552	474.6348	473.4270	472.2336	471.0569	469.8975	468.7561
2	474.9150	473.6997	472.4888	471.2866	470.1003	468.9333	467.7893	466.6665	465.5671	464.4941	463.4441	462.4160
3	467.9390	466.7637	465.5928	464.4446	463.3340	462.2612	461.2209	460.2063	459.2246	458.2749	457.3513	456.4417
4	461.1621	460.0093	458.8770	457.8076	456.8225	455.8838	454.9736	454.0798	453.2366	452.4321	451.6404	450.8342
5	457.2083	456.0547	454.9556	453.9744	453.1130	452.2722	451.4441	450.6174	449.8777	449.1677	448.4465	447.6750
6	455.9268	454.7690	453.6841	452.7429	451.9312	451.1199	450.3152	449.5071	448.8076	448.1274	447.4243	446.6550
7	454.2480	453.0852	452.0303	451.1577	450.4253	449.6494	448.8740	448.0876	447.4514	446.8098	446.1240	445.3486
8	452.1985	451.0349	450.0439	449.2964	448.6877	447.9338	447.1892	446.4219	445.8965	445.2920	444.6111	443.8015
9	450.2627	449.1123	448.2146	447.6267	447.1499	446.3799	445.6614	444.9043	444.5264	443.9319	443.2363	442.3694
10	447.8889	446.7866	446.0518	445.7117	445.4026	444.5391	443.8613	443.1052	442.9795	442.3396	441.6023	440.6299
11	444.8359	443.8916	443.4595	443.5227	443.4058	442.2488	441.6790	440.8965	441.2612	440.3940	439.5776	438.4094
12	441.5732	440.9922	440.9922	441.5737	441.5737	439.8289	439.5383	438.6660	439.8296	430.0383	429.6768	426.6411
13	428.6599	430.8345	432.8049	435.6697	435.4353	429.9028	432.1326	430.2910	436.2629	436.1375	429.0032	428.8975	425.6108
14	427.2312	429.9104	432.0737	435.2007	434.8303	428.7310	431.4875	429.4065	436.1375	429.0032	428.8975	425.6108
15	425.6851	429.1106	431.4443	434.8596	434.2305	427.3760	430.9626	428.4753	436.2598	427.7422	428.1394	424.4944
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	394.0427	392.8242	419.4231	510.3137	552.8372	565.6096	564.2002	559.9050	557.1206	555.4014	553.9226	552.6008
HB	1856.9	620.7	1535.7	-95.4	-173.7	-382.7	-97.9	-256.5	111.0	-405.8	-195.0	-321.1
TSAT	394.0	392.8	393.8	390.3	388.9	387.5	385.5	383.0	380.4	377.5	374.6	372.1
HSAT	1856.9	620.7	482.5	162.1	459.0	1361.3	288.5	752.7	-238.7	1053.0	462.8	797.6
P	230.9	227.7	230.2	221.1	217.6	214.0	209.0	202.9	196.6	189.9	183.5	177.8
S.F.	57191.8	22318.0	18052.4	7210.9	20658.5	53198.5	13058.2	33841.7	-13389.6	52117.4	24600.5	41335.3
S.TEMP	424.84	428.78	431.18	434.75	433.93	426.59	430.77	427.98	436.46	426.98	427.78	423.88
MASS-FLX	5.5157	7.9873	13.0592	16.5793	19.7532	23.1834	28.1561	35.2549	41.8091	47.2584	52.0652	54.9957
QUALITY	0.87338	0.93348	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06592	0.06537	0.06602	0.06648	0.06702	0.06697	0.06606	0.06666	0.06641	0.06754	0.06642	0.06652
***RELAP	PREDICTIONS	(STARRED)***										
*HB	32.7	44.9	70.1	79.5	91.0	104.6	120.4	144.8	166.9	185.1	202.9	209.7
*S.F.	13992.3	19210.1	29912.2	25557.1	24414.6	26208.4	29867.6	36269.8	41811.1	45979.7	50347.2	51592.3
*S.TEMP	822.74	821.36	818.72	816.89	815.99	814.90	813.39	811.01	808.08	804.84	801.73	798.86
*H.T.MODE	9	9	9	8	8	8	8	8	8	8	8	8

TIME--	17.4000	17.4500	17.5000	17.5500	17.6000	17.6500	17.7000	17.7500	17.8000	17.8500	17.9000	17.9500
NODE												
1	467.6333	466.5278	465.4395	464.3647	463.3030	462.2524	461.2126	460.1838	459.1650	458.1560	457.1541	456.1575
2	461.4050	460.4070	459.4177	458.4324	457.4495	456.4712	455.5000	454.5376	453.5840	452.6345	451.6838	450.7261
3	455.5386	454.6331	453.7197	452.7930	451.8616	450.9336	450.0190	449.1184	448.2239	447.3210	446.3938	445.4402
4	450.0173	449.1694	448.2930	447.3855	446.4802	445.5955	444.7439	443.9104	443.0686	442.1841	441.2312	440.2354
5	446.8875	446.0386	445.1560	444.2334	443.3408	442.4944	441.6963	440.9082	440.0833	439.1724	438.1531	437.1040
6	445.8728	445.0154	444.1255	443.1914	442.3054	441.4741	440.6973	439.9231	439.0972	438.1660	437.1111	436.0415
7	444.5713	443.6917	442.7888	441.8357	440.9658	440.1609	439.4180	438.6597	437.8257	436.8557	435.7412	434.6455
8	443.0288	442.0972	441.1743	440.1885	439.3599	438.6021	437.9124	437.1655	436.3013	435.2527	434.0364	432.9207
9	441.6091	440.5977	439.6606	438.6338	437.8770	437.1736	436.5430	435.7920	434.8757	433.7197	432.3823	431.2751
10	439.9104	438.7490	437.8159	436.7217	436.1091	435.4773	434.9270	434.1401	433.1262	431.7947	430.2813	429.2412
11	437.8206	436.3433	435.4924	434.2688	433.9788	433.4175	432.9824	432.0742	430.8750	429.2415	427.4722	426.6677
12	435.7571	433.7190	433.1367	431.6807	431.9719	431.3896	431.0981	429.9326	428.4756	426.4343	424.3923	424.1008
13	428.5808	422.7944	424.7107	421.5154	425.5896	423.9753	424.4795	421.5220	418.9492	414.9521	412.0671	415.2986
14	427.9504	421.5159	423.9548	420.4045	425.1169	423.1963	423.8555	420.5957	417.9233	413.6787	410.7456	414.5510
15	427.4253	420.0452	423.3103	419.2000	424.8308	422.3708	423.2747	419.5806	416.8318	412.2925	409.3584	413.9663
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	551.3008	549.9956	548.6917	553.8120	554.1445	555.0986	556.1257	558.1531	559.4934	560.8962	563.2314	567.2527
HB	-111.6	-439.6	-137.9	-330.4	-21.0	-226.7	-135.9	-272.7	-274.1	-342.0	-317.3	-89.2
TSAT	369.0	366.1	363.2	362.2	361.5	360.0	358.5	357.1	355.6	354.0	352.4	350.9
HSAT	237.9	1083.9	289.7	793.4	42.8	487.8	280.6	612.6	646.9	888.0	873.2	217.8
P	171.3	165.3	159.4	157.3	156.0	153.1	150.2	147.5	144.6	141.8	139.0	136.2
S.F.	13842.2	57498.4	17330.8	44698.2	2711.2	30186.1	18092.3	37946.2	39261.7	51087.0	49062.9	13697.8
S.TEMP	427.22	419.20	423.05	418.54	424.79	421.92	423.01	419.02	416.25	411.53	408.63	413.76
MASS-FLX	57.9796	60.1999	62.0837	57.2475	51.5596	48.3070	44.8595	41.4753	37.8061	33.9330	29.7458	25.0281
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06613	0.06666	0.06574	0.06633	0.06589	0.06681	0.06655	0.06674	0.06629	0.06600	0.06550	0.06526
***RELAP	PREDICTIONS	(STARRED)***										
*HB	219.6	226.3	231.2	221.3	200.8	189.9	179.2	169.6	157.2	143.1	128.8	114.5
*S.F.	53713.1	55099.3	55999.8	52185.6	46979.2	44122.6	41413.9	38960.3	35769.0	32339.1	28822.9	25349.4
*S.TEMP	796.06	793.40	790.88	788.86	788.18	787.60	787.18	786.90	786.80	786.92	787.23	787.77
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	18.0000	18.0500	18.1000	18.1500	18.2000	18.2500	18.3000	18.3500	18.4000	18.4500	18.5000	18.5500
NODE												
1	455.1658	454.1777	453.1965	452.2266	451.2725	450.3394	449.4312	448.5508	447.6990	446.8760	446.0815	445.3159
2	449.7642	448.8071	447.8706	446.9675	446.1074	445.2959	444.5305	443.8057	442.4509	441.8152	441.2095	
3	444.4827	443.5603	442.7034	441.9275	441.2349	440.6155	440.0457	439.5073	438.9880	438.4834	437.9985	437.5544
4	439.2756	438.4426	437.7571	437.2087	436.7766	436.4146	436.0635	435.7061	435.3342	434.9607	434.6108	434.3445
5	436.1719	435.4817	434.9912	434.6545	434.4316	434.2402	433.9968	433.7151	433.3972	433.0811	432.8110	432.6887
6	435.1323	434.5151	434.1069	433.8528	433.7063	433.5696	433.3513	433.0862	432.7793	432.4800	432.2400	432.1807
7	433.7876	433.3013	433.0210	432.8857	432.8452	432.7727	432.5708	432.3184	432.0173	431.7397	431.5425	431.5835
8	432.1855	431.9414	431.8511	431.8787	431.9719	431.9541	431.7302	431.4751	431.1658	430.9165	430.7864	430.9988
9	430.7297	430.7964	430.8938	431.0801	431.2952	431.2954	431.0044	430.7400	430.4109	430.1992	430.1509	430.5818
10	429.0396	429.5930	429.8984	430.2769	430.6292	430.5940	430.1577	429.8901	429.5229	429.3806	429.4612	430.2468
11	427.1309	428.4761	428.9219	429.5344	430.0276	429.8193	429.0852	428.8726	428.4297	428.4409	428.7390	430.1548
12	425.5591	427.8926	428.1843	429.0586	429.6414	429.0581	427.8923	427.8923	427.3088	427.6003	428.1831	430.5154
13	421.8210	428.3833	425.9695	428.3689	428.9436	425.8457	422.6196	424.5906	422.8948	425.0710	426.9133	434.2131
14	421.7014	428.6760	425.6694	428.3928	428.8994	425.4241	421.9937	424.3455	422.4087	424.9087	426.8599	434.8394
15	421.8457	429.2122	425.2700	428.5149	428.8740	424.8894	421.2617	424.1931	421.8665	424.8413	426.8796	435.7346
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	572.1650	581.1753	593.6484	606.7629	619.7505	627.3528	613.5051	598.1687	572.9204	550.4248	543.3792	536.6208
HB	94.3	175.0	-106.4	44.5	-2.1	-110.8	-148.0	-8.7	-136.5	11.0	26.7	401.0
TSAT	349.2	347.6	346.6	345.9	345.2	344.5	343.6	343.2	342.3	341.5	340.8	340.1
HSAT	-194.3	-323.3	228.8	-95.7	4.7	280.6	369.1	18.7	260.8	-16.5	-36.1	-417.8
P	133.3	130.4	128.7	127.6	126.4	125.3	123.8	123.2	121.7	120.5	119.3	118.1
S.F.	-14149.2	-26524.6	17942.9	-7922.3	392.4	22461.4	28506.9	1514.7	20666.5	-1375.9	-3107.2	-40220.5
S.TEMP	422.06	429.60	425.01	428.63	428.87	424.56	420.84	424.17	421.56	424.86	426.93	436.33
MASS-FLX	19.4992	12.4407	5.9221	1.5756	3.5230	7.8439	9.4385	12.7648	14.2161	15.6824	16.8385	17.9892
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06612	0.06737	0.06840	0.06777	0.06813	0.06814	0.06753	0.06702	0.06749	0.06723	0.06769	0.06799
***RELAP	PREDICTIONS	(STARRED)***										
*HB	95.3	69.8	38.8	17.9	18.8	41.3	50.5	59.5	69.4	75.2	80.3	83.4
*S.F.	20735.5	14735.2	7771.4	3420.5	3377.3	6918.2	9069.8	11565.0	15148.0	18054.4	19949.7	21060.0
*S.TEMP	788.63	789.97	791.98	794.01	795.79	796.19	795.97	795.58	794.58	793.26	791.97	790.80
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	18.6000	18.6500	18.7000	18.7500	18.8000	18.8500	18.9000	18.9500	19.0000	19.0500	19.1000	19.1500
NODE												
1	444.5803	443.8782	443.2102	442.5791	441.9834	441.4219	440.8933	440.3972	439.9319	439.4961	439.0876	438.7046
2	440.6421	440.1199	439.6431	439.2080	438.8059	438.4312	438.0811	437.7568	437.4583	437.1807	436.9194	436.6733
3	437.1733	436.8611	436.0021	436.3743	436.1570	435.9487	435.7546	435.5847	435.4360	435.2937	435.1497	435.0122
4	434.2004	434.1489	434.1267	434.0923	434.0168	433.9338	433.8672	433.8428	433.8301	433.7900	433.7207	433.6663
5	432.7488	432.8889	432.9958	433.0396	432.9946	432.9619	432.9661	433.0408	433.0991	433.0818	433.0234	433.0183
6	432.3252	432.5325	432.0733	432.7317	432.6846	432.6677	432.6980	432.8120	432.8892	432.8687	432.8079	432.8242
7	431.8574	432.1526	432.3228	432.3845	432.3186	432.3252	432.3926	432.5649	432.6584	432.6196	432.5498	432.6030
8	431.4707	431.8601	432.0227	432.0557	431.9329	431.9841	432.1067	432.3689	432.4553	432.3577	432.2705	432.3960
9	431.2744	431.7190	431.8220	431.8003	431.5952	431.7241	431.9077	432.2744	432.3142	432.1250	432.0261	432.2612
10	431.2410	431.6819	431.6345	431.5234	431.1833	431.4797	431.7427	432.2678	432.1738	431.8298	431.7412	432.1775
11	431.5496	431.7939	431.4138	431.1636	430.6172	431.3167	431.6538	432.4424	431.9883	431.3889	431.4001	432.2380
12	432.2634	431.9722	431.0979	430.8069	429.9326	431.3894	431.6804	432.8459	431.6807	430.8069	431.0981	432.5544
13	436.5876	432.2705	429.0852	429.2175	426.6794	433.1726	432.0791	435.4644	429.3784	427.9082	430.3835	435.1755
14	437.0840	432.1370	428.7756	429.0703	426.2742	433.5872	432.0764	435.8396	428.9343	427.5754	430.4065	435.6045
15	437.6448	431.8301	428.3530	428.9390	425.7793	434.2527	432.0188	436.3381	428.2537	427.2039	430.5325	436.2080
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	535.2744	534.4780	533.4182	533.7588	531.5793	530.7544	531.3875	533.6389	536.4270	540.5242	546.0708	545.0857
HB	215.1	-167.1	-172.3	-34.8	-189.8	335.0	-46.1	224.2	-297.4	-119.4	70.7	247.1
TSAT	339.6	339.2	338.8	338.3	337.8	337.4	336.9	336.5	336.0	335.5	335.7	336.0
HSAT	-212.7	186.1	203.2	40.3	229.8	-330.6	48.3	-217.1	352.1	148.2	-85.9	-266.6
P	117.3	116.7	116.1	115.4	114.6	114.0	113.3	112.6	111.9	111.1	111.4	111.9
S.F.	-20934.0	17197.2	18149.9	3647.2	20137.8	-32170.5	4584.7	-21747.2	32307.9	13552.4	-8154.4	-26808.5
S.TEMP	437.95	431.58	428.09	428.89	425.48	434.73	431.95	436.66	427.78	427.00	430.65	436.60
MASS-FLX	18.1481	17.7063	17.0787	16.0473	15.0292	13.9495	12.6426	11.2865	9.7594	7.9851	6.9834	7.6048
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06918	0.06933	0.06840	0.06784	0.06793	0.06753	0.06873	0.06842	0.06894	0.06778	0.06762	0.06815
***RELAP	PREDICTIONS	(STARRED)***										
*HB	85.7	83.9	80.8	77.7	73.4	68.7	63.6	58.5	52.0	43.9	39.3	41.8
*S.F.	21842.9	21354.9	20505.1	19738.7	18768.3	17592.4	16268.2	14833.3	13063.2	10851.9	9517.2	10132.5
*S.TEMP	789.64	788.78	788.12	787.65	787.30	787.06	786.96	787.00	787.17	787.49	787.92	788.05
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	19.2000	19.2500	19.3000	19.3500	19.4000	19.4500	19.5000	19.5500	19.6000	19.6500	19.7000	19.7500
NODE												
1	438.3459	438.0107	437.6978	437.4063	437.1360	436.8845	436.6521	436.4375	436.2380	436.0527	435.8799	435.7185
2	436.4451	436.2354	436.0432	435.8674	435.7061	435.5603	435.4272	435.3044	435.1882	435.0779	434.9707	434.8657
3	434.8948	434.7979	434.7129	434.6367	434.5718	434.5173	434.4670	434.4165	434.3613	434.3030	434.2388	434.1667
4	433.6589	433.6731	433.6807	433.6855	433.7041	433.7292	433.7407	433.7388	433.7156	433.6870	433.6404	433.5762
5	433.0974	433.1787	433.2231	433.2622	433.3286	433.3958	433.4241	433.4338	433.4082	433.3867	433.3347	433.2607
6	432.9402	433.0422	433.0925	433.1414	433.2256	433.3052	433.3333	433.3440	433.3135	433.2947	433.2373	433.1563
7	432.7771	432.9006	432.9492	433.0090	433.1194	433.2131	433.2329	433.2417	433.1992	433.1851	433.1157	433.0232
8	432.6648	432.7944	432.8198	432.8936	433.0457	433.1477	433.1382	433.1414	433.0713	433.0713	432.9724	432.8623
9	432.6392	432.7405	432.7224	432.8196	433.0227	433.1204	433.0601	433.0623	432.9531	432.9805	432.8347	432.7070
10	432.7085	432.7095	432.6145	432.7654	433.0510	433.1162	432.9622	432.9788	432.7993	432.8906	432.6509	432.5100
11	432.9673	432.6750	432.4636	432.7588	433.1799	433.1343	432.8015	432.8933	432.5696	432.8245	432.3679	432.2461
12	433.4282	432.5544	432.2632	432.8455	433.4282	433.1370	432.5547	432.8459	432.2632	432.8455	431.9717	431.9717
13	435.9385	431.2048	431.2722	433.7566	434.8936	432.8337	431.0928	432.9924	430.5981	433.5313	429.6875	431.0408
14	436.2043	430.9011	431.1804	433.9365	435.0752	432.7283	430.8879	433.0767	430.3496	433.7063	429.3269	431.0020
15	436.4839	430.4143	431.1018	434.2097	435.2917	432.5413	430.6235	433.2380	430.0110	433.9973	428.8191	431.0251
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	543.5596	541.2883	538.9490	536.2090	534.3076	531.3525	526.0776	520.7659	517.7937	516.2859	515.1072	512.1047
HB	89.8	-210.8	-16.6	125.8	86.0	-96.1	-115.7	97.2	-171.6	175.9	-266.0	42.3
TSAT	336.3	336.6	336.9	337.2	337.5	337.8	338.1	338.4	338.2	337.9	337.7	337.4
HSAT	-95.8	250.9	19.0	-131.8	-86.9	100.5	119.8	-89.4	164.9	-150.0	253.7	-36.5
P	112.4	112.8	113.3	113.7	114.2	114.5	115.0	115.5	115.3	114.8	114.4	113.9
S.F.	-9605.3	23442.5	1793.0	-12807.2	-8509.2	9507.4	11063.4	-8492.3	15098.8	-14438.6	23047.2	-3424.0
S.TEMP	436.63	430.07	431.08	434.40	435.42	432.40	430.46	433.36	429.79	434.21	428.48	431.08
MASS-FLX	8.1899	8.8222	9.4042	10.0825	10.5945	11.0623	11.5427	11.9234	12.4748	12.1896	12.0271	11.9519
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06895	0.06892	0.06801	0.06808	0.06854	0.06868	0.06825	0.06799	0.06837	0.06793	0.06849	0.06778
***RELAP	PREDICTIONS	(STARRED)***										
*HB	44.7	47.5	49.9	53.0	54.9	57.1	58.6	60.2	63.2	61.5	61.0	60.6
*S.F.	10907.7	11691.8	12387.4	13283.7	13814.3	14507.0	15143.8	15834.3	16779.5	16378.1	16290.0	16322.0
*S.TEMP	787.91	787.60	787.20	786.71	786.18	785.60	784.98	784.30	783.55	782.94	782.42	781.92
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	19.8000	19.8500	19.9000	19.9500	20.0000
1	435.5654	435.4192	435.2786	435.1426	435.0105
2	434.7603	434.6519	434.5422	434.4307	434.3171
3	434.0813	433.9873	433.8884	433.7839	433.6741
4	433.4817	433.3806	433.2822	433.1699	433.0544
5	433.1377	433.0286	432.9321	432.8059	432.6843
6	433.0183	432.9089	432.8157	432.6799	432.5586
7	432.8599	432.7542	432.6658	432.5139	432.3938
8	432.6521	432.5671	432.4897	432.3025	432.1934
9	432.4355	432.3982	432.3298	432.0884	432.0076
10	432.1367	432.2085	432.1431	431.8000	431.7893
11	431.6821	432.0269	431.9172	431.3669	431.5483
12	431.0981	431.9722	431.8807	430.8066	431.3889
13	428.1836	432.7068	430.5610	427.9714	431.4629
14	427.7983	432.9473	430.3750	427.6035	431.6003
15	427.3096	433.3655	430.1016	427.1475	431.8792
Q	0.0	0.0	0.0	0.0	0.0
TB	508.5386	505.1780	502.0151	499.0686	496.6904
HB	-253.2	295.3	-179.9	-258.1	230.5
TSAT	337.0	336.7	336.4	336.1	335.8
HSAT	229.5	-217.8	138.8	205.3	-154.6
P	113.4	113.0	112.5	112.0	111.6
S.F.	20646.0	-21113.9	12971.4	18637.2	-14887.3
S.TEMP	427.01	433.68	429.91	426.87	432.10
MASS-FLX	11.7419	11.5394	11.3248	11.0948	10.8900
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.06811	0.06763	0.06849	0.06806	0.06764
RELAP PREDICTIONS (STARRED)					
*HB	59.5	58.8	57.8	56.9	56.3
*S.F.	16233.4	16192.0	16096.7	15974.8	15925.3
*S.TEMP	781.43	780.96	780.50	780.06	779.64
*H.T.MODE	8	8	8	8	8

318207********** ENERGY BALANCE **********

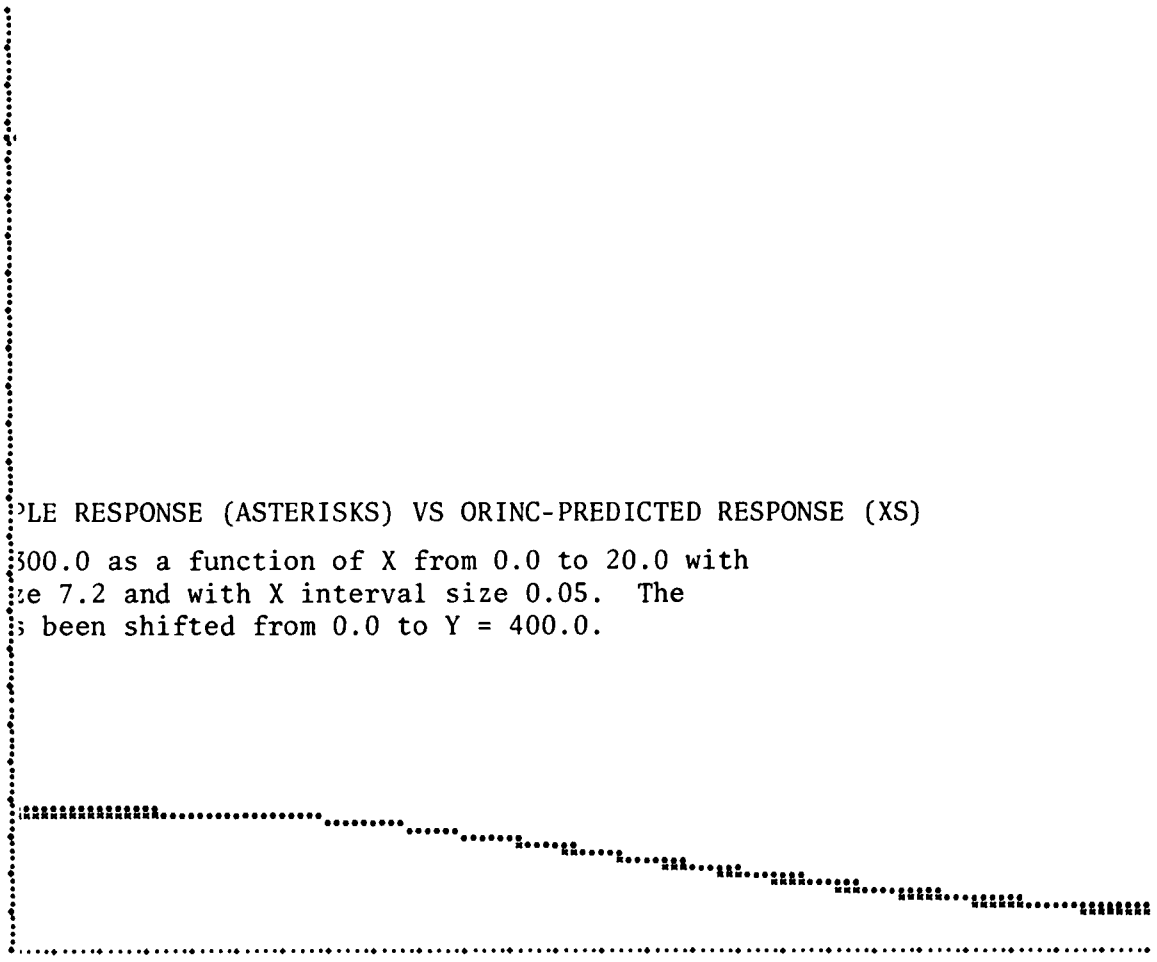
****** THERMOCOUPLE NUMBER: TE-318BG TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

CHANGE IN PIN INTERNAL ENERGY CONTENT = 31.644226 BTU/FT
DETERMINED BY SUMMATION OF DELTA U'S OVER THE INTERVAL FROM T=0 TO TEND.
CHANGE IN PIN INTERNAL ENERGY CONTENT = 31.547119 BTU/FT
DETERMINED BY DIFFERENCE IN PIN END POINT ENTHALPIES.
TOTAL HEAT INPUT = INTEGRAL OF QTOT*DT = 32.052841 BTU/FT

INTEGRAL OF SURFACE FLUX VERSUS TIME CURVE *2.0*PI*RO= 63.674576 BTU/FT

PERCENTAGE ERROR IN OVERALL HEAT BALANCE = 0.0353 PERCENT
ERROR IN OVERALL HEAT BALANCE (VIA METHOD 2)= 0.1173 PERCENT


PLE RESPONSE (ASTERISKS) VS ORINC-PREDICTED RESPONSE (XS)
300.0 as a function of X from 0.0 to 20.0 with
ze 7.2 and with X interval size 0.05. The
s been shifted from 0.0 to Y = 400.0.

Example 3. THTF Blowdown Test 104 (Preliminary, BD104.BE.P1), Thermocouple TE-304CH

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304308******************** CALIBRATION INFORMATION ************************

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

***** THERMOCOUPLE NO. 304-CH

***** MIDDLE T/C --- 304-MH

***** DATE OF LAST MODIFICATION : FEB. 17,1977

***** AXIAL POWER PEAKING FACTOR IS :   1.6820
      DETERMINED BY INDIV RESISTANCE CAL.

***** COEFFICIENTS FOR TEMPERATURE POLYNOMIAL FIT OF KBN
      DETERMINED FOR THE ABOVE SPECIFIC ITCS/ITCM PAIR
      C(1)=  0.25013443E 02
      C(2)= -0.92654452E-02
      C(3)= -0.57008589E-06
      C(4)=  0.11726001E-09

      VARIANCE OF FIT=  0.12019492E 02
      UNITS FOR KBN FIT :  BTU/(HR*FT**2/FT*F)

***** COEFFIEIENTS FOR TEMPERATURE POLYNOMIAL FIT FOR KMGO
      DETERMINED FOR THE ABOVE SPECIFIC T/C PAIR
      C(1)=  0.81721716E 01
      C(2)= -0.11537734E-01
      C(3)=  0.80284162E-05
      C(4)= -0.27536375E-08
      C(5)=  0.42359909E-12

      VARIANCE OF FIT=  0.67734o61E 01
      UNITS FOR KMGO FIT :  BTU/(HR*FT**2/FT*F)

      ACTUAL MGO POROSITY CALCULATED VIA MODIFIED
           RUSSELL EQUATION :   0.18026149E 00

***** COEFFICIENTS FOR THE THERMAL EXPANSION GAP MODEL FIT
      DETERMINED BY USING THE BIAS GAP VALUE AS A MEAN GAP

      C(1)=  0.0              SD=  0.0
      C(2)=  0.0              SD=  0.0
      C(3)=  0.0              SD=  0.0

      VARIANCE OF FIT=  0.0

      GAP CALCULATION AT THE BIAS POINT :          0.0826   (MILS)

      BIAS TEMP. INSIDE S.S.S. NODAL TEMP. :        858.5   DEG. F
      BIAS TEMP. OUTSIDE S.S.S. NODAL TEMP. :       701.4   DEG. F
      BIAS FLUX :   534119.6  BTU/HR/FT**2

      THE MAXIMUM TEMPERATURE FOR WHICH THE ABOVE
      REGRESSION FIT IS APPLICABLE IS     0.0  DEG. F
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304308********** CASE INFORMATION **********

****** THERMOCOUPLE NUMBER: TE-304CH TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

TOTAL NUMBER OF RADIAL NODES = 15

MAGNESIUM OXIDE CORE NODES	1	THROUGH	4
INCONEL-600 HEATER NODES	5	THROUGH	6
BORON NITRIDE NODES	7	THROUGH	9
INNER S.S.SHEATH NODES	10	THROUGH	12
OUTER S.S.SHEATH NODES	13	THROUGH	15

OUTSIDE RADIUS OF MGO CORE = 0.906700E-02 FT.
OUTSIDE RADIUS OF INCONEL LAYER = 0.101670E-01 FT.
OUTSIDE RADIUS OF BORON NITRIDE = 0.143330E-01 FT.
OUTSIDE RADIUS OF INNER S.S.SHEATH = 0.168330E-01 FT.
OUTSIDE RADIUS OF OUTER S.S.SHEATH = 0.176670E-01 FT.

RADIAL GAP INFORMATION: (I.E. BIAS POINT)
GAP BETWEEN INNER AND OUTER S.S.SHEATHS = 0.0826 MILS

POWER PEAKING FACTORS:
AXIAL = 1.681979
RADIAL (INCONEL) = 1.000000
RADIAL (CU-NI)= 0.0

304308********** STEADY STATE TEMPERATURE PROFILE **********

****** THERMOCOUPLE NUMBER: TE-304CH TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

Q = AVERAGE HEAT GENERATION PER FT = 9.790415 BTU/SEC/FT
Q*AXIAL PEAKING FACTOR = 16.467270 BTU/SEC/FT
HF = OUTSIDE FILM COEFFICIENT = 0.10329156E 06 BTU/(HR*FT**2*DEG F)
TB = BULK COOLANT TEMPERATURE = 619.45 DEG F

PIN TEMPERATURE PROFILE:

NODE	TEMPERATURE (DEG F)
1	1229.66
2	1229.66
3	1229.66
4	1229.66
5	1229.66
6	1211.02
7	1142.37
8	1059.90
9	997.21
10	945.42
11	898.89
12	856.36
13	699.47
14	684.64
15	670.19

SURFACE HEAT FLUX= 0.53405006E 06 BTU/HR/FT**2
SURFACE TEMPERATURE= 663.11 DEG F

PRESSURE= 2332.5 PSIA
SATURATION TEMPERATURE (AT THE ABOVE PRESSURE)= 657.94 DEG F

HEAT TRANSFER MODE AT THE SURFACE OF THE PIN: NUCLEATE BOILING

304308********** TRANSIENT RESULTS **********

****** THERMOCOUPLE NUMBER: TC-304CH TIME: 13:33:18

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

TIME-TEMPERATURE-NODE TABLE:
TIME HAS UNITS OF SEC
TEMPERATURE HAS UNITS OF DEG F
Q HAS UNITS OF BTU/SEC/FT
HB (BASED ON TB) HAS UNITS OF BTU/(HR*FT**2*DEG F)
BULK TEMPERATURE HAS UNITS OF DEG F
HSAT (BASED ON TSAT) HAS UNITS OF BTU/(HR*FT**2*DEG F)
PRESSURE HAS UNITS OF PSIA
SATURATION TEMPERATURE HAS UNITS OF DEG F
SURFACE FLUX (S.F.) HAS UNITS OF BTU/HR/FT**2
SURFACE TEMPERATURE HAS UNITS OF DEG F
AVERAGE MASS FLUX HAS UNITS OF LBM/SEC/FT**2
GAP HAS UNITS OF MILS

TIME--	0.0	0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500
NODE												
1	1229.6633	1229.6614	1229.0592	1229.6570	1229.6543	1229.6492	1229.6409	1229.6279	1229.6089	1229.5818	1229.5459	1229.4983
2	1229.6633	1229.6606	1229.0570	1229.6504	1229.6377	1229.6128	1229.5681	1229.4998	1229.4048	1229.2813	1229.1279	1228.9480
3	1229.6633	1229.6597	1229.0499	1229.6248	1229.5642	1229.4514	1229.2788	1229.0437	1228.7466	1228.4021	1228.0212	1227.6108
4	1229.6633	1229.6521	1229.0187	1229.5178	1229.2859	1228.9033	1228.4048	1227.8079	1227.1338	1226.4524	1225.7712	1225.0920
5	1229.6633	1229.6357	1229.0574	1229.3169	1228.8069	1228.0757	1227.2605	1226.3611	1225.4131	1224.5647	1223.7834	1222.9993
6	1211.0220	1210.9929	1210.9028	1210.6279	1210.0532	1209.2524	1208.3853	1207.4485	1206.4695	1205.6160	1204.8101	1204.0093
7	1142.3672	1142.3359	1142.2139	1141.8433	1141.1064	1140.1641	1139.2280	1138.2766	1137.2991	1136.4448	1135.7024	1134.9050
8	1059.8962	1059.8467	1059.0360	1059.0193	1057.8999	1056.6992	1055.7112	1054.7539	1053.7859	1053.0203	1052.4312	1051.6211
9	997.2068	997.1211	996.7783	995.8135	994.2087	992.7949	991.8633	990.9114	989.9448	989.3274	988.9197	988.0022
10	945.4236	945.2815	944.7410	943.2734	941.0313	939.4653	938.7041	937.7258	936.7285	936.3230	936.1174	934.9297
11	898.8909	898.6526	897.8069	895.5845	892.4902	890.9453	890.5525	889.4636	888.4077	888.3540	888.3835	886.6370
12	856.3579	855.9656	854.0665	851.3562	847.2188	846.1155	846.3914	845.0117	843.9082	844.4602	844.7361	841.9763
13	699.4697	698.6863	694.7378	685.1206	675.7334	678.9028	683.2842	679.3518	678.1472	682.6116	683.7590	674.1560
14	684.6375	683.7292	679.4216	669.0054	659.1299	663.1580	667.9819	663.5200	662.4045	667.4424	668.5608	657.9277
15	670.1899	669.1377	664.3552	652.9504	642.6062	647.9502	653.2434	647.9465	647.0293	652.8430	653.7996	641.7610
Q	16.46727	16.46417	16.46417	16.46417	16.46417	16.46417	16.46417	16.45212	16.44008	16.45212	16.44008	16.44008
TB	619.4534	617.2334	627.7915	628.5891	630.0339	631.0908	628.9185	628.5107	627.9131	627.5344	627.4136	627.7139
HB	103291.6	12089.6	19337.4	37212.9	144078.2	57846.4	31020.4	49368.4	48818.6	28899.7	28207.1	102856.1
TSAT	657.9	630.5	629.6	628.6	630.0	631.1	628.9	628.5	627.9	627.5	627.4	627.7
HSAT	103294.6	17211.4	20619.0	37212.9	144078.2	57846.4	31020.4	49368.4	48818.6	28899.7	28207.1	102856.1
P	2332.5	1927.1	1914.2	1900.3	1920.0	1934.4	1904.8	1899.3	1891.2	1886.1	1884.5	1888.5
S.F.	534050.1	540848.9	627088.5	606653.3	619684.0	549300.4	533299.1	578415.4	564571.9	527447.6	540693.7	609025.8
S.TEMP	663.11	661.97	656.89	644.89	634.33	640.59	646.11	640.23	639.48	645.79	646.58	633.64
MASS-FLX	742.5525	13.4230	398.0356	401.5842	156.1764	133.1134	198.1660	199.9494	361.0017	423.4685	452.9277	435.7056
QUALITY	0.0	0.0	0.0	0.03692	0.07285	0.11646	0.17392	0.21075	0.22149	0.20631	0.18314	0.16151
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	55751.2	21067.4	42793.8	41513.4	41525.3	42255.0	40086.4	11939.6	3400.7	2329.5	2562.0	3238.8
*S.F.	397408.0	273401.4	454857.1	438704.7	424706.7	428882.7	429040.4	330527.2	206075.4	202946.8	251507.6	316586.3
*S.TEMP	665.07	643.65	640.22	639.03	640.22	641.30	639.66	656.27	688.49	714.66	725.59	725.34
*H.T.MODE	2	4	2	2	2	2	4	4	4	4	4	4

TIME--	0.6000	0.6500	0.7000	0.7500	0.8000	0.8500	0.9000	0.9500	1.0000	1.0500	1.1000	1.1500
NODE												
1	1229.4377	1229.3640	1229.2764	1229.1738	1229.0559	1228.9219	1228.7712	1228.6047	1228.4236	1228.2283	1228.0186	1227.7957
2	1228.7417	1228.5088	1228.2498	1227.9658	1227.6589	1227.3328	1226.9912	1226.6389	1226.2778	1225.9089	1225.5330	1225.1487
3	1227.1711	1226.7004	1226.2007	1225.6755	1225.1387	1224.6021	1224.0747	1223.5630	1223.0598	1222.5593	1222.0547	1221.5439
4	1224.3809	1223.6272	1222.8569	1222.0732	1221.3342	1220.6563	1220.0435	1219.4910	1218.9270	1218.3518	1217.7471	1217.1284
5	1222.1301	1221.1960	1220.2910	1219.3801	1218.6331	1217.9966	1217.4556	1216.9819	1216.3752	1215.7529	1215.0605	1214.3760
6	1203.1060	1202.1362	1201.1987	1200.2769	1199.5278	1198.9165	1198.4014	1197.9282	1197.3101	1196.6631	1195.9592	1195.2627
7	1133.9556	1132.9497	1131.9839	1131.1091	1130.4097	1129.9265	1129.5234	1129.0576	1128.4309	1127.7405	1127.0557	1126.3699
8	1050.5500	1049.4944	1048.3393	1047.7925	1047.2654	1047.0659	1046.8440	1046.3564	1045.6438	1044.8823	1044.2397	1043.5818
9	986.7332	985.6501	984.7434	984.1753	983.8601	983.9985	983.8909	983.2737	982.4065	981.5745	981.0151	980.3669
10	933.3540	932.2766	931.4404	931.1082	931.0349	931.5952	931.5024	930.6033	929.5088	928.6079	928.1843	927.4993
11	884.6323	883.6777	882.9531	882.9709	883.1904	884.3279	884.0549	882.6445	881.2590	880.3308	880.1599	879.3481
12	839.4927	838.9407	838.3887	838.9407	839.4924	841.4246	840.5967	838.3884	836.7324	835.9043	836.1804	835.0759
13	669.6389	672.3518	672.6021	676.3169	678.3066	684.7361	679.3176	672.4150	669.9500	670.2234	673.3413	669.8806
14	653.3992	656.6816	656.9353	661.0713	663.1401	670.1511	663.8816	656.4773	654.0916	654.5762	658.0659	654.1511
15	637.4150	641.5308	641.0736	646.3633	648.4397	656.1885	648.6331	640.6892	638.5586	639.3428	643.3057	638.6975
Q	16.44008	16.44008	16.45049	16.44008	16.45049	16.43843	16.42801	16.43843	16.42801	16.43843	16.42801	16.42801
TB	627.3049	624.9048	622.3184	621.5581	620.4299	618.5605	616.9456	615.7295	614.2600	613.6972	612.1338	610.1890
HB	267630.7	59085.3	46900.3	30070.0	25696.0	16230.1	23656.8	34428.8	34245.5	30837.7	22237.7	27367.9
TSAT	627.3	624.9	622.3	621.6	620.4	618.6	616.9	615.7	614.3	613.9	612.1	610.2
HSAT	267630.7	59085.3	46900.3	30070.0	25696.0	16230.1	23656.8	34428.8	34245.5	30837.7	22237.7	27367.9
P	1883.0	1851.0	1817.0	1807.0	1792.4	1768.4	1747.8	1732.5	1714.1	1709.5	1687.7	1663.9
S.F.	589623.9	547635.3	557250.6	531540.0	535550.9	501793.5	569911.4	588433.3	570159.3	554897.9	533835.1	570850.8
S.TEMP	629.51	634.17	634.20	639.23	641.27	649.48	641.04	632.82	630.91	631.89	636.14	631.05
MASS-FLX	410.9890	488.3894	458.5015	443.1011	464.9485	449.1870	421.4880	395.7139	381.3660	176.8089	125.8027	142.3015
QUALITY	0.16470	0.15772	0.16016	0.16158	0.16276	0.16458	0.16982	0.17528	0.18145	0.19927	0.24891	0.28548
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	3580.9	3356.9	3149.0	2952.2	2597.2	2298.5	2014.6	1738.7	1424.9	1955.9	2009.0	1064.1
*S.F.	323612.1	319124.1	313152.8	307777.8	289230.0	278045.6	263161.3	246550.1	221067.2	311297.1	303785.1	182301.2
*S.TEMP	717.74	720.05	721.80	725.82	731.86	739.60	747.68	757.78	769.73	773.15	763.47	781.58
*H.T.MODE	4	4	4	4	4	4	4	4	4	4	4	4

