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AEROJET GENERAL TIRE GENERAL

REPORT NO. RN-S-0114
TO
AEC-NASA SPACE NUCLEAR PROPULSION OFFICE

TRANSIENT ENGINE SIMULATION PROGRAM

ROCKET ENGINE OPERATIONS - NUCLEAR

CONTRACT SNP-1 AUGUST 1964 NERVA PROGRAM

AEROJET-GENERAL CORPORATION
A SUBSIDIARY OF THE GENERAL TIRE & RUBBER COMPANY

ABSTRACT

This report describes the Transient Engine Simulation Program showing logic and the derivation of equations. Operating instructions are also given.

The program will calculate metal and fluid temperatures and stagnation pressure distributions as functions of time and distance. The overall engine system is represented by combining several separate existing mathematical models of engine subsystems (e.g. turbopump, reflector, shield, core, nozzle, hot-bleed port). The program is general and capable of handling design modifications.

Program accuracy is shown to be a direction function of input. Good agreement with NRX-A1 and other test data has been shown. The program is in production and is coded in SCAT for the IBM 7094 computer using the Aerojet Kismet monitor.

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I. PURPOSE

The Transient Engine Simulation Program is designed to predict the transient operation of the NERVA rocket engine with minimum run time on the computer; however, the mathematical model is flexible enough to determine the thermal and hydrodynamic characteristics of a wide range of mono-fluid flow systems. Therefore while the Logical Order of Solution, Sec. III, B, is tied into the NERVA engine, it is also applicable to other systems.

II. SUMMARY

A. METHOD OF SOLUTION

The transient engine simulation program is a finite-difference, explicit solution, digital-computer program that calculates solid temperature, liquid temperature, and pressure distribution as functions of distance and time throughout the engine system. Separate analyses of the turbopump, hot-bleed port, reflector, shield, core, nozzle, and various tanks and lines are combined to represent the transient performance of the complete engine.

The turbopump assembly model consists primarily of an energy balance, including an energy storage term to account for the angular energy of the rotating machinery.

The analytical representation of the reflector, shield, and core (identified as parts in the program) is a one-fluid-channel finite-difference energy balance. The single-channel representation allows computation simplicity and improves computing speed but necessitates utilization of several unique analysis techniques. The flow channels in the various components are of different size and shape and thus requires incorporation of a "void fraction"* in the heat-transfer analysis. The void fraction, when used properly, quite satisfactorily simulates the heat transfer of a many-channeled heat exchanger with a one-channel representation. However, this method destroys the hydrodynamic characteristics.

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* The void fraction is defined as the flow area divided by the total heat-transfer area (flow area plus metal area) of the heat exchanger.

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The fluid-pressure distribution is obtained by analyzing the various flow channels and calculating a bulk friction factor for use with the one-channel representation. This method has been tested for nuclear power engine cases and with test data for liquid, cold gas, and ambient gas flows; good results have been obtained in all cases for both heat-transfer and pressure-drop characteristics.

The nozzle, being a counter-current heat exchanger, is not adaptable to the basic model used for the reflector, shield, and core. Therefore, a model was developed treating the nozzle as a single-pass counter-current heat exchanger. The tubes are divided into finite distance increments for pressure-drop and heat-transfer calculations. Calculations are made for flow, heat-transfer coefficients, unique metal conductivities, and exit, entrance and turning pressure losses. Heat-transfer areas, wetted perimeter, and pressure-loss coefficients are required as input. The nozzle-tube representation is accurate for a nuclear transient run since the largest heat addition to the nozzle coolant is due to core exit gases; however this method gives poor results for a nozzle cool-down due to large heat additions from the nozzle tube jacket. A revised nozzle-tube program is presently being developed.

The hot-bleed port subroutine is also a counter-current finite difference routine which balances the turbine flow rate from both the diluent and hot inlet pressures. Entrance loss, exit loss, vena contracta, and angle of diluent injection are considered. The diluent extraction point can be varied within the engine. The representation of the hot bleed is moderately rigorous and agrees well with early tests run on a 2.5-in. hot-bleed port.

A linear predictor routine is used to project the program to the succeeding time point. The predictor is accurate enough to eliminate a closure on the pump discharge pressure, which greatly reduces the overall program running time.

At present a set of eight simultaneous partial differential equations are being programmed for inclusion in this program. The addition of these equations will enable the program to handle any transient fluid flow situation, including two-phase flow.

B. CAPABILITIES AND ACCURACIES

The program is designed so that the physical characteristics of the system may be input; therefore, the program is extremely flexible and is capable of handling major design modifications.

The single-flow channel, however, somewhat limits the program since this does not permit prediction of the metal temperatures in the tie-rod channel. A model of the tie-rod channel is presently being "checked out", for the inclusion in the program, and it will correct this deficiency.

The program accuracy is a direct function of the input. The closure tolerances, increments for finite differences, pressure-drop constants, and the constants used by the program to calculate convective heat-transfer-film coefficients are input. However, reasonably large time and distance nodes result in only a small error, but greatly improve the program operating time*. However, if proper input is applied to the program, the results will provide good agreement with test data.

Comparison of this program with data from NRX-A1 showed that the calculated values fell within the test data bandwidth (with the exception, as previously explained, of the nozzle chilldown, where there is a large heat addition to the fluid from the nozzle jacket).

* For example, $\Delta t = 1$ sec, and $\Delta t = 0.2$ sec,
$\dot{w}_p = 4.36$ $\dot{w}_p = 4.44$
This illustrates a difference of 1.8%.

III. TECHNICAL DISCUSSION

A. DERIVATION OF EQUATIONS*

1. Turbopump

The turbopump model consists of four basic equations:

(1) the turbine work
(2) the pump work
(3) a calculation of the pressure ratio across the turbine
(4) the energy balance on the turbopump assembly.

a. Turbine Work Done

The turbine work is found by calculating the isentropic turbine work and multiplying it by a turbine efficiency factor.

Turbine work = Turbine efficiency x turbine isentropic work, or

$$W_{T\ act} = \eta_T \left[\dot{w}_T\ C_p\ (T_{11} - T_{12})\ isen \right] \qquad (1)$$

Considering isentropic and ideal gas relationships,

$$T_{12} = T_{11} \left[\frac{P_{11}}{P_{12}} \right]^{\frac{\gamma-1}{\gamma}} \qquad (2)$$

where

$$\frac{\gamma-1}{\gamma} = \frac{R}{778\ C_p} \qquad (3)$$

therefore,

$$T_{12} = \left[\frac{P_{11}}{P_{12}} \right]^{\frac{R}{778\ C_p}} \qquad (4)$$

*A glossary of terms appears as Section IV of this volume.

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Now, substituting pressures for temperature and rearranging algebraically.

$$W_{T\ act} = \eta_T \dot{w}_T C_p T_{11} \left[1 - \left(\frac{P_{11}}{P_{12}} \right)^{\frac{R}{778\ C_p}} \right] \quad (5)$$

b. Pump Work Done

The pump work done is the flow times the enthalpy difference across the pump divided by the pump's efficiency

$$W_{P\ act} = \frac{\dot{w}_P \Delta h}{\eta_P} , \quad (6)$$

c. Pressure Ratio Across the Turbine

The pressure drop across the turbine is controlled by two choked nozzles, the turbine inlet nozzle (A_{tn}) and the last-stage rotor of the turbine (A_{rn}). Using the isentropic choked equation,* it is possible to calculate P_{12} and P_{11} from the turbine flow rate as functions of T_{12} and T_{11}:

$$P_{12} = \frac{\dot{w}_T \sqrt{T_{12}}}{A_{rn}(.1396)} \quad \text{and} \quad P_{11} = \frac{\dot{w}_T \sqrt{T_{11}}}{K_t} \quad (7)$$

where

$$K_t = (.1396\ A_{tn})$$

By equating $\dot{w}_T$, we obtain

$$\frac{P_{12}}{P_{11}} = \frac{K_t}{A_{rn}\ (.1396)} \sqrt{\frac{T_{12}}{T_{11}}} \quad (8)$$

*Acher Shapiro, Dynamics and Thermodynamics of Compressible Fluid Flow, page 83, Ronald Press Co.

Actual temperature differential across the turbine is equal to the product of turbine isentropic temperature differential and turbine efficiency:

$$\Delta T = \eta_T \Delta T_{isen} \quad (9)$$

$$(T_{12} - T_{11}) = \eta_T (T_{12\ isen} - T_{11}) \quad (10)$$

solving for

$$\frac{T_{12}}{T_{11}} = 1 - \eta_T \left(1 - \frac{T_{12\ isen}}{T_{11}} \right) \quad (11)$$

Now, since

$$\frac{T_{12\ isen}}{T_{11}} = \left(\frac{P_{12}}{P_{11}} \right)^{\frac{R}{778\ C_p}} \quad (12)$$

then

$$\frac{T_{12}}{T_{11}} = \left(\frac{P_{12}}{P_{11}} \right)^{\frac{R}{778\ C_p}} \quad (13)$$

Now, substituting for $\frac{T_{12}}{T_{11}}$ in Equation 8, we obtain

$$\frac{P_{12}}{P_{11}} = \frac{K_t}{A_{rn}\ (0.1396)} \sqrt{1 - \eta_T \left[1 - \left(\frac{P_{12}}{P_{11}} \right)^{\frac{R}{778\ C_p}} \right]} \quad (14)$$

The above equation lends itself to a digital iteration solution.

d. Energy Balance on the Turbopump Assembly

To obtain the pump work at time (i + 1), the average pump work between this time (i + 1), and i, plus the change in rotational energy over that time difference is equated to the average turbine work for the same time period, as given by

$$\frac{W_{P\ act\ (i)} + W_{P\ act\ (i+1)}}{2} + \frac{d\left(\frac{I\,\omega^2}{2}\right)}{dt} = \frac{W_{T\ act\ (i)} + W_{T\ act\ (i+1)}}{2} \qquad (15)$$

rearranging,

$$W_{P\ act\ (i+1)} = W_{P\ act\ (i)} - \frac{d(I\,\omega^2)}{dt} + W_{T\ act\ (i)} + W_{T\ act\ (i+1)} \qquad (16)$$

Using finite difference integration on $\frac{d(I\,\omega^2}{dt}$ and solving for

$$\omega^2 = \left(\frac{2\pi}{60}\right)^2 (N^2) \qquad (16a)$$

$$\frac{d(I\,\omega^2)}{dt} = \frac{I\left(\frac{2\pi}{60}\right)^2 N^2_{(i+1)} - N^2_{(i)}}{12g\ \Delta t 778} \qquad (17)$$

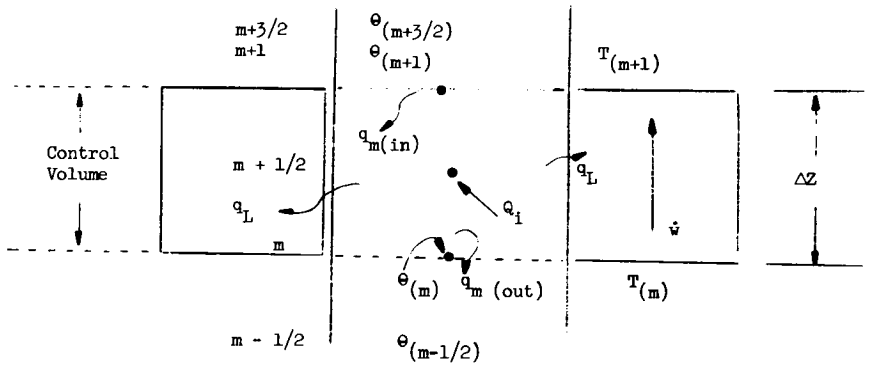
Substituting into the above, the equation for $W_{P\ act\ (1+1)}$ is obtained as

$$W_{P\ act\ (i+1)} = -W_{P\ act\ (i)} - \frac{I}{12g\ \Delta t}\left(\frac{2\pi}{60}\right)^2 \left(\frac{N^2_{(i+1)} - N^2_{(i)}}{778}\right)$$

$$+ W_{T\ act\ (i+1)} + W_{T\ act\ (i)} \qquad (18)$$

2. General Heat-Transfer Equations

The general heat-transfer model consists of two energy balances, one on a liquid node and one on a metal node. A control volume is assumed as follows:



The energy into the control volume is equated to the energy out of the control volume

$$\frac{\partial E_{in}}{\partial t} = \frac{\partial E_{out}}{\partial t}$$

The energy balance on the liquid assumes steady flow and steady-state over the distance increment, and thus no energy storage in the liquid. Therefore,

$$h_f\ \Delta Z F_P \left[\theta_{(m+\frac{1}{2},n)} - T_{(m+\frac{1}{2},n)}\right] = \dot{w}\ C_P \left[T_{(m+1,n)} - T_{(m,n)}\right] \qquad (19)$$

Define

$$M = \frac{\dot{w}\ C_P}{h_f\ \Delta Z\ F_P} \qquad (20)$$

and substitute into the above. Then,

$$T_{(m+1,n)} - T_{(m,n)} = \frac{1}{M}\left[\theta_{(m+\frac{1}{2},n)} - T_{(+\frac{1}{2}n)}\right] \qquad (21)$$

Assuming the temperature distribution in the fluid control volume varies linearly with distance, the average temperature of the fluid node becomes

$$T_{(m+\frac{1}{2},\,n)} = \frac{T_{(m+1,n)} + T_{(m,n)}}{2} \tag{22}$$

Now, substituting into the above and rearranging to solve for $T_{(m+1,n)}$ we obtain the next fluid temperature

$$T_{(m+1,n)} = \frac{2\Theta_{(m+\frac{1}{2},n)} + (2M-1)\,T_{(m,n)}}{2M+1} \tag{23}$$

The energy balance on the metal control volume is more complex than that of the liquid; the energy from the previcus node, plus the nuclear energy, minus the energy lost to the next node and the fluid, is equated to the energy storage,

$$\frac{\partial E_{in}}{\partial t} - \frac{\partial E_{out}}{\partial t} = \frac{\partial E_{storage}}{\partial t}$$

Substituting equivalent values,

$$q_{m(in)} + Q_i - q_{m(out)} - q_L = \frac{\partial E_{storage}}{\partial t} \tag{24}$$

Substituting and gathering terms,

$$\frac{2k(1-f)\,A_F}{f\,\Delta Z}\left[\Theta_{(m,n)} - \Theta_{(m+\frac{1}{2},n)}\right] + Q_i - \frac{2k(1-f)\,A_F}{f\,\Delta Z}\left[\Theta_{(m+\frac{1}{2},n)} - \Theta_{(m+1,n)}\right]$$

$$- \dot{w}\,C_P\left[T_{(m+1,n)} - T_{(m,n)}\right] = \frac{\Delta Z(1-f)A_F C_R \rho_R}{\Delta t\, f}\left[\Theta_{(m+\frac{1}{2},\,n+1)} - \Theta_{(m+\frac{1}{2},n)}\right] \tag{25}$$

Define N as equal to

$$\frac{\Delta Z(1-f)\,A_F C_R \rho_R}{f\,\Delta t\,\dot{w}\,C_P} \tag{26}$$

Substituting and gathering terms

$$\Theta_{(m+\frac{1}{2},\,n+1)} - \Theta_{(m+\frac{1}{2},n)} = \frac{1}{N}\left[T_{(m,n)} - T_{(m+1,n)}\right] + \frac{2K\,\Delta t}{(\Delta Z)^2\,\rho_R\,C_R}\left[\Theta_{(m+1,n)} - 2\Theta_{(m+\frac{1}{2},\,n)} + \Theta_{(m,n)}\right] + \frac{Q_i}{\dot{w}\,C_P\,N} \tag{27}$$

Define S as equal to

$$\frac{2K\,\Delta t}{(\Delta Z)^2\,\rho_R\,C_R} \tag{28}$$

Assuming the temperature gradient in the metal node varies linearly with distance,

$$\Theta_{(m+1,n)} = \frac{\Theta_{(m+\frac{3}{2},\,n)} + \Theta_{(m+\frac{1}{2},\,n)}}{2} \tag{29a}$$

and

$$\Theta_{(m,n)} = \frac{\Theta_{(m+\frac{1}{2},n)} + \Theta_{(m-\frac{1}{2},\,n)}}{2} \tag{29b}$$

Now, substituting Equations (29a) and (29b) into Equation (27),

$$\Theta_{(m+\frac{1}{2},\,n+1)} = \frac{1}{N}\left[T_{(m,n)} - T_{(m+1,n)}\right] + \frac{S}{2}\left[\Theta_{(m+\frac{3}{2},\,n)} - 2\Theta_{(m+\frac{1}{2},n)} + \Theta_{(m-\frac{1}{2},n)}\right] + \frac{Q_i}{\dot{w}\,C_P\,N} \tag{30}$$

From Equation (23),

$$\Theta_{(m+\frac{1}{2},\,n)} = \frac{(2M+1)\,T_{(m+1,n)} - (2M-1)\,T_{(m,n)}}{2} \tag{31}$$

Substituting in the above and gathering terms

$$\theta_{(m+\frac{1}{2},n+1)} = \theta_{(m+\frac{1}{2},n)}\left[1 - \frac{2}{N\,(2M+1)}\right] + T_{(m,n)}\left[\frac{1}{N} - \frac{2M-1}{N\,(2M+1)}\right]$$

$$+ \frac{S}{2}\left[\theta_{(m+\frac{3}{2},n)} - 2\theta_{(m+\frac{1}{2},n)} + \theta_{(m-\frac{1}{2},n)}\right] + \frac{Q_i}{\dot{w}\,C_P\,N} \qquad (32)$$

Let

$$U = \frac{Q_i}{\dot{w}\,C_P\,N} = \frac{H\,\Delta T}{\rho_R\,C_R} \qquad (33)$$

and substituting Equation (26) into (33), and $Q_i = \dfrac{H\,\Delta Z\,(1-f)\,A_F}{f}$

$$U = \frac{Q_i\,f\,\Delta t}{\rho_R\,C_R\,\Delta Z\,(1-f)\,A_F}$$

Therefore,

$$\theta_{(m+\frac{1}{2},n+1)} = \theta_{(m+\frac{1}{2},n)}\left[1 - \frac{2}{N(2M+1)}\right] + T_{(m,n)}\left[\frac{1}{N} - \frac{2M-1}{N\,(2M+1)}\right]$$

$$+ \frac{S}{2}\left[\theta_{(m+\frac{3}{2},n)} - 2\theta_{(m+\frac{1}{2},n)} + \theta_{(m-\frac{1}{2},n)}\right] + U \qquad (34)$$

3. Pressure-Drop Calculation

The pressure-drop calculation is a combination friction and heat-transfer pressure drop that is proportional to $\dfrac{\dot{w}^2}{A^2\,\rho}$

$$\Delta P = \frac{\dot{w}^2}{A_F^2\,\rho\,2g}\left[\frac{T_{(m+1,n)} - T_{m,n}}{T_{m,n}} + \frac{4\phi\,\Delta Z}{\not{D}}\right] \qquad (35)$$

Rearranging,

$$P_{(m,n)} - P_{(m+1,n)} = \frac{\dot{w}^2}{A_F^2\,2g\rho}\left[\frac{T_{(m+1,n)} - T_{(m,n)}}{T_{(m,n)}} + \frac{4\phi\,\Delta Z}{\not{D}}\right] \qquad (36)$$

and

$$P_{(m+1,n)} = P_{(m,n)} - \frac{\dot{w}^2}{A_F\,\rho\,2g}\left[\frac{T_{(m+1,n)} - T_{(m,n)}}{T_{(m,n)}} + \frac{4\phi\,\Delta Z}{\not{D}}\right] \qquad (37$$

4. Flow Rate Capacitance Effects

The change in flow rate over the next time point is equated to the change in flow rate over the previous time point, plus the mass change

$$\dot{w}_{(m+1,n)} - \dot{w}_{(m,n)} = \dot{w}_{(m,n-1)} + \frac{A_F\,\Delta Z}{\Delta t}\left[\rho_{(m,n-1)} - \rho_{(m,n)}\right] \qquad (38)$$

Therefore,

$$\dot{w}_{(m+1,n)} = \dot{w}_{(m,n)} + \frac{A_F\,\Delta Z}{\Delta t}\left[\rho_{(m,n-1)} - \rho_{(m,n)}\right] + \dot{w}_{(m,n-1)} - \dot{w}_{(m+1,n-1)} \qquad (39)$$

5. Hot-Bleed-Port and Nozzle-Tube Model

The heat-transfer and pressure-drop equations explained in paragraphs 2 and 3, above, are basically the same as those used in the hot-bleed-port and nozzle-tube programs. Complete descriptions of the equations used in the hot-bleed-port and nozzle-tube programs are available in REON Reports 8209-64-2 and 8209-64-5, respectively. Copies of these reports may be obtained by contacting the Manager, Contracting Division, REON.

B. LOGICAL ORDER OF OPERATION

Covering subroutines are referenced by comparable letters in enclosing brackets. Unless otherwise referenced, see Figure 1, AZM.

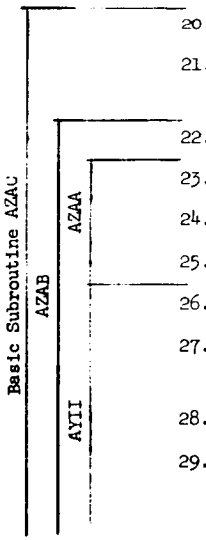
Steps

1. Read in AGC-modified LASL (PRPTY) hydrogen properties subroutine.
2. Set up curves for the pump under investigation of $\frac{\Delta H}{N^2}$ as a function $\frac{Q}{N}$ and $\frac{H_{sv}}{N^2}$ for interpolation.
3. Read standard case, which details the parameters describing the physical system. See AZXC. If an error is detected, print "ERROR IN STANDARD INPUT" and stop. If a tape check occurs, print "BAD TAPE - FLUSH," and stop.
4. Set counter to begin storing at first part (ref. II,A in text). See AZXA.
5. Test next card to see if a standard input is desired. If there is no input remaining, print "END OF INPUT" and stop. If tape check occurs, print "BAD TAPE - FLUSH," and stop.
6. Read in the input for the next part. If no input cards remain, print, "END OF INPUT," and stop, transferring to AZM-12. If the same number of parts as contained in the standard case are read in and no final "T" card is encountered, to flag end of input, print "ZERO T CARD MISSING," and stop.
7. If the final "T" card has been read, go to step 18; if not, continue.
8. Print input for this part.
9. Prepare to set up the input curves (AZM-7). If this is the first part, all input curves are expected. If this is not the first part, the number of curves for one part will be expected.
10. Check the next curve. If the number of points is -1, go to step 12. If the number of points is greater than the maximum number or less than 2, print "ERROR IN PTS/CURVE" and go to step 237.

11. Set up the curve for linear interpolation. See AZM-8.
12. If the required number of curves are not read in, go to step 10.
13. If the number of nodes input for this part is greater than the maximum, print "TOO MANY NODES" and go to step 237.
14. Set inlet and outlet plenum densities and the density for each node to $\rho = f(\Theta_o \text{ and } p_{o\ min})$; thus the density is determined by the initial metal temperature and the minimum outlet pressure. Set all metal temperatures equal to Θ_o and all flow rates to zero.
15. Compute total distance from AZM-19.

$$Z_{max} = (\text{Number of nodes} + \tfrac{1}{2})\ \Delta Z$$

16. If there is not enough storage for this part, go to step 236.
17. Set the counter to read in the next part, and go to step 6.
18. If no parts have been read in and the final "T" card is read in, stop.
19. Set counter to compute input number of time points.



20. Begin program initialization.
21. If the diluent extraction point is zero or beyond the last part, print "NO DILUENT REMOVED" and stop.
22. Set time $_i = -\Delta t$.
23. Time $_{i+1} = \Delta t + \text{time}_i$.
24. If input P_1 is not zero, go to step 31.
25. Interpolate input curves for P_1 and T_1 at time 0.
26. Find $h_1 = f(P_1 T_1)$ in hydrogen properties subroutine.
27. Find $\rho_1 = f(P_1 T_1)$ in hydrogen properties subroutines. If error occurs, print "BAD TANK PRESS, TEMP" and stop the program.
28. Find $S = f(P_2 \text{ and } T_1 + \Delta T)$ in parahydrogen properties subroutine.
29. Find vapor pressure at pump inlet. If the pressure is greater than the total pressure at the pump inlet, print "GAS AT PUMP INLET" and stop.