TIME--	1.2000	1.2500	1.3000	1.3500	1.4000	1.4500	1.5000	1.5500	1.6000	1.6500	1.7000	1.7500
NODE												
1	1227.5598	1227.3108	1227.0498	1226.7769	1226.4927	1226.1973	1225.8909	1225.5728	1225.2441	1224.9053	1224.5552	1224.1934
2	1224.7561	1224.3564	1223.9502	1223.5354	1223.1135	1222.6846	1222.2478	1221.8030	1221.3462	1220.8770	1220.3933	1219.8953
3	1221.0288	1220.5098	1219.9866	1219.4568	1218.9250	1218.3879	1217.8420	1217.2815	1216.6970	1216.0872	1215.4558	1214.8049
4	1216.5168	1215.9001	1215.2888	1214.6528	1214.0376	1213.4106	1212.7610	1212.0667	1211.3057	1210.5000	1209.6804	1208.8618
5	1213.7383	1213.0757	1212.4370	1211.7214	1211.1047	1210.4241	1209.6951	1208.8760	1207.9402	1206.9873	1206.0681	1205.1855
6	1194.6072	1193.9319	1193.2747	1192.5471	1191.9094	1191.2222	1190.4741	1189.6233	1188.6470	1187.6663	1186.7319	1185.8384
7	1125.6968	1125.0234	1124.3438	1123.6343	1122.9622	1122.3037	1121.5364	1120.6431	1119.6084	1118.6228	1117.7134	1116.8479
8	1042.9089	1042.2512	1041.5581	1040.8674	1040.1885	1039.5881	1038.7524	1037.7590	1036.6013	1035.6606	1034.8435	1034.0522
9	979.6848	979.0447	978.3252	977.6497	976.9680	976.4424	975.4551	974.3254	973.0107	972.1968	971.4924	970.7625
10	926.7815	926.1504	925.3655	924.6970	923.9927	923.5615	922.2815	920.9641	919.4277	918.8494	918.2537	917.5461
11	878.5696	877.9561	877.0476	876.4021	875.6489	875.3723	873.5476	872.0161	870.1763	870.0762	869.5591	868.8208
12	834.2478	833.6958	832.5913	832.0391	831.2107	831.2107	828.4487	826.7917	824.5820	825.4109	824.8584	824.0295
13	668.9697	668.8870	666.4722	666.7168	665.3347	667.1624	658.1196	656.6365	652.3833	659.6497	657.9287	656.3777
14	653.3254	653.3206	650.7009	651.1147	649.6274	651.7446	641.7285	640.5276	635.9556	644.2842	642.1438	640.5247
15	638.0566	638.1541	635.2434	635.9331	634.2759	636.7976	625.4133	624.7913	619.8660	629.5972	626.6877	625.0251
Q	16.44008	16.44008	16.43049	16.44008	16.46255	16.45212	16.45212	16.45212	16.45212	16.45212	16.45212	16.45212
TB	609.4617	609.2661	608.4922	607.2402	606.2776	606.1819	605.2251	603.7729	602.7217	601.8718	600.7991	599.5723
HB	26451.6	25782.5	29609.2	25983.7	27468.5	23198.4	50761.5	43043.9	64595.3	25118.9	30952.8	31688.6
TSAT	609.5	609.3	608.5	607.2	606.3	606.2	605.2	603.8	602.7	601.9	600.8	599.6
HSAT	26451.6	25782.5	29669.2	25983.7	27468.5	23198.4	50761.5	43043.9	64595.3	25118.9	30952.8	31688.6
P	1655.0	1652.6	1643.3	1628.2	1616.7	1615.6	1604.2	1587.1	1574.8	1564.9	1552.4	1538.3
S.F.	558144.7	553228.5	567538.7	552502.4	561669.1	541304.8	609212.7	572159.8	591435.1	519732.5	565424.4	564955.8
S.TEMP	630.56	630.72	627.62	628.50	626.73	629.52	617.23	617.07	611.88	622.56	619.07	617.40
MASS-FLX	160.0267	164.8113	151.8504	143.1043	141.7212	100.7939	68.6199	53.5345	61.5279	61.2524	57.0447	57.8241
QUALITY	0.30316	0.31668	0.32733	0.34049	0.35425	0.36732	0.39280	0.43246	0.46285	0.49375	0.52690	0.56339
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	553.7	582.5	554.1	533.9	537.7	440.6	338.6	369.2	317.5	328.3	321.8	336.9
*S.F.	112369.1	129596.1	113107.7	133563.8	140380.5	119887.5	97557.4	109781.3	99447.5	106520.3	107830.7	116148.2
*S.TEMP	812.42	831.78	845.55	857.50	867.42	878.33	893.46	901.24	915.97	926.36	935.96	944.44
*H.T.MODE	9	9	9	9	9	9	4	4	9	9	9	9

TIME--	1.8000	1.8500	1.9000	1.9500	2.0000	2.0500	2.1000	2.1500	2.2000	2.2500	2.3000	2.3500
NODE												
1	1223.8193	1223.4338	1223.0361	1222.6265	1222.1584	1221.5579	1220.7390	1219.6211	1218.1355	1216.2268	1213.8577	1211.0015
2	1219.3833	1218.8582	1218.3188	1217.7673	1216.6125	1214.4277	1211.0171	1206.3569	1200.5293	1193.6641	1185.9136	1177.4231
3	1214.1416	1213.4666	1212.7800	1212.0796	1207.0044	1197.9412	1186.0623	1172.4294	1157.8313	1142.8059	1127.6919	1112.6887
4	1208.0461	1207.2290	1206.3994	1205.5500	1180.6240	1151.6960	1123.9939	1098.6851	1075.7844	1054.9785	1035.8884	1018.1648
5	1204.3154	1203.4375	1202.5313	1201.5920	1130.6399	1088.1230	1056.9084	1031.4497	1009.5811	990.1633	972.4744	956.0325
6	1184.9556	1184.0620	1183.1360	1182.1755	1116.6589	1075.4902	1044.7788	1019.6594	998.0732	978.8870	961.3728	945.0542
7	1115.9829	1115.0979	1114.1694	1113.2053	1078.3218	1045.8455	1018.7478	995.7744	975.7078	957.6584	941.0024	925.3347
8	1033.2266	1032.3586	1031.4238	1030.4583	1013.9661	993.8608	974.4121	956.4883	939.9805	924.5154	909.7593	895.5234
9	969.9482	969.0750	968.1060	967.1250	958.4402	946.0188	932.5793	919.1157	905.9180	892.8813	879.9036	867.0173
10	916.6936	915.7729	914.7190	913.6946	909.0083	901.5647	892.6064	882.7024	872.2332	861.1738	849.6057	837.7832
11	867.8689	866.8618	865.6660	864.5842	862.3704	858.4712	852.9663	845.8591	837.5586	827.9807	817.3989	806.3274
12	822.9246	821.8196	820.4377	819.3328	819.0564	817.9509	815.1868	810.2112	803.5730	794.9558	785.0303	774.5017
13	654.3247	652.7388	650.2820	649.2471	657.0278	665.9243	672.1067	673.0603	670.9238	663.9578	654.5378	645.0410
14	638.3691	636.7583	634.1702	633.1958	642.0571	651.9500	658.8909	660.2393	658.4390	651.4790	642.0513	632.6816
15	622.7478	621.1292	618.3845	617.5217	627.7769	638.6804	646.2739	647.8103	646.2244	639.0981	629.5779	620.3306
Q	16.45212	16.45212	16.45212	16.45212	0.15536	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	598.4775	597.4971	596.3687	595.1104	594.8521	593.4011	592.0039	591.1313	590.6545	589.7725	588.5706	587.7175
HB	34372.4	35662.3	40431.2	38618.8	19300.0	12016.5	9352.0	8947.3	9060.5	10707.5	13443.5	17431.4
TSAT	598.5	597.5	596.4	595.1	594.9	593.4	592.0	591.1	590.7	589.8	588.6	587.7
HSAT	34372.4	35662.3	40431.2	38618.8	19300.0	12016.5	9352.0	8947.3	9060.5	10707.5	13443.5	17431.4
P	1525.8	1514.7	1501.9	1487.8	1484.9	1468.8	1453.4	1443.8	1438.6	1429.1	1416.1	1406.9
S.F.	569746.8	568637.1	575413.8	568278.9	503730.7	468202.3	450911.2	452886.3	449063.5	461948.3	466998.2	460333.2
S.TEMP	615.05	613.44	610.60	609.83	620.95	632.36	640.22	641.75	640.22	632.91	623.31	614.13
MASS-FLX	59.5925	63.3138	65.1625	73.9920	27.2237	13.7930	5.3472	28.2524	36.2568	21.1229	15.9901	29.1080
QUALITY	0.60319	0.62935	0.63759	0.63588	0.64131	0.65762	0.66947	0.68636	0.70176	0.71373	0.72097	0.72190
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	355.1	387.0	394.9	436.9	205.9	118.8	51.0	181.9	258.2	190.6	130.6	202.8
*S.F.	125235.3	138963.4	144333.1	162079.8	79062.7	48140.5	21664.3	78655.9	111119.1	82528.3	57684.6	89814.1
*S.TEMP	951.17	956.61	961.97	966.21	978.79	998.67	1017.05	1023.76	1021.13	1022.89	1030.23	1030.71
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	2.4000	2.4500	2.5000	2.5500	2.6000	2.6500	2.7000	2.7500	2.8000	2.8500	2.9000	2.9500
NODE												
1	1207.6450	1203.7839	1199.4221	1194.5708	1189.2483	1183.4790	1177.2920	1170.7192	1163.7535	1156.5471	1149.0098	1141.2090
2	1168.3289	1158.7476	1148.7834	1138.5361	1128.1040	1117.5828	1107.0532	1096.5750	1086.1821	1075.8921	1065.7070	1055.6216
3	1097.9048	1083.3977	1069.2307	1055.4912	1042.2917	1029.7117	1017.7576	1006.3630	995.4282	984.8611	974.5806	964.5156
4	1001.5381	985.8391	971.0896	957.4495	945.0862	933.9380	923.7092	914.0393	904.6765	895.5005	886.4294	877.4045
5	940.5645	925.9749	912.0486	900.6516	890.4797	881.6121	873.3452	865.1428	856.8508	848.5154	840.1089	831.6074
6	929.6750	915.1687	901.9033	890.2915	880.5195	872.0427	864.0552	856.0010	847.7798	839.4846	831.0881	822.5703
7	910.4810	896.4580	883.8320	873.0845	864.3420	856.7546	849.3367	841.5642	833.4949	825.3262	817.0059	808.5259
8	881.8447	868.9326	857.8206	849.0081	842.3948	836.3733	829.7241	822.1746	814.2153	806.2117	797.9834	789.5491
9	854.5024	842.7744	833.5105	827.0242	822.8359	818.2383	811.9827	804.3176	796.3271	788.4595	780.2495	771.8047
10	826.2705	815.7087	808.7454	805.1243	803.7791	800.3164	793.8762	785.6289	777.4529	769.6880	761.3340	752.7476
11	795.6970	786.3965	782.6646	782.8042	784.9045	781.8472	774.2388	764.7844	756.3745	748.7698	740.0137	731.1360
12	764.7996	757.0344	757.8665	762.5815	768.4067	764.2449	754.2544	743.1523	734.8169	727.5872	718.1279	708.9399
13	639.2876	639.1194	666.2712	692.9446	714.2336	695.9961	670.7336	651.6382	645.9358	641.1243	626.5037	615.9761
14	627.4656	628.2339	658.8201	687.5063	710.0220	689.0996	662.1819	642.5774	637.6104	633.0747	617.6516	607.1692
15	615.7788	617.6702	652.6321	683.2153	706.7041	681.6934	652.9524	633.0942	629.3464	625.0930	608.5154	598.2402
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	586.9829	585.9866	584.9897	584.1069	583.2068	582.3638	581.5232	580.6509	579.7810	578.9155	578.0400	577.1587
HB	18637.5	14281.3	2754.9	1216.5	761.8	3242.2	5699.8	7850.2	6712.4	6987.5	13670.0	20195.8
TSAT	587.0	586.0	585.0	584.1	583.2	582.4	581.6	580.7	579.8	578.9	578.0	577.2
HSAT	18637.5	14281.3	2754.9	1216.5	761.8	3242.2	5699.8	7850.2	6712.4	6987.5	13670.0	20195.8
P	1399.1	1388.5	1378.0	1368.7	1359.3	1350.5	1341.8	1332.8	1323.9	1315.1	1306.2	1297.4
S.F.	428588.8	379083.3	179644.6	118639.9	93147.9	308963.9	378666.3	372644.5	305135.8	294885.9	351676.7	334014.5
S.TEMP	609.98	612.53	650.20	681.63	705.48	677.66	647.96	628.12	625.24	621.12	603.77	593.70
MASS-FLX	28.3790	21.4997	23.1621	24.4101	23.1776	24.5344	24.2368	23.7682	23.9268	23.9105	23.6945	23.5662
QUALITY	0.72631	0.73407	0.74029	0.74770	0.75683	0.76587	0.77572	0.78531	0.79396	0.80152	0.80765	0.81204
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	220.8	173.3	175.1	188.4	180.1	188.6	189.8	187.0	188.4	189.3	188.4	187.6
*S.F.	97058.4	76436.1	77573.9	83304.8	79595.3	83206.3	83493.2	82062.6	82486.4	82679.6	82056.5	81502.9
*S.TEMP	1026.76	1027.25	1028.12	1026.56	1025.31	1023.66	1021.53	1019.74	1017.85	1015.79	1013.78	1011.82
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	3.0000	3.0500	3.1000	3.1500	3.2000	3.2500	3.3000	3.3500	3.4000	3.4500	3.5000	3.5500
NODE												
1	1133.1707	1124.9167	1116.4673	1107.8416	1099.0574	1090.1309	1081.0784	1071.9153	1062.6565	1053.3174	1043.9136	1034.4607
2	1045.6243	1035.7046	1025.8538	1016.0696	1006.3521	996.7031	987.1272	977.6289	968.2168	958.9021	949.6951	940.6052
3	954.6179	944.8618	935.2468	925.7800	916.4722	907.3276	898.3508	889.5471	880.9316	872.5229	864.3315	856.3599
4	868.4248	859.5391	850.8188	842.3040	834.0107	825.9333	818.0708	810.4382	803.0754	796.0151	789.2422	782.7339
5	823.1018	814.7305	806.6160	798.7734	791.1877	783.8245	776.6912	769.8196	763.2903	757.1316	751.2661	745.6497
6	814.0508	805.6899	797.6184	789.8367	782.3213	775.0281	767.9734	761.1948	754.7869	748.7712	743.0471	737.5696
7	800.0657	791.8262	783.9377	776.3584	769.0493	761.9514	755.1035	748.5535	742.4209	736.7095	731.2656	726.0520
8	781.2363	773.2888	765.8093	758.6375	751.7183	744.9707	738.4973	732.3579	726.7302	721.5479	716.5427	711.7344
9	763.6685	756.0886	748.0969	742.3572	735.8367	729.4314	723.3481	717.6462	712.5820	707.9583	703.3584	698.9353
10	744.8052	737.6753	731.2610	724.9534	718.8279	712.7368	707.0767	701.8635	697.4893	693.4995	689.2703	685.2419
11	723.5171	717.0291	711.3633	705.4705	699.7495	693.9375	688.7979	684.1843	680.7473	677.4983	673.5415	669.9546
12	701.9763	696.4016	691.6599	686.0801	680.7766	675.1907	670.7207	666.8081	664.5713	662.0544	658.1375	655.0596
13	613.5625	612.8813	612.5210	607.1978	603.6265	598.4895	597.6484	596.9846	601.1313	601.1680	595.8562	595.5159
14	605.4788	605.3210	605.3855	599.9189	596.5776	591.4380	591.0896	590.7314	595.6299	595.7542	590.1306	590.2170
15	597.5596	597.9722	598.4546	592.6572	589.6152	584.4099	584.7026	584.6482	590.4622	590.5034	584.3767	585.0786
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	576.2532	575.3855	574.5400	573.7646	572.9678	572.1482	571.3396	570.5261	569.7043	568.8813	568.0542	567.2222
HB	16323.3	13821.8	12052.9	17527.2	19142.2	29443.8	22138.9	19433.2	9640.9	9825.6	15879.9	11851.0
TSAT	576.3	575.4	574.5	573.8	573.0	572.1	571.3	570.5	569.7	568.9	568.1	567.2
HSAT	16323.3	13821.8	12052.9	17527.2	19142.2	29443.8	22138.9	19433.2	9640.9	9825.6	15879.9	11851.0
P	1288.3	1279.6	1271.2	1263.6	1255.7	1247.7	1239.8	1232.0	1224.0	1216.1	1208.2	1200.3
S.F.	284377.8	262593.6	247486.6	267169.5	252484.3	257194.6	226832.2	216597.2	176712.9	187232.6	212866.6	181977.9
S.TEMP	593.67	594.38	595.07	589.01	586.16	580.88	581.59	581.67	588.03	587.94	581.46	582.58
MASS-FLX	22.8788	23.4853	23.9197	23.9393	22.9719	21.9853	21.0433	19.7313	18.2756	16.6964	14.9018	12.9779
QUALITY	0.81489	0.81553	0.81458	0.81169	0.80789	0.80335	0.79839	0.79363	0.78939	0.78589	0.78338	0.78194
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	184.1	185.9	185.3	188.1	182.0	174.1	167.1	157.7	147.1	136.0	123.6	110.1
*S.F.	79817.6	80409.6	79944.8	80903.3	78074.4	74578.0	71521.1	67510.0	63055.3	58380.4	53171.2	47507.3
*S.TEMP	1009.89	1008.11	1006.09	1003.92	1002.05	1000.73	999.64	998.83	998.38	998.22	998.39	998.90
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	3.6000	3.6500	3.7000	3.7500	3.8000	3.8500	3.9000	3.9500	4.0000	4.0500	4.1000	4.1500
NODE												
1	1024.9741	1015.4680	1005.9563	996.4512	986.9656	977.5095	968.0957	958.7349	949.4365	940.2109	931.0674	922.0144
2	931.6414	922.8069	914.0999	905.5181	897.0627	888.7375	880.5471	872.4951	864.5830	856.8135	849.1875	841.7080
3	848.5940	841.0146	833.5969	826.3318	819.2246	812.2869	805.5271	798.9409	792.5200	786.2593	780.1611	774.2302
4	776.4219	770.2581	764.1995	758.2722	752.5305	746.9993	741.6765	736.5266	731.5259	726.6733	721.9949	717.4963
5	740.1455	734.7209	729.3320	724.0908	719.1052	714.3682	709.8513	705.4626	701.1938	697.0667	693.1411	689.4106
6	732.1763	726.8481	721.5386	716.3970	711.5417	706.9465	702.5745	698.3147	694.1702	690.1721	686.3914	682.8125
7	720.8582	715.7048	710.5396	705.5906	700.9844	696.6458	692.5234	688.4736	684.5325	680.7468	677.2085	673.8743
8	706.7910	701.8713	696.8872	692.2549	688.0674	684.1233	680.3679	676.5886	672.9226	669.4363	666.2600	663.2722
9	694.1558	689.4346	684.5796	680.3076	676.5872	673.0298	669.6230	666.0535	662.6411	659.4460	656.6487	653.9917
10	680.4939	675.9541	671.1604	667.3799	664.2512	661.1003	658.0608	654.6353	651.5007	648.6384	646.3142	644.0115
11	664.9758	660.6594	655.8171	652.8464	650.5210	647.7646	645.1245	641.7041	638.9348	636.4922	634.8237	632.8865
12	649.4602	645.5386	640.4958	638.8142	637.4126	634.8882	632.6445	628.9973	626.7517	624.7874	623.9451	622.2598
13	584.7639	583.9580	576.8862	583.7161	586.2754	583.4238	582.9451	576.8547	578.2507	578.0591	581.8115	580.1904
14	578.6409	578.4788	571.0076	579.1006	581.8604	578.7878	578.5532	572.0483	573.8247	574.1733	578.2456	576.4460
15	572.2927	573.1501	565.0400	574.9038	577.6753	574.1829	574.2842	567.1587	569.7783	570.2319	574.9312	572.7520
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	566.4167	565.6687	564.8984	564.1189	563.3445	562.5620	561.7766	560.9875	560.1946	559.3984	558.6772	558.0813
HB	94690.6	38346.3	-75925.8	15261.0	11744.2	18008.7	14493.4	49749.3	18247.7	15566.3	7568.1	10410.3
TSAT	566.4	565.7	564.9	564.1	563.3	562.6	561.8	561.0	560.2	559.4	558.7	558.1
HSAT	94690.6	38346.3	-75925.8	15261.0	11744.2	18008.7	14493.4	49749.3	18247.7	15566.3	7568.1	10410.3
P	1192.7	1185.7	1178.5	1171.2	1164.0	1156.8	1149.6	1142.4	1135.1	1127.9	1121.4	1116.1
S.F.	241812.6	187537.6	221345.2	135855.3	144833.3	167661.6	151055.9	182017.4	139606.8	138762.6	111357.6	133542.0
S.TEMP	568.97	570.56	561.98	573.02	575.68	571.87	572.20	564.65	567.85	568.31	573.39	570.91
MASS-FLX	11.6846	11.2599	10.6874	10.4726	10.3660	10.2706	10.2493	10.2108	10.2218	10.2106	10.0522	7.7566
QUALITY	0.78119	0.78056	0.78031	0.78017	0.78015	0.78028	0.78053	0.78093	0.78148	0.78217	0.78313	0.78555
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	99.0	95.9	91.3	89.0	88.0	86.9	86.4	85.9	85.5	85.3	84.7	73.0
*S.F.	42868.5	41625.3	39738.1	38811.6	38404.3	37977.5	37777.0	37578.5	37425.4	37358.0	37088.6	31998.5
*S.TEMP	999.64	999.99	1000.15	1000.15	999.93	999.58	999.12	998.57	997.97	997.30	996.61	996.37
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	4.2000	4.2500	4.3000	4.3500	4.4000	4.4500	4.5000	4.5500	4.6000	4.6500	4.7000	4.7500
NODE												
1	913.0605	904.2148	895.4844	886.8770	878.3997	870.0583	861.8577	853.8035	845.8994	838.1492	830.5535	823.1133
2	834.3796	827.2029	820.1802	813.3142	806.6035	800.0481	793.6462	787.3979	781.2979	775.3420	769.5220	763.8318
3	768.4678	762.8704	757.4377	752.1660	747.0459	742.0718	737.2405	732.5503	727.9844	723.5244	719.1543	714.8694
4	713.1716	709.0054	705.0029	701.1443	697.4106	693.7969	690.3140	686.9487	683.6531	680.3548	677.1626	673.9736
5	685.8467	682.4226	679.1667	676.0273	672.9827	670.0435	667.2395	664.5334	661.8250	659.0957	656.3569	653.6592
6	679.3982	676.1199	673.0181	670.0212	667.1138	664.3115	661.6516	659.0833	656.4856	653.8521	651.2041	648.6035
7	670.6951	667.6406	664.7761	661.9922	659.2854	656.6851	654.2402	651.8706	649.4177	646.9106	644.3838	641.9226
8	660.4109	657.6487	655.1140	652.5920	650.1343	647.7930	645.6372	643.5098	641.1873	638.8005	636.4023	634.1174
9	651.4197	648.9187	646.7122	644.4026	642.1621	640.0596	638.1860	636.2603	633.9880	631.6802	629.3835	627.2710
10	641.7395	639.5083	637.7004	635.5659	633.5522	631.7195	630.1843	628.4399	626.1152	623.8684	621.6689	619.7737
11	630.9260	628.9790	627.7175	625.6494	623.9045	622.4048	621.3162	619.6865	617.1072	614.9421	612.8513	611.2786
12	620.5750	618.8896	618.3276	616.0796	614.6743	613.5500	612.9880	611.3008	608.2068	606.2380	604.2683	603.1423
13	579.5276	578.8232	582.1719	577.3892	578.1553	578.7795	580.8586	577.7112	571.0361	570.9546	569.4851	570.9958
14	575.9072	575.2927	579.1299	573.8330	574.9915	575.7678	578.1301	574.6682	567.5549	567.9233	566.4023	568.2554
15	572.3792	571.8445	576.3162	570.2017	571.9651	572.8738	575.5684	571.5957	563.9282	564.9563	563.3594	565.6606
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	557.3303	556.7288	556.2427	555.5610	554.8689	554.2590	598.2097	673.3020	754.0652	834.1567	890.2017	921.0120
HB	9409.7	9133.7	5006.0	10681.7	6697.1	5879.1	-3660.8	-1101.3	-717.2	-381.6	-332.7	-248.2
TSAT	557.3	556.7	556.2	555.6	554.9	554.3	553.6	552.9	552.5	552.4	552.0	551.8
HSAT	9409.7	9133.7	5006.0	10681.7	6697.1	5879.1	4208.9	6648.8	14507.8	9291.5	11112.4	7011.3
P	1109.4	1104.0	1099.7	1093.7	1087.6	1082.2	1076.6	1070.5	1067.1	1066.1	1062.7	1060.9
S.F.	125317.3	122593.2	93985.1	136305.9	104790.6	101215.2	87300.9	113735.3	137738.7	103284.5	109233.4	88512.8
S.TEMP	570.65	570.15	575.02	568.32	570.52	571.48	574.36	570.03	562.02	563.52	561.85	564.43
MASS-FLX	3.1102	0.2112	2.1723	5.5477	9.1231	12.1838	15.5119	18.1027	20.8059	26.8825	28.5131	31.0706
QUALITY	0.78903	0.79206	0.80049	0.83179	0.88973	0.97552	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	34.3	14.8	26.3	55.9	91.5	122.4	126.8	119.1	122.9	146.1	153.5	162.6
*S.F.	15132.6	6576.9	11743.8	24966.4	40586.7	53784.9	50475.0	38263.7	29612.3	23775.4	16095.6	12658.0
*S.TEMP	998.21	1001.41	1003.20	1002.03	998.53	993.85	990.07	989.61	990.52	991.52	993.11	994.67
*H.T.MODE	9	7	9	9	9	9	8	8	8	8	8	8

TIME--	4.8000	4.8500	4.9000	4.9500	5.0000	5.0500	5.1000	5.1500	5.2000	5.2500	5.3000	5.3500
NODE												
1	815.8291	808.7000	801.7253	794.9050	788.2373	781.7214	775.3564	769.1431	763.0801	757.1648	751.3970	745.7732
2	758.2654	752.8201	747.4941	742.2856	737.1929	732.2175	727.3630	722.6304	718.0176	713.5186	709.1267	704.8394
3	710.6682	706.5535	702.5288	698.5896	694.7402	690.9924	687.3552	683.8262	680.3867	677.0183	673.7153	670.4771
4	670.8413	667.7803	664.7981	661.8701	659.0229	656.2932	653.6904	651.1741	648.6863	646.2048	643.7480	641.3328
5	651.0232	648.4666	645.9922	643.5352	641.1812	638.9858	636.9336	634.9209	632.8572	630.7517	628.6719	626.6404
6	646.0710	643.6211	641.2573	638.8950	636.6536	634.5889	632.6709	630.7690	628.7876	626.7539	624.7561	622.8115
7	639.5381	637.2444	635.0393	632.8035	630.7271	628.8582	627.1350	625.3789	623.4907	621.5452	619.6589	617.8340
8	631.9214	629.8284	627.8269	625.7185	623.8755	622.2852	620.8179	619.2056	617.3752	615.5046	613.7590	612.0830
9	625.2510	623.3464	621.5327	619.4968	617.9131	616.6133	615.3840	613.8474	612.0044	610.1831	608.5847	607.0466
10	617.9495	616.2615	614.6565	612.6274	611.4250	610.4937	609.5217	607.9734	606.0303	604.2607	602.8682	601.4836
11	609.6775	608.2563	606.8933	604.7253	604.1931	603.7378	603.0215	601.2668	599.0806	597.4180	596.3643	595.1414
12	601.7351	600.6091	599.4827	596.9478	597.5110	597.5110	596.9475	594.6941	592.1577	590.7483	590.1846	589.0566
13	570.0259	570.3276	570.1042	572.7668	573.9314	573.3174	567.2510	562.9978	563.7917	566.0635	564.6765	
14	567.2336	567.7078	567.6452	561.5623	570.9182	571.9285	571.2473	564.6504	560.3159	561.4866	564.0598	562.5154
15	564.4912	565.1848	565.0581	558.4341	569.4553	570.0239	569.2168	561.9011	557.5642	559.2922	562.2068	560.3694
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	928.2585	917.0403	898.8767	883.4353	872.9165	865.6372	859.5659	854.3550	849.5725	844.7571	839.4563	832.9995
HB	-268.9	-249.5	-262.2	-362.8	-124.4	-224.5	-249.7	-361.4	-348.5	-261.6	-221.2	-284.4
TSAT	551.6	551.3	551.0	550.7	550.4	550.1	549.8	549.3	548.9	548.4	548.0	547.5
HSAT	8483.9	6931.4	6833.8	19487.3	2044.2	3511.5	3946.7	9544.8	14047.0	7613.4	4596.5	6608.0
P	1058.7	1056.1	1053.8	1051.4	1049.0	1046.6	1043.5	1039.4	1035.7	1031.8	1028.1	1024.3
S.F.	98165.4	88095.7	87843.6	118517.6	37816.3	66558.7	72745.3	106209.3	102259.3	74952.2	61527.2	77853.6
S.TEMP	563.13	563.96	563.84	556.79	568.93	569.10	568.21	560.43	556.15	558.25	561.35	559.29
MASS-FLX	35.2010	38.0824	40.7432	42.9141	44.6683	46.3069	48.2628	49.1473	50.2894	51.1097	52.4936	53.8526
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	179.7	191.3	201.8	210.8	218.0	224.5	231.9	236.0	239.8	243.3	247.5	253.3
*S.F.	12079.4	14509.6	18780.1	22847.1	25823.1	28019.9	30054.0	31529.8	32848.3	34158.4	35644.5	37687.8
*S.TEMP	995.78	996.09	995.57	994.47	993.13	991.75	990.34	988.91	987.53	986.11	984.66	983.04
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	5.4000	5.4500	5.5000	5.5500	5.6000	5.6500	5.7000	5.7500	5.8000	5.8500	5.9000	5.9500
NODE												
1	740.2905	734.9463	729.7375	724.6626	719.7200	714.9082	710.2261	705.6707	701.2390	696.9253	692.7258	688.6362
2	700.6509	696.5598	692.5645	688.6687	684.8779	681.1931	677.6108	674.1206	670.7119	667.3770	664.1121	660.9172
3	667.3049	664.1956	661.1565	658.2112	655.3694	652.6250	649.9502	647.3154	644.7056	642.1201	639.5706	637.0667
4	638.9600	636.6226	634.3601	632.2344	630.2327	628.3042	626.3669	624.3718	622.3347	620.2913	618.2878	616.3347
5	624.6428	622.6646	620.7981	619.1433	617.6108	616.0952	614.4609	612.6841	610.8513	609.0317	607.2976	605.6233
6	620.8972	618.9971	617.2312	615.7083	614.2986	612.8779	611.2957	609.5483	607.7502	605.9805	604.3162	602.7119
7	616.0325	614.2356	612.6187	611.2976	610.0576	608.7549	607.2144	605.4802	603.7217	602.0200	600.4609	598.9541
8	610.4097	608.7253	607.3262	606.3159	605.2795	604.0803	602.5068	600.7236	599.0017	597.3926	595.9927	594.6055
9	605.4768	603.8796	602.7312	602.0720	601.1914	600.0305	598.3315	596.4561	594.7795	593.2751	592.0579	590.7690
10	600.0071	598.4875	597.7134	597.5447	596.7617	595.5632	593.5869	591.5640	589.9844	588.6309	587.6763	586.4678
11	593.7295	592.2747	592.1423	592.6948	591.8093	590.4297	587.8955	585.6965	584.3647	583.2437	582.6992	581.4890
12	587.6462	586.2366	587.0828	588.4932	587.0828	585.3901	582.0039	579.7456	578.8587	578.0515	578.0515	576.6396
13	562.9370	561.6819	568.8213	574.1790	567.5986	564.3479	555.7627	554.4841	557.0959	557.3145	560.3650	556.5864
14	560.7358	559.5129	567.5029	573.1384	565.6782	562.4106	553.1860	552.2588	555.3108	555.5366	558.9517	554.7224
15	558.5415	557.3694	566.5076	572.3267	563.5557	560.4211	550.3630	550.0684	553.6890	553.8218	557.7041	552.7678
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	827.0959	821.8965	817.0439	812.1265	806.8354	803.3372	798.9792	793.1714	785.4482	779.9126	776.1519	772.8953
HB	-294.7	-289.2	-94.4	-89.0	-351.5	-303.4	-446.7	-315.7	-225.1	-264.3	-178.0	-338.1
TSAT	547.1	546.6	546.2	545.7	545.2	544.7	544.2	543.7	543.2	542.6	542.1	541.6
HSAT	7664.3	7928.4	1182.7	812.1	5008.9	5041.3	24176.3	14454.9	5342.4	5784.4	2590.0	7377.9
P	1020.6	1016.8	1013.0	1009.2	1005.1	1001.0	996.7	992.3	988.3	983.8	979.7	975.5
S.F.	79472.5	76818.1	23675.8	21380.4	85934.9	74007.1	111744.4	77095.0	52325.4	59982.0	38971.1	74771.4
S.TEMP	557.44	556.30	566.18	572.03	562.37	559.39	548.81	548.99	552.96	552.99	557.16	551.73
MASS-FLX	55.3063	56.5044	57.6617	58.8185	60.0977	57.8784	58.1192	58.6773	60.3907	60.5297	59.6035	59.4052
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	257.8	262.5	266.5	270.5	275.1	267.7	268.0	271.9	274.1	279.3	276.2	276.4
*S.F.	39473.7	41134.8	42592.8	44077.4	45751.3	45114.8	45873.8	47503.6	49464.4	51463.6	51507.1	51985.8
*S.TEMP	981.36	979.62	977.85	976.06	974.20	972.67	971.06	969.35	967.33	965.19	963.29	961.54
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	6.0000	6.0500	6.1000	6.1500	6.2000	6.2500	6.3000	6.3500	6.4000	6.4500	6.5000	6.5500
NODE												
1	684.6536	680.7749	676.9949	673.3149	669.7317	666.2422	662.8457	659.5381	656.3176	653.1816	650.1262	647.1484
2	657.7932	654.7419	651.7644	648.8616	646.0315	643.2712	640.5806	637.9558	635.3923	632.8865	630.4343	628.0344
3	634.6196	632.2356	629.9148	627.6526	625.4458	623.2908	621.1860	619.1235	617.0967	615.0972	613.1284	611.1921
4	614.4529	612.6382	610.8806	609.1636	607.4790	605.8308	604.2146	602.6089	601.0090	599.3994	597.8135	596.2512
5	604.0466	602.5376	601.0713	599.6226	598.1917	596.7937	595.4150	594.0149	592.6047	591.1541	589.7529	588.3738
6	601.2175	599.7869	598.3933	597.0098	595.6396	594.3044	592.9834	591.6277	590.2598	588.8403	587.4883	586.1555
7	597.5784	596.2561	594.9590	593.6575	592.3652	591.1128	589.8662	588.5608	587.2444	585.8560	584.5762	583.3022
8	593.3979	592.2058	591.0176	589.8018	588.5938	587.4414	586.2744	585.0027	583.7373	582.3599	581.1907	579.9824
9	589.7437	588.6589	587.5601	586.4050	585.2668	584.2092	583.1023	581.8311	580.6079	579.2104	578.1841	577.0186
10	585.6985	584.7073	583.6941	582.5845	581.5217	580.5820	579.5215	578.2048	577.0366	575.5691	574.7896	573.6287
11	581.1370	580.1702	579.2385	578.1438	577.1741	576.4001	575.3472	573.8943	572.8325	571.1882	570.9001	569.6155
12	576.9221	575.7920	574.9443	573.8142	572.9663	572.4011	571.2705	569.5737	568.7258	566.7456	567.3113	565.6140
13	561.2046	557.8621	557.6348	556.0420	555.9729	556.5273	554.4548	551.1655	552.0869	547.5271	554.2615	548.4187
14	560.0188	556.1987	556.1365	554.4563	554.5095	555.1836	552.9348	549.4644	550.6917	545.7117	553.3875	546.7319
15	559.0574	554.4521	554.0841	552.8604	553.0933	553.9050	551.3843	547.6943	549.3840	543.7776	552.8125	544.8640
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	768.5737	764.9681	761.1440	757.4097	753.5723	748.9214	739.5273	732.1157	728.4819	726.4690	724.9343	722.9465
HB	-123.6	-317.3	-244.7	-283.6	-245.3	-224.0	-304.5	-359.2	-243.0	-406.2	-51.9	-420.4
TSAT	541.1	540.6	540.0	539.4	538.9	538.3	537.8	537.1	536.6	536.0	535.4	534.8
HSAT	1471.5	5182.4	3629.0	4621.8	3645.6	2918.2	4486.3	6922.4	3575.7	11083.9	517.7	8316.7
P	971.2	967.3	962.7	958.2	953.6	948.9	944.8	940.0	935.4	931.0	926.4	921.4
S.F.	25937.5	67083.6	50693.2	58250.2	49354.2	43816.8	57541.5	66570.4	43666.7	74626.8	8942.7	75305.2
S.TEMP	558.70	553.52	553.98	552.05	552.41	553.29	550.58	546.77	548.77	542.74	552.69	543.81
MASS-FLX	60.3948	60.8964	60.4885	60.1810	59.2286	58.6484	58.7164	57.6031	58.7747	55.9193	55.6972	51.8655
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	277.0	276.6	278.2	276.7	274.3	271.8	268.3	270.0	276.2	263.7	262.0	261.0
*S.F.	52709.8	53137.8	54024.4	54256.3	54376.7	54560.4	55573.4	57723.1	59697.6	56989.7	56564.9	56594.0
*S.TEMP	959.75	957.91	956.04	954.28	952.51	950.86	949.11	946.86	944.86	943.13	941.35	939.91
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	6.6000	6.6500	6.7000	6.7500	6.8000	6.8500	6.9000	6.9500	7.0000	7.0500	7.1000	7.1500
NODE												
1	644.2458	641.4165	638.0575	635.9670	633.3428	630.7832	628.2883	625.8574	623.4883	621.1802	618.9307	616.7388
2	625.6865	623.3904	621.1455	618.9504	616.8059	614.7136	612.6755	610.6917	608.7585	606.8733	605.0344	603.2375
3	609.2971	607.4419	605.6230	603.8403	602.1013	600.4146	598.7805	597.1929	595.6406	594.1216	592.6348	591.1714
4	594.7415	593.2595	591.7976	590.3621	588.9785	587.6680	586.4065	585.1733	583.9438	582.7346	581.5457	580.3484
5	587.0759	585.7810	584.4900	583.2266	582.0437	580.9590	579.9033	578.8489	577.7620	576.7039	575.6638	574.5745
6	584.9180	583.6672	582.4177	581.1995	580.0750	579.0588	578.0576	577.0466	575.9905	574.9739	573.9722	572.9026
7	582.1548	580.9573	579.7585	578.6006	577.5623	576.6450	575.7126	574.7534	573.7285	572.7678	571.8149	570.7605
8	578.9685	577.8108	576.6653	575.5828	574.6724	573.8953	573.0308	572.1155	571.1023	570.2202	569.3206	568.2502
9	576.1614	574.9983	573.8994	572.8938	572.1301	571.4995	570.6653	569.7732	568.7446	567.9590	567.0977	565.9709
10	573.0154	571.7634	570.7290	569.8267	569.2786	568.8350	567.9780	567.0930	566.0115	565.3501	564.5469	563.2900
11	569.4453	567.8826	566.9885	566.2400	566.0413	565.8325	564.8113	563.9238	562.7173	562.4260	561.5269	559.9897
12	566.1802	563.9163	563.3503	562.7844	563.0674	563.0674	561.6519	560.8025	559.3867	559.6699	558.5369	556.5532
13	554.3735	546.2041	548.7979	548.9451	552.0474	552.5305	547.9817	547.9077	545.0366	549.4680	545.8220	541.1311
14	553.5784	544.3892	547.6455	547.7666	551.2183	551.6453	546.6475	546.8010	543.7043	548.7566	544.6018	539.6423
15	553.0493	542.3074	546.6448	546.6277	550.5356	550.8042	545.1760	545.7346	542.3047	548.2466	543.2742	538.0242
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	714.7258	707.9949	705.7412	704.8206	710.6980	707.1394	709.4021	710.0281	709.2231	708.2322	706.6628	705.1860
HB	-51.7	-516.8	-185.5	-250.8	-118.6	-185.9	-354.0	-221.9	-316.9	-65.3	-320.3	-374.6
TSAT	534.3	533.7	533.2	532.6	532.0	531.4	530.9	530.3	529.7	529.1	528.5	527.8
HSAT	448.8	11639.5	2265.2	2945.7	1040.7	1534.3	4330.7	2448.5	4478.2	551.3	3734.4	6761.2
P	917.7	913.1	909.1	904.4	900.0	895.7	891.6	887.2	882.8	878.4	873.5	868.9
S.F.	8368.1	86244.5	29593.2	39813.5	19033.5	29130.9	58430.2	36562.4	53136.5	10464.2	52576.5	62954.2
S.TEMP	552.93	541.11	540.23	546.07	550.27	550.40	544.36	545.22	541.56	548.10	542.54	537.14
MASS-FLX	53.8370	54.1586	52.8560	53.5255	49.4245	50.4765	49.5883	48.1822	47.3171	46.6838	45.3325	45.1467
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	253.6	257.5	251.2	243.2	245.3	233.4	235.0	230.1	227.5	224.8	220.2	219.5
*S.F.	56157.6	58600.0	57395.3	55678.1	54318.3	52214.2	51798.1	50306.8	49667.6	49054.2	48156.4	48104.1
*S.TEMP	938.37	936.44	934.71	933.24	932.02	930.92	929.71	928.60	927.53	926.52	925.44	924.40
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	7.2000	7.2500	7.3000	7.3500	7.4000	7.4500	7.5000	7.5500	7.6000	7.6500	7.7000	7.7500
NODE												
1	614.6013	612.5166	610.4807	608.4929	606.5513	604.6548	602.8013	600.9907	599.2197	597.4878	595.7949	594.1416
2	601.4775	599.7488	598.0505	596.3865	594.7590	593.1677	591.6077	590.0764	588.5747	587.1045	585.6699	584.2737
3	589.7161	588.2671	586.8374	585.4451	584.0913	582.7649	581.4529	580.1541	578.8794	577.6382	576.4429	575.2952
4	579.1160	577.8660	576.6533	575.5176	574.4204	573.3267	572.2065	571.0913	570.0154	568.9929	568.0479	567.1553
5	573.4087	572.2297	571.1445	570.1860	569.2354	568.2451	567.1873	566.1558	565.2012	564.3198	563.5503	562.8147
6	571.7422	570.5781	569.5361	568.6387	567.7253	566.7556	565.7036	564.6963	563.7815	562.9458	562.2363	561.5457
7	569.5938	568.4478	567.4761	566.6743	565.8040	564.8506	563.7949	562.8232	561.9712	561.2021	560.5830	559.9487
8	567.0430	565.9226	565.0789	564.4294	563.5808	562.6201	561.5286	560.6204	559.8704	559.1960	558.7168	558.1343
9	564.6968	563.6199	562.9490	562.4709	561.5886	560.5938	559.4407	558.6311	558.0017	557.4229	557.1047	556.5374
10	561.9053	560.9248	560.5415	560.2935	559.2681	558.2065	556.9463	556.3289	555.8743	555.4084	555.3276	554.7097
11	558.4414	557.6990	557.8254	557.8701	556.4277	555.2815	553.8369	553.6433	553.4307	553.0823	553.3870	552.5332
12	554.8535	554.5701	555.4204	555.7039	553.4353	552.3013	550.6003	551.1677	551.1677	550.8840	551.7349	550.3167
13	539.1521	542.2595	547.2090	547.7646	539.3887	539.5737	536.2336	542.3420	542.5151	542.1511	546.4067	540.2104
14	537.7402	541.3220	546.6885	547.1074	537.8843	538.4946	534.8865	541.8127	541.7847	541.3936	546.1077	539.1233
15	536.3022	540.5398	546.3743	546.4854	536.1023	537.4707	533.4541	541.5439	541.0752	540.6460	545.9846	537.8247
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	703.8315	702.3662	700.8457	699.3464	697.8474	696.3367	694.8386	693.3523	691.8093	690.6707	689.6836	688.4065
HB	-310.0	-135.6	-24.3	-140.9	-461.4	-213.0	-338.1	4.4	-167.4	-176.7	16.1	-366.4
TSAT	527.2	526.6	526.0	525.3	524.7	524.0	523.4	522.8	522.1	521.4	520.8	520.1
HSAT	6244.9	1611.1	184.4	1034.6	7245.7	2622.0	5909.2	-35.6	1357.3	1410.3	-91.4	3265.7
P	864.3	859.7	855.0	850.4	845.8	841.2	836.6	831.9	827.1	822.4	817.8	812.8
S.F.	52159.5	21981.2	37355.5	21582.9	75110.4	33946.6	54823.0	-668.6	25291.9	26580.9	-2306.5	55451.8
S.TEMP	535.57	540.23	546.32	546.18	535.05	536.99	532.68	541.55	540.72	540.27	546.02	537.05
MASS-FLX	44.3799	43.4335	42.7168	41.9847	41.1895	40.4040	39.6194	38.8233	38.0840	37.0698	35.0482	33.2611
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	216.0	212.3	209.5	206.5	203.2	200.1	196.9	193.6	190.3	185.9	177.3	170.9
*S.F.	47397.6	46672.7	46104.8	45603.8	44989.6	44389.8	43786.4	43164.6	42568.0	41636.9	39757.1	38438.2
*S.TEMP	923.39	922.35	921.32	920.32	919.33	918.35	917.40	916.46	915.55	914.75	914.05	913.35
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	7.8000	7.8500	7.9000	7.9500	8.0000	8.0500	8.1000	8.1500	8.2000	8.2500	8.3000	8.3500
NODE												
1	592.5278	590.9534	589.4167	587.9160	586.4482	585.0112	583.6021	582.2185	580.8601	579.5256	578.2141	576.9238
2	582.9180	581.5981	580.3081	579.0398	577.7859	576.5442	575.3162	574.1045	572.9089	571.7297	570.5642	569.4155
3	574.1902	573.1089	572.0342	570.9482	569.8481	568.7444	567.6519	566.5789	565.5176	564.4636	563.4167	562.3906
4	566.3025	565.4231	564.5068	563.5217	562.4968	561.4805	560.5000	559.5596	558.6101	557.6577	556.7048	555.8010
5	562.1050	561.2925	560.4138	559.4150	558.3904	557.4192	556.5186	555.6694	554.7627	553.8525	552.9414	552.1323
6	560.8770	560.0679	559.1895	558.1697	557.1409	556.1865	555.3145	554.4958	553.5918	552.6914	551.7903	551.0195
7	559.3315	558.5066	557.6187	556.5537	555.5190	554.5972	553.7727	552.9980	552.0847	551.1965	550.3074	549.6018
8	557.5754	556.6689	555.7527	554.5874	553.5574	552.7048	551.9590	551.2454	550.2798	549.4128	548.5371	547.9539
9	556.0315	554.9719	554.0305	552.7229	551.7314	550.9788	550.3230	549.6658	548.5555	547.7705	546.9026	546.4912
10	554.2759	552.9084	551.9709	550.4158	549.5466	548.9614	548.4258	547.8276	546.5371	545.8203	544.9492	544.8381
11	552.2385	550.2229	549.4341	547.4021	546.8960	546.5869	546.1965	545.6409	543.8777	543.4705	542.5430	543.0137
12	550.3167	547.1951	546.9114	544.0728	544.3567	544.3567	544.0725	543.5046	540.9485	541.2327	540.0959	541.5166
13	542.9644	531.9978	536.8979	528.0115	534.9246	535.8066	535.6033	534.6565	526.7361	532.9583	529.3811	537.4282
14	542.4375	530.3030	536.2231	526.3213	534.3762	535.1125	534.8755	533.8696	525.2400	532.4836	528.3420	537.3755
15	542.0454	528.2332	535.7815	524.3318	534.1292	534.4658	534.1624	533.0710	523.4834	532.2795	527.1865	537.6443
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	687.4978	687.0708	686.7651	686.9951	688.0332	689.8706	691.8577	693.7964	695.6128	697.4165	699.2627	701.2153
HB	-58.1	-557.4	-40.1	-508.2	22.8	-141.6	-159.1	-180.4	-420.4	22.8	-268.3	135.9
TSAT	519.4	518.8	518.1	517.4	516.7	516.0	515.3	514.6	513.9	513.2	512.4	511.7
HSAT	375.7	10849.5	344.0	14385.7	-200.4	1217.7	1361.0	1610.2	8494.4	-196.5	3287.3	-845.1
P	808.1	803.6	798.8	794.0	789.4	784.9	780.0	775.1	770.2	765.3	760.4	755.5
S.F.	8459.8	89224.9	6003.5	83262.2	-3502.3	22049.8	25151.9	29064.8	72797.8	-3766.6	46345.3	-22185.6
S.TEMP	541.93	526.98	535.70	523.16	534.18	534.16	533.81	532.66	522.46	532.33	526.53	537.96
MASS-FLX	31.9890	30.3353	29.7135	28.3969	26.9266	25.3005	23.5975	22.2538	21.0021	19.7529	18.4878	17.1673
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	165.1	161.3	157.2	149.0	144.4	136.0	128.9	122.5	116.7	110.9	105.0	98.9
*S.F.	37179.7	36338.6	35380.6	33434.1	32259.2	30115.6	28279.4	26613.8	25149.3	23700.4	22256.9	20772.7
*S.TEMP	912.70	912.16	911.70	911.37	911.08	910.90	910.79	910.76	910.75	910.77	910.81	910.90
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	8.4000	8.4500	8.5000	8.5500	8.6000	8.6500	8.7000	8.7500	8.8000	8.8500	8.9000	8.9500
NODE												
1	575.6553	574.4089	573.1829	571.9761	570.7881	569.6182	568.4658	567.3318	566.2158	565.1182	564.0396	562.9790
2	568.2861	567.1750	566.0828	565.0022	563.9333	562.8787	561.8408	560.8208	559.8203	558.8391	557.8765	556.9321
3	561.3894	560.4092	559.4321	558.4556	557.4846	556.5322	555.6003	554.6929	553.8103	552.9451	552.0933	551.2634
4	554.9353	554.0830	553.1892	552.2849	551.3921	550.5427	549.7227	548.9360	548.1812	547.4260	546.6753	545.9624
5	551.3577	550.5740	549.6819	548.8008	547.9517	547.1843	546.4382	545.7341	545.0620	544.3528	543.6516	543.0225
6	550.2717	549.5051	548.5991	547.7239	546.8896	546.1541	545.4304	544.7532	544.1072	543.4060	542.7180	542.1201
7	548.8906	548.1416	547.1975	546.3357	545.5264	544.8430	544.1472	543.5090	542.8984	542.1975	541.5288	540.9817
8	547.2791	546.5306	545.4941	544.6714	543.9041	543.3137	542.6421	542.0618	541.4556	540.7676	540.1284	539.6697
9	545.8225	545.0688	543.8733	543.1370	542.4172	541.9448	541.2727	540.7612	540.2341	539.4448	538.8513	538.5076
10	544.1079	543.3188	541.8447	541.3201	540.6543	540.3713	539.6455	539.2488	538.7593	537.8352	537.3411	537.1846
11	542.0071	541.1592	539.1511	539.1753	538.5198	538.5715	537.6377	537.4756	536.9954	535.7776	535.5364	535.6973
12	539.8113	538.9583	536.1162	537.2534	536.4001	536.9690	535.5474	535.8318	535.2632	533.5559	533.8403	534.4092
13	529.4128	529.5063	521.1326	531.1824	527.2678	531.4751	525.8628	529.8416	527.9470	523.0159	527.6436	530.1257
14	528.2373	528.7078	519.5557	531.0369	526.3496	531.1631	524.8372	529.4792	527.2573	521.9429	527.2869	529.8547
15	526.7771	527.9500	517.7031	531.3030	525.2957	531.0315	523.6199	529.2930	526.5107	520.7144	527.1333	529.6821
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	703.3020	705.5242	707.8621	710.3774	713.3186	716.1511	719.1514	722.1965	725.1055	727.5298	729.7241	731.2839
HB	-362.0	-139.4	-401.6	144.7	-233.1	13.6	-261.8	2.8	-147.2	-239.3	12.6	-14.0
TSAT	511.0	510.2	509.5	508.7	508.0	507.3	506.7	506.0	505.3	504.5	503.8	503.1
HSAT	4309.1	1427.4	10706.1	-1128.1	2642.2	-105.9	3162.7	-22.9	1405.3	3203.4	-108.6	106.6
P	750.7	745.8	740.9	736.0	731.4	727.0	722.5	718.0	713.6	708.8	704.1	700.2
S.F.	64236.8	24794.5	76797.9	-25865.2	43969.4	-2512.6	51371.4	-533.9	29291.0	49663.2	-2542.1	2824.9
S.TEMP	525.88	527.60	516.62	531.67	524.68	531.07	522.90	529.30	526.10	520.01	527.17	529.64
MASS-FLX	15.8216	14.4556	13.0898	11.5901	9.7131	8.4578	7.2174	5.9986	4.6847	3.7468	2.0547	0.1324
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	92.5	85.9	79.4	72.1	62.9	55.9	49.3	42.7	35.4	27.1	13.8	5.0
*S.F.	19258.0	17711.7	16202.0	14558.1	12553.3	11008.4	9593.9	8200.9	6719.6	5069.4	2559.1	924.8
*S.TEMP	911.05	911.24	911.48	911.78	912.18	912.65	913.11	913.58	914.09	914.68	915.33	916.03
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	9.0000	9.0500	9.1000	9.1500	9.2000	9.2500	9.3000	9.3500	9.4000	9.4500	9.5000	9.5500
NODE												
1	561.9382	560.9160	559.9116	558.9224	557.9473	556.9846	556.0332	555.0928	554.1631	553.2463	552.3430	551.4539
2	556.0085	555.1025	554.2075	553.3164	552.4272	551.5405	550.6614	549.7915	548.9338	548.0930	547.2722	546.4712
3	550.4585	549.6643	548.8574	548.0298	547.1907	546.3540	545.5315	544.7266	543.9443	543.1899	542.4673	541.7681
4	545.2842	544.5842	543.8147	542.9902	542.1658	541.3677	537.8022	537.1362	536.5188	535.9597	535.4565	534.9236
5	542.4299	541.7529	540.9414	540.0732	539.2556	538.4963	536.9226	536.2756	535.6843	535.1560	534.6863	534.1653
6	541.5554	540.8733	540.0327	539.1438	538.3335	537.5916	536.4316	535.8025	535.1816	534.6287	534.1462	533.7244	533.2092
7	540.4539	539.7490	538.8508	537.9312	537.1416	536.4316	535.0505	534.4873	533.8958	533.4023	532.9878	532.6321	532.0947
8	539.1860	538.4041	537.3887	536.4314	535.7046	534.9968	533.7864	533.2979	532.7224	532.3008	531.9602	531.6719	531.0720
9	538.0535	537.1357	535.9692	534.9968	534.3774	533.7864	531.9048	531.3235	531.0178	530.7771	530.5737	529.8264
10	536.7329	535.5491	534.1567	533.2185	532.8037	532.2869	530.4832	530.2617	529.6067	529.5203	529.4099	529.3118	528.2180
11	535.1477	533.4270	531.7178	530.9692	530.9543	530.4832	528.7170	528.7170	527.8628	528.1475	528.1475	528.1475	526.4382
12	533.5549	530.9934	529.0020	528.7170	529.2866	528.7170	522.7642	520.1445	523.1907	523.2881	523.6653	517.5784
13	526.4382	518.6321	516.1841	519.6865	523.5266	521.2502	522.3184	519.3982	522.8840	522.8816	523.2998	516.6082
14	525.7014	517.2991	515.0083	519.0508	523.1809	520.5356	521.9473	518.5686	522.7102	522.4871	522.9617	515.4294
15	524.8403	515.7112	513.7896	518.5801	522.9922	519.7488						
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	731.3252	732.4883	737.0696	741.6553	748.7246	753.3213	754.6611	750.0504	741.3276	731.6965	723.4829	710.8174
HB	-173.0	-304.1	-198.3	-46.5	-4.8	-133.1	-43.3	-141.2	-4.2	-66.4	-55.4	-254.9
TSAT	502.3	501.6	501.4	501.0	500.7	500.3	500.0	499.7	499.3	498.9	498.5	498.5
HSAT	1624.6	5034.4	3764.4	593.4	48.6	1641.1	461.7	1778.5	38.8	595.1	457.4	3074.1
P	694.9	690.8	689.1	686.6	684.9	682.7	680.4	678.8	676.5	674.2	671.5	671.3
S.F.	35812.7	66205.3	44395.6	10369.4	1083.8	31142.9	10090.3	32762.7	908.3	13898.7	11117.7	49990.9
S.TEMP	524.34	514.78	513.16	518.43	522.98	519.31	521.80	518.11	522.70	522.29	522.80	514.72
MASS-FLX	1.5559	0.8434	2.2657	3.3470	4.7501	6.8401	7.8373	11.7398	13.7568	14.6743	13.5024	20.8646
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	15.7	8.4	21.6	20.2	33.8	43.4	51.0	67.5	79.7	83.9	80.7	114.2
*S.F.	2913.3	1546.3	3912.7	3563.7	5706.8	7102.3	8219.3	11035.7	13688.3	15044.7	15106.9	22581.1
*S.TEMP	916.51	916.98	917.00	917.07	916.70	916.30	915.78	914.88	913.92	912.94	912.10	911.09
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	9.6000	9.6500	9.7000	9.7500	9.8000	9.8500	9.9000	9.9500	10.0000	10.0500	10.1000	10.1500
NODE												
1	550.5803	549.7209	548.8750	548.0393	547.2134	546.3958	545.5854	544.7832	543.9883	543.2014	542.4236	541.6545
2	545.6875	544.9148	544.1477	543.3809	542.6140	541.8469	541.0837	540.3286	539.5837	538.8481	538.1221	537.4063
3	541.0786	540.3823	539.6729	538.9456	538.2063	537.4670	536.7405	536.0349	535.3433	534.6621	533.9912	533.3296
4	536.7578	536.0986	535.4038	534.6704	533.9331	533.2114	532.5337	531.9006	531.2708	530.6467	530.0317	529.4238
5	534.3394	533.6553	532.9375	532.1694	531.4292	530.7288	530.1094	529.5439	528.9446	528.3501	527.7681	527.1904
6	533.5796	532.8745	532.1455	531.3606	530.6226	529.9326	529.3396	528.7991	528.2039	527.6179	527.0459	526.4773
7	532.6128	531.8667	531.1208	530.3079	529.5798	528.9102	528.3618	527.8589	527.2605	526.6860	526.1279	525.5703
8	531.4622	530.6304	529.8687	529.0081	528.3167	527.6851	527.2190	526.7673	526.1367	525.5813	525.0427	524.4966
9	530.3879	529.4380	528.6809	527.7583	527.1377	526.5510	526.1907	525.7842	525.0845	524.5620	524.0437	523.5056
10	529.0657	527.9194	527.2173	526.1846	525.7178	525.1880	524.9990	524.6279	523.7781	523.3369	522.8408	522.3057
11	527.3684	525.8787	525.3855	524.1201	524.0129	523.5234	523.6370	523.2432	522.0659	521.8518	521.3611	520.8159
12	525.5833	523.5879	523.5879	521.8770	522.4473	521.8772	522.4478	521.8774	520.1658	520.4509	519.8804	519.3093
13	517.6865	512.3992	516.6382	511.2021	517.0669	514.8538	518.5278	515.9399	510.8110	515.3689	513.4912	512.8135
14	517.0239	511.2607	516.2065	510.1003	516.8284	514.1792	518.3318	515.3430	509.8340	515.1094	512.8845	512.2417
15	516.3965	509.9529	515.9651	508.8188	516.8374	513.4331	518.2900	514.6606	508.6919	515.0439	512.2168	511.6648
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	694.1704	669.3135	640.9670	620.8101	609.3755	602.1184	596.2908	590.5996	586.3381	582.1570	577.4143	571.6277
HB	-114.8	-330.9	-7.5	-469.7	109.5	-335.5	57.9	-366.8	-595.8	82.7	-403.1	-349.6
TSAT	497.9	497.5	497.1	496.6	496.2	495.7	495.3	494.9	494.4	493.9	493.6	493.2
HSAT	1119.9	4516.8	49.7	4625.8	-486.8	1731.7	-195.9	1442.6	3421.5	-261.6	1446.7	1132.2
P	667.7	665.3	662.9	660.2	657.6	655.0	652.4	649.7	647.0	644.3	642.1	640.2
S.F.	20437.2	52978.4	939.3	52954.3	-10119.7	29895.5	-4514.4	28003.4	46654.6	-5540.5	26429.6	20521.5
S.TEMP	516.11	509.20	515.95	508.07	516.98	513.01	518.35	514.26	508.03	515.12	511.84	511.37
MASS-FLX	19.4550	22.5631	23.5315	24.8987	25.8294	26.4529	26.9767	27.7373	27.4123	27.8849	28.6421	29.8174
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	103.1	116.7	123.1	131.6	138.5	142.0	144.8	149.3	148.2	151.0	154.0	160.3
*S.F.	21781.9	27522.1	31894.3	36667.9	40224.7	41927.2	43143.0	45135.5	45104.8	46222.6	47526.4	50027.1
*S.TEMP	909.50	907.68	905.26	902.67	900.05	897.59	895.35	893.14	891.08	889.11	887.15	884.96
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	10.2000	10.2500	10.3000	10.3500	10.4000	10.4500	10.5000	10.5500	10.6000	10.6500	10.7000	10.7500
NODE												
1	540.8938	540.1404	539.4918	538.6479	537.9060	537.1658	536.4287	535.6951	534.9661	534.2434	533.5269	532.8164
2	536.6956	535.9868	535.2734	534.5540	533.8296	533.1047	532.3870	531.6794	530.9834	530.2961	529.6174	528.9463
3	532.6624	531.9797	531.2751	530.5547	529.8269	529.1101	528.4226	527.7588	527.1104	526.4690	525.8357	525.2043
4	528.7769	528.0830	527.3469	526.5979	525.8567	525.1672	524.5540	523.9622	523.3752	522.7761	522.1882	521.5874
5	526.5205	525.7837	524.9990	524.2280	523.4863	522.8513	522.3320	521.7913	521.2349	520.6450	520.0867	519.4893
6	525.7881	525.0293	524.2236	523.4478	522.7092	522.1030	521.6250	521.0959	520.5449	519.9534	519.4067	518.8052
7	524.8411	524.0471	523.2109	522.4336	521.7053	521.1514	520.7412	520.2175	519.6707	519.0706	518.5442	517.9299
8	523.6760	522.8274	521.9490	521.1887	520.4851	520.0374	519.7371	519.1853	518.6355	518.0117	517.5283	516.8750
9	522.5444	521.6465	520.7271	520.0093	519.3398	519.0383	518.8616	518.2266	517.6748	517.0142	516.5991	515.8733
10	521.0847	520.1489	519.1794	518.5586	517.9380	517.8879	517.8770	517.0337	516.5012	515.7722	515.4939	514.6099
11	519.0776	518.1963	517.1606	516.7634	516.1965	516.6152	516.7981	515.4436	515.0383	514.1665	514.1914	512.9277
12	516.7410	516.1702	515.0276	515.0276	514.4568	515.5991	515.8848	513.5989	513.5589	512.4561	513.0278	511.0278
13	504.6741	507.6372	505.4119	508.2996	507.0452	513.0190	512.6938	503.7671	508.0173	504.4778	509.1948	501.3057
14	503.3584	507.0278	504.5215	507.8403	506.3757	513.0229	512.4124	502.6125	507.7031	503.6777	509.0471	500.1980
15	501.7688	506.5676	503.3698	507.5134	505.6750	513.2617	512.1196	501.1462	507.5818	502.7593	509.0950	498.8125
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	564.9558	557.6931	548.1907	541.6750	535.7266	529.6274	521.9653	512.5046	492.1289	492.8774	552.9419	488.9294
HB	-1041.8	-192.8	-805.1	-186.6	-864.1	1085.7	-1147.6	-5209.5	-238.4	4003.2	214.5	6671.7
TSAT	492.9	492.6	492.2	491.9	491.5	491.2	490.8	490.5	490.1	490.1	496.2	488.9
HSAT	8439.4	712.9	3352.6	410.6	1905.8	-784.2	543.4	6551.4	-210.7	3079.0	-717.5	6671.7
P	638.2	636.2	634.2	632.1	630.1	628.3	626.1	624.2	621.9	621.8	657.5	615.4
S.F.	66814.6	9885.7	36339.7	6391.1	26290.5	-17498.5	11485.7	63894.9	-3697.1	37426.5	-9375.5	60226.2
S.TEMP	500.82	506.43	503.05	507.42	505.30	513.51	511.96	500.24	507.63	502.23	509.23	497.96
MASS-FLX	30.9431	31.8138	33.0680	33.9765	35.0175	35.2271	37.1073	38.4656	39.4028	40.6533	41.8701	41.1985
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.98536
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	167.0	171.7	176.9	186.1	192.4	195.5	210.0	214.7	224.7	595.6	1591.2	1083.0
*S.F.	52879.2	55053.0	57703.4	61835.6	64340.2	65988.2	71936.4	74473.1	80249.1	210169.5	511286.4	325211.9
*S.TEMP	882.51	879.96	877.26	874.27	871.24	868.19	864.89	861.38	857.45	842.61	810.65	789.22
*H.T.MODE	8	8	8	8	8	8	8	8	8	3	3	3

TIME--	10.8000	10.8500	10.9000	10.9500	11.0000	11.0500	11.1000	11.1500	11.2000	11.2500	11.3000	11.3500
NODE												
1	532.1123	531.4136	530.7180	530.0237	529.3271	528.6279	527.9250	527.2209	526.5188	525.8240	525.1416	524.4761
2	528.2795	527.6130	526.9407	526.2551	525.5540	524.8408	524.1248	523.4170	522.7300	522.0764	521.4658	520.8977
3	524.5696	523.9219	523.2463	522.5320	521.7876	521.0383	520.3081	519.6226	519.0034	518.4641	518.0015	517.5981
4	520.9707	520.3132	519.5872	518.7847	517.9597	517.1797	516.4775	515.8865	515.4316	515.1091	514.8828	514.6943
5	518.8679	518.1741	517.3689	516.4673	515.5884	514.8298	514.2026	513.7437	513.4705	513.3501	513.3059	513.2434
6	518.1785	517.4641	516.6211	515.6772	514.7849	514.0474	513.4585	513.0588	512.8625	512.8206	512.8394	512.8113
7	517.2947	516.5435	515.6375	514.6313	513.7322	513.0417	512.5195	512.2163	512.1375	512.2090	512.3083	512.3132
8	516.2246	515.4028	514.3884	513.2910	512.4170	511.8374	511.4319	511.2903	511.3553	511.6233	511.8120	511.8208
9	515.2126	514.2922	513.1458	511.9553	511.1563	510.7356	510.4646	510.5156	510.8262	511.2095	511.4595	511.4290
10	513.9546	512.8611	511.5127	510.2112	509.5925	509.4402	509.3525	509.6938	510.2937	510.8621	511.1448	510.9993
11	512.3555	510.9226	509.2661	507.8572	507.6682	507.9688	508.1045	508.9104	509.9153	510.6755	510.8965	510.4790
12	510.7422	508.7397	506.7373	505.3074	505.8796	506.7383	507.0242	508.4541	509.8840	510.7422	510.7422	509.8843
13	504.1389	497.8982	494.5210	493.6743	499.5979	502.9827	503.1743	508.3867	511.4587	512.0137	510.1436	506.5674
14	503.6895	496.7581	493.3723	492.6672	499.2913	502.7917	502.8604	508.5720	511.7041	512.1404	510.0254	506.1565
15	503.3770	495.4075	492.1370	491.6667	499.2290	502.7332	502.5564	508.9558	512.0520	512.2788	509.8342	505.6226
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	488.3267	488.0830	487.6741	487.1472	486.7688	486.3604	485.9097	485.4314	485.0220	484.9038	482.8328	483.9758
HB	340.1	8584.9	12138.6	8626.6	-567.1	-137.7	641.9	-880.2	-578.8	-184.2	354.9	1103.6
TSAT	488.3	488.1	487.7	487.1	486.8	486.4	485.9	485.4	485.0	484.9	482.8	484.0
HSAT	340.1	8584.9	12138.6	8626.6	-567.1	-137.7	641.9	-880.2	-578.8	-184.2	354.9	1103.6
P	611.9	610.6	608.3	605.3	603.2	600.9	598.4	595.7	593.4	592.8	581.4	587.7
S.F.	5093.5	56025.9	46159.7	34700.0	-7123.4	-2259.6	10588.3	-20969.4	-15774.1	-5056.3	9533.8	23519.5
S.TEMP	503.30	494.61	491.48	491.17	499.33	502.77	502.41	509.25	512.28	512.35	509.70	505.29
MASS-FLX	43.8925	44.5907	43.9460	42.5369	43.2813	46.6091	48.2334	49.8953	51.6280	42.7177	58.9392	34.2010
QUALITY	0.91176	0.91729	0.92602	0.92536	0.93249	0.89756	0.83436	0.77867	0.72868	0.70383	0.69485	0.67666
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	953.3	1432.6	1856.5	1722.8	2813.6	3726.2	3868.2	3974.4	3993.0	3681.2	4649.8	3559.9
*S.F.	269164.2	361949.2	410486.2	320188.4	417677.4	461048.3	424055.8	396783.2	371747.3	323024.9	407543.8	298652.3
*S.TEMP	770.43	740.82	708.86	673.23	635.38	610.11	595.65	585.28	578.23	572.64	570.32	567.43
*H.T.MODE	4	4	4	3	3	3	3	3	3	3	3	3