30. Find pump inlet saturated vapor head.

$$H_{sv} = \frac{P_1 - P_{1\ vapor}}{12\ \rho_1} \frac{\text{ft-lbf}}{\text{lbm}} \qquad \text{(Eq. PT34)}$$

31. If the input gate position is not zero, go to step 33.

32. Interpolate input curve for gate position at time zero.

33. If input tank pressure is zero, go to step 35.

34. For functions of $P_{1_{i+1}}$ at $P_{1_{input}}$ and $T_{1_{input}}$, find entropy and hydrogen properties at P_1 and T_1. If an error occurs in the hydrogen properties subroutine, print "BAD TANK TEMP, PRS" and stop the problem.

35. If input gate position is zero, go to step 37.

36. G.P. = G. P. input.

37. $P_{1_o} = P_{2_c} = P_{1_{(i+1)}}$, $T_{i_o} = T_{2_o} = T_{2_{(i+1)}}$, Pump-outlet conditions at zero time are set equal to pump-inlet conditions.

38. Set $P_{o\ min}$ equal to the input minimum outlet pressure
Set $N_{(i+1)}$ equal to input initial turbine speed
Set $\dot{w}_{P_{(i+1)}}$ equal to input pump flow-rate guess
Set $\dot{w}_{c_{(i+1)}}$ equal to input diluent flow-rate guess
Set $\dot{w}_{b_{(i+1)}}$ equal to input hot-bleed-port flow-rate guess

39. The predicted values for P_6, P_8, T_8, P_{11}, T_{11}, T_{12}, Q_p, $W_{P\ act}$, $W_{T\ act}$, and ΔH are not used in the initial computations and are therefore set equal to zero.

40. Place input hot-bleed-port parameters in storage for hot bleed port program.

41. Set initial T_6 for nozzle tubes equal to the input initial metal temperature.

42. If the nozzle tube subroutine is not required, go to step 46.

43. Find $\sqrt{T_6}$; if $T_6 < 0$, stop the problem.

44. If input $P_{o\ min}$ is not zero, set P_6 equal to input $P_{o\ min}$.
If input $P_{o\ min}$ is zero, interpolate input curve for $P_{o\ min}$ at initial time and set P_6 equal to this value.

45. Set the initial q_1 guess equal to the input initial q_1 guess.

46. If input P_{11} is not zero, set flag to proceed with turbopump calculations as though the hot-bleed port were replaced with a star bottle.

47. Set flags to print nozzle tube and/or hot-bleed port iterations if desired.

48. Set flag to print only inlet and outlet distance nodes for each part if desired.

49. Flag option to ignore nozzle tube choking.

50. Move print-out paper to a new page. Return to AZM-31 and go to AZA

51. Set t_i equal to $t_{(i+1)}$, and proceed to next time point.

52. If $P_{o\ min}$ input is zero, interpolate input curve for $P_{o\ min}$ at next time point.

53. Set the following values at the current time point equal to the predicted values from the preceding time point: P_1, T_1, P_2, T_2, G.P., N, ρ_1, ΔH, $\dot{w}_P$, $\dot{w}_c$, H_{sv}.

54. Print inlet conditions for this time point.

55. Begin iteration to find pump flow ($\dot{w}_{P_i}$ by closing on the calculated pressure in comparison with the pressure required to choke the main nozzle.

56. Set diluent flow rate to the value computed by the hot-bleed-port program. Note that initially this value is that predicted in the previous time interval.
Set temperature equal to T_2, pressure equal to P_2, and flow rate equal to $\dot{w}_P$.

Basic Subroutine AZI

AZB

AZY

AZZ

57. Deactivate "P_6 too low" and "diluent removed" flags.

58. If the diluent is to be removed at the pump outlet, subtract $\dot{w}_c$ from the flow rate, and activate "diluent removed" flag. If $\dot{w}_c$ is greater than the current flow rate, go to step 96.

59. Find the nozzle tube inlet conditions P_3 and T_3 setting T_3 equal to T_2, and T_3 equal to T_2 (Eq. T1)

$$P_3 \text{ equal to } P_2 - K_2 \frac{(\dot{w}_R)^2}{(A_2)^2 \rho_2 2g} \text{ psia} \qquad \text{(Eq. T2)}$$

60. If the diluent is to be removed at the nozzle tube inlet, subtract $\dot{w}_c$ from the flow rate and activate the "diluent removed" flag. If $\dot{w}_c$ is greater than the current flow rate, go to step 96.

61. If the nozzle tube subroutine is desired, enter the nozzle-tube program to find P_4, T_4, the choked-flow rate, and the tube metal temperatures. If a negative pressure occurs in the nozzle tubes, go to step 88. If some other error occurs, print "NOZZLE TUBE ERROR," ignore the nozzle tubes, and continue.

AZY

62. Set counter to first part.

63. If the diluent is to be removed at the inlet to this part, subtract $\dot{w}_c$ from the flow rate, and activate the "diluent removed" flag. If $\dot{w}_c$ is greater than the current flow rate, go to step 96.

64. Set inlet pressure and temperature equal to the current pressure and temperature.

AZB

AZU

65. Find inlet plenum flow-rate change by:

$$\dot{w}_{out} = \dot{w}_{in} + \frac{V_{inlet\ plenum}}{\Delta t}\left\{\rho_{(i-1)} - \rho_i\right\} + \dot{w}_{in} - \dot{w}_{out}\Big|_{(i-1)} \text{ lb/sec}$$

If $\dot{w}_{out}$ < 0, go to step 96.

If current P < 0, go to step 88.

Basic Subroutine AZI

AZB

AZT

AYR

AYQ

AYE

66. In the input inlet orifice K is not zero, compute the inlet pressure drop by:

$$P_{out} = P_{in} - \frac{\dot{w}^2 K_{orifice}}{\rho^2 g} \text{ psia}$$

If P_{out} < 0, go to step 88.

67. Initial Z = 1/2 (Δ Z)

AYR

AZH

68. Find the parahydrogen properties for the pressure and temperature at this node. If P < 0, go to step 88. If some other error occurs, print "BAD FLUID TEMP, PRS," and stop program.

69. Interpolate input curves to find flow area (A_F) and wetted perimeter (F_p) at this distance node.

70. Find the hydraulic diameter by

$$\not{D} = \frac{4 A_F}{F_p} \text{ in inches.} \qquad \text{(Eq. HT4)}$$

AYH

71. Find the film coefficient by

$$h_f = \frac{k}{\not{D}} \left(\frac{4\dot{w}}{\pi F_p}\right)^{0.8} \left(\frac{T}{\theta}\right)^{\alpha} \left(\frac{\not{D}}{\not{D}+Z}\right)^{\beta} \left(\frac{C_P}{k}\right)^{0.4} \frac{\text{Btu}}{\text{in.}^2\text{-sec }^{\circ}\text{R}}$$

(Eq. HT8)

If an error occurs, print "CHECK DUMP FOR NEG" and stop the program.

72. Interpolate input curves to find the thermal conductivity (k) at this metal temperature.

AYN

73. If input wall thickness is zero, find M by:

$$M = \frac{\dot{w}\, C_P}{h_f\, \Delta Z\, F_p} \qquad \text{(Eq. HT1)}$$

If input wall thickness is not zero, find M by:

$$M = \frac{\dot{w}\, C_P}{F_p\, \Delta Z}\left(\frac{1}{h_f} + \frac{X}{2k}\right) \qquad \text{(Eq. HT1a)}$$

Basic Subroutine AZI

AZB

AZT

AYR

AYN

74. If $M < 1/2$, activate "M too small" flag.

75. Find fluid temperature for the next node by setting

$$T_{(m+1,n)} = \frac{2\Theta_{(m+1/2,n)} + (2M-1)\, T_{(m,n)}}{2M+1} \ {}^{\circ}R \qquad \text{(Eq. HT9)}$$

76. Find the fluid pressure for the next node by:

$$P_{(m+1,n)} = P_{(m,n)} - \frac{\dot{w}^2}{A_F^2\, \rho\, 2g} \left[\frac{T_{(m+1,n)} - T_{(m,n)}}{T_{(m,n)}} + \frac{4\phi\, \Delta Z}{D} \right] \text{psia} \qquad \text{(Eq. HT6)}$$

If $P_{(m+1,n)}$ is < 0, go to step 88.

77. Find the capacitance flow rate change by setting

$$\dot{w}_{(m+1,n)} + \dot{w}_{(m,n)} + \frac{A_f\, \Delta Z}{\Delta t} \left[\rho_{(m,n-1)} - \rho_{(m,n)} \right] + \left[W_{(m,n-1)} - W_{(m+1,n-1)} \right] \text{ lb/sec} \qquad \text{(Eq. HT13)}$$

If $\dot{w}_{(m+1,n)} < 0$, go to step 96.

78. Set $Z = Z + \Delta Z$ (meaning, proceed to next distance node)

79. If all nodes for this part have not been processed, to to step 68.

80. If input outlet orifice K is not zero, find the pressure drop by:

$$P_{out} = P_{in} - \frac{\dot{w}^2\, K_{outlet\ orifice}}{\rho\, 2g} \text{ psia} \qquad \text{(Eq. HT12)}$$

If $P_{out} < 0$, go to step 88.

AYEA

AYQ

81. Set outlet pressure equal to the current pressure.

Basic Subroutine AZI

AZB

AZT

AYEA

AZU

82. Find the outlet flow rate change by:

$$\dot{w}_{out} = \dot{w}_{in} + \frac{V_{outlet\ plenum}}{\Delta t} \left[\rho_{(i-1)} - \rho_{(i)} \right] + \dot{w}_{in(i-1)} - \dot{w}_{out\ (i-1)} \qquad \text{(Eq HT13a)}$$

If $\dot{w}_{out} < 0$, go to step 96.

83. Set outlet flow rate equal to the current flow rate.

84. Set increment counter to process next part. If all parts have not been processed, go to step 63.

85. Set P_6 and T_6 to current pressure and temperature.

86. If P_6 is less than $P_{o\ min}$, activate "P_6 too low" flag.

87. Go to step 89. (Exit AZB)

88. If the current pressure is negative, go to step 97. If not, print "HEAT TRANSFER ERROR" and stop the program. (AZB, AZFF)

89. If a start bottle is used, go to step 99.

90. Enter hot-bleed port program to find $\dot{w}_c$, $\dot{w}_h$, $\dot{w}_N$, and P_8. If a negative pressure occurs, go to step 101. If $\dot{w}_h$ is negative somewhere, go to step 99.

RAPA

91. If $\dot{w}_N$ from the hot-bleed port program and the calculated $\dot{w}_N$ agree within the input tolerance, go to step 93.

92. Calculate a new $\dot{w}_P$ guess and adjust if necessary to arrive at a value between the given maximum and minimum values. If the maximum number of iterations has been exceeded, go to step 98. If not, go to step 56.

93. If the diluent flow rate used does not agree with $\dot{w}_c$ from the hot-bleed port program within the input tolerance, and the maximum number of iterations has not been exceeded, go to step 56. If the maximum number of iterations has been exceeded, go to step 98.

94. Store the number of iterations for printing.

95. Go to step 102 and exit AZI.

Basic Subroutine AZPI

96. A negative flow rate has occurred somewhere in the system. If the "DILUENT REMOVED" flag is active, subtract the diluent flow from the current pump flow, and use this as a lower limit on $\dot{w}_P$. If not, use the current $\dot{w}_P$ as the lower limit. Go to step 92.

BDXA

97. A negative pressure has occurred somewhere in the system. If the "DILUENT REMOVED" flag is active, add the diluent flow from the current pump flow and use this as an upper limit on $\dot{w}_P$. If not, use the current $\dot{w}_P$ as an upper limit. Go to step 92.

AZFT

98. Print "WR, WC NOT CLOSED"; set number of iterations to the maximum and go to step 95.

99. Compute nozzle choke flow as follows, assuming $\dot{w}_h = 0$:

$$\dot{w}_{N\ choke} = \frac{0.1396\ A^*\ P_6}{\sqrt{T_6}}\ lb/sec \qquad \text{(Eq. HT11)}$$

RAPA

100. If $\dot{w}_{N\ choke}$ and $\dot{w}_N$ calculated agree within the input tolerance, go to step 94. If not, go to step 92.

NEWA

101. Halve the diluent flow rate. If the maximum number of iterations has been exceeded, go to step 98. If not, go to step 56.

102. Print the main engine system parameters. The following error messages are printed if applicable: "LIQ IN TUBE THROAT," "M TOO SMALL," "TEMP EXCEEDED MAX," "P6 TOO LOW."

AZK

103. Set counter to first part. Prepare to transfer current values to past time values.

104. Set past time point inlet and outlet plenum densities and flow rates equal to current values.

105. Set past time point densities and flow rates for each node equal to current values.

106. If all parts have not been processed, set counter to next part and go to step 104.

Basic Subroutine AYPA

AZPP

107. Print Values predicted from the preceding time point.

AYGA

108. Find $Q_{P\ i}$ from the following equations:

$$Q_{P_i} = \frac{\dot{w}_P}{\rho_1\ (.00228)(1728)}\ gal/min \qquad \text{(Eq. PT18)}$$

$$\beta = \frac{P_6}{\dot{w}_P} \qquad \text{(Eq. PT13)}$$

$$\alpha = (P_2 - P_6)\ \dot{w}_P^2 \qquad \text{(Eq. PT14)}$$

109. If a start bottle is not being used, go to step 127.

110. Set P_{11} and T_{11} equal to the input P_{11} and T_{11}.

111. Find $\sqrt{T_{11}}$. If $T_{11} \leq 0$, stop the program.

112. Find P_{11} from the following:

$$P_{11} = \dot{w}_T \frac{\sqrt{T_6}}{K_t}\ psi \qquad \text{(Eq. PT7)}$$

113. De-activate "P_{12} not closed" flag.

AYJ

114. Find $\eta_t = \left[-.6318076 \times 10^{-6} \left(\frac{N_i}{\sqrt{T_{11}}}\right)^2 + \left|.11039226 \times 10^{-2}\right| \left(\frac{N_i}{\sqrt{T_{11}}}\right)\right]$

AXB

115. Set the upper limit on $P_{12\ i}$ equal to $P_{11\ i}$.

AZH

116. Find $C_{P\ 11}$ from P_{11}, T_{11}. If an error occurs, stop.

NFWB

117. Begin the iteration to find $P_{12\ i}$ by closing on $\left(\frac{P_{12}}{P_{11}}\right)_i$

118. Find $T_{12} = T_{11} \left(\frac{P_{12}}{P_{11}}\right)^{\frac{R}{778\ C_{P\ 11}}}\ ^oR$ (Eq. PT44)

119. Find $\eta_T = \eta_T' \left[1 + \frac{\gamma\ RT_{12}}{(\gamma+1)\ C_{P\ 11}\ (778)\ (T_{11} - T_{12})}\right]$ (Eq. PT45)

Basic Subroutine AYPA

120. Find $\left(\frac{P_{12}}{P_{11}}\right)' = \frac{K_t}{2\,A_{rn}(.1396)}\sqrt{1 - \eta_T\left[1 - \left(\frac{P_{12}}{P_{11}}\right)'^{\frac{R}{778\,C_{P\,11}}}\right]}$ (Eq. PT9)

121. If $\frac{P_{12}}{P_{11}}$ and $\left(\frac{P_{12}}{P_{11}}\right)'$ are within the input closure tolerance, continue. If not, calculate a new P_{12} guess and adjust, if necessary, so it lies between the given minimum and maximum values. If the maximum number of iterations has been exceeded, activate the "P_{12} not closed" flag and continue. If not, go to step 118.

RAPB

AYB

122. Find $W_{T\,act\,i} = \dot{w}_{T\,i}\,\eta_T\,C_{P\,11}\,T_{11}\left[1 - \left(\frac{P_{12}}{P_{11}}\right)^{\frac{R}{778\,C_{P\,11}}}\right]$ Btu/sec (Eq. PT10)

AYK

123. Find η_P from program curves as a function of Q_P/N and $NPSP/N^2$.

124. If $\eta_P = 0$, set $W_{P\,act\,i} = 0$, and go to step 127.

AYZ

125. Find $W'_{P\,act\,i} = W_{P\,act\,i} = \frac{\dot{w}_P\,\Delta h}{\eta_P}$ Btu/sec (Eq. PT21)

126. Go to step 140. (Exit AYL).

127. Find $\dot{w}_{T\,i} = \dot{w}_{h\,i} + \dot{w}_{c\,i}$ lb/sec (Eq. PT27a)

128. Find $K_6 = \frac{T_{8\,i}\,\dot{w}_{T\,i}}{T_{2\,i}\,\dot{w}_{c\,i} + T_{6\,i}\,\dot{w}_{h\,i}}$ unitless (Eq. PT27)

129. Find $K_{10} = \frac{\dot{w}_c}{\sqrt{P_2 - P_{HM}}}$ lb/sec, $psia^{1/2}$ (Eq. PT36)

AYG

130. Find $K_{16} = \frac{\dot{w}_h}{\sqrt{P_6 - P_{HM}}}$ lb/sec, $psia^{1/2}$ (Eq. PT35)

Basic Subroutine AYPA

AYG

131. Find $K_{12} = \frac{\dot{w}_T}{V_8}$ lb/in. (Eq. PT37)

132. Find $K_{13} = \frac{\dot{w}_h}{V_{HM}}$ lb/in. (Eq. PT38)

133. Find $K_{14} = \frac{\dot{w}_c}{V_{CM}}$ lb/in. (Eq. PT39)

134. Find $K_{15} = \frac{\dot{w}_c}{\sqrt{P_2 - P_{CM}}}$ lb/sec, $psia^{1/2}$ (Eq. PT40)

135. Find $K_{v(i+1)} = A\left[GP_{(i+1)}\right] - B$ (Eq. PT33)

136. Find $K_3 = 1/K_t^2 + K_{1(i+1)} + K_2\,\frac{lbf^2, sec^2}{lbm^2, in.^4, {}^oR}$ (Eq. PT30)

where

$$K_{1(i+1)} = \frac{R\,(2\,\rho_{H_2O})}{\left[K_{v(i+1)}^2\right](144)} \quad \frac{lbf^2, sec^2}{lbm^2, in.^4, {}^oR} \qquad \text{(Eq. PT30a)}$$

$$K_2 = \frac{R\,(K_{11} + K_9)\,(12)}{A^2\,g} \quad \frac{lbf^2, sec^2}{lbm^2, in.^4, {}^oR} \qquad \text{(Eq. PT30b)}$$

$$K_t = A_{tn}\sqrt{\frac{\gamma\,g}{R(12)}\left(\frac{2}{\gamma+1}\right)^{\frac{\gamma+1}{\gamma-1}}}$$

137. Find $T_{11\,i} = T_{8\,i}$, ${}^oR$ (Eq. PT6)

AYB

138. Find $W_{T\,i} = P_{11\,i}\,\frac{K_t}{\sqrt{T_{11}}}$ lbm/sec (Eq. PT7)

139. Go to step 113.

AZPP

140. Print corrected values.

141. If all of the desired number of time points have been computed, go to step 4.

142. Set counter to compute metal temperatures for the first part at the next time.

143. Deactivate "maximum temperature exceeded" flag for this part.

144. Set time to time at which last fluid computations were made.

145. Set the node counter to the first node for this part.

$$A = 1/2\ (\Delta Z)$$

146. Find the average flow rate for this node

$$\dot{w}_{(m+1/2)} = 1/2 \left[\dot{w}_{(m)} + \dot{w}_{(m+1)} \right]$$

AZC

147. Interpolate the input curves to find A_F and F_P at this distance node.

148. Find the average pressure, temperature, and specific heat for this node.

$$T_{(m+1/2)} = 1/2 \left[T_{(m)} + T_{(m+1)} \right.$$

$$P_{(m+1/2)} = \left[P_{(m)} + P_{(m+1)} \right.$$

$$C_{P\ (m+1/2)} = 1/2 \left[C_{Pm} + C_{P\ (m+1)} \right.$$

149. Interpolate the input curves to find C_R and k for the metal temperature at this node.

150. Interpolate input curves for total heat-generation coefficient at this time point and fraction of total for this distance node. The internal heat-generation coefficient for this node will be the product of the total and the fraction.

151. If input wall thickness is 0, find M

$$M = \frac{\dot{w}\ C_P}{h_f\ \Delta Z\ F_P} \qquad \text{(Eq. HT1)}$$

If not,

$$M = \frac{\dot{w}\ C_P}{F_P\ \Delta Z} \left[\frac{1}{h_f} + \frac{X}{2k} \right. \qquad \text{(Eq. HT1a)}$$

AYN

152. If M < 1/2, activate "m too small" flag.

153. If input wall thickness is 0, find N

$$N = \frac{\Delta Z(1-f)\ A_F\ \rho_R\ C_R}{f\ \Delta t\ \dot{w}\ C_P} \qquad \text{(Eq. HT2)}$$

If not,

$$N = \frac{\Delta Z\ \pi\ (\bar{p}-x)\ \rho_R\ C_R}{\Delta t\ \dot{w}\ C_P} \qquad \text{(Eq. HT2a)}$$

154. If M ≥ N, go to step 165.

155. Find $S/2 = \dfrac{k_R\ \Delta t}{(\Delta Z)^2\ \rho_R\ C_R}$ (Eq. HT3)

156. Find $U = \dfrac{H\ \Delta t}{\rho_R\ C_R}$, ^{o}R (Eq. HT5)

157. Find metal temperature for the next time point.

$$\Theta_{(m+1/2,n+1)} = \left[\frac{1}{N} - \frac{2M-1}{N(2M+1)} \right] T_{(m,n)} + \left[1 - \frac{2}{N(2M+1)} \right] \Theta_{(m+1/2,n)}$$

$$+ \frac{S}{2} \left[\Theta_{(m+3/2,n)} - 2\Theta_{(m+1/2,n)} + \Theta_{(m-1/2,n)} \right] + U,\ ^{o}R \qquad \text{(Eq. HT10)}$$

158. If $\Theta_{(m+1/2,n+1)} \geq T_{max}$, activate the "maximum temperature exceed" flag.

159. Set increment counter to compute the next node

$$Z = Z + \Delta Z$$

160. If all nodes for this part have not been computed, go to step 146.

161. Extrapolate metal temperatures at the ends of parts:

$$\Theta_{(m-1/2)} = 2\Theta_{(m+1/2)} - \Theta_{(m+3/2)}$$

$$\Theta_{(m\ max\ +\ 3/2)} = 2\Theta_{(m\ max\ +\ 1/2)} - \Theta_{(m\ max\ +\ 3/2)}$$

162. Add the metal-temperature time-increment of this part to the current time. If it is less than the next fluid computation time, go to step 145.

163. Set the increment counter to compute the next part. If all the parts have not been computed, go to step 143.

164. Go to 166. (Exit AZJ)

145. Halve the time increment for this part. If $\Delta t < \Delta t_{min}$ print "DELTA T TOO SMALL" and stop. If not go to step 145.

146. If the outlet metal temperature of the last part is less than θ_{min} and this time point has already been printed, print "COOLDOWN REACHED," and go to step 4.

147. $Time_{(i+1)} = Time_{(i)} + \Delta t$

148. If input tank pressure (P_1) is not zero, go to step 175.

149. Interpolate the input curves of P_1 and T_1 for P_1 and T_1 at this time point.

170. Find the entropy at P_1 and T_1.

171. Find the hydrogen properties of P_1 and T_1. If an error occurs, print "BAD TANK PRS, TMP" and stop.

172. Find entropy at P_1 and $T_1 + \Delta T$, where ΔT is a temperature increment used in finding isentropic temperature changes across the pump.

173. Find vapor pressure at P_1 and T_1. If the vapor pressure is greater than the total pressure, print "GAS AT PUMP INLET" and stop.