TIME--	11.4000	11.4500	11.5000	11.5500	11.6000	11.6500	11.7000	11.7500	11.8000	11.8500	11.9000	11.9500
NODE												
1	523.8318	523.2102	522.6123	522.0376	521.4824	520.9402	520.4048	519.8682	519.3250	518.7705	518.2036	517.6230
2	520.3687	519.8738	519.4067	518.9580	518.5098	518.0422	517.5415	517.0020	516.4243	515.8149	515.1816	514.5313
3	517.2336	516.8938	516.5671	516.2285	515.8350	515.3562	514.7830	514.1382	513.4451	512.7271	511.9983	511.2708
4	514.5073	514.3137	514.1040	513.8186	513.3630	512.7239	511.9397	511.0984	510.2446	509.4126	508.6016	507.8269
5	513.1382	513.0054	512.8352	512.5120	511.8936	511.0369	510.0427	509.0688	508.1335	507.2676	506.4363	505.6714
6	512.7236	512.6050	512.4417	512.0879	511.3831	510.4312	509.3564	508.3462	507.3914	506.5234	505.6897	504.9351
7	512.2368	512.1296	511.9675	511.5498	510.6951	509.5984	508.4138	507.3718	506.4033	505.5461	504.7156	503.9849
8	511.7317	511.6260	511.4487	510.8923	509.7571	508.4446	507.1265	506.0962	505.1370	504.3250	503.5049	502.8289
9	511.3059	511.1975	510.9915	510.2327	508.7351	507.2090	505.7830	504.8308	503.8965	503.1553	502.3423	501.7434
10	510.8159	510.7085	510.4458	509.3269	507.2480	505.4834	503.9656	503.2185	502.3149	501.6997	500.8755	500.4153
11	510.2168	510.1365	509.7588	507.9529	504.9087	502.9878	501.4526	500.2698	499.8899	498.1462	498.1462	496.9995	497.2861
12	509.5984	509.5984	509.0261	506.1641	501.8701	500.1523	498.7192	499.2925	498.1462	488.5051	491.3425	487.9028	491.7329
13	506.8623	507.5127	505.5095	495.8315	484.9231	487.0115	486.3306	492.5564	488.5051	487.5498	490.8784	487.0156	491.4099
14	506.6445	507.3611	505.1409	494.6089	483.1001	485.9888	485.2690	492.2244	487.5498	486.4583	490.5493	486.0186	491.2556
15	506.4500	507.2397	504.7043	493.0500	480.9241	485.1003	484.2151	492.1497	486.4583	490.5493	486.0186	491.2556
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	483.1367	482.5339	482.1304	481.6038	481.1118	480.5691	480.0144	479.4822	478.9189	478.3504	477.8352	477.2932
HB	243.2	128.5	809.6	6459.9	-60890.0	6011.4	10055.3	-559.4	6394.3	517.9	5184.3	-79.0
TSAT	483.1	482.5	482.1	481.6	481.1	480.6	480.0	479.5	478.9	478.4	477.8	477.3
HSAT	243.2	128.5	809.6	6459.9	-60890.0	6011.4	10055.3	-559.4	6394.3	517.9	5184.3	-79.0
P	583.1	579.8	577.6	574.8	572.1	569.2	566.2	563.4	560.4	557.6	554.7	551.8
S.F.	5650.0	3170.0	18067.2	67714.4	89075.4	25069.8	36907.1	-7143.6	44163.7	6250.8	39491.0	-1104.7
S.TEMP	506.37	507.19	504.45	492.09	479.65	484.74	483.68	492.25	485.83	490.46	485.45	491.27
MASS-FLX	44.4769	50.4858	49.3864	45.9814	45.6332	45.6389	45.0378	44.8159	45.0297	44.6582	44.5764	43.9707
QUALITY	0.65123	0.61848	0.59822	0.58510	0.57499	0.56541	0.55563	0.54619	0.53561	0.52605	0.51659	0.50792
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	3677.9	3685.8	3658.1	3472.2	3389.9	3357.0	3290.2	3224.5	3236.4	3183.2	3149.3	3074.9
*S.F.	291023.3	285664.6	271527.7	252606.4	243029.9	235567.3	224959.3	215577.8	209685.4	201501.7	194279.8	185446.6
*S.TEMP	561.95	560.10	556.41	554.40	552.88	550.83	548.51	546.37	543.80	541.81	539.56	537.64
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	12.0000	12.0500	12.1000	12.1500	12.2000	12.2500	12.3000	12.3500	12.4000	12.4500	12.5000	12.5500
NODE												
1	517.0291	516.4231	515.8054	515.1746	514.5286	513.8657	513.1853	512.4866	511.7698	511.0361	510.2869	509.5239
2	513.8713	513.2041	512.5254	511.8276	511.1052	510.3572	509.5854	508.7947	507.9880	507.1697	506.3430	505.5139
3	510.5535	509.8389	509.1003	508.3215	507.4976	506.6423	505.7656	504.8806	503.9912	503.1025	502.2190	501.3523
4	507.0933	506.3525	505.5347	504.6313	503.6648	502.6865	501.7036	500.7458	499.7659	498.8638	497.9546	497.0952
5	504.9614	504.2043	503.2903	502.2632	501.1838	500.1416	499.1086	498.1375	497.1667	496.2300	495.3267	494.5095
6	504.2388	503.4702	502.5063	501.4272	500.3064	499.2488	498.2004	497.2327	496.2544	495.3193	494.4207	493.6270
7	503.3130	502.5210	501.4724	500.3167	499.1431	498.0789	497.0154	496.0642	495.0764	494.1501	493.2632	492.5117
8	502.1987	501.3484	500.1404	498.8784	497.6489	496.6106	495.5339	494.6318	493.6252	492.7263	491.8625	491.1941
9	501.1580	500.2095	498.7891	497.4304	496.1648	495.1926	494.0964	493.2747	492.2288	491.3774	490.5403	489.9841
10	499.8809	498.7327	496.9612	495.5117	494.2295	493.4033	492.2534	491.5894	490.4424	489.6921	488.8867	488.5242
11	498.2942	496.7156	494.3442	492.9031	491.6589	491.1484	489.8279	489.5029	488.0789	487.5745	486.7847	486.7874
12	496.7124	494.4163	491.2600	490.1118	488.9624	488.9624	487.2385	487.5259	485.5137	485.5137	484.6511	485.2263
13	489.8643	482.6990	475.4055	477.7800	477.0115	480.3958	475.0298	480.1196	473.0496	477.4250	475.2495	479.8005
14	489.2246	481.4568	473.8132	476.8384	475.9880	479.8071	473.8147	479.6917	471.7510	476.9146	474.3867	479.5176
15	488.5251	479.9749	471.9956	476.0359	474.9646	479.3738	472.4231	479.4878	470.2092	476.6052	473.4607	479.4280
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	476.7319	476.1902	475.5947	474.9036	474.2578	473.6057	472.9624	472.3132	471.6584	470.9675	470.3059	469.6311
HB	2379.5	20895.9	-15418.6	27422.9	190291.3	1650.4	-41484.3	-233.8	-26873.1	481.1	13276.2	-427.2
TSAT	476.7	476.2	475.6	474.9	474.3	473.6	473.0	472.3	471.7	471.0	470.3	469.6
HSAT	2379.5	20895.9	-15418.6	27422.9	190291.3	1650.4	-41484.3	-233.8	-26873.1	481.1	13276.2	-427.2
P	548.9	546.1	543.0	539.4	536.1	532.8	529.5	526.2	523.0	519.5	516.2	512.8
S.F.	27136.1	60846.0	71333.6	22234.3	35911.9	9298.1	55602.8	-1683.4	63541.5	2693.6	35151.4	-4210.7
S.TEMP	488.14	479.10	470.97	475.71	474.45	479.24	471.62	479.51	469.29	476.57	472.95	479.49
MASS-FLX	45.2175	44.4043	44.2819	43.2072	41.3548	41.3598	40.1825	39.3492	38.1996	37.0182	36.3367	35.2061
QUALITY	0.49802	0.48898	0.48022	0.47347	0.46913	0.46482	0.46115	0.45781	0.45514	0.45288	0.45111	0.44981
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	3116.6	3050.7	3046.2	2951.6	2868.2	2834.6	2774.9	2715.6	2644.1	2578.1	2532.0	2472.0
*S.F.	182923.6	174281.1	169624.4	162043.1	155526.8	151582.4	146083.1	141111.0	135802.8	130808.9	127155.1	122951.2
*S.TEMP	535.45	533.41	531.40	529.90	528.60	527.15	525.73	524.33	523.06	521.77	520.67	519.45
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	12.6000	12.6500	12.7000	12.7500	12.8000	12.8500	12.9000	12.9500	13.0000	13.0500	13.1000	13.1500
NODE												
1	508.7498	507.9668	507.1775	506.3845	505.5908	504.7998	504.0139	503.2349	502.4624	501.6965	500.9392	500.1921
2	504.6860	503.8611	503.0420	502.2336	501.4426	500.6719	499.9185	499.1768	498.4434	497.7192	497.0098	496.3232
3	500.5034	499.6699	498.8538	498.0693	497.3262	496.6201	495.9294	495.2412	494.5496	493.8728	493.2261	492.6296
4	496.2639	495.4543	494.6707	493.9592	493.3193	492.7209	492.0996	491.4519	490.7842	490.1646	489.6143	489.1648
5	493.7092	492.9258	492.1785	491.5559	491.0188	490.5010	489.8928	489.2424	488.5701	488.0149	487.5605	487.2544
6	492.8376	492.0640	491.3308	490.7500	490.2546	489.7625	489.1462	488.4890	487.8123	487.2903	486.8779	486.6350
7	491.7349	490.9749	490.2644	489.7544	489.3191	488.8567	488.2129	487.5425	486.8577	486.3967	486.0483	485.9004
8	490.4224	489.6814	489.0078	488.6267	488.2717	487.8311	487.1077	486.4172	485.7202	485.3855	485.1323	485.1365
9	489.1934	488.4744	487.8459	487.6353	487.3518	486.9082	486.0559	485.3564	484.6489	484.4988	484.3403	484.5266
10	487.6519	486.9746	486.4182	486.5002	486.2754	485.7876	484.6907	484.0200	483.2988	483.4915	483.4348	483.9067
11	485.6504	485.0854	484.0499	485.2737	485.0085	484.3818	482.8049	482.3115	481.5574	482.4426	482.4131	483.3833
12	483.5002	483.2126	482.9250	484.3638	483.7881	482.9250	480.6228	480.6228	479.7590	481.7739	481.4861	483.2126
13	473.0032	475.5127	475.8164	482.5354	478.3223	476.1765	469.2878	473.9839	471.6575	481.5889	477.5120	484.6287
14	471.8799	474.9653	475.2366	482.6316	477.7134	475.5364	468.0908	473.6077	470.8994	481.9407	477.0320	485.0103
15	470.5178	474.5474	474.0853	482.9910	476.9468	474.8389	466.6650	473.4412	470.0681	482.6785	476.3909	485.6646
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	468.8503	467.9531	467.0752	466.1719	465.2971	464.4060	463.4968	462.5889	461.6726	460.7498	459.8555	459.0076
HB	67303.1	1434.9	2515.2	-1296.7	2986.7	2605.4	24976.0	-236.9	4059.5	-1785.9	1824.1	-1232.0
TSAT	468.9	468.0	467.1	466.2	465.3	464.4	463.5	462.6	461.7	460.7	459.9	459.0
HSAT	67303.1	1434.9	2515.2	-1296.7	2986.7	2605.4	24976.0	-236.9	4059.5	-1785.9	1824.1	-1232.0
P	509.0	504.6	500.3	496.0	491.7	487.5	483.2	478.9	474.6	470.3	466.2	462.3
S.F.	56984.2	9269.4	18469.4	-22224.9	33361.0	26196.8	58159.5	-2579.3	32193.2	-40201.0	29391.4	-33435.2
S.TEMP	469.70	474.41	474.42	483.31	476.47	474.46	465.83	473.48	469.60	483.26	475.97	486.15
MASS-FLX	34.7548	32.7638	31.3785	30.4735	28.8126	27.9097	26.5548	25.2871	24.0188	22.7101	21.3915	21.1474
QUALITY	0.44858	0.44875	0.44998	0.45181	0.45467	0.45769	0.46141	0.46576	0.47076	0.47644	0.48282	0.48879
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	2453.2	2353.9	2273.4	2222.8	2139.8	2104.3	2037.5	1973.1	1909.7	1843.0	1770.9	1760.3
*S.F.	120612.4	115118.6	111186.9	108417.9	104220.9	102100.6	98652.8	95538.9	92541.0	89499.9	86311.2	85642.3
*S.TEMP	518.19	517.04	516.16	515.14	514.18	513.11	512.10	511.19	510.31	509.50	508.77	507.83
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	13.2000	13.2500	13.3000	13.3500	13.4000	13.4500	13.5000	13.5500	13.6000	13.6500	13.7000	13.7500
NODE												
1	499.4592	498.7454	498.0532	497.3887	496.7561	496.1609	495.6057	495.0906	494.6155	494.1768	493.7737	493.4043
2	495.6677	495.0508	494.4805	493.9619	493.5000	493.0969	492.7480	492.4438	492.1731	491.9282	491.7078	491.5129
3	492.0955	491.6304	491.2397	490.9270	490.6958	490.5400	490.4341	490.3496	490.2664	490.1836	490.1167	490.0747
4	488.8137	488.5686	488.4243	488.3811	488.4414	488.5781	488.7170	488.8162	488.8584	488.8843	488.9468	489.0483
5	487.0632	486.9978	487.0417	487.2000	487.4724	487.7988	488.0500	488.2007	488.2551	488.3184	488.4675	488.6636
6	486.5063	486.5120	486.6277	486.8608	487.2129	487.6042	487.8799	488.0334	488.0793	488.1548	488.3411	488.5723
7	485.8604	485.9656	486.1775	486.5132	486.9729	487.4434	487.7283	487.8674	487.8677	487.9812	488.2261	488.5032
8	485.2146	485.4600	485.7976	486.2698	486.8699	487.4214	487.6624	487.7451	487.7053	487.8379	488.1851	488.5159
9	484.7158	485.1118	485.5710	486.1841	486.9268	487.5320	487.6655	487.6660	487.5498	487.7544	488.2322	488.6033
10	484.2188	484.8318	485.4404	486.2463	487.1777	487.8066	487.7036	487.5803	487.3506	487.7151	488.4048	488.7927
11	483.7761	484.7322	485.5046	486.5920	487.7742	488.3257	487.7095	487.4431	487.0520	487.7966	488.8323	489.1350
12	483.5002	484.9390	485.8015	487.2385	488.6755	488.9629	487.5259	487.2385	486.6638	488.1008	489.5366	489.5366
13	482.7688	487.4708	487.9929	491.4858	493.9055	491.7827	485.0850	486.0913	484.4556	491.0154	493.9995	491.0952
14	482.6396	487.8611	488.1938	491.9661	494.4297	491.9385	484.6350	486.0330	484.2114	491.5010	494.4812	491.1187
15	482.4290	488.4209	488.4004	492.5681	495.0249	492.0012	483.9380	486.0271	483.9097	492.2305	495.0530	491.0200
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	458.1340	457.2571	456.3777	455.4902	454.5972	453.6987	452.7939	451.8806	451.0281	450.2463	449.4255	448.6060
HB	458.4	-833.4	-218.3	-682.4	-571.8	40.4	1095.1	-68.3	392.2	-822.3	-499.6	195.3
TSAT	458.1	457.3	456.4	455.5	454.6	453.7	452.8	451.9	451.0	450.2	449.4	448.6
HSAT	458.4	-833.4	-218.3	-682.4	-571.8	40.4	1095.1	-68.3	392.2	-822.3	-499.6	195.3
P	458.3	454.4	450.4	446.5	442.5	438.5	434.6	430.6	426.9	423.6	420.1	416.6
S.F.	11065.1	-26288.3	-7011.4	-25553.1	-23307.5	1545.4	33577.7	-2334.6	12823.4	-34937.1	-22958.3	8258.5
S.TEMP	482.27	488.80	488.50	492.93	495.36	491.98	483.46	486.06	483.73	492.73	495.38	490.90
MASS-FLX	20.8926	20.5597	20.3936	20.1871	20.0002	19.8016	19.5776	19.3688	18.8889	19.2963	19.3302	19.2524
QUALITY	0.49427	0.49929	0.50371	0.50767	0.51123	0.51449	0.51754	0.52042	0.52341	0.52543	0.52683	0.52782
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	1763.9	1755.4	1757.6	1757.3	1756.3	1754.2	1749.5	1745.1	1723.1	1752.3	1770.9	1770.3
*S.F.	84981.7	83702.3	82811.1	81730.6	80626.6	79481.7	78256.3	77107.8	75255.9	75363.9	74667.6	73407.2
*S.TEMP	506.49	505.11	503.67	502.18	500.68	499.19	497.71	496.25	494.86	493.42	491.75	490.23
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	13.8000	13.8500	13.9000	13.9500	14.0000	14.0500	14.1000	14.1500	14.2000	14.2500	14.3000	14.3500
NODE												
1	493.0669	492.7600	492.4800	492.2249	491.9919	491.7803	491.5898	491.4207	491.2725	491.1453	491.0374	490.9456
2	491.3428	491.1917	491.0525	490.9226	490.8047	490.7039	490.6216	490.5596	490.5193	490.4995	490.4929	490.4827
3	490.0513	490.0261	489.9871	489.9436	489.9146	489.9114	489.9319	489.9751	490.0454	490.1333	490.2080	490.2297
4	489.1555	489.2092	489.2141	489.2217	489.2769	489.3818	489.5098	489.6624	489.8530	490.0415	490.1465	490.1013
5	488.8342	488.8826	488.8689	488.9028	489.0320	489.2246	489.4175	489.6404	489.9141	490.1470	490.2019	490.0090
6	488.7583	488.7896	488.7620	488.8101	488.9741	489.2014	489.4146	489.6626	489.9680	490.2092	490.2253	489.9553
7	488.7004	488.6887	488.6377	488.7119	488.9329	489.2087	489.4421	489.7241	490.0737	490.3145	490.2542	489.8545
8	488.7012	488.5869	488.5005	488.6379	488.9573	489.2966	489.5381	489.8667	490.2795	490.4880	490.2654	489.6396
9	488.7444	488.4783	488.3706	488.6096	489.0510	489.4463	489.6702	490.0571	490.5410	490.6755	490.2217	489.3210
10	488.8276	488.2927	488.2019	488.6404	489.2656	489.7100	489.8716	490.3630	490.9485	490.9146	490.0593	488.7454
11	488.9312	487.9041	487.9841	488.8242	489.7173	490.1528	490.1494	490.8694	491.5986	491.1660	489.5864	487.6589
12	488.9619	487.2388	487.8137	489.2498	490.3987	490.6860	490.3989	491.5471	492.4087	491.2598	488.6753	486.0886
13	488.3904	482.5732	487.8376	492.6323	494.4265	493.1008	491.0217	495.5608	496.5842	490.2446	482.0222	476.8328
14	488.2424	481.9709	488.0344	493.0918	494.8269	493.2515	490.9963	496.0635	496.9695	489.9275	481.1648	475.8708
15	487.9973	481.1628	488.4414	493.7151	495.2776	493.3435	490.8918	496.7295	497.3755	489.3684	480.0215	474.7485
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	447.7827	446.9521	446.1172	445.2766	444.4304	443.5786	442.7554	441.9402	441.1248	440.3057	439.4797	438.6523
HB	300.6	1063.2	-531.8	-566.8	-338.2	-15.4	136.4	-540.6	-259.5	593.4	1263.8	1253.8
TSAT	447.8	447.0	446.1	445.3	444.4	443.6	442.8	441.9	441.1	440.3	439.5	438.7
HSAT	300.6	1063.2	-531.8	-566.8	-338.2	-15.4	136.4	-540.6	-259.5	593.4	1263.8	1253.8
P	413.2	409.7	406.2	402.8	399.3	395.8	392.5	389.2	386.0	382.7	379.5	376.3
S.F.	12038.3	35824.9	-22682.0	-27680.4	-17280.5	-765.0	6550.7	-29851.7	-14648.7	28867.5	50324.4	44455.5
S.TEMP	487.82	480.65	488.77	494.11	495.52	493.35	490.80	497.16	497.58	488.96	479.30	474.11
MASS-FLX	19.2453	19.1964	19.1548	19.1051	19.0472	18.9837	18.7867	18.7435	18.9200	18.8861	18.8639	18.7990
QUALITY	0.52840	0.52870	0.52875	0.52861	0.52832	0.52792	0.52756	0.52697	0.52605	0.52500	0.52391	0.52277
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	1776.1	1778.2	1779.9	1780.9	1780.9	1780.1	1770.5	1785.7	1782.2	1786.8	1784.6	1786.2
*S.F.	72448.9	71389.2	70365.4	69352.5	68342.4	67348.2	66073.8	65563.3	64541.5	63667.7	62747.9	61849.6
*S.TEMP	488.74	487.27	485.82	484.39	482.98	481.58	480.23	478.81	477.46	476.10	474.76	473.44
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	14.4000	14.4500	14.5000	14.5500	14.6000	14.6500	14.7000	14.7500	14.8000	14.8500	14.9000	14.9500
NODE												
1	490.8638	490.7847	490.7012	490.6057	490.4902	490.3477	490.1711	489.9548	489.6958	489.3918	489.0415	488.6448
2	490.4521	490.3870	490.2795	490.1228	489.9080	489.6257	489.2744	488.8564	488.3774	487.8438	487.2598	486.6299
3	490.1719	490.0273	489.7983	489.4851	489.0703	488.5488	487.9329	487.2444	486.5024	485.7156	484.8882	484.0266
4	489.8896	489.5444	489.0896	488.5288	487.8088	486.9473	485.9961	485.0046	484.0017	482.9724	481.9163	480.8459
5	489.5991	489.0613	488.4192	487.6648	486.6851	485.5613	484.3894	483.2319	482.1023	480.9436	479.7654	478.5901
6	489.4568	488.8438	488.1316	487.3035	486.2151	484.9924	483.7463	482.5388	481.3738	480.1704	478.9512	477.7432
7	489.2227	488.5078	487.7019	486.7737	485.5251	484.1716	482.8389	481.5823	480.3835	479.1252	477.8582	476.6150
8	488.8088	487.9700	487.0454	485.9836	484.4849	482.9736	481.5627	480.2808	479.0674	477.7383	476.4229	475.1543
9	488.2839	487.3438	486.3054	485.1050	483.3052	481.6663	480.2153	478.9436	477.7351	476.3235	474.9729	473.6953
10	487.4480	486.4219	485.2334	483.8403	481.5586	479.8198	478.3726	477.1565	475.9680	474.4138	473.0393	471.7688
11	486.0801	485.0508	483.6409	481.9634	478.8430	477.1772	475.8325	474.7568	473.5999	471.7598	470.4194	469.1917
12	484.3633	483.5007	481.7737	479.7581	475.4370	474.2844	473.1313	472.2654	471.1118	468.8027	467.6472	466.4927
13	475.5520	476.3813	472.3691	468.6577	456.8037	461.4475	461.0769	461.3843	459.8950	454.3198	455.2705	454.4119
14	474.7715	475.8198	471.4385	467.5989	454.8181	460.5557	460.0649	460.4958	458.9121	452.9146	454.2827	453.3813
15	473.9766	475.3137	470.3806	466.4355	452.4360	459.8984	459.0671	459.6497	457.9023	451.3384	453.3750	452.3513
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	437.8186	436.9807	436.1387	435.2893	434.4446	433.5955	432.7483	431.8953	431.0388	430.1797	429.3096	428.4436
HB	778.7	406.3	1242.0	1444.4	5865.1	498.5	1337.4	1012.8	1367.7	3001.9	1180.0	1528.2
TSAT	437.8	437.0	436.1	435.3	434.4	433.6	432.7	431.9	431.0	430.2	429.3	428.4
HSAT	778.7	406.3	1242.0	1444.4	5865.1	498.5	1337.4	1012.8	1367.7	3001.9	1180.0	1528.2
P	373.0	369.8	366.6	363.3	360.1	356.9	353.8	350.6	347.5	344.3	341.2	338.1
S.F.	27841.4	15484.3	41778.3	44068.0	97255.4	13016.3	34528.6	27703.0	36025.9	60858.0	27917.2	35739.9
S.TEMP	473.57	475.09	469.78	465.80	451.03	459.71	458.57	459.25	457.38	450.45	452.97	451.83
MASS-FLX	18.7753	18.7107	18.6747	18.6081	18.4761	18.3198	18.1136	17.8717	17.6507	17.3816	17.1489	16.7635
QUALITY	0.52165	0.52051	0.51944	0.51838	0.51750	0.51676	0.51634	0.51619	0.51636	0.51682	0.51758	0.51873
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	1782.9	1783.7	1780.5	1780.4	1772.3	1764.6	1750.4	1739.3	1722.4	1710.9	1690.8	1680.9
*S.F.	60998.9	60103.5	59339.5	58453.1	57643.3	56584.8	55716.8	54721.1	53829.8	52970.8	51996.5	51310.4
*S.TEMP	472.13	470.85	469.56	468.29	467.04	465.84	464.66	463.53	462.41	461.31	460.24	459.14
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	15.0000	15.0500	15.1000	15.1500	15.2000	15.2500	15.3000	15.3500	15.4000	15.4500	15.5000	15.5500
NODE												
1	488.2034	487.7212	487.2024	486.6511	486.0708	485.4629	484.8286	484.1685	483.4841	482.7781	482.0508	481.3032
2	485.9622	485.2710	484.3676	483.8552	483.1299	482.3840	481.6174	480.8323	480.0317	479.2170	478.3860	477.5403
3	483.1531	482.3000	481.4778	480.6646	479.8342	478.9729	478.0894	477.1970	476.3032	475.4019	474.4824	473.5537
4	479.8179	478.8953	478.0457	477.1838	476.2578	475.2698	474.2742	473.2996	472.3438	471.3752	470.3687	469.3728
5	477.5247	476.6521	475.8464	474.9531	473.9346	472.8428	471.7908	470.7954	469.8267	468.8181	467.7434	466.7261
6	476.6797	475.8467	475.0627	474.1475	473.0828	471.9473	470.8828	469.8872	468.9165	467.8887	466.7834	465.7659
7	475.5767	474.8225	474.0696	473.1111	471.9739	470.7803	469.7119	468.7275	467.7583	466.7021	465.5518	464.5474
8	474.1995	473.6040	472.8828	471.8235	470.5652	469.2998	468.2649	467.3154	466.3533	465.2449	464.0247	463.0750
9	472.8789	472.4937	471.7693	470.5520	469.1519	467.8281	466.8728	465.9700	465.0112	463.8286	462.5281	461.6838
10	471.2202	471.1741	470.3608	468.8450	467.2419	465.8718	465.0955	464.2578	463.2881	461.9658	460.5457	459.9316
11	469.1882	469.6917	468.5151	466.4250	464.5645	463.2219	462.8484	462.0623	461.0325	459.4331	457.8445	457.7646
12	467.3591	468.5144	466.4915	463.6013	461.5789	460.4214	460.7109	459.8430	458.6848	456.6584	454.9214	455.7903
13	461.1863	465.2822	456.0640	448.9102	447.2629	447.8911	452.5925	449.9993	447.9639	443.1687	441.1677	449.0115
14	460.9290	465.1685	454.8608	447.4304	446.0212	446.8831	452.0986	449.0928	447.0046	441.8799	439.9634	448.7466
15	460.9514	465.2092	453.3262	445.7305	444.7664	445.9360	451.8086	448.1060	446.0012	440.4468	438.7258	448.8074
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	427.5601	426.6792	425.8022	424.9404	424.0793	423.2227	422.3723	421.4980	420.6118	419.7249	418.8281	417.9258
HB	-331.7	-169.5	2487.4	3335.5	2145.8	1354.8	88.7	1438.1	1451.0	2736.7	2246.1	-455.0
TSAT	427.6	426.7	425.8	424.9	424.1	423.2	422.4	421.5	420.6	419.7	418.8	417.9
HSAT	-331.7	-169.5	2487.4	3335.5	2145.8	1354.8	88.7	1438.1	1451.0	2736.7	2246.1	-455.0
P	334.9	331.8	328.7	325.7	322.7	319.7	316.8	313.8	310.8	307.9	304.9	301.9
S.F.	-11128.5	-6547.1	66079.3	66128.3	43038.7	30172.5	2606.5	37479.2	36074.9	54526.0	43265.8	-14146.0
S.TEMP	461.11	465.30	452.37	444.77	444.14	445.49	451.77	447.56	445.47	439.65	438.09	449.01
MASS-FLX	16.4262	16.4523	15.9749	15.7459	15.7227	15.3234	15.1966	15.1045	14.7948	14.5829	14.3489	14.1221
QUALITY	0.52020	0.52165	0.52368	0.52583	0.52794	0.53037	0.53275	0.53511	0.53780	0.54063	0.54366	0.54687
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	1654.6	1660.6	1629.7	1630.0	1620.8	1609.4	1595.2	1597.7	1578.4	1568.7	1557.5	1546.6
*S.F.	50218.9	50071.1	48880.1	48524.4	47935.9	47243.5	46531.7	46266.4	45473.0	44967.1	44432.4	43925.8
*S.TEMP	458.08	457.01	455.96	454.87	453.83	452.74	451.71	450.64	449.60	448.57	447.54	446.51
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	15.6000	15.6500	15.7000	15.7500	15.8000	15.8500	15.9000	15.9500	16.0000	16.0500	16.1000	16.1500
NODE												
1	480.5371	479.7556	478.9614	478.1577	477.3464	476.5288	475.7068	474.8804	474.0515	473.2200	472.3848	471.5442
2	476.6865	475.8315	474.9814	474.1357	473.2920	472.4485	471.6050	470.7649	469.9282	469.0896	468.2422	467.3806
3	472.6375	471.7483	470.8828	470.0310	469.1799	468.3269	467.4766	466.6396	465.8101	464.9680	464.0933	463.1899
4	468.4382	467.5718	466.7385	465.9077	465.0537	464.1919	463.3440	462.5337	461.7231	460.8577	459.9165	458.9402
5	465.8306	465.0261	464.2322	463.4116	462.5405	461.6685	460.8325	460.0625	459.2595	458.3440	457.3159	456.2815
6	464.8970	464.1221	463.3411	462.5198	461.6357	460.7585	459.9307	459.1814	458.3750	457.4280	456.3569	455.3013
7	463.7300	463.0029	462.2361	461.4077	460.5015	459.6204	458.8081	458.0938	457.2761	456.2737	455.1377	454.0623
8	462.3625	461.7078	460.9434	460.0923	459.1426	458.2654	457.4890	456.8369	455.9788	454.8716	453.6357	452.5588
9	461.1079	460.5247	459.7375	458.8486	457.8423	456.9844	456.2595	455.6848	454.7488	453.5024	452.1587	451.1165
10	459.5740	459.0676	458.2039	457.2476	456.1482	455.3481	454.7131	454.2612	453.1492	451.6694	450.1804	449.2505
11	457.7383	457.2666	456.1934	455.1289	453.8762	453.2432	452.7644	452.5132	450.9751	449.1072	447.4504	446.8389
12	456.0798	455.5005	454.0520	452.8928	451.4431	451.1531	450.8633	450.8633	448.5422	446.2207	444.4788	444.4788
13	449.8630	447.7939	443.7815	442.5842	439.9907	442.4807	442.9517	444.3098	436.0249	431.8472	430.4575	435.0540
14	449.3845	447.0837	442.7891	441.6931	438.9536	441.8625	442.3213	443.8225	434.6885	430.5134	429.2566	434.4541
15	448.9426	446.3123	441.6716	440.7905	437.8501	441.3687	441.7263	443.4055	433.0664	429.0698	428.0481	434.0615
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	417.0479	416.1946	415.3203	414.4443	413.5598	412.6702	411.7729	410.8689	409.9578	409.0393	408.1394	407.2556
HB	459.8	974.6	1667.0	1202.7	1699.3	427.7	653.0	366.9	3006.4	2737.2	2137.4	216.6
TSAT	417.0	416.2	415.3	414.4	413.6	412.7	411.8	410.9	410.0	409.0	408.1	407.3
HSAT	459.8	974.6	1667.0	1202.7	1699.3	427.7	653.0	366.9	3006.4	2737.2	2137.4	216.6
P	299.0	296.2	293.4	290.6	287.8	285.0	282.2	279.4	276.6	273.8	271.0	268.4
S.F.	14567.9	28941.7	42881.4	31137.4	40272.7	12198.7	19375.1	11872.9	66541.9	52703.7	41251.6	5786.4
S.TEMP	448.73	445.89	441.04	440.33	437.26	441.19	441.44	443.23	432.09	428.29	427.44	433.98
MASS-FLX	13.8520	13.8161	13.6176	13.4416	13.2666	13.0860	12.9198	12.7514	12.5860	12.4208	12.2280	12.1803
QUALITY	0.55030	0.55357	0.55690	0.56025	0.56365	0.56715	0.57072	0.57439	0.57816	0.58205	0.58608	0.58997
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	1531.6	1535.6	1528.7	1523.0	1516.7	1507.7	1501.8	1495.2	1489.0	1482.7	1473.2	1477.4
*S.F.	43307.6	43128.3	42645.9	42240.7	41834.5	41387.7	41027.2	40663.4	40320.5	39989.4	39575.8	39461.5
*S.TEMP	445.49	444.45	443.39	442.36	441.32	440.30	439.27	438.25	437.22	436.19	435.18	434.14
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	16.2000	16.2500	16.3000	16.3500	16.4000	16.4500	16.5000	16.5500	16.6000	16.6500	16.7000	16.7500
NODE												
1	470.6970	469.8428	468.9812	468.1125	467.2375	466.3547	465.4641	464.5662	463.6619	462.7542	461.8447	460.9355
2	466.5056	465.6216	464.7307	463.8342	462.9307	462.0171	461.0942	460.1653	459.2380	458.3176	457.4070	456.5046
3	462.2729	461.3523	460.4343	459.5134	458.5825	457.6326	456.6716	455.7188	454.7876	453.8813	452.9951	452.1216
4	457.9744	457.0259	456.0969	455.1580	454.1946	453.1929	452.1914	451.2375	450.3413	449.4858	448.6516	447.8176
5	455.3013	454.3528	453.4338	452.4788	451.4829	450.4299	449.4104	448.4917	447.6538	446.8518	446.0562	445.2407
6	454.3228	453.3772	452.4641	451.4983	450.4851	449.4072	448.3848	447.4890	446.6792	445.8979	445.1150	444.3018
7	453.0969	452.1604	451.2585	450.2739	449.2351	448.1211	447.1042	446.2534	445.4878	444.7341	443.9651	443.1504
8	451.6379	450.7185	449.8396	448.8130	447.7356	446.5657	445.5828	444.8215	444.1233	443.4001	442.6409	441.8132
9	450.2666	449.3611	448.5095	447.4170	446.2974	445.0637	444.1494	443.5085	442.8779	442.1741	441.4148	440.5618
10	448.5266	447.6226	446.8140	445.5879	444.4136	443.0798	442.3198	441.8801	441.3286	440.6272	439.8535	438.9487
11	446.3267	445.3611	444.0331	443.1116	441.8936	440.3904	440.0012	439.8987	439.3965	438.6458	437.8308	436.8213
12	444.1885	443.0259	442.4451	440.4102	439.2468	437.5027	437.7937	438.0845	437.5027	436.6301	435.7571	434.5928
13	435.3086	432.2822	432.9937	427.1108	427.2158	423.7852	429.3167	431.1987	429.2205	427.4929	426.3804	424.2300
14	434.5916	431.2903	432.2478	425.8040	426.2373	422.5369	428.8313	430.7068	428.4700	426.6826	425.5745	423.3064
15	433.9026	430.2100	431.5598	424.3054	425.3037	421.1931	428.5906	430.2993	427.6636	425.8345	424.7532	422.3274
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	406.3550	405.4502	404.5374	403.6165	402.6897	401.7544	400.8115	399.8608	398.7136	397.2222	396.1563	395.0928
HB	847.7	1666.7	792.8	2944.9	1336.0	2636.4	-32.4	378.2	1048.3	1075.1	1009.2	1318.7
TSAT	406.4	405.5	404.5	403.6	402.7	401.8	400.8	399.9	398.7	397.2	396.2	395.1
HSAT	847.7	1666.7	792.8	2944.9	1336.0	2636.4	-32.4	378.2	1048.3	1075.1	1009.2	1318.7
P	265.7	263.0	260.3	257.6	254.9	252.2	249.6	246.9	243.7	239.5	236.6	233.7
S.F.	23063.6	40280.1	21176.3	58393.3	29628.2	49326.7	-900.2	11448.0	29887.6	30281.5	28435.1	35228.4
S.TEMP	433.56	429.62	431.25	423.45	424.87	420.46	428.60	430.13	427.22	425.39	424.33	421.81
MASS-FLX	12.0286	11.8940	11.7630	11.6156	11.4809	11.3416	11.2017	11.0621	9.2675	2.6749	2.1814	4.2794
QUALITY	0.59390	0.59785	0.60183	0.60592	0.61009	0.61437	0.61878	0.62333	0.63051	0.64716	0.66249	0.72908
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	1473.1	1468.3	1465.1	1459.9	1455.3	1450.7	1445.8	1440.9	1348.0	639.3	258.0	722.7
*S.F.	39132.7	38825.5	38568.6	38278.3	38021.6	37773.1	37531.6	37302.6	35146.3	18758.8	9106.3	25708.1
*S.TEMP	433.10	432.07	431.04	430.02	429.00	427.98	426.96	425.94	425.06	426.74	431.55	430.80
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	16.8000	16.8500	16.9000	16.9500	17.0000	17.0500	17.1000	17.1500	17.2000	17.2500	17.3000	17.3500
NODE												
1	460.0273	459.1206	458.2161	457.3130	456.4116	455.5122	454.6140	453.7173	452.8210	451.9285	451.0400	450.1592
2	455.6094	454.7170	453.8269	452.9385	452.0532	451.1680	450.2825	449.3962	448.5134	447.6401	446.7810	445.9404
3	451.2502	450.3770	449.5010	448.6272	447.7583	446.8865	446.0085	445.1294	444.2649	443.4258	442.6184	441.8447
4	446.9695	446.1055	445.2380	444.3792	443.5298	442.6643	441.7839	440.9097	440.0823	439.3071	438.5854	437.9106
5	444.3923	443.5222	442.6563	441.8108	440.9771	440.1025	439.2104	438.3428	437.5667	436.8601	436.2158	435.6204
6	443.4480	442.5718	441.7058	440.8662	440.0383	439.1543	438.2546	437.3918	436.6438	435.9668	435.3560	434.7913
7	442.2854	441.3997	440.5354	439.7070	438.8870	437.9854	437.0759	436.2241	435.5234	434.8906	434.3252	433.8022
8	440.9236	440.0237	439.1682	438.3601	437.5513	436.6106	435.6902	434.8657	434.2524	433.6807	433.1782	432.7073
9	439.6387	438.7258	437.8870	437.1062	436.3057	435.3057	434.3813	433.5996	433.1023	432.5884	432.1519	431.7290
10	437.9702	437.0447	436.2422	435.5054	434.7092	433.5925	432.6814	431.9824	431.6853	431.2324	430.8887	430.5229
11	435.7542	434.8323	434.1123	433.4475	432.6350	431.2754	430.4495	429.9167	429.9844	429.5459	429.3440	429.0352
12	433.4282	432.5547	431.9722	431.3896	430.5156	428.7668	428.1841	427.8926	428.4758	427.8926	427.8926	427.6011
13	422.6648	422.3401	422.6699	422.4194	420.9326	416.5251	418.3550	419.4038	423.1558	420.5430	422.0735	421.4922
14	421.7290	421.4966	421.9255	421.6802	420.0979	415.3633	417.6243	418.7527	422.8635	419.8481	421.6577	420.9744
15	420.7659	420.6697	421.2192	420.9551	419.2314	414.0679	416.9988	418.1643	422.7305	419.0654	421.3213	420.4478
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	394.0139	392.7773	391.4895	466.5400	522.4014	540.9900	543.3813	540.5964	538.9128	538.8870	536.7290	535.4917
HB	1282.3	995.4	769.7	-527.3	-295.6	-383.0	-134.7	-146.7	9.2	-251.2	-72.6	-159.6
TSAT	394.0	392.8	391.4	390.2	388.8	387.3	385.2	382.6	379.7	376.6	373.6	370.8
HSAT	1282.3	995.4	767.3	796.1	1021.1	1879.5	541.3	509.5	-24.8	719.7	176.1	372.8
P	230.8	227.6	224.0	220.8	217.2	213.6	208.3	201.9	195.2	188.0	181.1	175.1
S.F.	33664.9	27360.2	22624.0	24228.5	30635.7	48889.6	17062.7	17994.2	-1066.9	30206.1	8390.7	18404.1
S.TEMP	420.27	420.26	420.88	420.60	418.78	413.34	416.75	417.90	422.75	418.62	421.20	420.18
MASS-FLX	7.6174	10.0034	14.8229	18.5018	20.5228	23.5554	28.5085	35.6405	42.2298	47.6103	52.4989	55.3797
QUALITY	0.84107	0.95644	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)												
*HB	1173.7	1369.3	250.9	93.8	97.2	107.4	122.7	147.1	169.3	187.7	205.4	211.7
*S.F.	38887.8	41952.2	8708.3	-1735.2	-7737.0	-10747.4	-12530.0	-14265.5	-15758.2	-16951.8	-17862.2	-18167.1
*S.TEMP	427.36	423.66	426.37	431.32	435.48	438.92	441.68	444.05	446.17	448.13	449.84	451.33
*H.T.MODE	3	3	3	8	8	8	8	8	8	8	8	8

TIME--	17.4000	17.4500	17.5000	17.5500	17.6000	17.6500	17.7000	17.7500	17.8000	17.8500	17.9000	17.9500
NODE												
1	449.2874	448.4270	447.5786	446.7417	445.9153	445.1006	444.2969	443.5049	442.7251	441.9578	441.1995	440.4487
2	445.1208	444.3201	443.5330	442.7549	441.9858	441.2280	440.4841	439.7551	439.0386	438.3298	437.6216	436.9082
3	441.1038	440.3792	439.6570	438.9319	438.2139	437.5134	436.8350	436.1726	435.5195	434.8596	434.1807	433.4746
4	437.2742	436.6265	435.9531	435.2603	434.5886	433.9541	433.3540	432.7639	432.1677	431.5291	430.8406	430.0989
5	435.0593	434.4390	433.7688	433.0781	432.4421	431.8633	431.3254	430.7742	430.2004	429.5415	428.8125	428.0161
6	434.2590	433.6392	432.9631	432.2693	431.6511	431.0984	430.5859	430.0447	429.4746	428.7969	428.0449	427.2205
7	433.3059	432.6743	431.9836	431.2847	430.6980	430.1826	429.7036	429.1697	428.6001	427.8867	427.0991	426.2346
8	432.2532	431.5740	430.8530	430.1470	429.6208	429.1619	428.7258	428.1841	427.6052	426.8193	425.9780	425.0537
9	431.3123	430.5466	429.7920	429.0842	428.6460	428.2461	427.8491	427.2786	426.6846	425.7957	424.9001	423.9104
10	430.1494	429.2007	428.4106	427.7117	427.4377	427.1143	426.7625	426.1157	425.4990	424.4214	423.4622	422.3752
11	428.7080	427.3528	426.5767	425.9187	425.9783	425.7231	425.4121	424.5776	423.9451	422.4937	421.5027	420.2607
12	427.3096	425.2678	424.6846	424.1011	424.6848	424.3931	424.1013	422.9338	422.3503	420.3064	419.4304	417.9705
13	421.3428	414.3606	416.3474	416.0686	420.2205	418.6941	418.4766	414.8757	415.2104	408.9529	409.9795	406.9099
14	420.8523	413.2139	415.7456	415.4067	420.0149	418.1748	418.0120	414.0867	414.6428	407.7983	409.2512	405.8984
15	420.3730	411.8254	415.2542	414.7529	419.9819	417.6060	417.5566	413.1812	414.1150	406.4312	408.5999	404.7979
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	535.1646	534.2964	533.2188	537.8140	538.0835	538.7878	539.4380	539.8994	542.7117	543.0896	544.5725	546.2480
HB	-138.1	-454.1	-101.9	-179.0	43.8	-177.9	-123.3	-275.5	-126.1	-393.6	-137.7	-286.0
TSAT	367.6	364.5	361.3	360.6	360.1	358.8	357.4	356.1	354.7	353.3	351.9	350.5
HSAT	302.1	1203.2	224.1	410.5	-86.3	369.7	251.3	619.9	274.6	1034.1	332.4	755.9
P	168.2	161.9	155.6	154.2	153.3	150.8	148.1	145.6	143.1	140.5	138.0	135.4
S.F.	15885.5	55988.6	12043.0	22091.4	-5172.3	21613.2	15055.8	35059.2	16246.1	54109.4	18761.2	40621.7
S.TEMP	420.14	411.00	415.07	414.42	420.06	417.29	417.33	412.66	413.87	405.63	408.32	404.19
MASS-FLX	58.4550	60.6284	62.5191	57.1804	51.7871	48.5294	45.1004	41.7090	38.0209	34.1281	29.9427	25.2445
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	221.5	227.7	232.4	220.1	201.3	190.5	180.0	170.1	156.0	143.6	129.5	115.4
*S.F.	-18340.5	-18373.9	-18232.8	-18108.9	-16437.2	-15553.7	-14756.8	-14092.7	-13115.2	-12230.7	-11196.4	-10150.9
*S.TEMP	452.66	453.84	454.89	455.84	456.46	456.92	457.31	457.63	457.86	458.04	458.13	458.12
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	18.0000	18.0500	18.1000	18.1500	18.2000	18.2500	18.3000	18.3500	18.4000	18.4500	18.5000	18.5500
NODE												
1	439.7026	438.9604	438.2217	437.4878	436.7607	436.0430	435.3347	434.6357	433.9451	433.2595	432.5774	431.8970
2	436.1895	435.4692	434.7534	434.0461	433.3550	432.6824	432.0244	431.3745	430.7234	430.0669	429.4031	428.7346
3	432.7588	432.0476	431.3555	430.6855	430.0500	429.4458	428.8499	428.2412	427.6106	426.9568	426.2869	425.6143
4	429.3711	428.6760	428.0286	427.4197	426.8755	426.3650	425.8240	425.2251	424.5723	423.8872	423.1887	422.5112
5	427.2932	426.6289	426.0369	425.4829	425.0264	424.5830	424.0464	423.4102	422.7100	421.9868	421.2666	420.6013
6	426.5083	425.8618	425.2961	424.7659	424.3511	423.9309	423.3831	422.7209	421.9946	421.2556	420.5273	419.8733
7	425.5503	424.9326	424.4077	423.9087	423.5562	423.1606	422.5818	421.8745	421.1123	420.3542	419.6201	418.9883
8	424.4453	423.8743	423.4141	422.9519	422.6987	422.3152	421.6584	420.8738	420.0625	419.2874	418.5542	417.9722
9	423.4309	422.9048	422.5205	422.0876	421.9585	421.5564	420.7791	419.9050	419.0486	418.2686	417.5452	417.0352
10	422.1650	421.6785	421.4141	421.0027	421.0884	420.5986	419.5928	418.5938	417.6502	416.9221	416.2227	415.8464
11	420.6597	420.1216	420.0701	419.6316	420.1326	419.3440	417.8992	416.7605	415.8359	415.1287	414.4800	414.3674
12	419.4307	418.5540	418.8462	418.2622	419.4309	417.9700	415.9248	414.7561	413.8792	413.2542	412.7097	413.0022
13	416.3149	411.1567	414.2876	412.0242	418.0774	410.6233	405.4019	405.1914	404.8762	405.1528	404.8276	407.8623
14	416.4170	410.3655	414.0359	411.4341	418.1951	409.7490	404.3550	404.4102	404.1362	404.5051	404.1792	407.5608
15	416.8979	409.3792	413.9250	410.7690	418.5547	408.5967	403.1438	403.6555	403.4102	403.8916	403.5391	407.3926
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	548.6013	551.4414	556.5073	555.9880	533.1821	486.4792	460.5000	442.4910	399.7874	382.6885	377.4265	370.7107
HB	229.8	-290.4	12.7	-176.0	184.5	-634.2	-795.8	-614.1	7365.3	931.7	828.0	25.0
TSAT	349.0	347.5	346.6	345.9	345.2	344.6	343.7	343.4	342.5	341.8	341.1	340.4
HSAT	-441.2	675.9	-26.8	397.4	-286.3	788.0	786.2	401.9	396.9	315.1	343.6	13.7
P	132.8	130.3	128.7	127.6	126.4	125.4	124.0	123.5	122.0	120.8	119.7	118.6
S.F.	-30165.7	41433.7	-1809.1	25632.2	-21094.3	49865.6	46193.9	24069.5	24037.9	19484.0	21356.3	917.6
S.TEMP	417.35	408.76	413.95	410.39	418.87	407.86	402.46	403.30	403.05	403.60	403.22	407.38
MASS-FLX	19.7343	12.7165	6.0506	1.7499	3.4367	7.9049	9.4775	13.0674	14.4492	15.7133	16.6786	18.0041
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	96.3	71.2	39.6	19.1	18.0	40.7	49.3	62.0	69.4	75.2	80.3	83.9
*S.F.	-8681.5	-6634.1	-3900.4	-1924.3	-1546.9	-1666.3	-448.4	540.4	3402.1	5124.9	5925.8	6603.6
*S.TEMP	457.99	457.65	456.98	456.21	455.42	455.11	454.71	454.25	453.51	452.44	451.54	450.75
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	18.6000	18.6500	18.7000	18.7500	18.8000	18.8500	18.9000	18.9500	19.0000	19.0500	19.1000	19.1500
NODE												
1	431.2185	430.5437	429.8740	429.2124	428.5596	427.9170	427.2844	426.6631	426.0532	425.4531	424.8611	424.2751
2	428.0684	427.4121	426.7717	426.1492	425.5430	424.9500	424.3687	423.8015	423.2451	422.6934	422.1409	421.5854
3	424.9609	424.3396	423.7520	423.1921	422.6458	422.1094	421.5835	421.0735	420.5723	420.0569	419.5210	418.9771
4	421.8977	421.3489	420.8491	420.3728	419.8892	419.4058	418.9326	418.4875	418.0347	417.5210	416.9678	416.4194
5	420.0505	419.5820	419.1565	418.7363	418.2754	417.8169	417.3757	416.9802	416.5444	415.9895	415.3999	414.8513
6	419.3582	418.9268	418.5313	418.1313	417.6711	417.2214	416.7932	416.4192	415.9839	415.3987	414.7917	414.2490
7	418.5325	418.1541	417.7969	417.4167	416.9497	416.5105	416.1003	415.7583	415.3137	414.6746	414.0454	413.5188
8	417.6199	417.3132	416.9983	416.6316	416.1345	415.7139	415.3279	415.0347	414.5547	413.8125	413.1653	412.6809
9	416.8149	416.5747	416.2922	415.9250	415.3770	414.9866	414.6277	414.3936	413.8452	412.9653	412.3235	411.9080
10	415.8462	415.6770	415.4209	415.0327	414.3823	414.0652	413.7441	413.6069	412.9050	411.7876	411.2090	410.9270
11	414.7476	414.6003	414.3433	413.8848	413.0266	412.9089	412.6292	412.6660	411.5928	410.0610	409.7412	409.7134
12	413.8792	413.5869	413.2944	412.7097	411.5398	411.8323	411.5398	411.8323	410.0771	408.0291	408.3215	408.6143
13	411.4858	409.1401	408.7007	407.2380	404.0686	407.8547	406.7805	408.8394	401.7573	397.2266	402.9436	404.5444
14	411.4290	408.6936	408.3125	406.7417	403.3472	407.6768	406.3562	408.6746	400.8201	396.1851	402.7244	404.2769
15	411.5144	408.1614	407.9241	406.2036	402.5244	407.6606	405.8970	408.6006	399.6274	395.0073	402.7522	404.0740
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	369.6267	368.0063	365.9453	363.6921	358.4229	355.6812	355.1240	355.1082	355.1475	355.4705	357.1501	356.5496
HB	-183.6	538.9	311.9	466.3	717.8	-107.8	339.1	-14.7	1138.7	1130.3	-220.5	106.3
TSAT	339.8	339.5	339.0	338.6	338.0	337.6	337.1	336.6	336.1	335.6	335.8	336.1
HSAT	-107.4	314.0	189.7	292.3	489.3	-80.1	249.9	-10.9	793.4	747.9	-150.3	74.3
P	117.8	117.2	116.5	115.7	115.0	114.3	113.5	112.8	112.0	111.2	111.5	112.0
S.F.	-7713.1	21466.5	13031.1	19685.7	31320.7	-5614.9	17133.0	-784.5	49803.8	43944.1	-10086.8	5045.9
S.TEMP	411.63	407.84	407.73	405.91	402.06	407.74	405.64	408.61	398.89	394.35	402.90	404.00
MASS-FLX	18.0946	17.6513	17.0434	16.0063	14.9957	13.9061	12.5693	11.2081	9.6798	7.9120	7.0451	7.6469
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	86.3	84.6	81.3	78.3	74.2	69.4	64.3	59.0	52.4	44.0	39.8	42.4
*S.F.	6927.0	6880.6	6757.1	6601.3	6633.2	6397.5	5960.0	5461.7	4849.4	4062.6	3612.1	3856.3
*S.TEMP	450.04	449.49	449.05	448.69	448.35	448.05	447.85	447.73	447.70	447.73	447.82	447.80
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	19.2000	19.2500	19.3000	19.3500	19.4000	19.4500	19.5000	19.5500	19.6000	19.6500	19.7000	19.7500
NODE												
1	423.6943	423.1184	422.5476	421.9814	421.4187	420.8596	420.3040	419.7505	419.2002	418.6514	418.1050	417.5598
2	421.0317	420.4817	419.9358	419.3916	418.8494	418.3083	417.7681	417.2302	416.6929	416.1575	415.6213	415.0840
3	418.4409	417.9146	417.3896	416.8633	416.3354	415.8069	415.2791	414.7539	414.2271	413.7014	413.1711	412.6338
4	415.9082	415.4099	414.9050	414.3877	413.8674	413.3462	412.8301	412.3176	411.7969	411.2800	410.7466	410.1997
5	414.3799	413.9036	413.4019	412.8813	412.3618	411.8440	411.3364	410.8323	410.3088	409.7979	409.2517	408.6907
6	413.8000	413.3303	412.8264	412.3015	411.7822	411.2654	410.7617	410.2603	409.7334	409.2251	408.6699	408.1011
7	413.1077	412.6421	412.1316	411.5989	411.0811	410.5652	410.0681	409.5703	409.0359	408.5337	407.9619	407.3835
8	412.3372	411.8611	411.3323	410.7871	410.2744	409.7605	409.2744	408.7805	408.2292	407.7417	407.1360	406.5466
9	411.6477	411.1357	410.5811	410.0222	409.5210	409.0081	408.5371	408.0439	407.4678	407.0054	406.3477	405.7529
10	410.7988	410.1846	409.5901	409.0144	408.5400	408.0251	407.5818	407.0840	406.4592	406.0520	405.2876	404.7021
11	409.7898	408.8899	408.2561	407.6680	407.2595	406.7280	406.3403	405.8181	405.0933	404.8250	403.8147	403.3013
12	408.9070	407.4441	406.8589	406.2732	405.9805	405.3950	405.1023	404.5166	403.6379	403.6379	402.1733	401.8806
13	405.7146	399.7627	400.4646	399.8911	400.4355	399.2637	399.7239	398.5098	396.6340	398.8296	393.6746	395.7456
14	405.5010	398.9192	399.9761	399.3550	400.0100	398.7266	399.3088	397.9807	396.0000	398.5259	392.7974	395.3308
15	405.3389	397.8645	399.5420	398.8147	399.6211	398.1597	398.9277	397.4197	395.3142	398.3235	391.7395	395.0217
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	356.2383	355.3523	354.3586	352.7927	351.6487	347.5503	340.1370	338.5342	338.4072	338.0996	337.8088	337.5125
HB	77.3	1037.7	270.5	404.9	245.2	402.5	196.4	342.8	439.8	50.2	794.4	107.4
TSAT	336.4	336.7	337.0	337.3	337.6	337.9	338.2	338.5	338.4	338.1	337.8	337.5
HSAT	55.0	718.1	195.3	302.4	189.6	337.6	190.2	342.8	439.8	50.2	794.4	107.4
P	112.5	112.9	113.4	113.8	114.3	114.7	115.2	115.7	115.5	115.0	114.6	114.1
S.F.	3788.9	43443.8	12175.0	18523.3	11718.0	20250.7	11513.1	20081.5	24866.0	3019.4	42339.3	6164.9
S.TEMP	405.28	397.22	399.36	398.54	399.45	397.86	398.76	397.12	394.94	398.28	391.11	394.93
MASS-FLX	8.2475	8.8915	9.4894	10.0969	10.6487	11.1378	11.6575	11.9861	12.4357	12.1785	12.0110	11.9493
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.99861	0.99735	0.99622	0.99465	0.99099
GAP	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264	0.08264
***RELAP	PREDICTIONS	(STARRED)***										
*HB	45.3	48.3	51.0	53.8	56.0	58.3	60.6	86.1	124.6	155.0	183.7	318.9
*S.F.	4142.7	4454.1	4735.3	5069.7	5315.1	5759.8	6375.5	9191.6	13117.1	16112.3	18795.8	31648.5
*S.TEMP	447.68	447.49	447.27	447.01	446.73	446.42	446.03	445.24	443.76	442.09	440.19	436.80
*H.T.MODE	8	8	8	8	8	8	8	3	3	3	3	3