174. Find $H_{ev\ (i+1)} = \dfrac{P_1 - P_{1\ vapor}}{12\ \rho_1}$, $\dfrac{ft, lbf}{lbm}$ (Eq. PT34)

175. If input gate position is 0, interpolate input curves for G.P. at this time point.

176. If $N_1 = 0$, set $N_{(i+1)}$ guess = 5000. If not, set $N_{(i+1)}$ guess = N_1.

177. Begin iteration to find $N_{(i+1)}$ by closing on $W_{P\ act(i+1)}$ computed by energy balance and work required.

178. Deactivate $\theta_{P(i+1)}$ not closed flag.

179. $\theta_{P(i+1)\ guess} = \theta_{P\ (i)}$

180. Begin iteration to find $\theta_{P\ (i+1)}$ by closing on $\Delta H_{(i+1)}$.

181. Find $\dot{w}_{P(i+1)} = Q_{P(i+1)}\ \rho_1\ (0.602228)\ (1728)$ lbm/sec (Eq. PT18)

182. Find $P_{2(i+1)} = \alpha\ \dot{w}^2_{P\ (i+1)} + \beta \dot{w}_{P(i+1)}$, psia (Eq. PT17)

183. Find $T_{2\ (i+1)}$ from P_2, P_1, and T_1 isentropically

$$T_{2(i+1)} = T_{1(i+1)} + \frac{\Delta T\ (S'' - S)}{(S - S')}\ ,\ ^{o}R$$

where

$S = S\ (P_1 \text{ and } T_1)$

$S' = S'\ (P_1 \text{ and } T_1 + \Delta T)$

$S'' = S\ (P_2 \text{ and } T_1)$

ΔT = small temperature increment, in. ^{o}R

184. Find parahydrogen properties at P_2 and T_2. If an error occurs, go to step 191.

185. Find $\Delta H_{(i+1)} = 776 \left[h\ (P_2, T_2) - h\ (P_1\ T_1) \right]$, $\dfrac{ft, lbf}{lbm}$ (Eq. PT16)

If $\Delta H_{(i+1)} < 0$, go to step 192.

186. Find $\Delta H/N^2 = f\ (Q/N \text{ and } NPSP/N^2)$ from the turbopump curves.

187. Find $\Delta H_{(i+1)} = \left[\dfrac{\Delta H}{N^2} \right]_{(i+1)} N^2_{(i+1)}$, $\dfrac{ft, lbf}{lbm}$ (Eq. PT20)

188. If $\Delta H_{(i+1)}$ and $\Delta H'_{(i+1)}$ are within the input closure tolerance, go to step 193.

189. Compute a new $Q_{P(i+1)}$ guess, and adjust, if necessary, so that it is between the given maximum and minimum values.

190. If the maximum number of iterations has been exceeded, activate the $Q_{P(i+1)}$ not closed flag and go to step 193. If not, go to step 181.

191. If $T_{2\ (i+1)}$ is too low, go to step 192. If $P_{2\ (i+1)}$ is too large, use the current value of $Q_{P\ (i+1)}$ as an upper limit on $Q_{P\ (i+1)}$ and go to step 189.

Basic Subroutine AYPB

AYA

BDWB

192. Use the current value of $Q_{P\ (i+1)}$ as a lower limit on $Q_{P\ (i+1)}$ and go to step 189.

193. If a start assistance is being used, find

$$\dot{w}_{T\ (i+1)} = \frac{P_{11\ (i+1)}\ K_t}{\sqrt{T_{11\ (i+1)}}}\ \text{lb/sec, and go to step 216}$$

AYB

If $T_{11\ (i+1)} < 0$, stop.

194. Deactivate $\dot{w}_H$ not closed flag.

195. Find $P_{6\ (i+1)} = \beta\ \dot{w}_{P\ (i+1)}$, psia (Eq. PT21)

196. Set $\dot{w}_{h\ (i+1)}$ guess $= \dot{w}_{h\ (i)}$

NEMB

197. Begin iteration to find $\dot{w}_{h\ (i+1)}$ by closing on $P_{8\ (i+1)}$

198. Find $P_{HM} = \left[\frac{\dot{w}_{h(i+1)}}{K_{16}}\right]^2 - P_{6\ (i+1)}$, psia (Eq. PT35)

If $P_{HM} < 0$, go to step 212.

199. Find $\dot{w}_c = K_{10}\ \sqrt{P_{2\ (i+1)} - P_{HM\ (i+1)}}$, lb/sec (Eq. PT36)

If $P_{2\ (i+1)} < P_{HM\ (i+1)}$, stop.

200. Find $\dot{w}_{T\ (i+1)} = \dot{w}_{h\ (i+1)} + \dot{w}_{c\ (i+1)}$, lb/sec (Eq. PT27a)

201. Find $V_{8\ (i+1)} = K_{12}\ \dot{w}_{T\ (i+1)}$, in./sec (Eq. PT37)

202. Find $V_{HM\ (i+1)} = K_{13}\ \dot{w}_{h\ (i+1)}$, in./sec (Eq. PT38)

203. Find $V_{CM\ (i+1)} = K_{14}\ \dot{w}_{c\ (i+1)}$, in./sec (Eq. PT39)

204. Find $P_{CM\ (i+1)} = \left[\frac{\dot{w}_{c\ (i+1)}}{K_{15}}\right]^2 - P_{2\ (i+1)}$, psia (Eq. PT40)

$P_{CM\ (i+1)} < 0$, go to step 212.

Basic Subroutine AYPB

AYA

205. Find $T_{8\ (i+1)} = K_6\left(\frac{T_2\ \dot{w}_c + T_6\ \dot{w}_h}{\dot{w}_T}\right)\ (i+1)$, °R (Eq. PT28)

and $T_{8\ (i+1)}$ static $= \left(\frac{T_{8\ (i+1)}}{\frac{\gamma-1}{2} M^2 + 1}\right)$, °R (Eq. PT41)

AZQ

206. Find $P_{8\ (i+1)}$ static

$$= \frac{\left[A_H\ P_{HM} + (P_{CM}-P_{HM})A_{cn}\cos\theta\right] + \dot{w}_c(V_{CM}\cos\theta - V_8) + (V_{HM}-V_8)\dot{w}_h}{g\ A_H + \frac{f\ V_8\ P\ D_H\ L}{2\ RT_8}}\text{, psia}$$ (Eq. PT42)

207. Find $P_{8\ (i+1)} = P_{8\ (i+1)\ \text{static}}\left[\frac{\gamma-1}{2} M^2 + 1\right]^{\left[\frac{2}{\gamma-1}\right]}$, psia (Eq. PT43)

208. Find $P'_{8\ (i+1)} = \dot{w}_{T\ (i+1)}\sqrt{\frac{T_{8\ (i+1)}}{K_3}}$, psia (Eq. PT29)

AYA

209. If $P_{8\ (i+1)}$ agrees with $P'_{8\ (i+1)}$ within the input tolerance, go to step 213.

210. Compute a new $\dot{w}_{h\ (i+1)}$ guess and adjust, if necessary, so that it lies between the given maximum and minimum values.

RAPB

211. If the maximum number of iterations has been exceeded, activate the $\dot{w}_{h\ (i+1)}$ not closed flag and go to step 213; if not, go to step 198.

BDXB

212. Use the current $\dot{w}_{h\ (i+1)}$ value as an upper limit on $\dot{w}_{h\ (i+1)}$ and go to step 210.

213. Find $\sqrt{T_{11\ (i+1)}}$; if $T_{11\ (i+1)} < 0$, stop.

214. Find $P_{11\ (i+1)} = \frac{\dot{w}_{T\ (i+1)}}{K_t}\sqrt{T_{11\ (i+1)}}$, psia

AYB

215. Deactivate the $P_{12\ (i+1)}$ not closed flag.

Basic Subroutine AYPB

AYB

216. Find $\eta_T = -(0.6318076 \times 10^{-6}) \left[\frac{N_{(i+1)}^2}{\sqrt{T_{11(i+1)}}} \right] + (0.11039226 \times 10^{-2}) \left[\frac{N_{i+1}}{\sqrt{T_{11(i+1)}}} \right]$

217. Set upper limit of $P_{12\ (i+1)}$ equal to $P_{11\ (i+1)}$

AZA

218. Find $C_{P\ 11}$ at $P_{11(i+1)}$ and $T_{11(i+1)}$. If error occurs, stop.

NEWB

219. Begin iteration to find $P_{12\ (i+1)}$ closing on $P_{12}/P_{11\ (i+1)}$

220. Find $T_{12\ (i+1)} = T_{11\ (i+1)} \left[\frac{P_{12\ (i+1)}}{P_{11\ (i+1)}} \right]^{\frac{R}{778\ C_{P\ 11}}}$, °R (Eq. PT44)

221. $\eta_T = \eta_T' \left[\frac{\gamma R T_{12\ (i+1)}}{1 + (\gamma+1) C_{P\ 11} (778) \left[T_{11\ (i+1)} - T_{12\ (i+1)} \right]} \right]$, unitless (Eq. PT45)

222. Find $P_{12}/P_{11} = \frac{K_t}{2 A_{rn} (0.1396)} \left\{ 1 - \eta_T \left[1 - \left(\frac{P_{12(i+1)}}{P_{11(i+1)}} \right)^{\frac{R}{778\ C_{P\ 11}}} \right] \right\}$, unitless (Eq. PT9)

APB

223. If $(P_{12}/P_{11})_{(i+1)}$ and $P_{12\ (i+1)}/P_{11\ (i+1)}$ agree within the input tolerance, go to step 226.

224. Compute a new $P_{12\ (i+1)}$ guess and adjust, if necessary so that it lies between the given maximum and minimum values.

225. If the maximum number of iterations have been exceeded, activate the $P_{12\ (i+1)}$ not closed flag and go to step 228. If not, go to step 220.

226. Find $W_{P\ act\ (i+1)} = \dot{w}_{T\ (i+1)}\ \eta_T\ C_{P\ 11}\ T_{11\ (i+1)} \left[1 - \left(\frac{P_{12}}{P_{11}} \right)^{\frac{R}{778\ C_{P\ 11}}} \right]$ Btu/sec (Eq. PT10)

Basic Subroutine AYPB

AYL

AYK

227. Find η_P from program curves as a function of $Q_P/N_{(i+1)}$ and $NPSP/N^2_{(i+1)}$. If $\eta_P = 0$, set $W_{P\ act\ (i+1)} = 0$, and go to step 229.

228. Find $W'_{P\ act\ (i+1)} = \frac{\dot{w}_{P\ (i+1)}\ \Delta h_{(i+1)}}{\eta_P}$, Btu/sec (Eq. PT21)

AYM

229. Find $W_{P\ act\ (i+1)} = W_{P\ act\ (i)} - \frac{I_{PT}}{(776)\ 12g\ \Delta t} \left(\frac{2\pi}{60} \right)^2 \left[N^2_{(i+1)} - N^2_{(i)} \right] + W_{T\ act\ (i+1)} + W_{T\ act\ (i)}$, Btu/sec (Eq. PT11)

KRPA

230. If $W_{P\ act\ (i+1)}$ and $W'_{P\ act\ (i+1)}$ are within the input tolerance, to go to step 234.

231. Compute a new $N_{(i+1)}$ guess, and adjust it if necessary so that it lies between the given maximum and minimum values.

232. If the maximum number of iterations have been exceeded, go to step 233; if not, go to step 178.

233. Print "PREDICTOR FAILED," and go to step 235.

234. If $Q_{P\ (i+1)}$ is not closed, and/or $W_{h\ (i+1)}$ is not closed, and/or $P_{12\ (i+1)}$ is not closed, flags are activated. Go to step 233.