TIME--	19.8000	19.8500	19.9000	19.9500	20.0000
1	417.0149	416.4707	415.9290	415.3916	414.8623
2	414.5430	414.0042	413.4751	412.9626	412.4683
3	412.0898	411.5598	411.0608	410.5979	410.1606
4	409.6436	409.1414	408.7097	408.3340	407.9749
5	408.1243	407.6707	407.3215	407.0237	406.7122
6	407.5300	407.1086	406.8008	406.5359	406.2388
7	406.8071	406.4417	406.1953	405.9717	405.6855
8	405.9668	405.7097	405.5527	405.3760	405.0833
9	405.1726	405.0706	405.0059	404.8623	404.5398
10	404.1243	404.3142	404.3645	404.2397	403.8403
11	402.7288	403.5186	403.6509	403.4866	402.9043
12	401.2947	403.0522	403.0522	402.7593	401.8806
13	394.7393	403.3960	400.6331	399.4451	396.6243
14	394.1750	403.7500	400.3337	399.1343	396.0959
15	393.5862	404.4412	399.9211	398.7888	395.4739
Q	0.0	0.0	0.0	0.0	0.0
TB	337.1921	336.8872	336.5779	336.2458	335.9661
HB	372.2	-520.1	299.4	202.2	409.9
TSAT	337.2	336.9	336.6	336.2	336.0
HSAT	372.2	-520.1	299.4	202.2	409.9
P	113.6	113.2	112.7	112.2	111.8
S.F.	20874.8	-35409.4	18881.4	12607.6	24243.8
S.TEMP	393.27	404.97	399.64	398.60	395.11
MASS-FLX	11.7312	11.5424	11.3165	11.0851	10.8944
QUALITY	0.98737	0.98380	0.98144	0.97849	0.97392
GAP	0.08264	0.08264	0.08264	0.08264	0.08264
RELAP PREDICTIONS (STARRED)					
*HB	462.0	538.1	660.1	746.0	806.5
*S.F.	43804.2	48386.9	56108.2	59899.6	61222.5
*S.TEMP	432.02	426.85	421.57	416.55	411.93
*H.T.MODE	3	3	3	3	3

304308********** ENERGY BALANCE **********

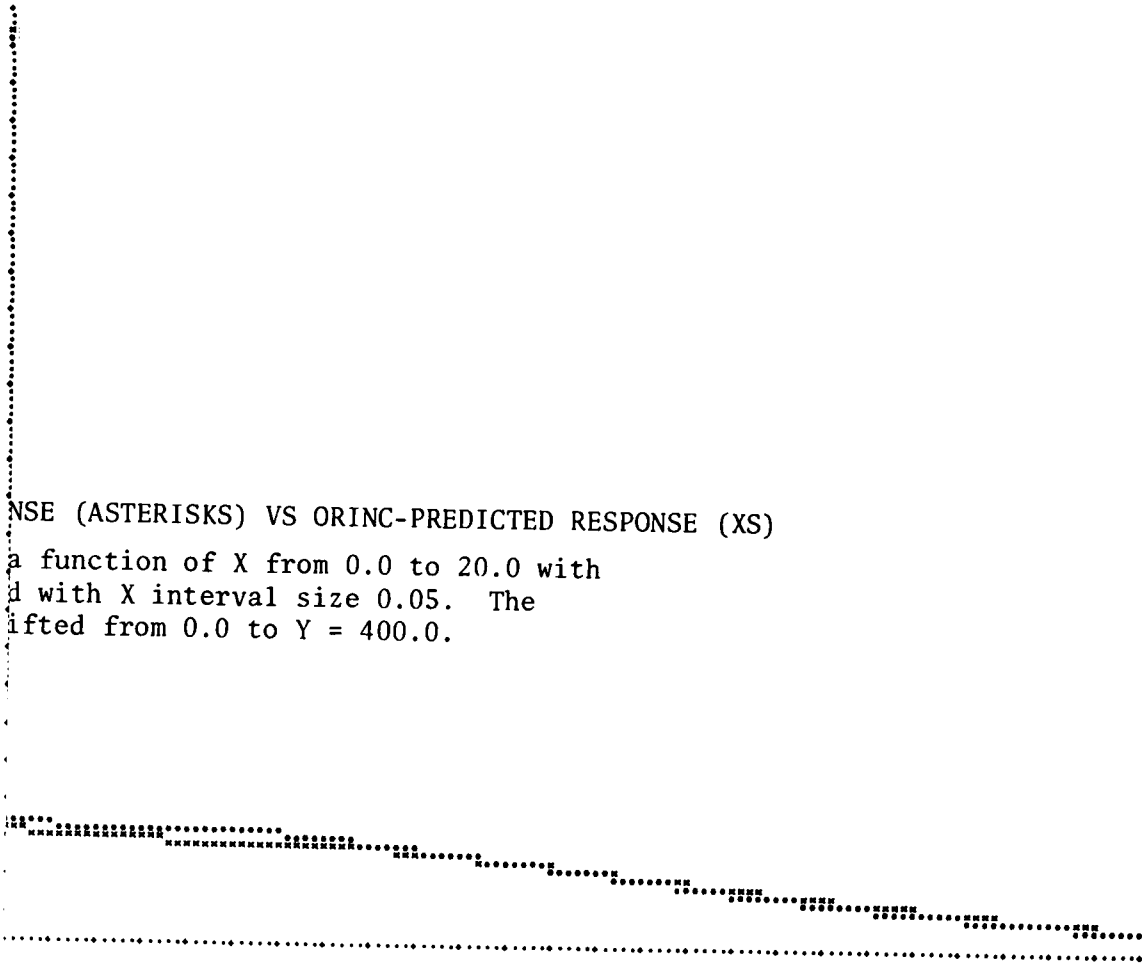
****** THERMOCOUPLE NUMBER: TE-304CH TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

CHANGE IN PIN INTERNAL ENERGY CONTENT = 35.376083 BTU/FT
DETERMINED BY SUMMATION OF DELTA U'S OVER THE INTERVAL FROM T=0 TO TEND.
CHANGE IN PIN INTERNAL ENERGY CONTENT = 35.340485 BTU/FT
DETERMINED BY DIFFERENCE IN PIN END POINT ENTHALPIES.
TOTAL HEAT INPUT = INTEGRAL OF QTOT*DT = 32.080856 BTU/FT

INTEGRAL OF SURFACE FLUX VERSUS TIME CURVE *2.0*PI*RO= 67.438065 BTU/FT

PERCENTAGE ERROR IN OVERALL HEAT BALANCE = 0.0280 PERCENT
ERROR IN OVERALL HEAT BALANCE (VIA METHOD 2)= 0.0248 PERCENT


NSE (ASTERISKS) VS ORINC-PREDICTED RESPONSE (XS)
a function of X from 0.0 to 20.0 with
d with X interval size 0.05. The
ifted from 0.0 to Y = 400.0.

Example 4. THTF Blowdown Test 104 (Preliminary, BD104.BE.P1), Thermocouple TE-301DJ

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301410******************** CALIBRATION INFORMATION ************************

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

***** THERMOCOUPLE NO. 301-DJ

***** MIDDLE T/C --- 301-MJ

***** DATE OF LAST MODIFICATION : FEB. 17.1977

***** AXIAL POWER PEAKING FACTOR IS :   1.3012
      DETERMINED BY INDIV RESISTANCE CAL.

***** COEFFICIENTS FOR TEMPERATURE POLYNOMIAL FIT OF KBN
      DETERMINED FOR THE ABOVE SPECIFIC ITCS/ITCM PAIR
      C(1)=  0.20661514E 02
      C(2)= -0.70098527E-02
      C(3)=  0.11629254E-05
      C(4)= -0.10709349E-09

      VARIANCE OF FIT=  0.1e591b68E 02
      UNITS FOR KBN FIT :  BTU/(HR*FT**2/FT*F)

***** COEFFIEIENTS FOR TEMPERATURE POLYNOMIAL FIT FOR KMGO
      DETERMINED FOR THE ABOVE SPECIFIC T/C PAIR
      C(1)=  0.77045898E 01
      C(2)= -0.99152625E-02
      C(3)=  0.79940228E-05
      C(4)= -0.28400076E-08
      C(5)=  0.37483889E-12

      VARIANCE OF FIT=  0.23226364E 02
      UNITS FOR KMGO FIT :  BTU/(HR*FT**2/FT*F)

      ACTUAL MGO POROSITY CALCULATED VIA MODIFIED
           RUSSELL EQUATION :   0.16666609E 00

***** COEFFICIENTS FOR THE THERMAL EXPANSION GAP MODEL FIT
      DETERMINED BY USING THE BIAS GAP VALUE AS A MEAN GAP

      C(1)=  0.0              SD=  0.0
      C(2)=  0.0              SD=  0.0
      C(3)=  0.0              SD=  0.0

      VARIANCE OF FIT=  0.0

      GAP CALCULATION AT THE BIAS POINT :          0.0449   (MILS)

      BIAS TEMP. INSIDE S.S.S. NODAL TEMP. :        769.5   DEG. F
      BIAS TEMP. OUTSIDE S.S.S. NODAL TEMP. :       691.9   DEG. F
      BIAS FLUX :   409625.6  BTU/HR/FT**2

      THE MAXIMUM TEMPERATURE FOR WHICH THE ABOVE
      REGRESSION FIT IS APPLICABLE IS     0.0  DEG. F
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301410********************  CASE INFORMATION  ****************************

****** THERMOCOUPLE NUMBER:  Tc-301DJ      TIME: 13:33:18       DATE:  JULY  8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

TOTAL NUMBER OF RADIAL NODES = 15
     MAGNESIUM OXIDE CORE NODES     1  THROUGH   4
     INCONEL-600 HEATER NODES       5  THROUGH   6
     BORON NITRIDE NODES            7  THROUGH   9
     INNER S.S.SHEATH NODES        10  THROUGH  12
     OUTER S.S.SHEATH NODES        13  THROUGH  15

OUTSIDE RADIUS OF MGO CORE = 0.872500E-02 FT.
OUTSIDE RADIUS OF INCONEL LAYER = 0.101670E-01 FT.
OUTSIDE RADIUS OF BORON NITRIDE = 0.143330E-01 FT.
OUTSIDE RADIUS OF INNER S.S.SHEATH = 0.168330E-01 FT.
OUTSIDE RADIUS OF OUTER S.S.SHEATH = 0.176670E-01 FT.

RADIAL GAP INFORMATION: (I.E. BIAS POINT)
     GAP BETWEEN INNER AND OUTER S.S.SHEATHS =  0.0449 MILS

POWER PEAKING FACTORS:
     AXIAL = 1.301200
     RADIAL (INCONEL) = 1.000000
     RADIAL (CU-NI)= 0.0
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301410**************  STEADY STATE TEMPERATURE PROFILE  ********************

****** THERMOCOUPLE NUMBER:  Tc-301DJ      TIME: 13:33:18       DATE:  JULY  8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

Q = AVERAGE HEAT GENERATION PER FT =  9.707630 BTU/SEC/FT
Q*AXIAL PEAKING FACTOR = 12.631567 BTU/SEC/FT
HF = OUTSIDE FILM COEFFICIENT = 0.92599000E 05 BTU/(HR*FT**2*DEG F)
TB = BULK COOLANT TEMPERATURE =  615.79 DEG F

PIN TEMPERATURE PROFILE:
                          NODE     TEMPERATURE (DEG F)
                             1          1062.53
                             2          1062.53
                             3          1062.53
                             4          1062.53
                             5          1062.53
                             6          1042.07
                             7           986.91
                             8           926.52
                             9           879.10
                            10           838.59
                            11           801.48
                            12           767.67
                            13           690.19
                            14           678.78
                            15           667.68

SURFACE HEAT FLUX= 0.40965431E 06 BTU/HR/FT**2
SURFACE TEMPERATURE=  662.25 DEG F

PRESSURE=  2330.6 PSIA
SATURATION TEMPERATURE (AT THE ABOVE PRESSURE)=  657.82 DEG F

HEAT TRANSFER MODE AT THE SURFACE OF THE PIN:   NUCLEATE BOILING
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301410********** TRANSIENT RESULTS **********

****** THERMOCOUPLE NUMBER: Tc-301DJ TIME: 13:33:18

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

TIME-TEMPERATURE-NODE TABLE:
TIME HAS UNITS OF SEC
TEMPERATURE HAS UNITS OF DEG F
Q HAS UNITS OF BTU/SEC/FT
HB (BASED ON TB) HAS UNITS OF BTU/(HR*FT**2*DEG F)
BULK TEMPERATURE HAS UNITS OF DEG F
HSAT (BASED ON TSAT) HAS UNITS OF BTU/(HR*FT**2*DEG F)
PRESSURE HAS UNITS OF PSIA
SATURATION TEMPERATURE HAS UNITS OF DEG F
SURFACE FLUX (S.F.) HAS UNITS OF BTU/HR/FT**2
SURFACE TEMPERATURE HAS UNITS OF DEG F
AVERAGE MASS FLUX HAS UNITS OF LBM/SEC/FT**2
GAP HAS UNITS OF MILS

TIME--	0.0	0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500
NODE												
1	1062.5305	1062.5291	1062.5271	1062.5225	1062.5144	1062.4976	1062.4663	1062.4167	1062.3440	1062.2441	1062.1145	1061.9546
2	1062.5305	1062.5283	1062.5229	1062.5063	1062.4680	1062.3940	1062.2747	1062.1025	1061.8757	1061.5969	1061.2717	1060.9065
3	1062.5305	1062.5286	1062.5105	1062.4521	1062.3245	1062.1064	1061.7905	1061.3813	1060.8594	1060.3601	1059.7837	1059.1824
4	1062.5305	1062.5288	1062.4680	1062.2937	1061.9556	1061.4397	1060.7744	1060.0039	1059.1524	1058.3525	1057.5278	1056.7156
5	1062.5305	1062.5303	1062.4931	1062.0579	1061.4683	1060.6489	1059.6846	1058.6538	1057.6565	1056.6682	1055.7385	1054.8459
6	1042.0693	1042.0601	1041.8896	1041.4749	1040.7686	1039.8228	1038.7478	1037.6292	1036.5686	1035.5320	1034.5823	1033.6663
7	986.9063	986.8716	986.8318	986.0508	985.1228	983.9578	982.7190	981.4905	980.3633	979.3174	978.3513	977.4285
8	926.5181	926.4385	926.0220	925.0908	923.7559	922.2483	920.8132	919.4897	918.3606	917.3633	916.4343	915.5400
9	879.0955	878.9487	878.2634	876.8621	875.0588	873.2231	871.6680	870.3164	869.2612	868.3535	867.4790	866.6196
10	838.5859	838.3347	837.2419	835.1946	832.8369	830.6829	829.0886	827.7563	826.8411	826.0430	825.2124	824.3750
11	801.4849	801.0576	799.3176	796.3564	793.3594	790.9426	789.4612	788.2087	787.5381	786.8647	786.0532	785.2212
12	767.6709	766.9600	764.2471	760.0864	756.4800	753.9824	752.8721	751.7620	751.4844	750.9292	750.0962	749.2634
13	690.1936	688.5740	682.4771	674.2495	669.3936	667.3147	667.9316	667.1753	668.3386	667.9106	666.8352	665.9766
14	678.7808	676.9387	669.9478	661.2896	656.3655	654.4580	655.4321	654.6863	656.1355	655.6711	654.5398	653.6870
15	667.6794	665.5588	657.7134	648.3789	643.5146	641.8767	643.3027	642.5083	644.3101	643.7488	642.5378	641.7007
Q	12.63157	12.63683	12.62883	12.62883	12.62883	12.62883	12.62883	12.62883	12.63683	12.62883	12.63683	12.63683
TB	615.7903	615.7354	621.2057	625.4888	629.0378	630.6062	628.7576	627.9963	628.2141	627.5553	627.8069	627.6421
HB	92599.0	9558.7	15174.1	29635.3	58848.5	90896.8	51133.1	52254.6	41572.8	43892.8	49825.7	53688.5
TSAT	657.8	632.7	629.4	628.6	630.3	630.6	628.8	628.0	628.2	628.0	627.8	627.6
HSAT	92601.8	15503.5	20766.9	36516.3	69851.4	90896.8	51133.1	52254.6	41572.8	43892.8	49825.7	53688.5
P	2330.6	1956.7	1911.4	1900.4	1924.0	1927.8	1902.6	1892.3	1895.3	1891.8	1889.8	1887.6
S.F.	409654.3	422650.9	461023.9	486355.6	476750.1	461874.0	441209.9	445988.3	429683.8	436536.2	440134.9	438893.0
S.TEMP	662.25	659.95	651.59	641.90	637.14	635.69	637.39	636.53	638.55	637.90	636.64	635.82
MASS-FLX	626.8406	36.8512	398.8416	433.6838	494.1956	532.3049	537.3252	223.8468	366.0530	389.6218	371.1494	376.3525
QUALITY	0.0	0.0	0.0	0.0	0.0	0.00315	0.01818	0.03200	0.04256	0.05199	0.05977	0.06500
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	50465.3	47880.0	39513.8	38241.4	38172.1	38309.5	37892.3	37484.5	37204.9	37107.2	36937.4	36541.3
*S.F.	326625.1	547768.5	389383.5	371200.3	356340.5	356535.5	363170.7	361169.8	354231.1	354360.1	352198.3	346532.6
*S.TEMP	664.29	644.09	639.26	638.29	639.65	639.94	638.35	637.65	637.74	637.51	637.35	637.05
*H.T.MODE	2	4	2	2	2	2	2	2	2	2	2	2

TIME--	0.6000	0.6500	0.7000	0.7500	0.8000	0.8500	0.9000	0.9500	1.0000	1.0500	1.1000	1.1500
NODE												
1	1061.7632	1061.5400	1061.2874	1061.0056	1060.6978	1060.3655	1060.0100	1059.6338	1059.2390	1058.8267	1058.3984	1057.9561
2	1060.5071	1060.0789	1059.6267	1059.1577	1058.6743	1058.1794	1057.6748	1057.1606	1056.6406	1056.1150	1055.5835	1055.0457
3	1058.5652	1057.9412	1057.3108	1056.6912	1056.0745	1055.4607	1054.8496	1054.2378	1053.6326	1053.0310	1052.4307	1051.8245
4	1055.9189	1055.1487	1054.3867	1053.6897	1052.9897	1052.3062	1051.6282	1050.9487	1050.3035	1049.6609	1049.0173	1048.3540
5	1053.9854	1053.1763	1052.3660	1051.6958	1050.9573	1050.2585	1049.5569	1048.8472	1048.2170	1047.5579	1046.8545	1046.1865
6	1032.7876	1031.9700	1031.1670	1030.4954	1029.7549	1029.0413	1028.3262	1027.6152	1026.9827	1026.3228	1025.6470	1024.9270
7	976.5505	975.7529	975.0166	974.3503	973.6396	972.9065	972.1860	971.5073	970.8848	970.2478	969.5620	968.8430
8	914.7004	913.9788	913.3579	912.7444	912.0532	911.2991	910.5913	909.9792	909.4043	908.7554	908.0830	907.3604
9	865.8311	865.2139	864.7209	864.1499	863.4436	862.6479	861.9697	861.4468	860.9224	860.3218	859.5493	858.8208
10	823.6389	823.1563	822.8047	822.2373	821.4653	820.5940	819.9670	819.5601	819.0715	818.4453	817.5566	816.8247
11	784.5552	784.2668	784.0818	783.4429	782.5359	781.5520	781.0376	780.8000	780.3130	779.6116	778.5212	777.8237
12	748.7083	748.7083	748.7083	747.8752	746.7644	745.6536	745.3760	745.3760	744.8203	743.9871	742.5984	742.0427
13	665.8411	666.8740	667.3323	665.5112	663.7014	662.2483	663.0381	663.7942	662.7317	661.3860	658.9043	659.1667
14	653.6418	654.8713	655.3765	653.3298	651.4175	649.9304	650.9600	651.8289	650.6289	649.1575	646.5164	646.9998
15	641.7700	643.2351	643.7639	641.4104	639.4014	637.8943	639.2441	640.2170	638.8137	637.2696	634.3711	635.1780
Q	12.63683	12.63683	12.61950	12.63683	12.61950	12.62751	12.62751	12.61818	12.62751	12.61818	12.61818	12.61018
TB	627.7239	625.1719	622.5159	621.7456	620.6062	618.7275	617.1382	615.9006	614.4502	613.8672	612.2380	610.2693
HB	52634.0	34143.8	27205.5	31807.3	34265.6	33289.6	25955.1	22646.1	23332.6	24830.6	27659.1	22441.4
TSAT	627.7	625.2	622.5	621.7	620.6	618.7	617.1	615.9	614.5	613.9	612.2	610.3
HSAT	52634.0	34143.8	27205.5	31807.3	34265.6	33289.6	25955.1	22646.1	23332.6	24830.6	27659.1	22441.4
P	1888.7	1854.5	1819.5	1809.5	1794.7	1770.5	1750.3	1734.6	1716.4	1709.2	1689.0	1664.8
S.F.	433394.9	423046.4	423611.4	438569.8	441244.6	440990.3	425438.9	422291.5	432917.0	436173.1	446319.7	429367.1
S.TEMP	635.96	637.96	638.09	635.53	633.48	631.97	633.53	634.55	633.00	631.43	628.37	629.40
MASS-FLX	233.0907	367.0210	319.4741	345.8953	388.3633	376.0637	342.7808	311.4082	286.8486	61.8676	27.0206	71.0419
QUALITY	0.07569	0.08692	0.10180	0.10943	0.11473	0.12082	0.13101	0.14374	0.15532	0.18547	0.22295	0.28925
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	36946.0	36392.9	35427.6	34872.4	34587.6	34136.3	33580.0	32994.9	32692.9	32227.2	8297.8	31430.3
*S.F.	352406.1	361031.9	361996.6	356559.3	358682.5	363007.1	362530.6	357757.9	361044.8	356671.7	323688.0	373505.1
*S.TEMP	637.35	635.17	632.77	631.98	631.04	629.44	628.04	627.00	625.81	625.01	651.36	622.23
*H.T.MODE	2	2	2	2	2	2	2	2	2	2	4	2

TIME--	1.2000	1.2500	1.3000	1.3500	1.4000	1.4500	1.5000	1.5500	1.6000	1.6500	1.7000	1.7500
NODE												
1	1057.5007	1057.0322	1056.5520	1056.0613	1055.5598	1055.0479	1054.5271	1053.9978	1053.4607	1052.9165	1052.3655	1051.8088
2	1054.5017	1053.9517	1053.3955	1052.8333	1052.2629	1051.6868	1051.1045	1050.5183	1049.9294	1049.3381	1048.7449	1048.1470
3	1051.2158	1050.6052	1049.9912	1049.3733	1048.7463	1048.1194	1047.4858	1046.8572	1046.2324	1045.6108	1044.9917	1044.3569
4	1047.6956	1047.0393	1046.3809	1045.7175	1045.0339	1044.3728	1043.6892	1043.0444	1042.4058	1041.7722	1041.1394	1040.4473
5	1045.5117	1044.8374	1044.1580	1043.4702	1042.7395	1042.0854	1041.3591	1040.7458	1040.1055	1039.4719	1038.8328	1038.0586
6	1024.2346	1023.5486	1022.8564	1022.1541	1021.4102	1020.7383	1020.0081	1019.3892	1018.7515	1018.1121	1017.4514	1016.6531
7	968.1289	967.4419	966.7434	966.0295	965.2876	964.5852	963.8855	963.2620	962.6499	962.0134	961.3123	960.4963
8	906.6375	905.9731	905.2739	904.5518	903.8091	903.1042	902.4502	901.8691	901.3008	900.6660	899.8987	899.0178
9	858.0903	857.4666	856.7532	856.0151	855.2649	854.5723	853.9741	853.4536	852.9233	852.2642	851.3950	850.4209
10	816.0759	815.5107	814.7466	813.9766	813.2041	812.5295	812.0000	811.5476	811.0388	810.3091	809.2732	808.1721
11	777.0430	776.5798	775.6973	774.8848	774.0796	773.4417	773.0117	772.6411	772.1287	771.2546	769.9548	768.6982
12	741.2095	740.9316	739.8203	738.9868	738.1533	737.5974	737.3196	737.0417	736.4858	735.3740	733.7063	732.3162
13	658.0378	658.5315	656.3513	655.5989	654.6826	654.4771	654.7363	654.6831	653.8413	651.7900	648.8447	647.2534
14	645.7830	646.4465	644.0173	643.3301	642.3989	642.2720	642.6284	642.5999	641.6892	639.4570	636.2949	634.7244
15	633.8152	634.7119	631.9338	631.3667	630.4126	630.3921	630.8606	630.8416	629.8345	627.3801	623.9722	622.4780
Q	12.61818	12.61818	12.61818	12.61818	12.61018	12.62751	12.61018	12.62751	12.61950	12.61950	12.62751	12.61018
TB	609.5396	609.2979	608.5195	607.2747	606.3215	606.1443	605.2070	603.7908	602.7314	601.8792	600.8044	599.5847
HB	23786.4	21639.7	25409.5	23910.0	24000.4	23428.1	21462.6	20071.6	20308.0	22606.5	26441.6	26423.4
TSAT	609.5	609.3	608.5	607.3	606.3	606.1	605.2	603.8	602.7	601.9	600.8	599.6
HSAT	23786.4	21639.7	25409.5	23910.0	24000.4	23428.1	21462.6	20071.6	20308.0	22606.5	26441.6	26423.4
P	1656.0	1653.0	1643.6	1628.6	1617.2	1615.1	1604.0	1587.3	1574.9	1564.9	1552.5	1538.5
S.F.	437493.3	425936.6	443406.9	435744.3	436946.0	431777.9	427082.4	427385.0	432170.6	441858.8	451515.6	445771.6
S.TEMP	627.93	628.98	625.97	625.50	624.53	624.57	625.11	625.08	624.01	621.42	617.88	616.46
MASS-FLX	106.0731	117.2405	105.2917	100.2294	101.5784	59.0847	36.0003	33.7051	41.0194	39.5853	35.3508	39.5862
QUALITY	0.32778	0.34584	0.38022	0.37752	0.38787	0.41201	0.44200	0.46115	0.48704	0.51959	0.55268	0.56020
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	22867.0	13495.2	10106.0	8517.0	6045.3	7083.4	3718.5	1831.2	2196.3	2233.4	2125.4	962.8
*S.F.	365221.7	302726.2	306910.2	297932.4	267338.3	303302.4	210878.9	155060.6	207302.4	218362.3	219012.3	121622.7
*S.TEMP	625.52	631.75	638.78	642.34	650.58	649.02	662.04	688.59	697.15	699.69	703.92	725.99
*H.T.MODE	2	4	4	4	4	2	2	3	3	3	3	4

TIME--	1.8000	1.8500	1.9000	1.9500	2.0000	2.0500	2.1000	2.1500	2.2000	2.2500	2.3000	2.3500
NODE												
1	1051.2451	1050.6746	1050.0977	1049.5137	1048.7627	1047.6399	1045.9729	1043.6475	1040.6064	1036.8398	1032.3662	1027.2288
2	1047.5427	1046.9280	1046.3062	1045.6775	1043.8296	1040.2637	1035.0239	1028.3848	1020.6724	1012.1780	1003.1394	993.7405
3	1043.7119	1043.0457	1042.3743	1041.7029	1035.2954	1024.8787	1012.4050	999.1094	985.6606	972.3960	959.4695	946.9465
4	1039.7490	1039.0071	1038.2910	1037.5918	1015.5950	991.9690	970.4082	951.1487	933.8210	918.0386	903.4990	889.9880
5	1037.3323	1036.5129	1035.8022	1035.1072	985.6929	954.7256	931.2349	911.6279	894.4878	879.1011	865.0566	852.0996
6	1015.8918	1015.0564	1014.3318	1013.6348	968.3943	938.9429	916.1965	897.0864	880.3328	865.2661	851.5012	838.8010
7	959.6755	958.8516	958.1123	957.4316	933.7432	910.9495	891.1855	873.8638	858.3806	844.2969	831.3440	819.3494
8	898.1431	897.3423	896.6436	896.0217	884.3928	869.6560	854.8784	840.8787	827.8120	815.5898	804.1592	793.4717
9	849.5078	848.7544	848.1257	847.5786	841.2349	831.5833	820.7036	809.6287	798.8374	788.4204	778.5054	769.1416
10	807.2300	806.5552	806.0166	805.5498	801.8965	795.4907	787.4946	778.8032	770.0005	761.2043	752.7070	744.6194
11	767.7649	767.2356	766.8154	766.4395	764.2461	759.9106	753.9995	747.2144	740.1404	732.7783	725.6287	718.8018
12	731.4822	731.2043	730.9263	730.6482	729.2578	726.1982	721.7471	716.4595	710.8909	704.7627	698.9104	693.3337
13	646.9810	647.6558	647.7280	647.6824	647.4019	646.1819	644.1685	641.7659	639.4639	635.7930	633.0779	630.5527
14	634.5859	635.4382	635.5432	635.5278	635.4038	634.4255	632.7512	630.7732	628.9695	625.6270	623.4211	621.3650
15	622.5155	623.5791	623.6897	623.7007	623.7241	622.9541	621.5859	620.0115	618.7019	615.6272	613.9553	612.3625
Q	12.62751	12.61018	12.62751	12.62751	0.06146	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	598.5212	597.5090	596.4067	595.1655	594.7515	593.4063	592.0078	591.1545	590.6536	589.7664	588.5837	587.7251
HB	24159.5	21115.2	19988.3	18843.1	18198.7	17421.6	16860.8	16617.4	16221.8	17470.1	16600.2	16171.0
TSAT	598.5	597.5	596.4	595.2	594.8	593.4	592.0	591.2	590.7	589.8	588.6	587.7
HSAT	24159.5	21115.2	19988.3	18843.1	18198.7	17421.6	16860.8	16617.4	16221.8	17470.1	16600.2	16171.0
P	1526.3	1514.8	1502.3	1488.4	1483.8	1468.8	1453.4	1444.1	1438.6	1429.0	1416.2	1407.0
S.F.	437035.9	428226.9	429302.0	428566.3	423195.5	416681.4	406145.1	391532.2	373085.9	365358.8	343789.4	326720.6
S.TEMP	616.61	617.79	617.89	617.91	618.01	617.32	616.10	614.72	613.65	610.68	609.29	607.93
MASS-FLX	43.7536	46.3279	45.7766	51.3604	5.6711	0.3768	2.4740	21.3935	26.4944	12.4058	9.4460	22.0866
QUALITY	0.56464	0.57240	0.58107	0.59277	0.60271	0.60495	0.60801	0.61102	0.62401	0.64066	0.65071	0.66575
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	925.5	874.4	742.8	905.2	62.6	10.6	34.5	143.3	215.7	138.0	93.1	175.9
*S.F.	131475.1	134140.6	122554.3	155535.1	12232.1	2352.8	8284.6	35811.8	54373.9	35531.1	24752.1	47156.2
*S.TEMP	740.63	750.97	761.48	767.16	790.32	815.34	832.13	841.14	842.88	847.37	854.53	856.00
*H.T.MODE	4	4	4	4	9	7	9	9	9	9	9	9

TIME--	2.4000	2.4500	2.5000	2.5500	2.6000	2.6500	2.7000	2.7500	2.8000	2.8500	2.9000	2.9500
NODE												
1	1021.4824	1015.1880	1008.4070	1001.2026	993.6343	985.7578	977.6245	969.2827	960.7766	952.1465	943.4285	934.6548
2	984.1162	974.3672	964.5688	954.7732	945.0203	935.3413	925.7600	916.2944	906.9597	897.7681	888.7268	879.8401
3	934.8457	923.1636	911.8857	900.9966	890.4790	880.3184	870.4976	861.0076	851.8359	842.9651	834.3765	826.0535
4	877.3474	865.4587	854.2285	843.5898	833.4871	823.8784	814.7290	806.0129	797.6563	789.7402	782.1057	774.7646
5	840.0527	828.7874	818.1995	808.2256	798.8040	789.8970	781.4658	773.4868	765.9114	758.6855	751.7629	745.1191
6	826.9963	815.9651	805.0047	795.8589	786.6648	777.9897	769.7949	762.0579	754.7219	747.7275	741.0247	734.5967
7	808.1746	797.7195	787.8889	778.6519	769.9402	761.7375	754.0046	746.7241	739.8208	733.2292	726.8994	720.8328
8	783.4404	774.0095	765.0996	756.7356	748.8286	741.4033	734.4094	727.8496	721.6628	715.6021	709.8076	704.2600
9	760.2710	751.8823	743.9016	736.4351	729.3379	722.7063	716.4580	710.6265	705.0146	699.5735	694.2805	689.2344
10	736.8713	729.5044	722.4294	715.8789	709.5803	703.7686	698.2756	693.1990	688.2021	683.2939	678.4775	673.9397
11	712.1577	705.8215	699.6465	694.0884	688.5894	683.6792	678.9783	674.7312	670.3225	665.9297	661.5759	657.5957
12	687.7544	682.4517	677.1465	672.6768	667.9260	664.0117	660.0962	656.7388	652.8203	648.9004	644.9792	641.6167
13	627.4119	624.6533	621.3306	619.9146	616.7029	615.6343	613.5413	612.6133	609.4473	606.5889	603.6423	602.0723
14	618.5720	616.2085	613.1672	612.2742	609.2280	608.6560	606.7988	606.2688	603.1362	600.4492	597.6458	596.3867
15	609.8826	607.9214	605.1294	604.8186	601.8643	601.8611	600.1873	600.0908	596.9028	594.3950	591.7271	590.8257
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	586.9814	585.9839	584.9919	584.1069	583.2073	582.3650	581.5232	580.6514	579.7808	578.9150	578.0393	577.1580
HB	16997.8	16853.9	18108.6	15721.5	17875.0	15073.8	15531.8	13495.2	16219.9	17614.5	19994.3	18266.7
TSAT	587.0	586.0	585.0	584.1	583.2	582.4	581.5	580.7	579.8	578.9	578.0	577.2
HSAT	16997.8	16853.9	18108.6	15721.5	17875.0	15073.8	15531.8	13495.2	16219.9	17614.5	19994.3	18266.7
P	1399.1	1388.5	1378.0	1368.7	1359.3	1350.5	1341.8	1332.8	1323.9	1315.1	1306.2	1297.3
S.F.	316273.2	300818.3	292584.4	268191.3	268189.9	243764.0	239211.7	221534.9	227375.9	219760.4	214884.5	199693.6
S.TEMP	605.59	603.83	601.15	601.17	598.21	598.54	596.92	597.07	593.80	591.39	588.79	588.09
MASS-FLX	19.8853	13.6520	15.8784	16.9729	15.9850	17.3648	17.0850	16.8043	17.3973	17.7433	17.7861	17.8392
QUALITY	0.68927	0.70956	0.72780	0.74899	0.77014	0.79070	0.81106	0.82974	0.84668	0.86205	0.87547	0.88684
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	188.0	136.9	146.4	163.8	156.3	168.9	171.4	170.0	175.7	180.9	182.8	184.3
*S.F.	50313.5	37018.7	39942.6	44773.3	42839.7	46347.5	47025.8	46651.9	48206.6	49567.8	50024.2	50356.9
*S.TEMP	854.80	856.56	858.08	857.70	857.54	856.95	855.99	855.24	854.29	853.04	851.80	850.57
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	3.0000	3.0500	3.1000	3.1500	3.2000	3.2500	3.3000	3.3500	3.4000	3.4500	3.5000	3.5500
NODE												
1	925.8547	917.0525	908.2722	899.5347	890.8586	882.2610	873.7568	865.3584	857.0781	848.9253	840.9070	833.0313
2	871.1121	862.5459	854.1458	845.9175	837.8645	829.9905	822.2957	814.7808	807.4438	800.2842	793.2993	786.4866
3	817.9832	810.1577	802.5767	795.2368	788.1321	781.2542	774.5933	768.1418	761.8867	755.8201	749.9333	744.2217
4	767.7009	760.9165	754.4128	748.1851	742.2097	736.4705	730.9497	725.6326	720.4973	715.5349	710.7385	706.1040
5	738.7485	732.6731	726.8977	721.4065	716.1553	711.1284	706.3074	701.6736	697.1963	692.8770	688.7126	684.7017
6	728.4426	722.5984	717.0649	711.8181	706.8037	702.0093	697.4175	693.0061	688.7390	684.6296	680.6726	676.8672
7	715.0361	709.5708	704.4250	699.5608	694.9011	690.4539	686.1965	682.1038	678.1335	674.3193	670.6523	667.1338
8	698.9783	694.0713	689.4827	685.1506	680.9602	676.9736	673.1541	669.4702	665.8669	662.4304	659.1299	655.9744
9	684.4553	680.1213	676.0847	672.2632	668.4956	664.9456	661.5308	658.2188	654.9363	651.8560	648.8938	646.0757
10	669.6794	665.9844	662.5256	659.2239	655.8474	652.7512	649.7378	646.7888	643.8003	641.1003	638.4773	636.0063
11	653.9067	650.9976	648.1628	645.4031	642.3687	639.7944	637.1880	634.6038	631.8789	629.6360	627.3618	625.2734
12	638.5337	636.5713	634.3276	632.0835	629.2781	627.3137	625.0679	622.8215	620.2939	618.6086	616.6418	614.9556
13	600.5811	601.5908	600.5471	599.4973	596.8315	596.8489	595.2546	593.7832	591.5085	591.6941	590.2534	589.6921
14	595.1318	596.6602	595.7185	594.8398	592.1394	592.5378	590.9817	589.6257	587.3613	587.9028	586.4812	586.1123
15	589.8010	591.9287	590.9998	590.2927	587.4949	588.3706	586.7830	585.5481	583.2615	584.2466	582.7742	582.6284
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	576.2515	575.3845	574.5396	573.7632	572.9653	572.1458	571.3369	570.5227	569.7004	568.8770	568.0493	567.2166
HB	17533.8	11642.8	11996.1	11415.8	13856.6	10380.0	11343.5	11282.3	12920.7	9472.5	10375.3	9049.5
TSAT	576.3	575.4	574.5	573.8	573.0	572.1	571.3	570.5	569.7	568.9	568.0	567.2
HSAT	17533.8	11642.8	11996.1	11415.8	13856.6	10380.0	11343.5	11282.3	12920.7	9472.5	10375.3	9049.5
P	1288.3	1279.6	1271.2	1263.6	1255.7	1247.7	1239.8	1231.9	1224.0	1216.1	1208.2	1200.3
S.F.	191548.9	166105.9	169590.9	163171.2	169191.4	147413.7	151616.6	146786.2	148805.1	128811.1	133706.7	124033.6
S.TEMP	587.18	589.65	588.68	588.06	585.18	586.35	584.70	583.53	581.22	582.48	580.94	580.92
MASS-FLX	17.1503	17.9600	18.0568	18.4391	17.3824	16.4341	15.5409	14.2844	12.9174	11.4523	9.7931	8.0324
QUALITY	0.89668	0.90431	0.91071	0.91537	0.91954	0.92332	0.92712	0.93153	0.93674	0.94288	0.95003	0.95702
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	181.3	186.0	186.7	191.8	184.3	175.4	168.0	157.4	145.4	132.5	117.7	101.2
*S.F.	49502.7	50725.9	50853.6	52094.0	49994.9	47604.8	45629.5	42832.0	39663.6	36277.7	32361.2	27972.4
*S.TEMP	849.44	848.33	847.01	845.57	844.41	843.69	843.12	842.76	842.68	842.82	843.22	843.92
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	9	9

TIME--	3.6000	3.6500	3.7000	3.7500	3.8000	3.8500	3.9000	3.9500	4.0000	4.0500	4.1000	4.1500
NODE												
1	825.3025	817.7266	810.3076	803.0474	795.9500	789.0166	782.2480	775.6467	769.2100	762.9390	756.8318	750.8875
2	779.8450	773.3738	767.0720	760.9387	754.9719	749.1682	743.5259	738.0405	732.7087	727.5269	722.4924	717.6021
3	738.6812	733.3113	728.1096	723.0728	718.1919	713.4609	708.8735	704.4258	700.1111	695.9272	691.8677	687.9294
4	701.6311	697.3232	693.1770	689.1797	685.3157	681.5769	677.9592	674.4578	671.0671	667.7832	664.5967	661.5129
5	680.8457	677.1563	673.6228	670.2224	666.9294	663.7458	660.6680	657.6951	654.8171	652.0322	649.3257	646.7168
6	673.2202	669.7429	666.4211	663.2227	660.1211	657.1252	654.2310	651.4399	648.7378	646.1243	643.5828	641.1409
7	663.7756	660.5933	657.5598	654.6306	651.7781	649.0300	646.3760	643.8213	641.3455	638.9517	636.6187	634.3938
8	652.9846	650.1807	647.3071	644.8989	642.3364	639.8855	637.5164	635.2463	633.0334	630.8984	628.8032	626.8418
9	643.4338	640.9912	638.6470	636.3164	634.0002	631.8223	629.7078	627.6958	625.7122	623.8079	621.9158	620.2073
10	633.7319	631.6777	629.6631	627.5896	625.5020	623.6147	621.7517	620.0066	618.2419	616.5730	614.8713	613.4504
11	623.4180	621.8125	620.1292	618.2837	616.4104	614.8708	613.2585	611.8125	610.2532	608.8455	607.3171	606.2712
12	613.5500	612.4258	611.0198	609.3325	607.6448	606.5195	605.1128	603.9871	602.5798	601.4536	600.0459	599.4829
13	589.5317	589.7285	588.7771	587.2585	585.9929	586.2217	585.1035	584.9158	583.6670	583.3884	582.0664	583.2190
14	586.1431	586.5420	585.6145	584.0996	582.9048	583.3796	582.2534	582.2329	580.9690	580.8459	579.4990	580.9819
15	582.8606	583.4670	582.5166	580.9856	579.8699	580.6411	579.4539	579.6331	578.3118	578.3792	576.9641	578.8674
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	566.4119	565.6638	564.8936	564.1140	563.3396	562.5571	561.7720	560.9827	560.1897	559.3933	560.9216	563.2634
HB	7841.8	6656.9	6919.2	7348.2	7266.3	5743.6	6195.0	5297.6	5714.0	4919.3	6202.7	4972.7
TSAT	566.4	565.7	564.9	564.1	563.3	562.6	561.8	561.0	560.2	559.4	558.7	558.1
HSAT	7841.8	6656.9	6919.2	7348.2	7266.3	5743.6	6195.0	5297.6	5714.0	4919.3	5383.1	3668.5
P	1192.7	1185.6	1178.4	1171.2	1164.0	1156.8	1149.5	1142.3	1135.1	1127.9	1121.4	1116.0
S.F.	116430.4	108574.0	111345.9	112596.6	109192.5	96253.6	100932.7	92083.4	95995.3	87467.1	91671.8	72615.9
S.TEMP	581.26	581.97	580.99	579.44	578.37	579.32	578.06	578.36	576.99	577.17	575.70	577.87
MASS-FLX	6.9102	6.5887	6.0666	5.9022	5.8235	5.7460	5.7399	5.7099	5.7177	5.7356	5.6566	3.3903
QUALITY	0.96256	0.96727	0.97180	0.97594	0.97997	0.98394	0.98786	0.99178	0.99568	0.99964	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	87.3	84.6	79.0	76.6	75.9	75.0	74.8	74.6	74.6	74.8	73.9	56.0
*S.F.	24300.0	23646.7	22187.7	21593.6	21459.6	21250.3	21254.0	21241.3	21262.3	21363.5	21007.2	15796.3
*S.TEMP	844.84	845.39	845.79	846.07	846.15	846.11	845.98	845.76	845.50	845.17	844.86	845.04
*H.T.MODE	9	9	9	9	9	9	9	9	9	9	8	8

TIME--	4.2000	4.2500	4.3000	4.3500	4.4000	4.4500	4.5000	4.5500	4.6000	4.6500	4.7000	4.7500
NODE												
1	745.1033	739.4780	734.0095	728.6953	723.5322	718.5161	713.6443	708.9138	704.3215	699.8633	695.5374	691.3408
2	712.8516	708.2390	703.7620	699.4138	695.1912	691.0898	687.1062	683.2380	679.4822	675.8369	672.3015	668.8735
3	684.1106	680.4087	676.8176	673.3289	669.9360	666.6379	663.4351	660.3250	657.3059	654.3782	651.5432	648.7979
4	658.5271	655.6406	652.8359	650.1011	647.4307	644.8342	642.3174	639.8760	637.5059	635.2141	633.0054	630.8718
5	644.1919	641.7598	639.3835	637.0510	634.7668	632.5527	630.4160	628.3438	626.3313	624.3970	622.5457	620.7554
6	638.7771	636.5063	634.2766	632.0806	629.9282	627.8501	625.8513	623.9116	622.0281	620.2263	618.5093	616.8438
7	632.2344	630.1716	628.1179	626.0874	624.0964	622.1919	620.3684	618.5925	616.8674	615.2349	613.6892	612.1763
8	624.9170	623.1035	621.2336	619.3804	617.5698	615.8738	614.2588	612.6680	611.1226	609.6960	608.3555	607.0081
9	618.4807	616.9039	615.1611	613.4553	611.8022	610.3088	608.8862	607.4502	606.0625	604.8372	603.6873	602.4700
10	611.9026	610.5828	608.9155	607.3552	605.8635	604.6047	603.3813	602.0869	600.8591	599.8696	598.9204	597.8057
11	604.8545	603.8647	602.1516	600.7671	599.4556	598.5051	597.4902	596.3096	595.2620	594.5854	593.8484	592.7788
12	598.0747	597.5115	595.5396	594.4124	593.2854	592.7219	591.8762	590.7488	589.9031	589.6211	589.0571	587.9290
13	581.2444	582.2610	578.7021	578.7500	578.0581	578.7949	578.1497	576.9458	576.7664	577.8064	577.4529	575.7891
14	578.8171	580.1626	576.2173	576.5615	575.9045	576.8750	576.2085	574.9753	574.9265	576.1943	575.8203	574.0356
15	576.3894	578.1787	573.6736	574.4534	573.7952	575.0500	574.3057	573.0227	573.1426	574.6797	574.2280	572.2749
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	563.8000	567.6565	578.9192	595.7222	617.1462	643.7637	668.9065	688.5696	701.8833	710.5171	713.6658	714.4670
HB	7853.8	7110.9	-14598.7	-3306.3	-1701.2	-906.3	-715.3	-606.9	-486.0	-378.9	-406.4	-452.6
TSAT	557.3	556.7	556.2	555.5	554.9	554.2	553.6	552.9	552.5	552.4	552.0	551.8
HSAT	5006.3	3322.5	5945.4	4119.1	4218.6	3163.4	3456.5	3692.5	3187.5	2398.5	2658.4	3306.1
P	1109.4	1104.0	1099.6	1093.5	1087.4	1082.1	1076.3	1070.3	1067.0	1066.0	1062.6	1060.7
S.F.	89220.3	68139.9	95804.5	73685.6	75523.3	63066.7	68343.3	70723.2	62990.8	51736.5	56987.5	64766.6
S.TEMP	575.16	577.24	572.35	573.44	572.75	574.18	573.36	572.05	572.27	573.97	573.44	571.38
MASS-FLX	0.7061	3.7693	7.0225	10.3426	14.0066	16.4283	19.2424	20.6499	22.4003	26.9929	27.5748	29.6356
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	14.0	43.8	84.3	100.5	120.2	129.1	141.5	146.5	153.1	174.6	177.6	185.7
*S.F.	3971.6	12325.6	22626.5	25344.3	27512.1	26257.4	24658.0	22416.0	21300.4	22654.1	22326.9	23075.5
*S.TEMP	847.41	847.77	846.18	844.31	842.72	841.55	840.91	840.59	840.38	839.88	839.34	838.71
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	4.8000	4.8500	4.9000	4.9500	5.0000	5.0500	5.1000	5.1500	5.2000	5.2500	5.3000	5.3500
NODE												
1	687.2705	683.3232	679.4958	675.7852	672.1875	668.7002	665.3201	662.0442	658.8682	655.7881	652.8005	649.9019
2	665.5500	662.3262	659.1990	656.1658	653.2244	650.3718	647.6052	644.9194	642.3108	639.7747	637.3079	634.9075
3	646.1357	643.5493	641.0376	638.5994	636.2368	633.9438	631.7151	629.5442	627.4258	625.3577	623.3376	621.3625
4	628.7935	626.7605	624.7854	622.8728	621.0227	619.2205	617.4607	615.7314	614.0291	612.3579	610.7173	609.1013
5	618.9922	617.2522	615.5730	613.9541	612.3931	610.8577	609.3499	607.8521	606.3633	604.9028	603.4639	602.0361
6	615.1895	613.5515	611.9827	610.4744	609.0210	607.5811	606.1628	604.7432	603.3291	601.9446	600.5776	599.2146
7	610.6475	609.1277	607.6982	606.3274	605.0085	603.6768	602.3647	601.0327	599.7026	598.4097	597.1274	595.8381
8	605.5991	604.2029	602.9478	601.7368	600.5715	599.3435	598.1445	596.8931	595.6477	594.4614	593.2676	592.0500
9	601.1389	599.8442	598.7715	597.7026	596.6741	595.5103	594.4111	593.2083	592.0325	590.9500	589.8250	588.6575
10	596.5137	595.3250	594.4878	593.5530	592.6650	591.5225	590.5347	589.3481	588.2441	587.2859	586.2134	585.0801
11	591.4636	590.4131	589.9268	589.0935	588.3599	587.1514	586.3254	585.0864	584.0806	583.2944	582.2354	581.1138
12	586.5188	585.6726	585.0726	584.8262	584.2620	582.8511	582.2864	580.8752	580.0283	579.4636	578.3340	577.2043
13	573.9502	573.9741	575.7104	574.2424	574.2693	571.7878	572.4233	570.0134	569.9299	570.0840	568.3899	567.2346
14	572.1311	572.3435	574.3843	572.7158	572.8774	570.1560	571.0732	568.4141	568.5220	568.7856	566.9468	565.8064
15	570.3020	570.7715	573.1719	571.1770	571.5361	568.4814	569.7974	566.7722	567.1611	567.5369	565.4832	564.3838
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	713.4238	710.9500	708.1157	705.4739	703.3706	701.7393	700.2490	698.7559	697.5588	696.3804	695.2654	694.0303
HB	-466.2	-390.0	-294.3	-421.2	-354.7	-469.8	-331.2	-464.9	-362.5	-336.8	-415.1	-395.4
TSAT	551.5	551.2	551.0	550.7	550.4	550.1	549.8	549.3	548.8	548.4	547.9	547.5
HSAT	3766.5	2928.6	1841.7	2888.1	2294.9	3604.3	2232.9	3712.5	2690.1	2350.4	3226.8	3183.6
P	1058.6	1056.0	1053.7	1051.3	1048.9	1046.5	1043.3	1039.3	1035.5	1031.6	1027.9	1024.0
S.F.	67153.5	54968.3	39872.3	56892.1	46990.1	63012.5	43408.2	61761.8	47513.1	43602.4	54188.8	51545.5
S.TEMP	569.37	570.01	572.62	570.39	570.89	567.61	569.20	565.92	566.50	566.93	564.73	563.67
MASS-FLX	32.8787	34.7240	36.4540	38.0169	39.4418	40.8789	42.6982	43.4162	44.4570	45.3304	46.5444	47.2658
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	202.3	212.3	221.1	229.2	236.3	243.4	252.2	256.6	261.1	265.6	270.8	275.4
*S.F.	25085.4	26575.1	28042.4	29413.2	30553.1	31569.5	32748.3	33377.4	33951.2	34513.7	35157.2	35727.5
*S.TEMP	837.79	836.70	835.53	834.29	833.02	831.74	830.43	829.10	827.84	826.58	825.32	824.01
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	5.4000	5.4500	5.5000	5.5500	5.6000	5.6500	5.7000	5.7500	5.8000	5.8500	5.9000	5.9500
NODE												
1	647.0884	644.3502	641.7012	639.1204	636.6111	634.1704	631.7959	629.4849	627.2358	625.0466	622.9146	620.8372
2	632.5686	630.2896	628.0659	625.8965	623.7803	621.7166	619.7053	617.7444	615.8325	613.9670	612.1450	610.3643
3	619.4277	617.5322	615.6748	613.8557	612.0767	610.3416	608.6501	606.9983	605.3826	603.8005	602.2493	600.7241
4	607.5054	605.9319	604.3826	602.8621	601.3779	599.9353	598.5320	597.1514	595.7966	594.4590	593.1387	591.8289
5	600.6121	599.2087	597.8228	596.4663	595.1492	593.8765	592.6382	591.4053	590.1914	588.9824	587.7852	586.5845
6	597.8501	596.5078	595.1812	593.8853	592.6328	591.4277	590.2537	589.0713	587.9102	586.7458	585.5528	584.4290
7	594.5383	593.2705	592.0125	590.7925	589.6221	588.5017	587.4058	586.2783	585.1804	584.0642	582.9634	581.8372
8	590.8118	589.6299	588.4458	587.3147	586.2451	585.2280	584.2188	583.1338	582.1101	581.0364	579.9929	578.8955
9	587.4619	586.3672	585.2419	584.1978	583.2268	582.3083	581.3706	580.2974	579.3523	578.2966	577.3091	576.2183
10	583.9170	582.9321	581.8528	580.9141	580.0579	579.2483	578.3723	577.2710	576.4360	575.3650	574.4500	573.3357
11	579.9714	579.1555	578.0891	577.3027	576.5881	575.9023	575.0649	573.8584	573.2231	572.0564	571.2654	570.0593
12	576.0747	575.5095	574.3794	573.8142	573.2490	572.6838	571.8359	570.4224	570.1396	568.7258	568.1602	566.7458
13	566.1309	566.5518	564.8723	565.2229	565.0098	564.7275	563.6538	561.3491	562.6919	559.8977	560.4561	557.9509
14	564.7078	565.3228	563.4912	564.0422	563.8584	563.6130	562.4795	560.0066	561.7078	558.5725	559.4084	556.6404
15	563.2927	564.1545	562.0891	562.9194	562.7378	562.5261	561.3018	558.6201	560.8147	557.1790	558.4241	555.2756
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	692.8152	691.4670	690.1897	688.9485	687.6392	686.5776	685.5662	684.4365	683.2053	681.9055	680.6699	679.3596
HB	-393.5	-313.7	-403.4	-304.4	-316.5	-309.6	-344.1	-412.0	-233.6	-426.7	-269.5	-415.9
TSAT	547.0	546.6	546.1	545.7	545.2	544.7	544.2	543.6	543.1	542.6	542.1	541.6
HSAT	3297.1	2356.7	3409.4	2305.0	2334.3	2228.2	2596.9	3656.1	1656.5	3865.4	2081.9	3996.3
P	1020.3	1016.5	1012.7	1008.9	1004.8	1000.7	996.4	992.1	987.9	983.5	979.4	975.3
S.F.	51251.9	40106.1	51905.4	38530.3	39711.8	38570.1	42969.8	52134.7	28682.8	53533.6	33070.4	51903.9
S.TEMP	562.58	563.60	561.37	562.38	562.19	561.99	560.71	557.90	560.42	556.44	557.96	554.55
MASS-FLX	48.3904	49.3931	50.3648	51.3439	52.4495	50.3660	50.9387	51.8556	52.2104	52.7041	51.2997	51.3160
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	279.5	284.4	288.9	293.4	299.3	290.9	292.3	296.5	298.5	302.0	297.0	295.2
*S.F.	36241.4	36891.4	37472.5	38032.6	38764.7	37700.0	37839.4	38351.4	38606.7	39047.9	38449.9	38256.5
*S.TEMP	822.76	821.46	820.14	818.81	817.45	816.39	815.25	814.03	812.75	811.48	810.37	809.29
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	6.0000	6.0500	6.1000	6.1500	6.2000	6.2500	6.3000	6.3500	6.4000	6.4500	6.5000	6.5500
NODE												
1	618.8115	616.8359	614.9082	613.0259	611.1880	609.3933	607.6392	605.9253	604.2493	602.6099	601.0054	599.4333
2	608.6213	606.9146	605.2429	603.6074	602.0068	600.4409	598.9072	597.4053	595.9329	594.4866	593.0652	591.6680
3	599.2222	597.7444	596.2935	594.8740	593.4841	592.1223	590.7852	589.4702	588.1741	586.8945	585.6296	584.3833
4	590.5273	589.2446	587.9873	586.7637	585.5645	584.3845	583.2209	582.0681	580.9233	579.7810	578.6467	577.5334
5	585.3840	584.2078	583.0615	581.9565	580.8655	579.7871	578.7195	577.6514	576.5835	575.5085	574.4419	573.4080
6	583.2617	582.1282	581.0261	579.9709	578.9202	577.8784	576.8464	575.8076	574.7661	573.7126	572.6711	571.6709
7	580.7065	579.6279	578.5820	577.5930	576.5874	575.5891	574.5981	573.5898	572.5764	571.5447	570.5332	569.5793
8	577.8003	576.7959	575.8181	574.9155	573.9478	572.9961	572.0493	571.0659	570.0781	569.0620	568.0874	567.2017
9	575.1519	574.2349	573.3201	572.5083	571.5522	570.6426	569.7322	568.7578	567.7505	566.7783	565.8452	565.0405
10	572.3027	571.5105	570.6565	569.9619	568.9744	568.1174	567.2417	566.2566	565.3101	564.2883	563.4172	562.7266
11	569.0862	568.5005	567.6855	567.1614	566.0432	565.2825	564.4348	563.4019	562.4871	561.4297	560.6711	560.1560
12	565.8972	565.6143	564.7654	564.4824	563.0674	562.5012	561.6521	560.5195	559.6699	558.5369	557.9705	557.6870
13	557.7905	558.6240	557.2935	557.9768	555.0598	555.5491	554.4963	552.9260	552.4265	550.9116	551.1987	551.6646
14	556.6611	557.6851	556.2104	557.1016	553.8445	554.6042	553.4688	551.8184	551.4060	549.8030	550.2737	550.8496
15	555.5684	556.8137	555.1099	556.2859	552.5542	553.7175	552.4338	550.6877	550.4050	548.6731	549.3945	550.0820
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	677.8635	676.6587	675.4592	674.3855	673.3357	672.3752	671.5449	670.5854	669.8013	669.0469	668.1672	667.3794
HB	-309.3	-241.8	-337.1	-229.5	-411.1	-249.2	-316.7	-346.7	-295.6	-345.0	-250.7	-221.5
TSAT	541.0	540.5	540.0	539.4	538.8	538.3	537.7	537.1	536.5	536.0	535.4	534.8
HSAT	2711.1	1831.0	2797.4	1649.1	3832.1	1971.6	2669.1	3216.2	2651.7	3444.4	2196.9	1745.1
P	970.9	966.9	962.4	958.0	953.3	948.7	944.4	939.8	935.3	930.8	926.1	921.6
S.F.	37987.8	29080.4	40703.3	27196.4	49934.5	29675.5	37893.3	41773.6	35439.1	41726.3	29880.4	26057.8
S.TEMP	555.04	556.41	554.54	555.91	551.86	553.30	551.91	550.11	549.91	548.09	548.98	549.72
MASS-FLX	51.7790	51.9482	51.7510	52.0120	50.5691	51.1280	49.9574	49.1444	49.3336	47.9788	47.2838	46.8695
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	298.5	298.2	297.8	295.2	293.9	292.8	289.7	286.1	283.2	278.0	278.6	273.0
*S.F.	38801.7	38801.8	38752.8	38414.3	38221.9	38078.3	37632.6	37163.2	36769.6	36047.6	36109.1	35352.3
*S.TEMP	808.13	806.98	805.80	804.71	803.61	802.62	801.63	800.63	799.73	798.84	797.95	797.14
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	6.6000	6.6500	6.7000	6.7500	6.8000	6.8500	6.9000	6.9500	7.0000	7.0500	7.1000	7.1500
NODE												
1	597.8936	596.3845	594.9063	593.4578	592.0376	590.6458	589.2817	587.9443	586.6333	585.3484	584.0886	582.8535
2	590.2964	588.9514	587.6333	586.3408	585.0725	583.8281	582.6069	581.4094	580.2356	579.0847	577.9558	576.8464
3	583.1619	581.9680	580.7988	579.6499	578.5203	577.4106	576.3210	575.2532	574.2078	573.1831	572.1746	571.1790
4	576.4536	575.4058	574.3767	573.3572	572.3511	571.3660	570.3982	569.4521	568.5293	567.6233	566.7229	565.8240
5	572.4207	571.4673	570.5190	569.5676	568.6318	567.7209	566.8252	565.9531	565.1067	564.2698	563.4246	562.5745
6	570.7263	569.8125	568.8945	567.9663	567.0588	566.1787	565.3113	564.4705	563.6560	562.8474	562.0190	561.1841
7	568.6948	567.8323	566.9460	566.0408	565.1682	564.3291	563.4958	562.6956	561.9219	561.1445	560.3303	559.5110
8	566.4014	565.5979	564.7341	563.8447	563.0193	562.2324	561.4346	560.6860	559.9622	559.2153	558.4014	557.5955
9	564.3330	563.5757	562.7117	561.8281	561.0588	560.3264	559.5530	558.8613	558.1848	557.4546	556.6223	555.8303
10	562.1355	561.4075	560.5134	559.6292	558.9460	558.2751	557.5139	556.8994	556.2732	555.5439	554.6638	553.8962
11	559.7151	558.9712	557.9890	557.1072	556.5774	555.9734	555.1934	554.7063	554.1257	553.3621	552.3826	551.6768
12	557.4038	556.5537	555.4204	554.5703	554.2866	553.7197	552.8691	552.5857	552.0186	551.1677	550.0332	549.4661
13	551.7542	550.2495	548.5535	547.9775	548.6777	547.9971	546.7754	547.3777	546.6392	545.3794	543.6731	543.8354
14	550.9778	549.3237	547.5425	547.0466	547.9297	547.1838	545.8899	546.6812	545.8713	544.5359	542.7344	543.0649
15	550.2310	548.3706	546.5029	546.1279	547.2361	546.3694	544.9883	546.0359	545.0584	543.6716	541.7615	542.3320
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	666.6731	665.7852	665.0811	663.9995	663.4434	662.0598	660.8467	659.5747	658.5977	658.0276	657.3962	656.9001
HB	-222.5	-302.8	-325.1	-275.4	-196.3	-254.5	-285.8	-187.0	-247.2	-278.3	-312.7	-216.6
TSAT	534.3	533.7	533.1	532.4	532.0	531.3	530.8	530.3	529.7	529.1	528.4	527.8
HSAT	1664.7	2513.0	3018.3	2461.6	1531.5	2022.0	2427.3	1374.5	1872.3	2260.1	2833.2	1755.7
P	917.4	912.9	908.8	903.5	900.0	895.2	891.3	886.9	882.5	878.2	873.3	868.7
S.F.	25992.9	35706.9	38720.8	32589.1	22869.4	29549.7	33246.0	21283.6	28159.9	31953.8	36317.2	24891.6
S.TEMP	549.87	547.87	545.96	545.67	546.92	545.96	544.52	545.74	544.70	543.22	541.25	541.98
MASS-FLX	45.8187	45.8000	44.7122	44.0926	43.0409	42.1842	42.0576	40.0523	39.7244	39.1098	37.9194	37.8802
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	268.1	269.8	262.2	265.3	252.1	254.7	248.2	240.4	237.7	233.9	228.9	228.7
*S.F.	34720.8	34940.7	33944.6	34486.6	32660.4	33167.5	32466.7	31543.4	31272.0	30756.2	30090.3	30028.1
*S.TEMP	796.31	795.46	794.70	793.83	793.24	792.40	791.72	790.96	790.22	789.55	788.87	788.23
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	7.2000	7.2500	7.3000	7.3500	7.4000	7.4500	7.5000	7.5500	7.6000	7.6500	7.7000	7.7500
NODE												
1	581.6416	580.4526	579.2852	578.1392	577.0129	575.9058	574.8184	573.7485	572.6960	571.6611	570.6431	569.6423
2	575.7561	574.6841	573.6304	572.5925	571.5698	570.5618	569.5703	568.5942	567.6333	566.6873	565.7559	564.8396
3	570.1975	569.2302	568.2773	567.3350	566.4026	565.4829	564.5796	563.6902	562.8135	561.9490	561.0979	560.2595
4	564.9365	564.0654	563.2031	562.3416	561.4861	560.6475	559.8291	559.0208	558.2209	557.4324	556.6558	555.8906
5	561.7397	560.9270	560.1138	559.2915	558.4775	557.6904	556.9285	556.1655	555.4097	554.6655	553.9331	553.2129
6	560.3716	559.5845	558.7886	557.9775	557.1794	556.4160	555.6802	554.9336	554.1943	553.4685	552.7556	552.0525
7	558.7278	557.9734	557.1956	556.3936	555.6162	554.8860	554.1841	553.4531	552.7349	552.0320	551.3416	550.6609
8	556.8547	556.1438	555.3750	554.5725	553.8252	553.1458	552.4873	551.7615	551.0671	550.3531	549.7300	549.0742
9	555.1418	554.4741	553.8958	552.8843	552.1768	551.5574	550.9399	550.1985	549.5337	548.8884	548.2500	547.6165
10	553.2876	552.6672	551.8479	551.0178	550.3772	549.8411	549.2639	548.4722	547.8564	547.2449	546.6318	546.0210
11	551.2021	550.6200	549.8970	548.8433	548.3354	547.9175	547.3665	546.4519	545.9456	545.3684	544.7805	544.1924
12	549.1824	548.6147	547.4797	546.6282	546.3442	546.0605	545.4927	544.3569	544.0730	543.5051	542.9370	542.3691
13	544.2075	543.4561	541.4260	540.7788	541.4319	541.4663	540.6550	538.5867	539.4375	538.6890	538.1650	537.6458
14	543.5361	542.7180	540.5188	539.9504	540.7795	540.8352	539.9595	537.7180	538.8323	537.9998	537.4900	536.9771
15	542.9028	541.9756	539.5623	539.1279	540.1780	540.2268	539.2566	536.7976	538.2844	537.3032	536.8196	536.3123
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	656.5063	656.1147	655.7427	655.3987	655.0701	654.7563	654.4607	654.1821	653.8552	653.6570	653.5676	653.4246
HB	-188.0	-236.4	-311.4	-250.2	-170.9	-184.3	-222.7	-297.9	-148.8	-218.3	-204.8	-202.4
TSAT	527.2	526.6	525.9	525.3	524.7	524.0	523.4	522.7	522.1	521.4	520.8	520.1
HSAT	1389.2	1800.4	2708.7	2175.2	1291.6	1330.3	1659.3	2588.8	1078.5	1639.1	1524.5	1493.0
P	864.1	859.5	854.8	850.2	845.6	841.0	836.4	831.8	826.9	822.2	817.6	812.7
S.F.	21410.2	27068.4	36337.7	29194.2	19682.4	21158.9	25736.4	35110.4	17230.1	25472.4	23977.4	23775.5
S.TEMP	542.60	541.60	539.05	538.72	539.90	539.93	538.90	536.31	538.04	536.95	536.48	535.98
MASS-FLX	37.2472	36.3986	35.7877	35.1700	34.4872	33.8120	33.1391	32.4550	31.8386	31.0526	29.2288	27.5457
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	224.8	220.5	217.4	214.1	210.4	206.9	203.3	199.7	196.2	191.7	181.8	174.2
*S.F.	29467.5	28856.8	28404.8	27922.1	27401.5	26893.2	26385.5	25870.3	25386.1	24764.6	23442.1	22422.6
*S.TEMP	787.63	787.02	786.43	785.86	785.31	784.77	784.25	783.75	783.26	782.84	782.49	782.14
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	7.8000	7.8500	7.9000	7.9500	8.0000	8.0500	8.1000	8.1500	8.2000	8.2500	8.3000	8.3500
NODE												
1	568.6577	567.6890	566.7363	565.8008	564.8821	563.9783	563.0896	562.2139	561.3511	560.5000	559.6604	558.8333
2	563.9370	563.0505	562.1814	561.3298	560.4939	559.6704	558.8550	558.0464	557.2456	556.4548	555.6763	554.9104
3	559.4355	558.6289	557.8440	557.0784	556.3240	555.5688	554.8113	554.0535	553.3040	552.5691	551.8513	551.1482
4	555.1416	554.4170	553.7239	553.0459	552.3633	551.6550	550.9314	550.2092	549.5071	548.8337	548.1831	547.5449
5	552.5117	551.8462	551.2190	550.5950	549.9429	549.2378	548.5186	547.8142	547.1504	546.5273	545.9277	545.3303
6	551.3728	550.7383	550.1418	549.5383	548.8906	548.1753	547.4534	546.7585	546.1165	545.5208	544.9458	544.3630
7	550.0090	549.4146	548.8643	548.2795	547.6274	546.8845	546.1592	545.4819	544.8757	544.3198	543.7759	543.2068
8	548.4607	547.9277	547.4358	546.8577	546.1772	545.3762	544.6538	544.0110	543.4646	542.9658	542.4568	541.8916
9	547.0457	546.5850	546.1514	545.5540	544.8215	543.9397	543.2422	542.6501	542.1794	541.7400	541.2561	540.6780
10	545.5088	545.1497	544.7798	544.1174	543.2964	542.2939	541.6709	541.1580	540.7949	540.4216	539.9497	539.3320
11	543.7732	543.5684	543.2605	542.4319	541.4668	540.2795	539.8613	539.4651	539.2622	538.9526	538.4592	537.7522
12	542.0850	542.0850	541.8010	540.6643	539.5276	538.1064	538.1064	537.8223	537.8223	537.5381	536.9692	536.1162
13	537.8843	538.5737	538.1423	535.6628	534.1157	531.9319	533.9453	533.7239	534.4094	533.9805	533.0276	531.6223
14	537.3157	538.1105	537.6245	534.8850	533.3159	531.0046	533.4473	533.1523	533.9675	533.4775	532.4519	530.9548
15	536.7776	537.7019	537.1060	534.0356	532.4863	530.0254	533.0527	532.5906	533.5669	532.9724	531.8591	530.2563
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	653.4475	653.5982	653.5967	653.5715	653.6758	653.9958	654.4036	655.0391	655.7588	656.4526	657.0718	657.5923
HB	-155.3	-114.4	-101.1	-278.0	-252.9	-297.8	-82.2	-163.9	-103.7	-147.7	-175.1	-205.6
TSAT	519.4	518.7	518.1	517.4	516.7	516.0	515.3	514.6	513.9	513.2	512.4	511.7
HSAT	1059.9	707.4	1001.3	2058.4	2002.4	2752.8	567.9	1136.4	650.9	934.5	1149.9	1443.9
P	808.1	803.5	798.7	793.9	789.3	784.8	779.9	775.0	770.1	765.3	760.4	755.5
S.F.	18155.4	13276.0	18810.0	33357.2	30758.5	37068.1	9991.5	20117.2	12695.2	18274.9	21984.4	26259.7
S.TEMP	536.52	537.52	536.84	533.57	532.05	529.50	532.91	532.31	533.39	532.72	531.55	529.89
MASS-FLX	26.4293	24.8653	24.3357	23.6838	22.5294	21.2630	19.7856	18.6452	17.5729	16.5013	15.4195	14.2906
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	167.6	163.6	159.8	152.0	148.7	140.2	132.9	126.1	120.0	113.9	107.7	101.2
*S.F.	21509.5	20959.1	20432.3	19390.7	18950.9	17798.5	16812.7	15866.6	15015.8	14167.0	13330.3	12480.5
*S.TEMP	781.82	781.57	781.36	781.21	781.03	780.91	780.80	780.77	780.74	780.74	780.75	780.79
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	8.4000	8.4500	8.5000	8.5500	8.6000	8.6500	8.7000	8.7500	8.8000	8.8500	8.9000	8.9500
NODE												
1	558.0183	557.2151	556.4229	555.6396	554.8657	554.1013	553.3459	552.5994	551.8611	551.1306	550.4065	549.6865
2	554.1565	553.4109	552.6716	551.9380	551.2112	550.4924	549.7827	549.0813	548.3860	547.6938	547.0015	546.3064
3	550.4526	549.7573	549.0613	548.3660	547.6787	547.0029	546.3389	545.6809	545.0227	544.3569	543.6809	542.9951
4	546.9004	546.2410	545.5715	544.9050	544.2571	543.6299	543.0139	542.3955	541.7622	541.1030	540.4216	539.7283
5	544.7056	544.0505	543.3872	542.7368	542.1216	541.5332	540.9482	540.3472	539.7146	539.0391	538.3381	537.6318
6	543.7395	543.0786	542.4150	541.7739	541.1775	540.6091	540.0359	539.4385	538.7979	538.1064	537.3923	536.6794
7	542.5764	541.9001	541.2363	540.6094	540.0447	539.5042	538.9424	538.3425	537.6846	536.9646	536.2319	535.5125
8	541.2334	540.5269	539.8672	539.2681	538.7563	538.2510	537.6929	537.0779	536.3823	535.6138	534.8589	534.1384
9	539.9702	539.2263	538.5833	538.0239	537.5796	537.1040	536.5337	535.8911	535.1428	534.3140	533.5461	532.8345
10	538.5403	537.7495	537.1504	536.6531	536.3057	535.8508	535.2422	534.5522	533.7227	532.8120	532.0479	531.3604
11	536.8154	535.9761	535.4863	535.0864	534.8896	534.4185	533.7178	532.9519	531.9912	530.9702	530.2585	529.6213
12	534.9788	534.1252	533.8408	533.5564	533.5564	532.9873	532.1335	531.2795	530.1409	529.0017	528.4324	527.8628
13	529.8000	529.1155	529.7285	529.7207	530.3938	529.1802	527.7559	526.6907	524.9211	523.4578	523.6770	523.2678
14	529.0239	528.4038	529.1882	529.1936	529.9846	528.6143	527.1033	526.0227	524.1421	522.6919	523.0334	522.6238
15	528.2039	527.6929	528.6924	528.6855	529.6169	528.0183	526.4199	525.3389	523.3208	521.8604	522.4224	521.9866
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	658.0303	658.3914	658.0772	658.8816	659.0835	659.1965	659.4758	659.7520	659.7725	659.3977	658.6956	657.7336
HB	-238.0	-192.9	-122.6	-135.3	-89.5	-172.2	-192.7	-185.8	-225.8	-221.5	-149.7	-166.0
TSAT	511.0	510.2	509.5	508.7	508.0	507.3	506.7	506.0	505.3	504.5	503.8	503.1
HSAT	1844.9	1477.6	841.0	896.1	541.8	1112.4	1324.7	1315.8	1753.6	1806.2	1112.4	1218.8
P	750.6	745.8	740.9	736.0	731.4	727.0	722.5	718.0	713.6	708.8	704.1	700.2
S.F.	30999.7	25280.9	15904.5	17649.6	11604.0	22637.7	25704.5	25039.7	30914.8	30556.7	20447.0	22584.1
S.TEMP	527.77	527.34	528.47	528.44	529.45	527.70	526.06	524.99	522.88	521.43	522.13	521.67
MASS-FLX	13.1422	11.9904	10.8349	9.5494	7.8857	6.8768	5.8295	4.7501	3.5752	2.9080	1.6549	0.6515
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	94.5	87.7	80.9	73.3	63.2	56.1	49.4	42.2	34.1	25.4	12.4	5.0
*S.F.	11620.5	10753.3	9910.2	8966.8	7741.7	6879.8	6051.2	5174.1	4192.1	3136.0	1542.5	628.6
*S.TEMP	780.86	780.95	781.07	781.23	781.45	781.71	781.97	782.24	782.55	782.92	783.34	783.77
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	9.0000	9.0500	9.1000	9.1500	9.2000	9.2500	9.3000	9.3500	9.4000	9.4500	9.5000	9.5500
NODE												
1	548.9707	548.2576	547.5469	546.8384	546.1313	545.4265	544.7244	544.0259	543.3318	542.6421	541.9570	541.2766
2	545.6101	544.9133	544.2153	543.5176	542.8223	542.1301	541.4438	540.7649	540.0923	539.4258	538.7651	538.1096
3	542.3071	541.6172	540.9260	540.2349	539.5496	538.8750	538.2117	537.5583	536.9141	536.2749	535.6396	535.0095
4	539.0413	538.3555	537.6665	536.9807	536.3130	535.6660	535.0364	534.4177	533.8062	533.1941	532.5823	531.9795
5	536.9512	536.2676	535.5769	534.8960	534.2495	533.6333	533.0320	532.4390	531.8479	531.2478	530.6489	530.0649
6	536.0056	535.3215	534.6282	533.9509	533.3198	532.7205	532.1335	531.5510	530.9683	530.3701	529.7756	529.2019
7	534.8557	534.1689	533.4707	532.8015	532.1975	531.6235	531.0549	530.4849	529.9109	529.3118	528.7236	528.1650
8	533.5200	532.8215	532.1150	531.4641	530.9094	530.3706	529.8220	529.2637	528.6968	528.0881	527.5100	526.9768
9	532.2766	531.5449	530.8298	530.2095	529.7217	529.2156	528.6809	528.1282	527.5649	526.9375	526.3755	525.8752
10	530.9043	530.0920	529.3728	528.8083	528.4226	527.9426	527.4131	526.8611	526.2993	525.6345	525.1069	524.6555
11	529.3469	528.3315	527.0389	527.1836	526.9631	526.4783	525.9363	525.3774	524.8125	524.0752	523.6284	523.2532
12	527.8628	526.4382	525.8684	525.5835	525.5835	525.0134	524.4434	523.8733	523.3030	522.4478	522.1626	521.8774
13	524.3347	520.9041	521.2400	521.5701	522.3013	521.1160	520.4763	519.8777	519.2947	517.9514	518.4626	518.3940
14	523.8906	520.0220	520.0194	521.0327	521.8789	520.5391	519.9111	519.3091	518.7263	517.2869	517.9773	517.9165
15	523.5076	519.0303	520.0405	520.5286	521.5020	519.9346	519.3418	518.7390	518.1553	516.5945	517.5308	517.4521
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	656.4377	654.5771	652.3132	649.2090	644.8274	640.4653	637.3459	635.0576	633.5320	631.8594	629.2908	623.3259
HB	-85.7	-292.4	-141.7	-130.6	-96.1	-188.9	-172.4	-175.5	-176.7	-223.5	-127.2	-152.0
TSAT	502.3	501.6	501.4	501.0	500.7	500.3	500.0	499.7	499.3	498.9	498.5	498.5
HSAT	542.1	2362.8	1020.3	870.8	574.9	1184.3	1067.8	1090.7	1101.5	1494.7	756.6	859.4
P	694.9	690.7	689.1	686.6	684.9	682.7	680.4	678.8	676.5	674.2	671.5	671.3
S.F.	11410.8	39799.1	18782.8	16833.7	11870.8	22833.5	20398.2	20463.9	20433.7	25842.2	14247.0	16126.2
S.TEMP	523.35	518.47	519.77	520.29	521.33	519.61	519.05	518.45	517.87	516.23	517.33	517.22
MASS-FLX	1.3820	0.9419	3.3313	4.2927	6.0282	8.2744	8.8093	12.1929	13.2826	13.5675	11.9511	19.3543
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	17.2	10.8	33.8	29.6	49.2	61.3	68.0	84.5	93.6	95.4	88.7	133.1
*S.F.	2195.0	1405.9	4434.1	3959.0	6773.8	8665.3	9791.8	12271.8	13669.9	13999.5	13171.1	20324.5
*S.TEMP	783.99	784.21	783.99	783.87	783.25	782.57	781.79	780.68	779.74	778.95	778.37	777.57
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	9.6000	9.6500	9.7000	9.7500	9.8000	9.8500	9.9000	9.9500	10.0000	10.0500	10.1000	10.1500
NODE												
1	540.6016	539.9316	539.2673	538.6082	537.9543	537.3062	536.6643	536.0278	535.3960	534.7688	534.1470	533.5288
2	537.4602	536.8174	536.1797	535.5474	534.9214	534.3027	533.6897	533.0803	532.4739	531.8706	531.2717	530.6758
3	534.3889	533.7739	533.1638	532.5588	531.9629	531.3765	530.7915	530.2053	529.6184	529.0361	528.4595	527.8811
4	531.3904	530.8047	530.2207	529.6421	529.0801	528.5291	527.9683	527.3948	526.8213	526.2598	525.7051	525.1387
5	529.5020	528.9326	528.3613	527.8003	527.2666	526.7422	526.1855	525.6079	525.0405	524.4576	523.9604	523.3904
6	528.6536	528.0889	527.5215	526.9683	526.4514	525.9395	525.3767	524.7917	524.2290	523.6582	523.1687	522.5884
7	527.6379	527.0747	526.5105	525.9697	525.4792	524.9807	524.3997	523.8030	523.2512	522.7412	522.2192	521.6177
8	526.4814	525.9065	525.3457	524.8252	524.3777	523.8896	523.2634	522.6494	522.1235	521.6484	521.1304	520.4810
9	525.4167	524.8105	524.2563	523.7632	523.3708	522.8794	522.1785	521.5544	521.0742	520.6411	520.1143	519.3887
10	524.2444	523.5667	523.0327	522.5828	522.2729	521.7507	520.9182	520.3047	519.9092	519.5308	518.9685	518.1138
11	522.9038	522.0615	521.5979	521.2207	521.0415	520.4158	519.3425	518.8142	518.5793	518.2629	517.6011	516.5139
12	521.5923	520.4512	520.1660	519.8806	519.8806	519.0247	517.5977	517.3123	517.3123	517.0266	516.1702	514.7424
13	518.2612	515.7847	516.5457	516.4797	517.1140	515.0874	512.3967	513.5193	514.2900	513.8691	512.1318	509.4722
14	517.8018	515.0569	516.0801	516.0127	516.7593	514.4753	511.5896	513.0437	513.9060	513.4236	511.5173	508.6560
15	517.3525	514.2554	515.6653	515.5593	516.4436	513.8030	510.7046	512.6348	513.5654	512.9758	510.8552	507.7649
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	612.0776	596.7256	580.6440	571.7139	567.4985	564.7451	562.6448	561.2024	559.0540	557.3826	555.2852	553.0244
HB	-164.3	-379.5	-192.8	-279.8	-191.7	-515.1	-653.9	-240.1	-231.9	-362.1	-567.2	-753.2
TSAT	497.9	497.5	497.1	496.6	496.3	495.7	495.3	494.9	494.4	494.0	493.6	493.2
HSAT	810.1	1928.4	682.6	843.5	490.9	1490.1	2302.1	665.1	557.3	860.6	1503.5	2453.6
P	667.7	665.4	663.0	660.3	658.4	654.6	652.5	649.8	647.1	644.4	642.3	640.1
S.F.	15603.6	31469.3	12562.8	15774.3	9812.3	26434.5	34280.5	11701.9	10584.5	16161.7	25403.0	34455.9
S.TEMP	517.13	513.81	515.49	515.34	516.30	513.43	510.22	512.47	513.42	512.75	510.49	507.28
MASS-FLX	17.3832	20.0462	20.3075	21.2207	23.4748	21.2030	22.8881	22.5263	23.5751	24.1213	24.8687	24.6702
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	114.1	129.7	135.1	141.9	160.5	149.6	153.5	150.0	148.8	160.3	163.1	171.4
*S.F.	18434.2	22893.6	25625.3	28114.6	32359.7	30321.5	31205.6	30504.1	30376.7	32764.0	33448.4	35309.1
*S.TEMP	776.30	774.84	772.94	771.11	769.34	767.60	766.23	764.56	763.46	762.07	760.73	759.25
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	10.2000	10.2500	10.3000	10.3500	10.4000	10.4500	10.5000	10.5500	10.6000	10.6500	10.7000	10.7500
NODE												
1	532.9146	532.3037	531.6956	531.0898	530.4868	529.8865	529.2881	528.6914	528.0947	527.4966	526.8965	526.2930
2	530.0808	529.4863	528.8926	528.3003	527.7109	527.1243	526.5388	525.9507	525.3567	524.7544	524.1448	523.5291
3	527.2998	526.7146	526.1306	525.5493	524.9741	524.4019	523.8257	523.2378	522.6318	522.0105	521.3787	520.7434
4	524.5618	523.9778	523.4016	522.8347	522.2786	521.7209	521.1445	520.5391	519.8982	519.2405	518.5815	517.9268
5	522.8081	522.2178	521.6519	521.0989	520.5593	520.0066	519.4177	518.7825	518.0994	517.4106	516.7368	516.0769
6	522.0022	521.4070	520.8501	520.3054	519.7744	519.2205	518.6182	517.9604	517.2495	516.5479	515.8699	515.2114
7	521.0244	520.4231	519.8845	519.3516	518.8335	518.2725	517.6453	516.9514	516.1997	515.4866	514.8110	514.1584
8	519.8845	519.2747	518.7756	518.2561	517.7551	517.1738	516.4998	515.7488	514.9380	514.2280	513.5679	512.9292
9	518.8059	518.1851	517.7493	517.2351	516.7524	516.1321	515.3950	514.5769	513.7031	513.0237	512.3901	511.7688
10	517.5828	516.9409	516.6174	516.0867	515.6316	514.9351	514.1025	513.1956	512.2437	511.6479	511.0525	510.4514
11	516.1465	515.4448	514.8450	514.7263	514.3254	513.4673	512.4905	511.4668	510.4180	510.0293	509.4729	508.8914
12	514.7424	513.8855	514.1711	513.3142	513.0283	511.8855	510.7419	509.5984	508.4543	508.4543	508.4543	507.8823
13	511.3887	509.5309	511.5767	509.3179	509.7205	507.2712	505.7251	504.2917	502.9165	504.6843	503.6570	503.1069
14	511.0020	508.8707	511.2974	508.6907	509.2856	506.5537	504.9854	503.5166	502.1125	504.2373	503.0452	502.5151
15	510.7126	508.1628	511.1147	507.9912	508.8857	505.7617	504.2144	502.7148	501.2852	503.8804	502.4109	501.9243
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	548.7556	548.4944	546.4065	545.0046	540.8459	535.6357	534.9285	532.0537	528.8157	526.2844	524.2205	521.1267
HB	-167.1	-680.1	-75.9	-745.6	-393.6	-1024.0	-912.1	-986.1	-1077.6	-402.2	-1063.7	-1069.9
TSAT	492.9	492.6	492.2	492.0	491.6	491.2	490.8	490.5	490.1	485.7	489.4	488.8
HSAT	360.2	1822.7	142.4	1790.1	738.0	2203.5	2190.0	2485.9	2805.2	646.5	1853.7	1631.7
P	638.4	636.3	634.4	633.0	630.4	628.5	626.3	624.2	622.1	619.9	617.8	614.8
S.F.	6372.0	27695.8	2680.8	27893.8	12651.2	31041.5	28383.9	29342.0	30130.3	9063.1	23557.0	20863.0
S.TEMP	510.62	507.77	511.08	507.60	508.71	505.32	503.81	502.30	500.86	503.75	502.08	501.63
MASS-FLX	26.5438	26.7417	28.3023	30.4538	30.4078	30.1945	31.2354	31.2262	31.8269	32.9810	33.1773	32.8719
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	157.5	177.8	182.0	187.3	193.6	195.0	203.6	205.6	209.4	213.5	215.1	213.8
*S.F.	32890.0	36942.5	37834.9	38936.0	40505.1	41435.1	43257.6	44009.2	44992.9	45979.2	46475.0	46476.8
*S.TEMP	757.83	756.13	754.60	753.00	751.27	749.44	747.61	745.89	744.06	742.28	740.48	738.62
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	10.8000	10.8500	10.9000	10.9500	11.0000	11.0500	11.1000	11.1500	11.2000	11.2500	11.3000	11.3500
NODE												
1	525.6863	525.0754	524.4592	523.8384	523.2114	522.5796	521.9441	521.3062	520.6670	520.0251	519.3818	518.7368
2	522.9070	522.2788	521.6428	520.9990	520.3503	519.6985	519.0476	518.3989	517.7529	517.1062	516.4583	515.8057
3	520.1021	519.4504	518.7886	518.1179	517.4456	516.7798	516.1235	515.4766	514.8323	514.1851	513.5305	512.8652
4	517.2654	516.5835	515.8884	515.1870	514.4985	513.8318	513.1897	512.5583	511.9194	511.2686	510.6001	509.9089
5	515.4001	514.6880	513.9678	513.2461	512.5596	511.9089	511.2920	510.6763	510.0342	509.3723	508.6841	507.9639
6	514.5247	513.7932	513.0598	512.3291	511.6504	511.0137	510.4136	509.8037	509.1545	508.4829	507.7813	507.0408
7	513.4551	512.6929	511.9463	511.2070	510.5491	509.9368	509.3625	508.7571	508.0911	507.4058	506.6824	505.9126
8	512.1929	511.3811	510.6282	509.8838	509.2744	508.7014	508.1655	507.5535	506.8508	506.1462	505.3899	504.5762
9	510.9785	510.1069	509.3652	508.6187	508.0862	507.5549	507.0596	506.4219	505.6646	504.9441	504.1479	503.2825
10	509.5613	508.6084	507.9126	507.1624	506.7642	506.2742	505.8291	505.1265	504.2822	503.5559	502.6987	501.7632
11	507.7993	506.7400	506.1792	505.4060	505.2661	504.7871	504.4092	503.5515	502.5684	501.8760	500.9106	499.8755
12	505.8796	504.7349	504.4485	503.5896	503.8760	503.3035	503.0171	501.8713	500.7256	500.1526	499.0061	497.8594
13	500.2361	499.0886	500.0898	498.6062	500.7546	499.3286	499.4690	497.0020	495.4614	495.5942	493.5916	492.1724
14	499.3635	498.2798	499.5349	497.8745	500.4094	498.7361	498.9934	496.2505	494.6902	494.9810	492.7839	491.3484
15	498.4075	497.4587	499.0430	497.1077	500.1672	498.1040	498.5415	495.4260	493.8894	494.3987	491.9241	490.5010
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	518.8835	515.6619	512.9790	506.6147	506.3337	504.0735	501.1497	497.1184	494.9893	489.4873	484.2834	483.6174
HB	-1765.0	-1572.1	-1053.1	-2884.9	-733.9	-3827.8	-5289.9	-14898.9	-19275.2	4161.4	4512.7	4758.4
TSAT	488.5	488.1	487.7	487.3	486.8	486.4	486.0	485.5	485.1	484.6	484.3	483.6
HSAT	3941.0	3274.0	1335.8	3042.7	345.1	2123.7	1206.0	3373.4	3480.0	2029.3	4512.7	4758.4
P	612.7	610.6	608.2	606.1	603.6	600.9	598.6	595.9	593.6	591.2	589.4	585.7
S.F.	37073.4	29275.5	14910.2	28605.6	4573.8	24170.6	14924.3	32031.2	29270.4	19289.1	32388.8	30664.6
S.TEMP	497.88	497.04	498.83	496.70	500.10	497.76	498.33	494.97	493.47	494.12	491.46	490.06
MASS-FLX	33.2910	34.8095	34.7904	36.7690	35.3927	35.3303	35.2946	35.8232	36.3118	37.3747	33.6139	32.1616
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.99817	0.99746	
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	214.1	226.9	235.3	233.9	231.8	234.3	229.8	236.5	238.0	251.0	224.9	302.6
*S.F.	46465.4	49707.8	52147.5	51666.2	51289.2	52245.3	51386.3	53519.4	53821.1	57567.3	52301.8	69010.7
*S.TEMP	737.07	735.08	733.03	730.92	729.12	727.18	725.52	723.53	721.59	719.24	716.94	711.61
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	3