AZFF

235. Go to step 51.

236. Print, "TOO MANY PARTS."

237. Read next input card. If a tape error has occurred print, "HELP HELP HEELLLLP" and stop.

238. If the last card read was the final "T" card, go to step 4; if not go to step 237.

IV. GLOSSARY OF TERMS

A. SYMBOLS

Symbol	Unit	Definition
T	^{o}R	Temperature - Fluid
P	$lbf/in.^2$	Pressure
ρ	$lbm/in.^3$	Density
h_f	$Btu/sec-^{o}R-in.^2$	Convective Heat Transfer Film Coefficient
θ	^{o}R	Temperature - Metal
f	Unitless	Void Fraction
F_p	in.	Wetted Perimeter
A_F	$in.^2$	Flow Area
ΔZ	in.	Distance node
M	Unitless	Equation Coefficient
N	Unitless, RPM	Defined in Equation 26 Turbine Speed
Δt	sec	Time increment
k	$Btu/in.-sec-^{o}R$	Thermal Conductivity
q	Btu/sec	Heat Flow
H	$Btu/sec-in.^3$	Internal Heat Generation
υ	^{o}R	Temperature Rise Due to Internal Heat Generation
S	--	Axial Conduction Coefficient
C_P-C_R	$Btu/in.-^{o}R$	Specific Heat Fluid, Metal
g	$in.-lbm/lbf-sec^2$	Gravitational Constant
$\dot{w}$	lbm/sec	Flow Rate
W	Btu/sec	Work
$\emptyset$	in.	Hydraulic Diameter

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Symbol	Unit	Definition
I	$in.^2$-lbm	Moment of Inertia
Q_p	gal/min	Flow Rate
Q_i	Btu/sec	Internal Heat Generated
H	ft lbf/lbm	Pump Head Rise
h	Btu/lb	Enthalpy
S	Btu/lb-^oR	Entropy
ϕ	Unitless	Friction Factor
η_T	Unitless	Turbine Efficiency
η_p	Unitless	Pump Efficiency
γ	Unitless	Ratio of Specific Heats
ω	rad/sec	Rotational Speed

B. SUBSCRIPTS

Subscripts	Description
1	Pump Inlet
2	Pump Outlet
3	Nozzle Tube Inlet
4	Nozzle Tube Outlet
6	Nozzle Chamber - Core Outlet
8	Hot Bleed Port Outlet
11	Turbine Inlet
12	Turbine Outlet
m	Distance Node
n, i	Time
T act	Actual Turbine
P act	Actual Pump
isen	Isentropic

Subscripts	Description
HM	Hot Mixture
CM	Cold Mixture
c	Cold
h	Hot
N	Nozzle
T	Turbine

SECTION V

FIGURES

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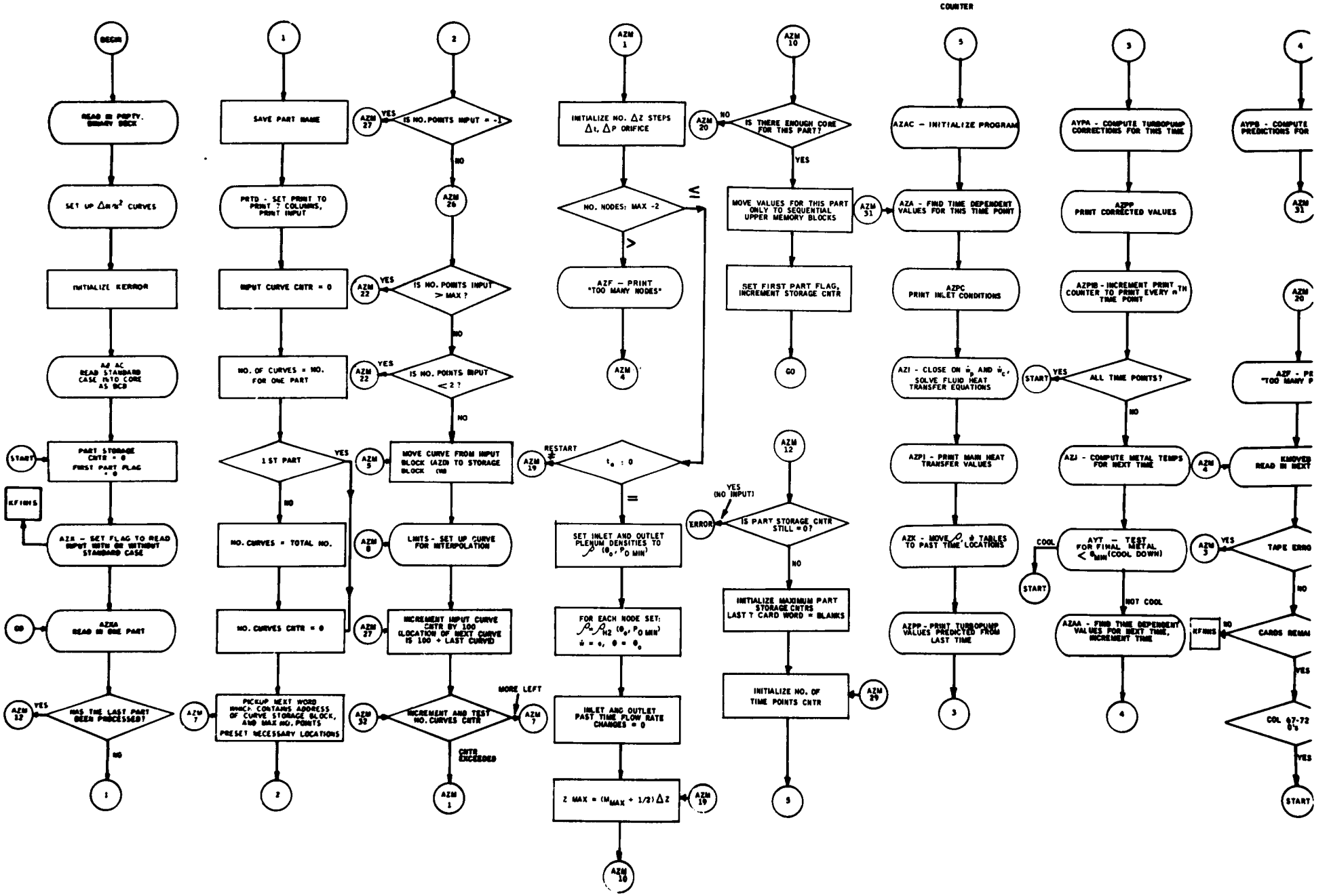
BEGIN
READ IN PRPTV. BINARY DECK
SET UP ΔR/R² CURVES
INITIALIZE KERROR
AZ AC READ STANDARD CASE INTO CORE AS BCD
START
PART STORAGE CNTR = 0 FIRST PART FLAG = 0
KFIMS
AZR - SET FLAG TO READ INPUT WITH OR WITHOUT STANDARD CASE
GO
AZRA READ IN ONE PART
AZM 32
YES
HAS THE LAST PART BEEN PROCESSED?
NO
1
1
SAVE PART NAME
PRTD - SET PRINT TO PRINT 7 COLUMNS, PRINT INPUT
INPUT CURVE CNTR = 0
NO. OF CURVES = NO. FOR ONE PART
1 ST PART
YES
NO
NO. CURVES = TOTAL NO.
NO. CURVES CNTR = 0
AZM 7
PICKUP NEXT WORD WHICH CONTAINS ADDRESS OF CURVE STORAGE BLOCK, AND MAX NO. POINTS
PRESET NECESSARY LOCATIONS
2
2
AZM 27
YES
IS NO. POINTS INPUT = -1
NO
AZM 26
AZM 22
YES
IS NO. POINTS INPUT > MAX ?
NO
AZM 22
YES
IS NO. POINTS INPUT < 2 ?
NO
AZM 5
MOVE CURVE FROM INPUT BLOCK (AZD) TO STORAGE BLOCK (NB)
AZM 8
LIMTS - SET UP CURVE FOR INTERPOLATION
AZM 27
INCREMENT INPUT CURVE CNTR BY 100 (LOCATION OF NEXT CURVE IS 100 + LAST CURVED)
AZM 32
INCREMENT AND TEST NO. CURVES CNTR
MORE LEFT
AZM 7
CNTR EXCEEDED
AZM 1
AZM 1
INITIALIZE NO. ΔZ STEPS Δt, ΔP ORIFICE
NO. NODES: MAX -2
≤
>
AZF - PRINT "TOO MANY NODES"
AZM 4
AZM 19
RESTART
t_o : 0
=
SET INLET AND OUTLET PLENUM DENSITIES TO (ρ_o, P_O MIN)
FOR EACH NODE SET: ρ_e ρ_H2 (ρ_o, P_O MIN) u̇ = 0, θ = θ_o
INLET AND OUTLET PAST TIME FLOW RATE CHANGES = 0
Z MAX = (M_MAX + 1/2) ΔZ
AZM 19
AZM 10
AZM 10
AZM 20
NO
IS THERE ENOUGH CORE FOR THIS PART?
YES
MOVE VALUES FOR THIS PART ONLY TO SEQUENTIAL UPPER MEMORY BLOCKS
AZM 31
SET FIRST PART FLAG, INCREMENT STORAGE CNTR
GO
AZM 12
AZM 12
YES (NO INPUT)
ERROR
IS PART STORAGE CNTR STILL = 0?
NO
INITIALIZE MAXIMUM PART STORAGE CNTRS LAST T CARD WORD = BLANKS
INITIALIZE NO. OF TIME POINTS CNTR
AZM 29
5
5
AZAC - INITIALIZE PROGRAM
AZA - FIND TIME DEPENDENT VALUES FOR THIS TIME POINT
AZPC PRINT INLET CONDITIONS
AZI - CLOSE ON u̇_p AND u̇_c, SOLVE FLUID HEAT TRANSFER EQUATIONS
AZPI - PRINT MAIN HEAT TRANSFER VALUES
AZK - MOVE ρ, ϕ TABLES TO PAST TIME LOCATIONS
AZPP - PRINT TURBOPUMP VALUES PREDICTED FROM LAST TIME
3
3
AYPA - COMPUTE TURBOPUMP CORRECTIONS FOR THIS TIME
AZPP PRINT CORRECTED VALUES
AZPB - INCREMENT PRINT COUNTER TO PRINT EVERY n TH TIME POINT
START
YES
ALL TIME POINTS?
NO
AZJ - COMPUTE METAL TEMPS FOR NEXT TIME
COOL
AYT - TEST FOR FINAL METAL < θ_MIN (COOL DOWN)
START
NOT COOL
AZAA - FIND TIME DEPENDENT VALUES FOR NEXT TIME, INCREMENT TIME
4
4
AYPB - COMPUTE PREDICTIONS FOR
AZM 31
AZM 20
AZF - PR "TOO MANY P
KMOVED READ IN NEXT
AZM 4
AZM 3
YES
TAPE ERRO
NO
KFIMS
NO
CARDS REMA
YES
COL 67-72 0's
YES
START