TIME--	11.4000	11.4500	11.5000	11.5500	11.6000	11.6500	11.7000	11.7500	11.8000	11.8500	11.9000	11.9500
NODE												
1	518.0889	517.4365	516.7798	516.1182	515.4517	514.7798	514.1021	513.4185	512.7290	512.0330	511.3303	510.6213
2	515.1455	514.4771	513.8015	513.1204	512.4326	511.7383	511.0374	510.3301	509.6150	508.8933	508.1650	507.4299
3	512.1841	511.4893	510.7893	510.0847	509.3755	508.6577	507.9314	507.1980	506.4556	505.7068	504.9519	504.1877
4	509.1887	508.4602	507.7351	507.0125	506.2795	505.5339	504.7808	504.0178	503.2454	502.4702	501.6885	500.8950
5	507.2048	506.4512	505.7180	504.9866	504.2363	503.4675	502.6946	501.9116	501.1179	500.3264	499.5278	498.7100
6	506.2583	505.4946	504.7625	504.0276	503.2659	502.4827	501.7007	500.9072	500.1013	499.3035	498.4956	497.6638
7	505.0964	504.3281	503.5042	502.8655	502.0852	501.2822	500.4924	499.6851	498.8655	498.0625	497.2439	496.3921
8	503.7124	502.9570	502.2571	501.5100	500.6985	499.8704	499.0771	498.2510	497.4143	496.6138	495.7798	494.8984
9	502.3672	501.6521	500.9871	500.2202	499.3667	498.5132	497.7278	496.8777	496.0247	495.2358	494.3811	493.4636
10	500.7830	500.1619	499.5447	498.7302	497.8105	496.9324	496.1721	495.2805	494.4099	493.6499	492.7556	491.7847
11	498.8120	498.4109	497.8433	496.9124	495.8882	494.9973	494.3032	493.3230	492.4414	491.7483	490.7666	489.7134
12	496.7126	496.7126	496.1392	494.9915	493.8442	492.9832	492.4089	491.2605	490.3992	489.8247	488.6755	487.5259
13	490.8225	492.6306	491.0226	489.5283	488.0811	487.5005	487.4258	485.4468	484.8430	484.7651	482.7874	481.3997
14	489.9739	492.1458	490.9734	488.7119	487.2480	486.7378	486.7493	484.5884	484.0706	484.0789	481.9187	480.5208
15	489.1047	491.7527	490.3042	487.8403	486.3892	485.9807	486.0950	483.6804	483.3030	483.4150	481.0007	479.6206
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	483.0557	482.5493	482.1277	481.5679	481.1057	480.5735	479.9236	479.3159	478.9255	478.3718	477.8535	477.2065
HB	5598.8	1120.6	3143.8	5635.9	6409.2	5219.4	3780.2	8727.4	6637.8	4751.0	12848.8	16540.1
TSAT	483.1	482.5	482.1	481.6	481.1	480.6	479.9	479.3	478.9	478.4	477.9	477.2
HSAT	5598.8	1120.6	3143.8	5635.9	6409.2	5219.4	3780.2	8727.4	6637.8	4751.0	12848.8	16540.1
P	582.6	579.9	577.6	574.6	572.1	569.2	565.7	562.5	560.4	557.5	554.8	551.4
S.F.	31351.0	10150.1	24597.4	32709.2	31010.0	26254.8	22127.6	33848.6	26525.4	22427.9	34132.8	32248.3
S.TEMP	488.66	491.61	489.95	487.37	485.94	485.60	485.78	483.19	482.92	483.09	480.51	479.16
MASS-FLX	32.9320	33.7316	34.8562	32.7953	33.4458	33.7906	33.1413	32.5738	33.0109	33.0177	33.2204	32.3259
QUALITY	0.99571	0.98802	0.99061	0.98431	0.99601	0.99653	0.94751	0.97536	0.98775	0.97756	0.97510	0.97050
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	434.3	453.3	655.9	644.7	967.2	1161.2	574.2	840.9	1461.6	1464.5	1636.2	1523.6
*S.F.	95700.1	97285.8	134013.5	125492.2	177836.0	200180.9	94754.3	131926.2	210826.4	198321.1	206720.3	185089.5
*S.TEMP	703.53	697.28	686.50	676.29	665.03	653.04	645.17	636.19	623.25	613.92	604.24	598.55
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	12.0000	12.0500	12.1000	12.1500	12.2000	12.2500	12.3000	12.3500	12.4000	12.4500	12.5000	12.5500
NODE												
1	509.9060	509.1824	508.4504	507.7097	506.9595	506.2000	505.4324	504.6589	503.8809	503.0994	502.3140	501.5247
2	506.6855	505.9292	505.1619	504.3826	503.5928	502.7961	501.9958	501.1980	500.4021	499.6064	498.8076	498.0034
3	503.4094	502.6147	501.8037	500.9805	500.1501	499.3198	498.5000	497.6934	496.8960	496.0964	495.2839	494.4614
4	500.0732	499.2285	498.3660	497.4971	496.6299	495.7803	494.9619	494.1716	493.3879	492.5828	491.7444	490.8948
5	497.8474	496.9622	496.0613	495.1650	494.2803	493.4341	492.6401	491.8779	491.1057	490.2817	489.4082	488.5361
6	496.7739	495.8665	494.9463	494.0398	493.1492	492.3123	491.5391	490.7939	490.0232	489.1802	488.2793	487.3984
7	495.4614	494.5276	493.5854	492.6716	491.7793	490.9646	490.2275	489.5078	488.7319	487.8538	486.9126	486.0264
8	493.9026	492.9424	491.9780	491.0679	490.1819	489.4160	488.7393	488.0496	487.2512	486.3049	485.3049	484.4346
9	492.3840	491.4141	490.4304	489.5381	488.6641	487.9697	487.3647	486.6965	485.8508	484.8108	483.7493	482.9258
10	490.5781	489.6260	488.6201	487.7700	486.9114	486.3374	485.8286	485.1636	484.2224	483.0354	481.9063	481.1936
11	488.2937	487.4473	486.3982	485.6448	484.7988	484.4465	484.0598	483.3435	482.2085	480.7839	479.6035	479.1482
12	485.8013	485.2263	484.0759	483.5005	482.6377	482.6377	482.3499	481.4863	480.0471	478.3193	477.1672	477.1672
13	478.5112	479.4373	477.6174	477.8950	476.7778	478.2690	478.0073	476.3606	473.7549	471.0723	470.4106	472.3721
14	477.4204	478.6909	476.6794	477.1499	475.9463	477.7358	477.4126	475.6089	472.8110	469.9973	469.4775	471.8008
15	476.2529	478.0132	475.6995	476.4446	475.0991	477.2832	476.8257	474.8171	471.7966	468.8550	468.5540	471.3296
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	476.9438	476.1060	475.5356	474.9421	474.2063	473.6570	472.9182	472.2151	471.7351	470.9634	470.2490	469.6621
HB	-33091.5	12951.2	-101315.9	19615.6	66685.6	3675.4	5660.5	13423.1	-78033.8	-15513.6	-14650.1	8421.5
TSAT	476.9	476.1	475.5	474.9	474.2	473.7	472.9	472.2	471.7	471.0	470.2	469.7
HSAT	-33091.5	12951.2	-101315.9	19615.6	66685.6	3675.4	5660.5	13423.1	-78033.8	-15513.6	-14650.1	8421.5
P	550.0	545.7	542.7	539.6	535.9	533.1	529.3	525.8	523.3	519.5	515.9	513.0
S.F.	43683.1	20811.7	36039.4	22967.9	30347.2	12655.7	20448.9	29261.3	37986.1	42166.2	31517.7	12515.1
S.TEMP	475.62	477.71	475.18	476.11	474.66	477.10	476.53	474.40	471.25	468.25	468.10	471.15
MASS-FLX	33.9118	32.3122	32.0197	32.3961	30.5321	31.1780	29.6431	28.8317	29.4505	27.4765	26.6656	26.8694
QUALITY	0.97066	0.93616	0.94962	0.97069	0.95128	0.96588	0.95372	0.95865	0.94917	0.96027	0.94821	0.95384
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	2807.6	1206.4	1698.4	2417.2	1853.8	2599.0	2076.4	1987.8	2776.2	2601.1	2098.0	2881.7
*S.F.	315690.3	129201.9	166394.5	218478.8	161601.5	214914.4	164851.1	148438.3	203561.9	177801.4	139653.8	181638.5
*S.TEMP	589.13	583.39	573.68	565.39	561.53	556.34	552.47	547.09	544.91	539.43	537.03	532.79
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	12.6000	12.6500	12.7000	12.7500	12.8000	12.8500	12.9000	12.9500	13.0000	13.0500	13.1000	13.1500
NODE												
1	500.7314	499.9365	499.1448	498.3618	497.5940	496.8472	496.1270	495.4395	494.7881	494.1746	493.5999	493.0645
2	497.1970	496.3992	495.6235	494.8828	494.1843	493.5342	492.9370	492.3945	491.9050	491.4626	491.0627	490.7002
3	493.6460	492.8679	492.1516	491.5085	490.9409	490.4485	490.0300	489.6804	489.3879	489.1370	488.9180	488.7246
4	490.0862	489.3772	488.7917	488.3220	487.9524	487.6758	487.4851	487.3640	487.2856	487.2231	487.1726	487.1289
5	487.7610	487.1575	486.7239	486.4231	486.2227	486.1174	486.1011	486.1414	486.1995	486.2419	486.2810	486.3162
6	486.6575	486.1335	485.7988	485.5952	485.4841	485.4692	485.5422	485.6592	485.7764	485.8574	485.9319	485.9973
7	485.3545	484.9626	484.7725	484.6992	484.7009	484.8013	484.9854	485.1919	485.3694	485.4819	485.5908	485.6853
8	483.8994	483.7266	483.7415	483.8306	483.9634	484.2058	484.5234	484.8215	485.0464	485.1663	485.3064	485.4236
9	482.5916	482.6909	482.9199	483.1597	483.4092	483.7942	484.2388	484.6050	484.8484	484.9458	485.1165	485.2461
10	481.1917	481.6809	482.1597	482.5527	482.9216	483.4863	484.0745	484.4878	484.7161	484.7517	484.9729	485.1035
11	479.7354	480.7988	481.5337	482.0571	482.5415	483.3606	484.1055	484.5081	484.6572	484.5625	484.8999	485.0000
12	478.6072	480.3350	481.1987	481.7742	482.3499	483.5007	484.3638	484.6514	484.6514	484.3638	484.9387	484.9387
13	476.9526	480.5015	481.0310	481.5186	482.3137	484.6924	485.6250	485.2075	484.6355	483.6707	485.4575	484.7900
14	476.9009	480.6553	481.0283	481.5027	482.3389	484.9404	485.8293	485.2666	484.6123	483.5405	485.5935	484.7451
15	477.0332	480.9387	481.0398	481.5044	482.3931	485.2749	486.0588	485.3052	484.5669	483.3782	485.7996	484.6721
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	468.8315	467.9170	467.0798	466.1379	465.2769	464.3655	463.4854	462.5500	461.6523	460.7163	459.8318	458.9800
HB	-1361.3	-1084.4	-34.8	-40.8	-170.0	-702.4	-386.1	-16.4	107.1	309.9	-380.3	151.0
TSAT	468.8	467.9	467.1	466.1	465.3	464.4	463.5	462.6	461.7	460.7	459.8	459.0
HSAT	-1361.3	-1084.4	-34.8	-40.8	-170.0	-702.4	-386.1	-16.4	107.1	309.9	-380.3	151.0
P	508.9	504.4	500.3	495.8	491.6	487.3	483.1	478.7	474.5	470.2	466.1	462.2
S.F.	-11388.8	-14344.9	-486.2	-626.8	-2916.5	-14835.8	-8764.7	-372.2	2451.1	6990.6	-9929.6	3870.0
S.TEMP	477.20	481.15	481.05	481.51	482.43	485.49	486.18	485.31	484.53	483.28	485.94	484.62
MASS-FLX	25.9761	24.2792	23.8486	22.6790	21.6438	20.8139	20.1759	18.9286	18.2672	17.1842	16.3666	16.2431
QUALITY	0.95593	0.95229	0.95263	0.95729	0.96123	0.95779	0.96678	0.96346	0.97002	0.97015	0.97452	0.97598
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	2464.5	2145.5	2497.2	2033.9	1975.4	1643.9	1795.1	1366.3	1386.8	1108.2	1024.5	898.6
*S.F.	152827.3	131868.9	152773.4	124866.2	121647.9	102178.5	113377.9	88173.4	92071.2	75890.6	72745.5	65802.6
*S.TEMP	531.00	529.58	528.38	527.71	527.02	526.73	526.80	527.29	528.21	529.39	531.00	532.38
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	13.2000	13.2500	13.3000	13.3500	13.4000	13.4500	13.5000	13.5500	13.6000	13.6500	13.7000	13.7500
NODE												
1	492.5664	492.1050	491.6780	491.2837	490.9202	490.5842	490.2747	489.9907	489.7305	489.4927	489.2771	489.0825
2	490.3711	490.0710	489.7976	489.5479	489.3188	489.1086	488.9155	488.7419	488.5872	488.4512	488.3333	488.2312
3	488.5527	488.3987	488.2603	488.1348	488.0188	487.9114	487.8164	487.7390	487.6799	487.6353	487.6040	487.5847
4	487.0928	487.0618	487.0356	487.0129	486.9854	486.9597	486.9480	486.9607	486.9905	487.0293	487.0759	487.1270
5	486.3516	486.3835	486.4167	486.4468	486.4592	486.4749	486.5146	486.5901	486.6750	486.7607	486.8513	486.9409
6	486.0620	486.1187	486.1753	486.2258	486.2507	486.2834	486.3494	486.4580	486.5662	486.6711	486.7815	486.8857
7	485.7793	485.8594	485.9409	486.0117	486.0430	486.0950	486.1948	486.3474	486.4797	486.6040	486.7346	486.8533
8	485.5452	485.6421	485.7478	485.8335	485.8582	485.9343	486.0830	486.2947	486.4429	486.5830	486.7346	486.8630
9	485.3904	485.4944	485.6213	485.7139	485.7166	485.8259	486.0337	486.3091	486.4534	486.6035	486.7756	486.9053
10	485.2751	485.3748	485.5298	485.6199	485.5757	485.7476	486.0405	486.3984	486.5037	486.6650	486.8633	486.9827
11	485.2144	485.2847	485.4878	485.5530	485.4141	485.7251	486.1484	486.6135	486.5911	486.7842	487.0220	487.1038
12	485.2263	485.2263	485.5139	485.5139	485.2266	485.8015	486.3765	486.9514	486.6638	486.9514	487.2388	487.2388
13	485.4670	485.0845	485.7881	485.4172	484.5598	486.4111	487.3484	488.1875	486.6221	487.5647	487.9707	487.5601
14	485.5247	485.0508	485.8506	485.3904	484.4387	486.5613	487.5151	488.3843	486.5593	487.6821	488.0847	487.5886
15	485.6089	485.0017	485.9414	485.3494	484.2874	486.7834	487.7095	488.6074	486.4329	487.8369	488.2095	487.5984
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	458.1079	457.2302	456.3513	455.4639	454.5710	453.6724	452.7673	451.8547	451.0034	450.2219	449.4004	448.5813
HB	-145.0	86.3	-141.6	71.8	217.1	-318.3	-221.3	-235.4	196.6	-184.2	-121.1	10.2
TSAT	458.1	457.2	456.4	455.5	454.6	453.7	452.8	451.9	451.0	450.2	449.4	448.6
HSAT	-145.0	86.3	-141.6	71.8	217.1	-318.3	-221.3	-235.4	196.6	-184.2	-121.1	10.2
P	458.2	454.3	450.3	446.3	442.4	438.4	434.5	430.5	426.8	423.5	420.0	416.5
S.F.	-3997.1	2393.7	-4199.7	2143.1	6430.3	-10588.7	-7756.4	-8679.9	6944.4	-6946.2	-4706.7	398.0
S.TEMP	485.67	484.97	486.00	485.32	484.19	486.94	487.82	488.73	486.33	487.94	488.28	487.59
MASS-FLX	16.0910	15.8381	15.7270	15.5639	15.4212	15.2588	15.0737	14.9202	14.5299	14.8862	14.8656	14.7799
QUALITY	0.97865	0.98071	0.98286	0.98482	0.98670	0.98845	0.99011	0.99168	0.99321	0.99424	0.99523	0.99611
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	822.9	727.4	653.9	580.0	514.4	452.3	395.0	344.3	290.5	263.5	235.2	208.8
*S.F.	61909.1	56248.9	51933.1	47286.9	43049.7	38845.3	34807.0	31122.2	26923.4	24973.1	22740.7	20576.8
*S.TEMP	533.52	534.73	535.95	537.17	538.44	539.74	541.07	542.42	543.85	545.17	546.24	547.29
*H.T.MODE	3	3	3	3	3	3	3	3	3	3	3	3

TIME--	13.8000	13.8500	13.9000	13.9500	14.0000	14.0500	14.1000	14.1500	14.2000	14.2500	14.3000	14.3500
NODE												
1	488.9080	488.7512	488.6108	488.4844	488.3689	488.2622	488.1633	488.0696	487.9797	487.8884	487.7874	487.6672
2	488.1440	488.0676	487.9985	487.9321	487.8662	487.7996	487.7327	487.6653	487.5903	487.4927	487.3511	487.1445
3	487.5730	487.5615	487.5435	487.5137	487.4724	487.4248	487.3752	487.3198	487.2358	487.0845	486.8247	486.4326
4	487.1780	487.2100	487.2173	487.1943	487.1531	487.1079	487.0664	487.0103	486.8792	486.5920	486.0964	485.3867
5	487.0227	487.0613	487.0630	487.0229	486.9678	486.9216	486.8865	486.8193	486.6113	486.1448	485.3831	484.3643
6	486.9778	487.0103	487.0012	486.9451	486.8806	486.8354	486.8062	486.7275	486.4561	485.8604	484.9248	483.7251
7	486.9524	486.9651	486.9360	486.8523	486.7756	486.7368	486.7168	486.6147	486.2346	485.4321	484.2400	482.7932
8	486.9626	486.9270	486.8650	486.7368	486.6516	486.6309	486.6265	486.4741	485.8577	484.7566	483.1926	481.4282
9	486.9973	486.8870	486.7908	486.6094	486.5293	486.5403	486.5527	486.3208	485.4729	483.9082	481.9333	479.8616
10	487.0576	486.8176	486.6914	486.4336	486.3857	486.4531	486.4834	486.1047	484.8191	482.6372	480.1399	477.7332
11	487.1458	486.6633	486.5444	486.1624	486.2197	486.3853	486.4209	485.7505	483.6995	480.5681	477.4180	474.6919
12	487.2388	486.3765	486.3765	485.8015	486.0891	486.3765	486.3765	485.2261	482.0605	477.7415	473.9958	471.1118
13	487.4602	485.0461	485.9705	484.5051	485.9856	486.5671	486.2686	483.1101	475.7617	467.6543	462.9014	460.2595
14	487.4863	484.7769	485.9495	484.2764	486.0264	486.6147	486.2434	482.7080	474.6406	466.0425	461.2300	458.7017
15	487.5090	484.4207	485.9722	483.9958	486.1289	486.6814	486.2056	482.1936	473.2673	464.1338	459.4387	457.1025
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	447.7581	446.9277	446.0928	445.2512	444.4045	443.5520	442.8735	441.9111	441.1021	440.2773	439.4543	438.6313
HB	-16.4	426.5	-06.2	309.9	-145.2	-68.5	43.0	560.8	1834.7	3322.4	3471.0	3205.6
TSAT	447.8	446.9	446.1	445.3	444.4	443.6	442.9	441.9	441.1	440.3	439.5	438.6
HSAT	-16.4	426.5	-06.2	309.9	-145.2	-68.5	43.0	560.8	1834.7	3322.4	3471.0	3205.6
P	413.1	409.6	406.1	402.7	399.2	395.7	393.0	389.1	385.9	382.6	379.4	376.2
S.F.	-65C.1	15894.7	-2641.1	11955.4	-6070.2	-2955.8	1861.8	22409.9	57495.8	75631.1	66041.0	56574.6
S.TEMP	487.52	484.19	480.01	483.82	486.22	486.72	486.18	481.87	472.44	463.04	458.48	456.28
MASS-FLX	14.7520	14.6903	14.0337	14.5536	14.4817	14.4021	14.1767	14.1793	14.3571	14.2945	14.2706	14.3165
QUALITY	0.99685	0.99754	0.99814	0.99849	0.99865	0.99891	0.99884	0.99805	0.99936	0.99828	0.99950	0.99866
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	187.3	168.5	151.4	140.5	135.1	131.9	104.7	105.1	132.5	104.1	126.6	103.9
*S.F.	18785.9	17190.7	15691.4	14780.5	14385.8	14202.7	11347.4	11540.4	14636.8	11591.3	14202.9	11753.0
*S.TEMP	548.24	549.11	549.91	550.61	551.09	551.42	551.66	551.92	551.74	551.84	551.72	551.97
*H.T.MODE	3	3	3	3	3	3	8	8	3	8	3	8