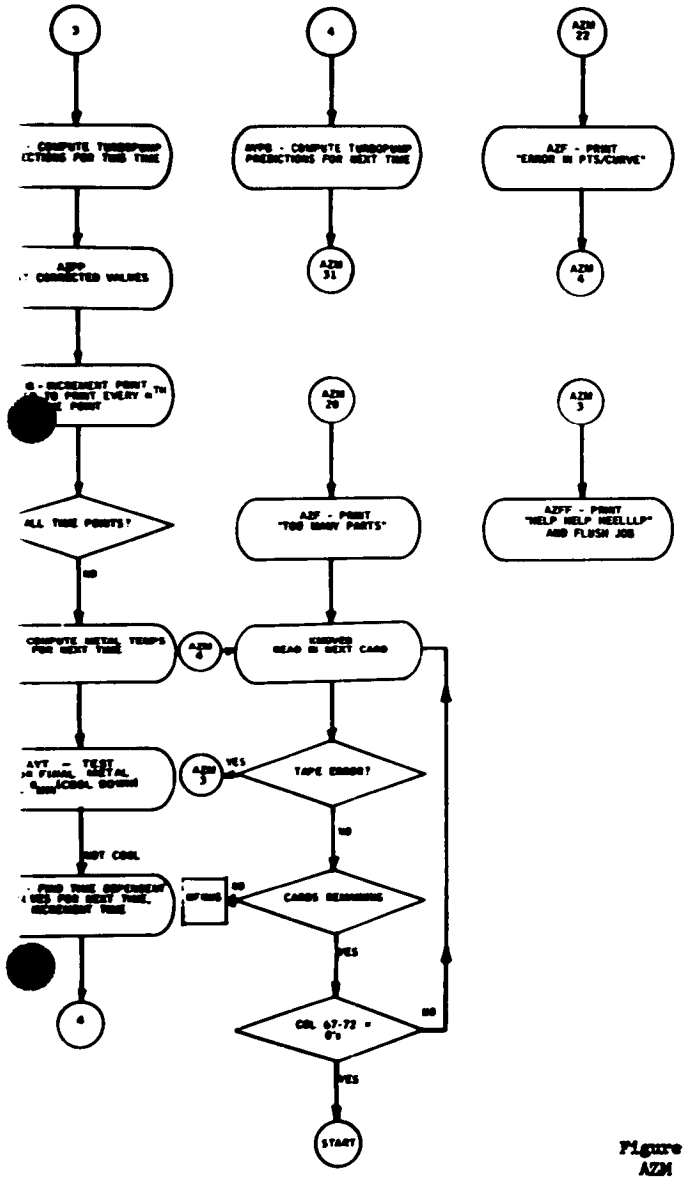

Figure 1
AZM
12013 Master Control Region and Input Initialization

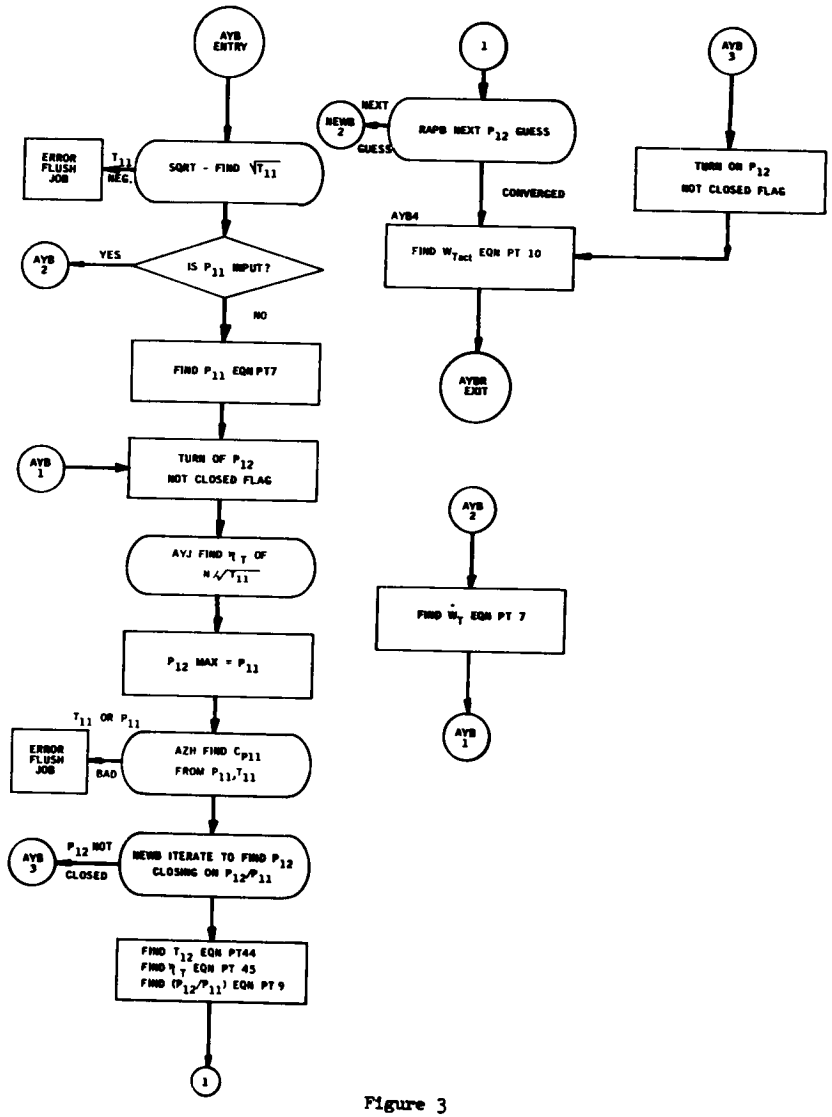

Figure 3
AYB
Find Actual Turbine Work

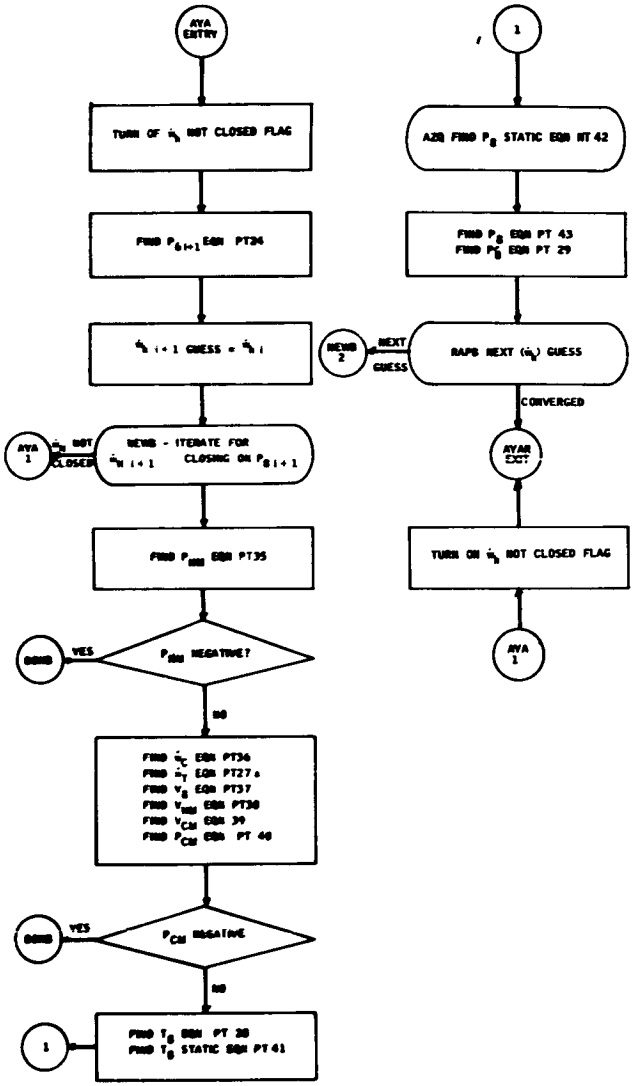

Figure 2
AYA
Iterate to Find $\dot{w}_h$ Closing on P_B

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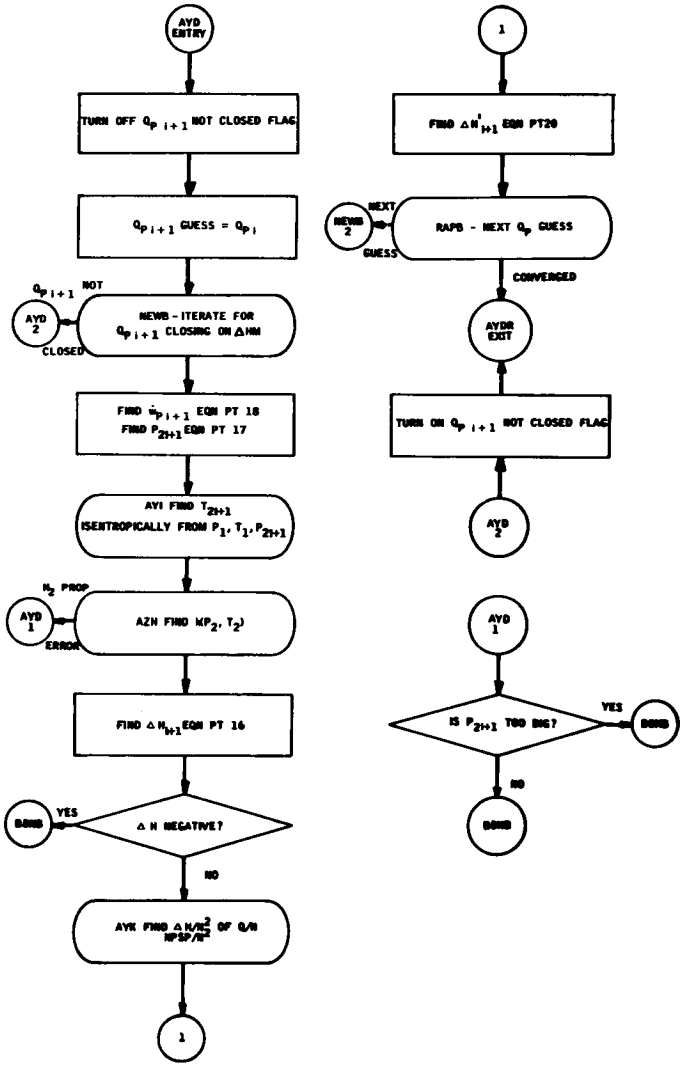

Figure 4
AYD
Find Pump Flow Rate

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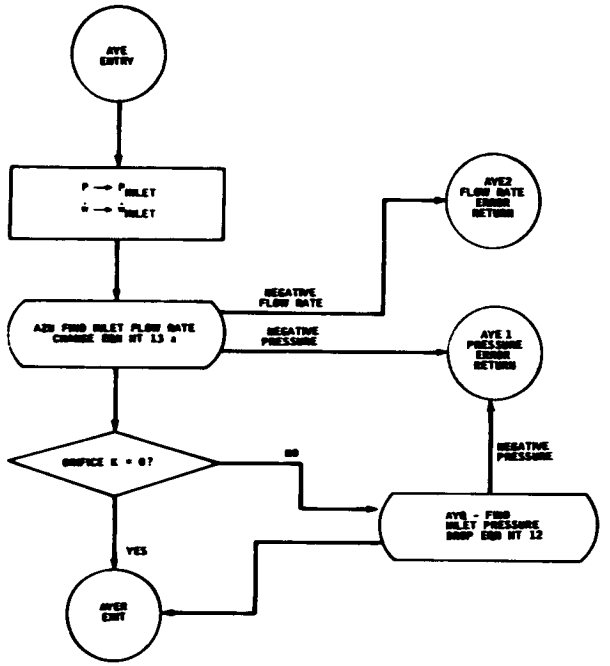

Figure 5
AYE
Find Inlet Pressure and Flow Rate Changes for One Part

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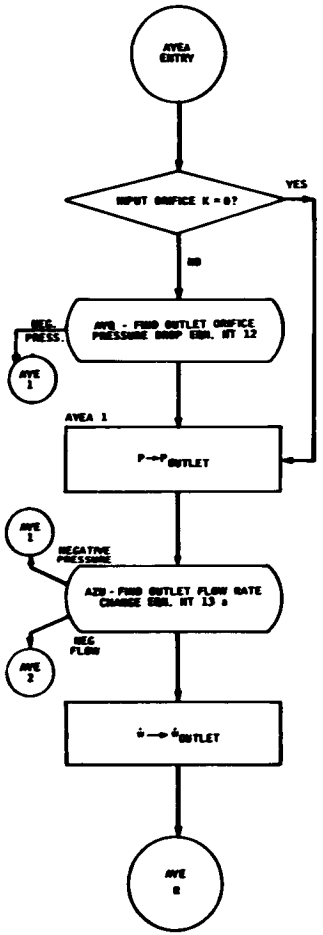