TIME--	14.4000	14.4500	14.5000	14.5500	14.6000	14.6500	14.7000	14.7500	14.8000	14.8500	14.9000	14.9500
NODE												
1	487.5168	487.3257	487.0874	486.7974	486.4539	486.0574	485.6108	485.1169	484.5798	484.0029	483.3899	482.7441
2	486.8599	486.4922	486.0454	485.5278	484.9497	484.3232	483.6565	482.9578	482.2317	481.4819	480.7122	479.9268
3	485.9084	485.2738	484.5469	483.7620	482.9370	482.0872	481.2246	480.3547	479.4771	478.5923	477.7014	476.8125
4	484.5103	483.5273	482.4937	481.4434	480.3960	479.3643	478.3535	477.3613	476.3735	475.3882	474.4104	473.4580
5	483.1943	481.9661	480.7446	479.5515	478.3977	477.2883	476.2207	475.1807	474.1423	473.1104	472.0945	471.1294
6	482.4026	481.0620	479.7656	478.5208	477.3323	476.1995	475.1177	474.0632	473.0044	471.9543	470.9248	469.9648
7	481.2866	479.8276	478.4651	477.1797	475.9690	474.8271	473.7422	472.6799	471.6001	470.5337	469.4966	468.5571
8	479.7295	478.17o0	476.7854	475.4883	474.2837	473.1565	472.0891	471.0288	469.9243	468.8469	467.8123	466.9272
9	478.0278	476.4390	475.0698	473.7886	472.6145	471.5205	470.4832	469.4260	468.2900	467.2122	466.1914	465.3887
10	475.8274	474.2676	472.9780	471.7363	470.6206	469.5808	468.5881	467.5288	466.3394	465.2754	464.2834	463.6218
11	472.8809	471.4692	470.3540	469.1694	468.1565	467.1987	466.2678	465.1829	463.8916	462.8848	461.9468	461.5459
12	469.6689	468.5144	467.0479	466.4927	465.6260	464.7590	463.8921	462.7358	461.2896	460.4219	459.5540	459.5540
13	460.7795	460.4683	460.4236	459.1226	458.8242	458.1768	457.4646	455.9155	453.8696	453.7710	453.0732	454.7034
14	459.6057	459.3779	459.4536	458.0862	457.9028	457.2712	456.5774	454.9460	452.8013	452.8787	452.1809	454.1150
15	458.4998	458.3127	458.5161	457.0330	457.0022	456.3708	455.6929	453.9468	451.6885	452.0156	451.2905	453.6160
Q	0.C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	437.7913	436.9551	436.1106	435.5527	435.6169	435.7273	435.8494	436.0491	436.2651	436.5273	436.8062	437.2981
HB	1753.9	1727.9	1422.8	1774.5	1443.9	1533.3	1571.8	2048.5	2696.2	1889.0	2184.0	863.4
TSAT	437.8	437.0	436.1	435.3	434.4	433.6	432.7	431.9	431.0	430.1	429.3	428.4
HSAT	1753.9	1727.9	1422.8	1749.2	1364.7	1384.4	1352.6	1650.1	1989.6	1326.5	1420.8	556.2
P	372.9	369.7	3o6.5	363.2	360.0	356.8	353.7	350.5	347.4	344.2	341.1	337.9
S.F.	35415.7	35999.5	31231.9	37157.1	30242.5	30962.7	30491.8	35601.9	40012.5	28472.6	30656.6	13913.2
S.TEMP	457.98	457.79	45d.06	456.49	456.56	455.92	455.25	453.43	451.11	451.60	450.84	453.41
MASS-FLX	14.1838	14.1309	14.0670	14.1141	14.0641	13.9534	13.7969	13.6201	13.4576	13.2681	13.1157	12.7863
QUALITY	0.99890	0.99928	0.99950	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	102.8	102.4	101.4	101.3	100.8	100.0	98.6	97.5	96.0	94.8	93.0	92.0
*S.F.	11727.1	11766.5	11752.2	11788.1	11723.3	11608.8	11423.1	11268.0	11053.4	10883.2	10637.3	10488.3
*S.TEMP	552.01	552.07	552.07	552.01	551.90	551.78	551.67	551.55	551.43	551.31	551.19	551.06
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	15.0000	15.0500	15.1000	15.1500	15.2000	15.2500	15.3000	15.3500	15.4000	15.4500	15.5000	15.5500
NODE												
1	482.0703	481.3721	480.0536	479.9180	479.1685	478.4087	477.6394	476.8613	476.0762	475.2847	474.4878	473.6858
2	479.1299	478.3279	477.5232	476.7178	475.9126	475.1079	474.3013	473.4910	472.6772	471.8601	471.0417	470.2229
3	475.9341	475.0693	474.2180	473.3777	472.5474	471.7222	470.8950	470.0620	469.2258	468.3823	467.5632	466.7358
4	472.5417	471.6570	470.7935	469.9485	469.1165	468.2866	467.4446	466.5903	465.7356	464.8853	464.0669	463.2378
5	470.2197	469.3472	468.4939	467.6589	466.8357	466.0059	465.1462	464.2729	463.4089	462.5762	461.7559	460.9255
6	469.0693	468.2095	467.3638	466.5369	465.7185	464.8862	464.0115	463.1272	462.2600	461.4365	460.6218	459.7881
7	467.6921	466.8540	466.0198	465.2051	464.3950	463.5566	462.6582	461.7603	460.8955	460.0913	459.2852	458.4431
8	466.1162	465.3074	464.4851	463.6897	462.8887	462.0374	461.0972	460.1880	459.3354	458.5703	457.7710	456.9116
9	464.6409	463.8567	463.0413	462.2673	461.4729	460.5979	459.6008	458.6907	457.8638	457.1531	456.3508	455.4614
10	462.9521	462.1826	461.3650	460.6240	459.8301	458.9089	457.8218	456.9331	456.1541	455.5288	454.6990	453.7559
11	460.9548	460.1655	459.3289	458.6479	457.8359	456.8223	455.5820	454.7839	454.0925	453.6094	452.6790	451.6394
12	458.9751	458.1067	457.2383	456.6594	455.7903	454.6313	453.1826	452.6030	452.0232	451.7334	450.5735	449.4131
13	453.7209	452.4395	451.4905	451.3767	450.1492	448.4146	446.2334	446.8394	446.5337	446.9343	444.5574	443.0945
14	452.9829	451.6343	450.6873	450.6670	449.3516	447.5195	445.2251	446.0935	445.7908	446.3088	443.6677	442.1992
15	452.2266	450.8066	449.8750	449.9792	448.5305	446.5874	444.1653	445.4016	445.0603	445.7229	442.7097	441.2771
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	437.7090	437.5474	437.8992	438.2524	438.2395	438.8320	438.8093	438.6689	438.7986	438.9170	438.8997	438.9761
HB	1911.9	2294.5	2447.2	2008.9	2960.2	4610.2	7985.7	3362.1	4204.0	2873.9	10818.2	17764.4
TSAT	427.5	426.6	425.8	424.9	424.0	423.2	422.3	421.5	420.6	419.7	418.8	417.9
HSAT	1110.5	1239.9	1193.9	924.6	1213.2	1461.2	1799.9	913.0	1027.8	728.5	1520.7	1415.3
P	334.8	331.7	328.6	325.5	322.6	319.6	316.7	313.7	310.8	307.8	304.8	301.8
S.F.	27003.9	29438.5	28296.7	22886.6	29200.4	33497.2	38296.6	21573.6	24798.0	18769.8	35584.5	32432.1
S.TEMP	451.83	450.38	449.46	449.65	448.10	446.10	443.60	445.09	444.70	445.45	442.19	440.80
MASS-FLX	12.5860	12.7025	12.3784	12.1129	12.1951	11.8229	11.8541	11.8546	11.6620	11.5231	11.3787	11.2284
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	89.5	89.3	86.8	87.2	85.8	84.7	82.9	82.4	80.7	79.4	78.2	77.0
*S.F.	10149.7	10099.1	9762.0	9813.2	9622.9	9472.3	9211.6	9136.7	8914.2	8757.4	8612.4	8460.1
*S.TEMP	550.94	550.81	550.68	550.54	550.41	550.26	550.13	549.98	549.83	549.68	549.54	549.39
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	15.6000	15.6500	15.7000	15.7500	15.8000	15.8500	15.9000	15.9500	16.0000	16.0500	16.1000	16.1500
NODE												
1	472.8799	472.0703	471.2563	470.4390	469.6182	468.7957	467.9719	467.1467	466.3201	465.4919	464.6604	463.8252
2	469.4019	468.5774	467.7498	466.9202	466.0913	465.2629	464.4363	463.6094	462.7805	461.9468	461.1064	460.2600
3	465.5043	465.0667	464.2266	463.3896	462.5586	461.7319	460.9082	460.0828	459.2488	458.4038	457.5491	456.6858
4	462.3923	461.5388	460.6895	459.8533	459.0293	458.2124	457.3965	456.5691	455.7209	454.8552	453.9768	453.0923
5	460.0623	459.1953	458.3433	457.5171	456.7051	455.8970	455.0864	454.2498	453.3804	452.4907	451.5923	450.6938
6	458.9089	458.0342	457.1851	456.3672	455.5623	454.7576	453.9475	453.1008	452.2136	451.3086	450.3997	449.4934
7	457.5386	456.6570	455.8169	455.0151	454.2207	453.4207	452.6101	451.7446	450.8315	449.9075	448.9871	448.0752
8	455.9629	455.0837	454.2664	453.4919	452.7112	451.9131	451.1003	450.2002	449.2878	448.3022	447.3733	446.4597
9	454.4539	453.5957	452.8125	452.0720	451.3003	450.5000	449.6809	448.7307	447.7339	446.7727	445.8420	444.9309
10	452.6565	451.8584	451.1296	450.4343	449.6628	448.8521	448.0217	446.9858	445.9307	444.9624	444.0374	443.1338
11	450.3899	449.7581	449.1099	448.4731	447.6755	446.8394	445.9897	444.7917	443.6680	442.7217	441.8171	440.9272
12	447.5626	447.6726	447.0920	446.5112	445.6404	444.7693	443.8979	442.4453	441.2830	440.4109	439.5386	438.6663
13	440.9302	442.3513	441.7185	441.2727	440.0015	439.0420	438.1157	435.5950	434.5515	434.0818	433.2852	432.4536
14	439.9119	441.6963	440.9810	440.5596	439.2041	438.2458	437.3115	434.5906	433.6187	433.2231	432.4258	431.5994
15	438.8442	441.1262	440.2385	439.8538	438.3826	437.4387	436.5002	433.5203	432.6799	432.3774	431.5645	430.7407
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	439.1189	439.0547	439.0764	438.9802	439.2371	439.4253	439.6052	439.7744	439.9197	440.0459	440.2205	440.2292
HB	-45870.9	8856.0	32852.3	45948.7	-22711.3	-11668.5	-7992.5	-5736.2	-4171.5	-3513.0	-3250.3	-2967.5
TSAT	417.0	416.2	415.3	414.4	413.5	412.6	411.7	410.8	409.9	409.0	408.1	407.2
HSAT	1810.2	656.4	1048.2	955.3	1191.5	1146.8	1154.7	1771.9	1443.9	1237.6	1283.4	1275.4
P	299.0	296.2	293.4	290.6	287.7	284.9	282.1	279.3	276.5	273.7	271.0	268.3
S.F.	38502.0	16233.2	25762.1	23972.8	29110.0	27974.8	28118.1	39178.7	32176.5	28409.7	29549.6	29444.9
S.TEMP	438.28	440.89	439.86	439.50	437.96	437.03	436.09	432.94	432.21	431.96	431.13	430.31
MASS-FLX	11.0416	11.0380	10.8977	10.7894	10.6775	10.5685	10.4633	10.3554	10.2490	10.1427	10.0100	9.9922
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	75.6	75.2	74.2	73.4	72.5	71.5	70.7	69.8	69.0	68.1	67.1	66.9
*S.F.	8278.2	8233.1	8104.5	8004.6	7877.7	7740.6	7626.5	7506.6	7391.7	7279.1	7147.0	7104.1
*S.TEMP	549.25	549.09	548.94	548.78	548.63	548.48	548.32	548.17	548.03	547.88	547.73	547.58
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	16.2000	16.2500	16.3000	16.3500	16.4000	16.4500	16.5000	16.5500	16.6000	16.6500	16.7000	16.7500
NODE												
1	462.9861	462.1426	461.2939	460.4395	459.5791	458.7131	457.8428	456.9685	456.0903	455.2083	454.3201	453.4265
2	459.4075	458.5476	457.6799	456.8047	455.9231	455.0376	454.1511	453.2644	452.3752	451.4790	450.5728	449.6582
3	455.8135	454.9316	454.0396	453.1401	452.2368	451.3362	450.4409	449.5500	448.6619	447.7363	446.8015	445.8606
4	452.1960	451.2876	450.3665	449.4417	448.5195	447.6140	446.7217	445.8357	444.9226	443.9722	442.9919	442.0271
5	449.7766	448.8464	447.9021	446.9624	446.0337	445.1362	444.2542	443.3757	442.4351	441.4429	440.4192	439.4519
6	448.5627	447.6189	446.6606	445.7153	444.7859	443.8982	443.0222	442.1472	441.1799	440.1570	439.1069	438.1499
7	447.1255	446.1658	445.1909	444.2429	443.3164	442.4485	441.5825	440.7104	439.6965	438.6306	437.5488	436.6240
8	445.4807	444.5037	443.5093	442.5686	441.6521	440.8220	439.9668	439.0974	437.9946	436.8730	435.7578	434.9143
9	443.9121	442.9224	441.9080	440.9868	440.0854	439.3088	438.4546	437.5835	436.3503	435.1799	434.0403	433.3306
10	442.0454	441.0491	440.0068	439.1304	438.2490	437.5583	436.6851	435.8069	434.3459	433.1409	431.9834	431.5229
11	439.7019	438.7290	437.6416	436.8684	436.0059	435.4717	434.5142	433.6270	431.7214	430.5676	429.4070	429.4509
12	437.2119	436.3391	435.1750	434.5928	433.7195	433.4282	432.2632	431.3894	428.7664	427.8521	426.7263	427.6011
13	429.9927	429.8025	428.2280	428.5559	427.4348	428.1833	425.8408	425.2173	419.4866	420.6245	419.2244	423.7129
14	428.9443	428.9290	427.2485	427.7681	426.5605	427.5166	424.9031	424.3765	418.0442	419.7053	418.1807	423.3677
15	427.8306	428.0820	426.2383	427.0242	425.6702	426.9058	423.8994	423.5437	416.4180	418.8757	417.1143	423.2217
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	440.2485	440.2615	440.2324	440.1924	440.1064	439.9993	439.8760	439.7295	441.2810	446.9712	468.6543	531.1633
HB	-3101.7	-2202.8	-2454.5	-1750.6	-2086.6	-1399.9	-2226.9	-1683.1	-2414.5	-856.6	-715.0	23.1
TSAT	406.3	405.4	404.5	403.6	402.7	401.7	400.8	399.8	398.7	397.2	396.1	395.0
HSAT	1929.8	1246.0	1680.4	1024.9	1378.1	751.5	1629.7	1199.2	3700.9	1142.8	1821.4	-88.2
P	265.6	262.9	260.2	257.6	254.9	252.2	249.5	246.8	243.6	239.5	236.5	233.6
S.F.	40362.4	27731.2	35639.1	23664.9	31080.9	18716.2	36788.4	27938.3	62253.5	24377.4	37246.5	-2491.8
S.TEMP	427.24	427.97	428.71	426.67	425.21	426.63	423.36	423.13	415.50	418.51	416.56	423.26
MASS-FLX	9.8945	9.8031	9.7141	9.6161	9.5306	9.4395	9.3476	9.2574	7.6835	1.4980	4.2140	6.3067
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	66.1	65.4	64.7	64.0	63.3	62.6	61.9	61.2	56.2	22.5	26.3	44.5
*S.F.	7007.4	6918.9	6832.4	6745.1	6665.0	6586.1	6507.5	6430.2	5869.7	2271.4	2341.6	949.8
*S.TEMP	547.43	547.28	547.13	546.98	546.83	546.68	546.53	546.38	546.27	546.71	547.33	547.59
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	16.8000	16.8500	16.9000	16.9500	17.0000	17.0500	17.1000	17.1500	17.2000	17.2500	17.3000	17.3500
NODE												
1	452.5269	451.6233	450.7168	449.8083	448.8997	447.9907	447.0837	446.1812	445.2847	444.3977	443.5212	442.6572
2	448.7393	447.8215	446.9067	445.9951	445.0862	444.1819	443.2871	442.4058	441.5420	440.6965	439.8691	439.0598
3	444.9270	444.0061	443.0945	442.1885	441.2891	440.4006	439.5330	438.6921	437.8811	437.0567	436.3345	435.5894
4	441.0947	440.1917	439.2971	438.4050	437.5205	436.6594	435.8394	435.0640	434.3303	433.6240	432.9370	432.2583
5	438.5435	437.6692	436.7886	435.9048	435.0322	434.2019	433.4331	432.7207	432.0554	431.4058	430.7695	430.1301
6	437.2639	436.4087	435.5315	434.6494	433.7837	432.9744	432.2402	431.5674	430.9404	430.3179	429.7048	429.0808
7	435.7773	434.9490	434.0706	433.1895	432.3354	431.5603	430.8787	430.2595	429.6812	429.0869	428.5002	427.8892
8	434.1294	433.3320	432.4373	431.5574	430.7227	430.0051	429.4021	428.8528	428.3337	427.7605	427.2002	426.5950
9	432.6111	431.8357	430.9026	430.0281	429.2205	428.5791	428.0681	427.5886	427.1243	426.5544	426.0193	425.4067
10	430.8672	430.0989	429.0854	428.2307	427.4680	426.9478	426.5652	426.1648	425.7603	425.1667	424.6658	424.0259
11	428.7949	427.9941	426.8096	426.0313	425.3472	425.0391	424.8396	424.5168	424.1746	423.4890	423.0566	422.3394
12	426.7263	425.8513	424.3931	423.8096	423.2258	423.2258	423.2258	422.9341	422.6421	421.7666	421.4749	420.5991
13	420.9636	419.8987	417.3149	417.8787	417.5435	418.7534	419.2468	418.8081	418.6392	416.8445	417.3469	415.6313
14	420.1003	419.0730	416.2837	417.1169	416.7813	418.2083	418.7407	418.2478	418.1052	416.1284	416.8223	414.9121
15	419.1450	418.2354	415.1831	416.4089	416.0313	417.7329	418.2698	417.6870	417.5820	415.3630	416.3379	414.1462
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	583.2568	599.9087	601.0948	601.1973	600.8984	600.9656	600.2861	599.5574	599.1682	599.6104	598.4219	599.5898
HB	-221.1	-157.6	-213.3	-117.8	-135.8	-74.3	-81.6	-105.2	-95.3	-150.8	-80.9	-149.7
TSAT	393.9	392.6	391.3	390.1	388.7	387.2	385.1	382.4	379.5	376.3	373.1	370.3
HSAT	1473.6	1139.9	1712.9	838.6	932.9	449.9	451.3	547.2	458.2	720.7	343.0	640.4
P	230.6	227.2	223.7	220.6	217.0	213.4	208.0	201.5	194.6	187.2	180.1	174.0
S.F.	36410.3	28689.8	39900.0	21808.2	25151.2	13624.2	14866.3	19155.6	17336.4	27853.8	14744.0	27816.0
S.TEMP	418.61	417.81	414.59	416.08	415.66	417.53	418.05	417.40	417.32	414.95	416.12	413.73
MASS-FLX	8.8205	10.5787	12.9596	14.7538	17.0678	19.7121	24.1229	30.1334	35.6696	40.1740	44.2353	46.8359
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	57.8	65.4	76.8	85.7	95.8	107.8	124.4	149.4	171.9	190.3	209.1	215.3
*S.F.	-1605.2	-3217.0	-3980.7	-4349.9	-4778.0	-5330.5	-6033.8	-7022.7	-7894.6	-8547.2	-9113.2	-9222.4
*S.TEMP	548.26	549.12	549.87	550.48	551.00	551.52	552.05	552.67	553.33	554.01	554.65	555.23
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	17.4000	17.4500	17.5000	17.5500	17.6000	17.6500	17.7000	17.7500	17.8000	17.8500	17.9000	17.9500
NODE												
1	441.8059	440.9678	440.1445	439.3357	438.5430	437.7673	437.0076	436.2629	435.5330	434.8174	434.1167	433.4307
2	438.2659	437.4866	436.7256	435.9834	435.2617	434.5576	433.8672	433.1892	432.5227	431.8691	431.2297	430.6064
3	434.8577	434.1421	433.4485	432.7810	432.1377	431.5063	430.8809	430.2622	429.6528	429.0571	428.4790	427.9224
4	431.5884	430.9363	430.3188	429.7390	429.1797	428.6155	428.0413	427.4707	426.9128	426.3762	425.8633	425.3792
5	429.4958	428.8884	428.3328	427.8223	427.3188	426.7844	426.2295	425.6853	425.1614	424.6692	424.2034	423.7773
6	428.4622	427.8792	427.3616	426.8894	426.4111	425.8821	425.3301	424.7991	424.2544	423.8276	423.3879	422.9949
7	427.2886	426.7383	426.2732	425.8499	425.3958	424.8608	424.3069	423.7937	423.3145	422.8818	422.4746	422.1257
8	426.0139	425.5103	425.1208	424.7571	424.3152	423.7490	423.1880	422.7041	422.2595	421.8730	421.5039	421.2146
9	424.8477	424.4009	424.1006	423.7905	423.3391	422.7168	422.1514	421.7107	421.3035	420.9692	420.6345	420.4128
10	423.5022	423.1431	422.9727	422.7153	422.2173	421.4929	420.9373	420.5728	420.2124	419.9509	419.6519	419.5288
11	421.8933	421.6841	421.7170	421.4851	420.8538	419.9419	419.4551	419.2380	418.9290	418.7788	418.5039	418.5469
12	420.3071	420.3071	420.5991	420.3069	419.4309	418.2625	417.9705	417.9705	417.6782	417.6782	417.3862	417.6782
13	416.1667	416.9092	418.0654	417.1755	415.2458	413.2146	414.0769	414.8398	414.3650	414.9609	414.4011	415.7573
14	415.6411	416.4902	417.7754	416.7302	414.6223	412.4734	413.5977	414.4568	413.9109	414.6260	413.9885	415.5564
15	415.1584	416.1138	417.5408	416.2605	413.9419	411.6777	413.1724	414.1165	413.4517	414.3274	413.5642	415.4182
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	597.6587	597.5750	597.2141	599.0598	598.8713	598.9058	598.9717	598.6704	599.6284	599.8848	600.1213	599.8069
HB	-80.2	-61.7	-33.4	-92.8	-135.8	-153.8	-65.3	-54.4	-85.2	-47.2	-79.4	-12.6
TSAT	366.9	363.8	360.5	360.0	359.6	358.3	357.0	355.7	354.4	353.0	351.7	350.3
HSAT	305.2	214.8	105.4	303.2	466.2	545.4	216.9	172.5	270.0	143.3	240.6	35.8
P	166.9	160.4	154.0	153.0	152.3	149.8	147.3	144.9	142.5	140.0	137.6	135.2
S.F.	14650.3	11213.5	6003.0	16991.1	25161.4	28867.7	12147.0	10051.2	15887.0	8766.8	14838.8	2327.2
S.TEMP	414.94	415.95	417.45	416.01	413.57	411.25	412.99	413.97	413.22	414.20	413.34	415.38
MASS-FLX	49.4871	51.3131	52.9662	47.8362	43.6412	40.8690	37.9402	35.0027	31.8592	28.5892	25.0154	20.9353
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	226.1	232.8	238.1	223.9	205.0	194.0	183.3	173.3	160.6	145.8	131.4	116.3
*S.F.	-9538.0	-9586.1	-9586.3	-9810.6	-8453.0	-8003.7	-7558.7	-7221.8	-6651.7	-6078.2	-5578.6	-4868.4
*S.TEMP	555.77	556.26	556.71	557.12	557.36	557.51	557.64	557.74	557.81	557.85	557.84	557.78
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	18.0000	18.0500	18.1000	18.1500	18.2000	18.2500	18.3000	18.3500	18.4000	18.4500	18.5000	18.5500
NODE												
1	432.7598	432.1045	431.4646	430.8384	430.2253	429.6240	429.0332	428.4521	427.8806	427.3169	426.7605	426.2095
2	430.0020	429.4131	428.8374	428.2710	427.7131	427.1609	426.6160	426.0771	425.5435	425.0137	424.4866	423.9629
3	427.3867	426.8665	426.3508	425.8350	425.3188	424.8074	424.2991	423.7954	423.2915	422.7876	422.2822	421.7776
4	424.9202	424.4648	423.9966	423.5144	423.0269	422.5474	422.0703	421.5947	421.1123	420.6245	420.1321	419.6440
5	423.3718	422.9524	422.4983	422.0237	421.5466	421.0884	420.6292	420.1689	419.6924	419.2085	418.7188	418.2419
6	422.6167	422.2092	421.7532	421.2769	420.8037	420.3582	419.9065	419.4517	418.9736	418.4890	417.9985	417.5298
7	421.7778	421.3757	420.9072	420.4253	419.9558	419.5295	419.0837	418.6343	418.1497	417.6633	417.1711	416.7148
8	420.8945	420.4807	419.9805	419.4883	419.0271	418.6326	418.1855	417.7407	417.2390	416.7512	416.2554	415.8223
9	420.1072	419.6616	419.1133	418.6152	418.1685	417.8159	417.3552	416.9148	416.3850	415.8989	415.3989	415.0000
10	419.2168	418.7014	418.0769	417.5864	417.1675	416.8821	416.3789	415.9480	415.3665	414.8533	414.3845	414.0474
11	418.1621	417.5017	416.7585	416.3220	415.9575	415.7898	415.1653	414.7698	414.0808	413.6589	413.1282	412.9158
12	417.0940	416.2173	415.3408	415.0486	414.7561	414.7561	413.8792	413.5869	412.7097	412.4172	411.8325	411.8325
13	414.0071	412.3674	411.1594	411.6741	411.5593	412.1992	410.0220	410.4351	408.6396	409.1174	408.1733	409.1509
14	413.5354	411.7996	410.3649	411.2502	411.1355	411.8882	409.4331	410.0369	408.0376	408.7014	407.6577	408.8350
15	413.0051	411.1860	409.9431	410.8640	410.7197	411.6128	408.7744	409.6721	407.3821	408.3232	407.1199	408.5730
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	599.1982	597.5251	596.0569	590.8179	549.7056	514.2354	503.5491	488.1931	461.5374	446.9614	445.5203	440.9431
HB	-108.9	-119.6	-117.4	-64.2	-99.2	-77.4	-263.0	-138.2	-444.7	-290.5	-492.8	-211.5
TSAT	348.9	347.4	346.6	345.9	345.2	344.6	343.7	343.5	342.6	341.9	341.2	340.5
HSAT	318.4	352.0	347.0	178.5	211.3	118.8	387.0	164.7	376.3	170.2	290.5	101.0
P	132.7	130.2	128.7	127.6	126.4	125.4	124.0	123.6	122.2	121.1	119.9	118.8
S.F.	20317.8	22321.0	21882.3	11563.5	13802.4	7948.9	25025.1	10874.4	24241.1	11274.3	19065.2	6867.1
S.TEMP	412.70	410.85	409.62	410.69	410.51	411.49	408.40	409.51	407.02	408.16	406.84	408.47
MASS-FLX	16.1944	10.0877	4.4169	0.5911	3.9782	7.2416	7.8981	11.2598	11.9123	13.0856	13.7226	14.8358
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)												
*HB	96.5	69.8	36.2	14.1	25.3	45.4	49.8	64.6	66.7	73.2	79.0	81.7
*S.F.	-4046.7	-2841.2	-1410.1	-508.9	-114.2	1668.7	2485.4	4105.4	6175.4	7651.3	8411.7	8921.9
*S.TEMP	557.65	557.42	557.02	556.62	556.26	555.78	555.21	554.69	553.84	552.86	552.07	551.30
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	18.6000	18.6500	18.7000	18.7500	18.8000	18.8500	18.9000	18.9500	19.0000	19.0500	19.1000	19.1500
NODE												
1	425.6646	425.1248	424.5903	424.0608	423.5337	423.0090	422.4856	421.9626	421.4402	420.9160	420.3906	419.8635
2	423.4431	422.9282	422.4167	421.9063	421.3943	420.8796	420.3623	419.8435	419.3213	418.7949	418.2651	417.7319
3	421.2788	420.7866	420.2954	419.7966	419.2886	418.7747	418.2581	417.7373	417.2095	416.6743	416.1338	415.5928
4	419.1672	418.6987	418.2212	417.7214	417.2046	416.6836	416.1624	415.6355	415.0947	414.5457	413.9929	413.4431
5	417.7839	417.3337	416.8567	416.3416	415.8088	415.2810	414.7576	414.2239	413.6675	413.1050	412.5432	411.9929
6	417.0842	416.6428	416.1602	415.6289	415.0854	414.5544	414.0315	413.4919	412.9233	412.3533	411.7871	411.2383
7	416.2874	415.8557	415.3579	414.8000	414.2422	413.7124	413.1914	412.6431	412.0554	411.4778	410.9084	410.3660
8	415.4207	414.9903	414.4644	413.8628	413.2935	412.7729	412.2566	411.6917	411.0752	410.4941	409.9253	409.3962
9	414.6265	414.2029	413.6167	412.9634	412.3918	411.8921	411.3804	410.7900	410.1379	409.5630	408.9973	408.4888
10	413.7095	413.2734	412.5889	411.8645	411.3123	410.8518	410.3413	409.7051	408.9595	408.4504	407.8899	407.4180
11	412.6162	412.1323	411.2566	410.4414	409.9692	409.5830	409.0564	408.3264	407.5396	407.0725	406.5142	406.1108
12	411.5400	410.9548	409.7847	408.9070	408.6145	408.3218	407.7366	406.8586	405.9805	405.6877	405.1023	404.8093
13	408.6501	407.5881	405.2334	404.4224	405.0283	404.9692	404.0110	402.5376	401.4299	402.0232	401.1443	401.3506
14	408.2522	407.1057	404.5483	403.8040	404.5813	404.5278	403.4871	401.9160	400.7925	401.5652	400.5923	400.9055
15	407.8457	406.5979	403.7910	403.1770	404.1760	404.0974	402.9409	401.2561	400.1333	401.1501	400.0225	400.4851
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	441.3704	422.7532	416.0543	412.5820	403.3721	416.3667	421.9065	409.9358	404.4739	412.6379	410.3450	440.4663
HB	-420.8	-1104.6	-2119.1	-2183.5	19331.0	-1133.8	-998.8	-2610.0	-4882.3	-1057.9	-1878.5	-327.6
TSAT	340.0	339.6	339.2	338.7	338.1	337.6	337.0	336.6	336.2	335.6	335.8	336.1
HSAT	209.8	272.0	438.4	330.8	183.1	213.6	293.1	366.6	359.3	188.9	312.1	205.0
P	118.0	117.4	116.7	116.0	115.1	114.3	113.4	112.7	112.1	111.2	111.5	112.0
S.F.	14196.0	18143.7	28147.5	21228.0	12058.3	14150.7	19229.5	23573.6	22860.6	12347.9	19951.5	13160.8
S.TEMP	407.63	406.33	403.37	402.86	404.00	403.89	402.65	400.90	399.79	400.97	399.72	400.29
MASS-FLX	14.7881	14.4663	13.9437	13.1252	12.1071	11.1312	10.3585	8.4036	7.7516	6.1217	5.3971	5.5620
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	82.5	82.1	78.9	75.9	70.7	63.7	60.1	57.4	56.0	41.0	36.5	34.7
*S.F.	8801.1	10423.2	10438.2	10267.9	10173.7	8361.3	7614.5	7904.8	7147.6	5528.5	4997.0	3445.7
*S.TEMP	550.70	549.79	549.15	548.61	548.13	547.90	547.86	547.73	547.67	547.87	547.97	548.18
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	19.2000	19.2500	19.3000	19.3500	19.4000	19.4500	19.5000	19.5500	19.6000	19.6500	19.7000	19.7500
NODE												
1	419.3345	418.8035	418.2703	417.7349	417.1963	416.6538	416.1067	415.5540	414.9976	414.4399	413.8835	413.3330
2	417.1960	416.6580	416.1177	415.5737	415.0249	414.4685	413.9031	413.3311	412.7600	412.1975	411.6497	411.1223
3	415.0496	414.5044	413.9561	413.4028	412.8398	412.2615	411.6687	411.0750	410.4988	409.9517	409.4390	408.9641
4	412.8945	412.3413	411.7844	411.2195	410.6348	410.0193	409.3911	408.7830	408.2271	407.7300	407.2864	406.8979
5	411.4402	410.8806	410.3171	409.7397	409.1301	408.4771	407.8215	407.2205	406.7095	406.2781	405.9048	405.5947
6	410.6836	410.1201	409.5515	408.9656	408.3376	407.6580	406.9885	406.4026	405.9316	405.5459	405.2161	404.9553
7	409.8074	409.2375	408.6636	408.0649	407.4102	406.6921	406.0120	405.4604	405.0547	404.7344	404.4602	404.2639
8	408.8296	408.2512	407.6711	407.0535	406.3567	405.5842	404.9070	404.4263	404.1265	403.8518	403.6831	403.5701
9	407.9067	407.3186	406.7336	406.0913	405.3411	404.5071	403.8555	403.4800	403.3096	403.1602	403.0105	402.9868
10	406.8008	406.2000	405.6108	404.9285	404.0947	403.1750	402.5962	402.4009	402.4172	402.3611	402.2732	402.3745
11	405.4060	404.7974	404.2065	403.4487	402.4729	401.4314	401.0486	401.1797	401.4695	401.4875	401.4548	401.7556
12	403.9309	403.3452	402.7593	401.8806	400.7087	399.5369	399.5369	400.1228	400.7090	400.7090	400.7090	401.2947
13	399.5869	399.2832	398.7075	397.3013	395.4099	393.9089	395.7739	397.9512	399.2764	398.7739	398.8557	400.6047
14	398.9526	398.7397	398.1555	396.6484	394.6455	393.1174	395.3528	397.7495	399.1392	398.5027	398.6174	400.5813
15	398.2659	398.2056	397.6001	395.9624	393.8320	392.2935	395.0254	397.6418	399.0566	398.2166	398.3894	400.6292
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	431.1895	427.3052	434.0830	416.7847	400.3511	417.6348	396.3086	397.2356	370.8909	359.6655	352.5166	337.6714
HB	-752.1	-595.7	-512.8	-1148.5	-4175.5	-1110.8	-5299.1	1016.9	35.2	269.1	157.4	-67.2
TSAT	336.5	336.9	336.8	337.5	337.7	339.0	338.3	338.6	338.4	338.2	337.9	337.7
HSAT	407.7	286.3	311.7	419.0	521.0	541.2	130.5	6.9	16.4	172.5	119.2	-67.2
P	112.5	113.1	113.1	114.2	114.4	116.4	115.3	115.8	115.6	115.1	114.7	114.4
S.F.	25044.7	17489.3	18852.4	24333.7	29037.7	28627.2	7388.5	406.9	991.0	10334.1	7205.3	-4236.0
S.TEMP	397.89	397.94	397.32	395.60	393.40	391.86	394.91	397.64	399.04	398.06	398.28	400.69
MASS-FLX	5.7653	6.5579	5.8100	11.1828	8.4347	9.6197	9.6964	9.5191	10.2226	10.0025	9.8093	9.6516
QUALITY	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.99860
GAP	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488	0.04488
***RELAP	PREDICTIONS	(STARRED)***										
*HB	38.9	46.5	40.2	59.8	55.2	65.3	56.7	56.2	62.5	61.4	60.9	58.5
*S.F.	4390.0	5518.4	4473.5	7797.7	8202.0	8364.2	8460.8	8147.3	10283.7	11241.6	11547.2	11644.0
*S.TEMP	548.09	547.90	547.72	547.41	546.89	546.53	546.10	545.58	545.11	544.22	543.52	542.38
*H.T.MODE	8	8	8	8	8	8	8	8	8	8	8	8

TIME--	19.8000	19.8500	19.9000	19.9500	20.0000
1	412.7910	412.2617	411.7490	411.2554	410.7834
2	410.6189	410.1428	409.6970	409.2817	408.8979
3	408.5293	408.1372	407.7839	407.4690	407.1924
4	406.5623	406.2825	406.0432	405.8459	405.6907
5	405.3459	405.1597	405.0051	404.8950	404.8298
6	404.7578	404.6270	404.5164	404.4553	404.4385
7	404.1311	404.0701	404.0083	404.0063	404.0479
8	403.5164	403.5417	403.5237	403.5952	403.7026
9	403.0110	403.1245	403.1311	403.2834	403.4531
10	402.4922	402.7202	402.7249	402.9988	403.2373
11	401.9785	402.3674	402.2922	402.7898	403.0898
12	401.5876	402.1736	401.8806	402.7593	403.0522
13	400.8452	402.1465	400.6309	403.3662	403.1851
14	400.7568	402.1929	400.4099	403.5481	403.1956
15	400.6782	402.2893	400.1323	403.8386	403.1934
Q	0.0	0.0	0.0	0.0	0.0
TB	376.0515	389.4326	336.1909	336.2241	566.7551
HB	102.1	-392.3	182.8	-205.1	-5.2
TSAT	337.0	340.8	336.2	336.2	349.9
HSAT	39.5	-82.4	182.8	-205.1	15.8
P	113.4	119.3	112.1	112.2	134.5
S.F.	2510.9	-5073.9	11657.9	-13908.6	843.4
S.TEMP	400.64	402.36	399.96	404.05	403.18
MASS-FLX	8.5569	9.1027	7.7386	8.4340	8.3881
QUALITY	1.00000	1.00000	0.99957	0.99322	1.00000
GAP	0.04488	0.04488	0.04488	0.04488	0.04488
RELAP PREDICTIONS (STARRED)					
*HB	53.1	234.0	49.2	93.2	353.5
*S.F.	8649.5	47279.3	9832.1	18587.6	69353.3
*S.TEMP	540.88	539.00	537.64	535.71	532.18
*H.T.MODE	8	3	8	3	3

301410********** ENERGY BALANCE **********

****** THERMOCOUPLE NUMBER: TE-301DJ TIME: 13:33:18 DATE: JULY 8

****** THTF BLOW-DOWN TEST NO.104*PRELIMINARY*BD104.BE.P1*

CHANGE IN PIN INTERNAL ENERGY CONTENT = 28.116425 BTU/FT
DETERMINED BY SUMMATION OF DELTA U'S OVER THE INTERVAL FROM T=0 TO TEND.
CHANGE IN PIN INTERNAL ENERGY CONTENT = 28.100098 BTU/FT
DETERMINED BY DIFFERENCE IN PIN END POINT ENTHALPIES.
TOTAL HEAT INPUT = INTEGRAL OF QTOT*DT = 24.621078 BTU/FT

INTEGRAL OF SURFACE FLUX VERSUS TIME CURVE *2.0*PI*RO= 52.718079 BTU/FT

PERCENTAGE ERROR IN OVERALL HEAT BALANCE = 0.0368 PERCENT
ERROR IN OVERALL HEAT BALANCE (VIA METHOD 2)= 0.0059 PERCENT

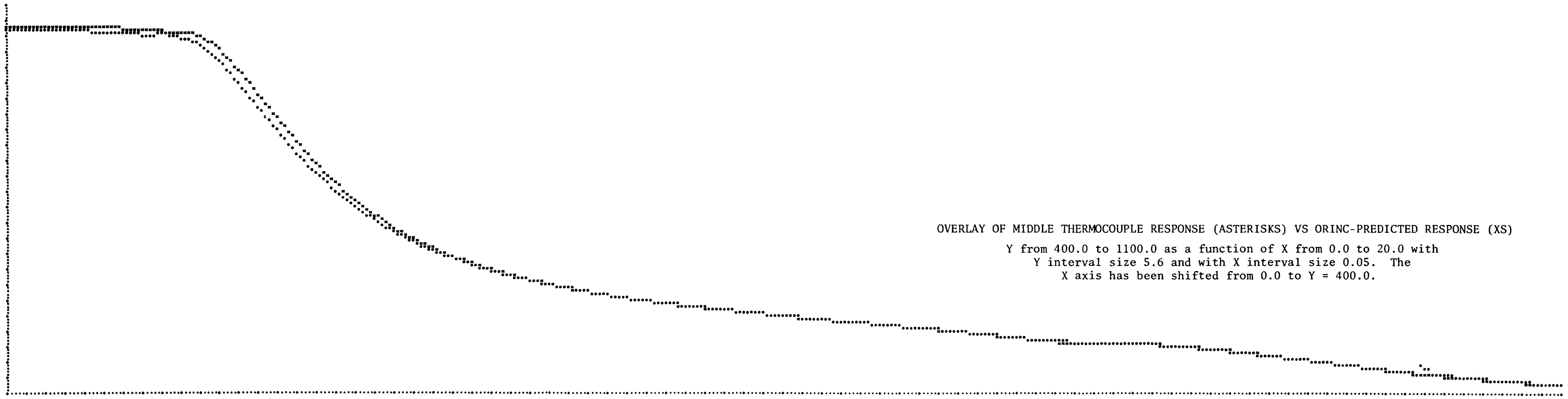

Fig. E-4. Overlay of TE-301MJ response with ORINC predicted centerline response.

VITA

Larry J. Ott, born in Knoxville, Tennessee, on October 31, 1946, is the son of the late David William Ott and the former Annie Myers. He graduated from Young High School, Knoxville, Tennessee, in 1964, entered the University of Tennessee in September 1964, and received a Bachelor of Science degree in chemical engineering in June 1968.

He entered the Graduate School of the University of Tennessee in June 1968. He took a position with the Tennessee Eastman Company in October 1970 and has been with the Oak Ridge National Laboratory since November 1975.

He is married to the former Charlotte Ann Fowler of Knoxville, Tennessee, daughter of Clyde Bernard Fowler and the former Delores Glandon.