Figure 6
AYEA
Find Outlet Pressure and Flow Rate for One Part

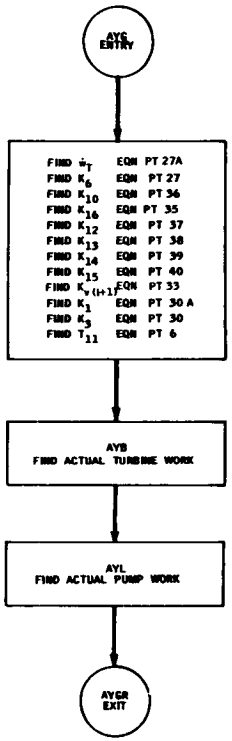

Figure 7
AYG
Region to Compute Part of Corrector Equations

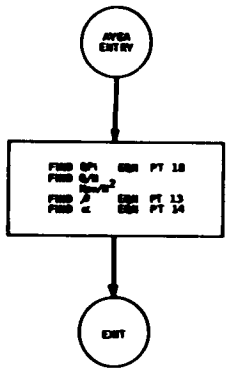

Figure 8
AYGA
Compute Some Corrector Equations

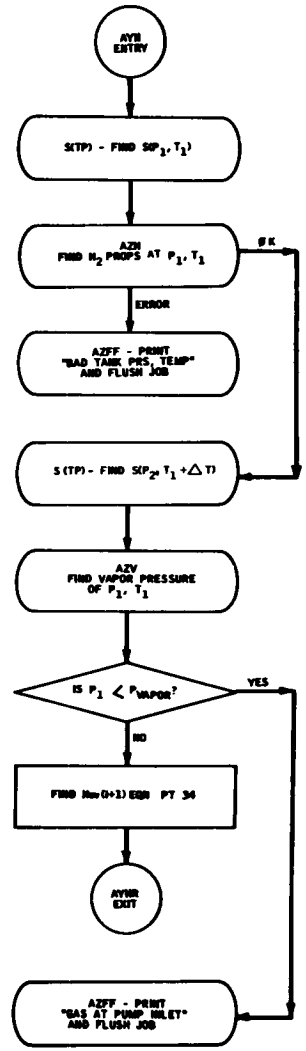

Figure 9
AYII
Look-Up Isentropic Values

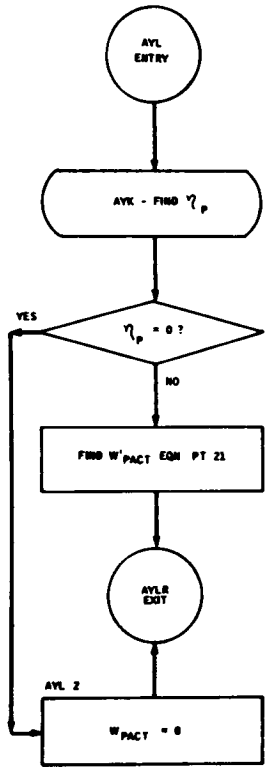

Figure 10
AYL
Compute Work Required by the Pump

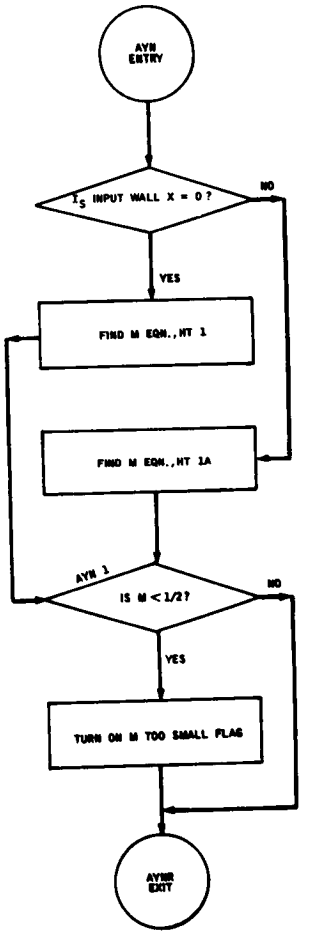

Figure 11
AYH
Compute Heat Resistance Term,M, for One Mode

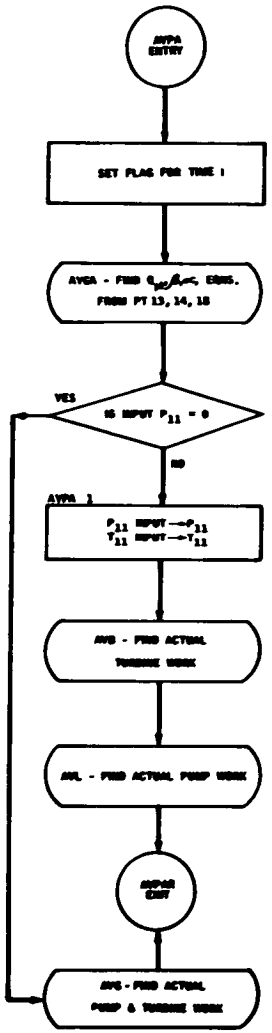

Figure 12
AYPA
Pump and Turbine Master Control (Corrector)

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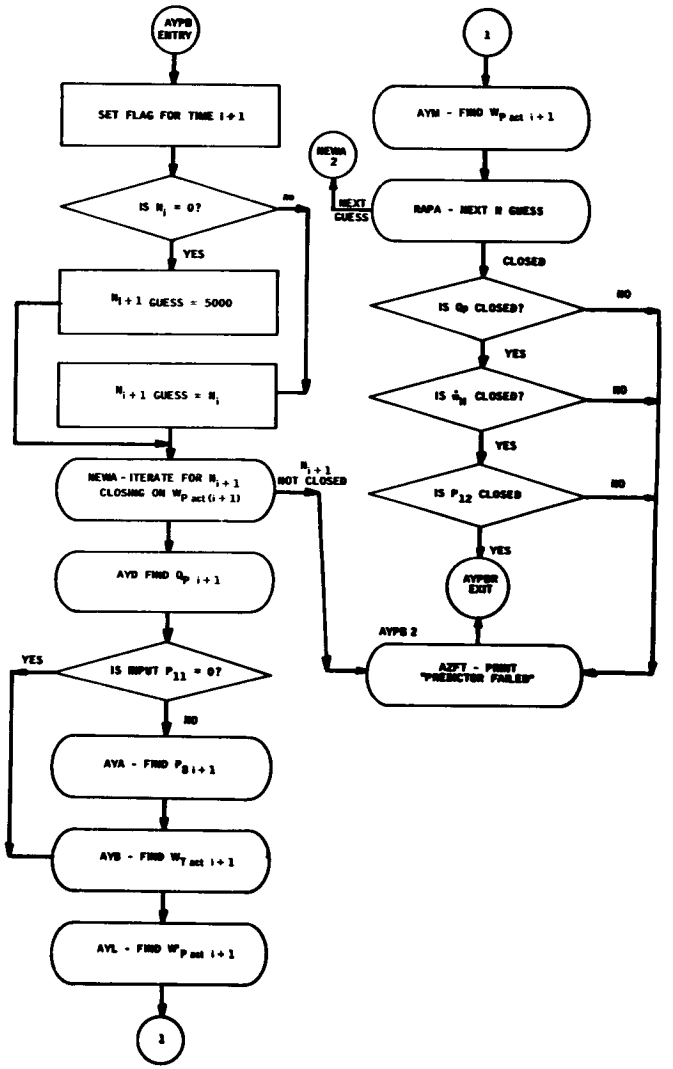

Figure 13
AYPB
Turbopump Master Control Time, i+1 (Prediction)

Page 61

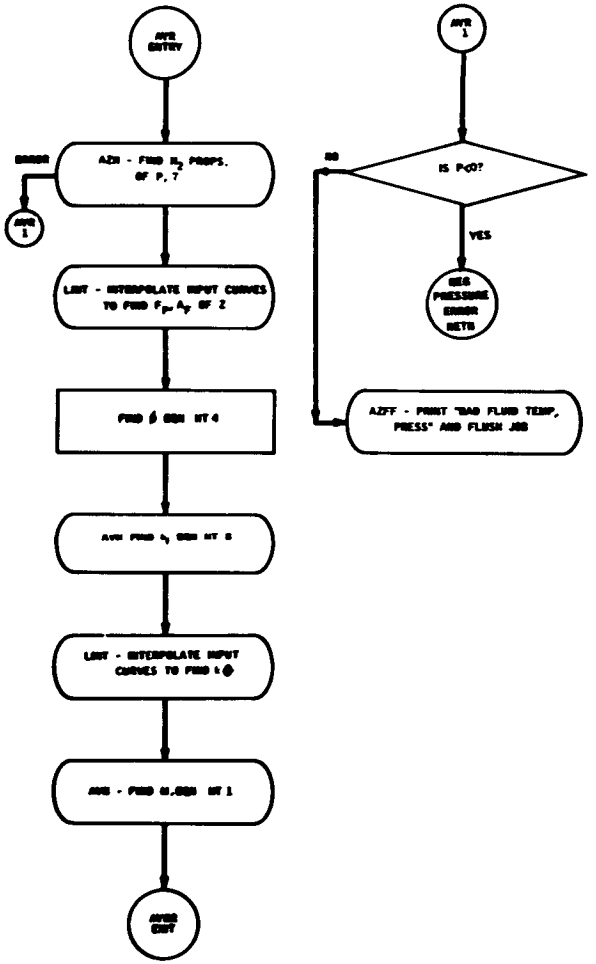

Figure 14
AYR
Find Values for One Node

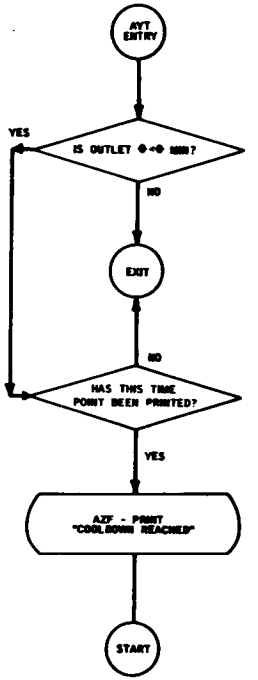

Figure 15
AYT
Check for Cool-Down Reached

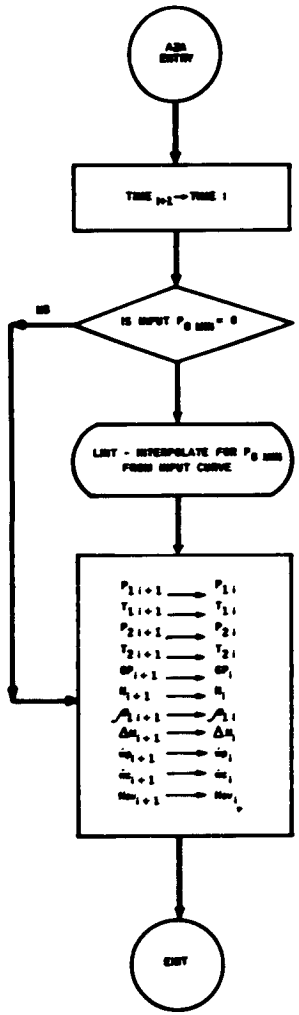

Figure 16
AZA
Set Values for One Time Step

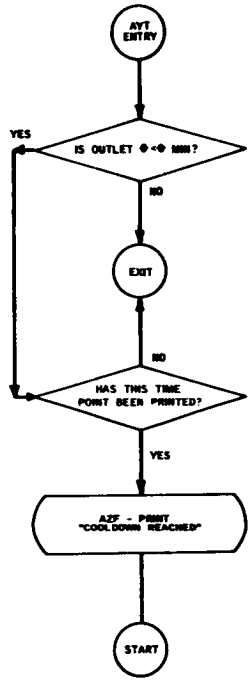

Figure 15
AYT
Check for Cool-Down Reached

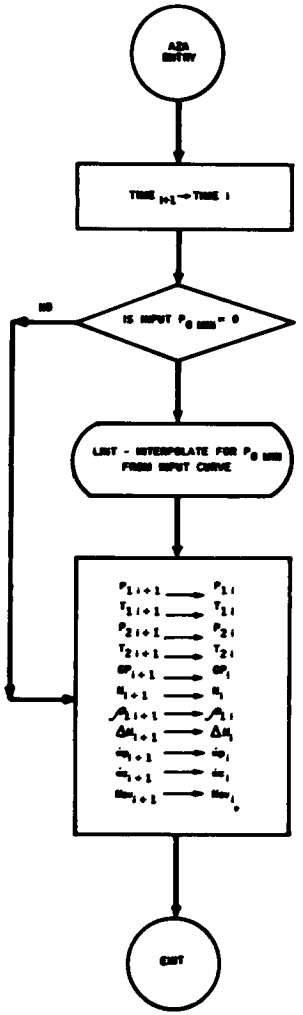

Figure 16
AZA
Set Values for One Time Step

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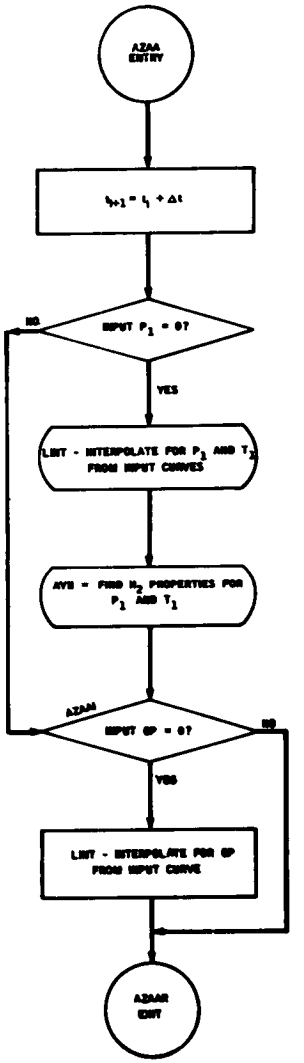

Figure 17
AZAA
Obtain Values for Next Time Point

Page 65

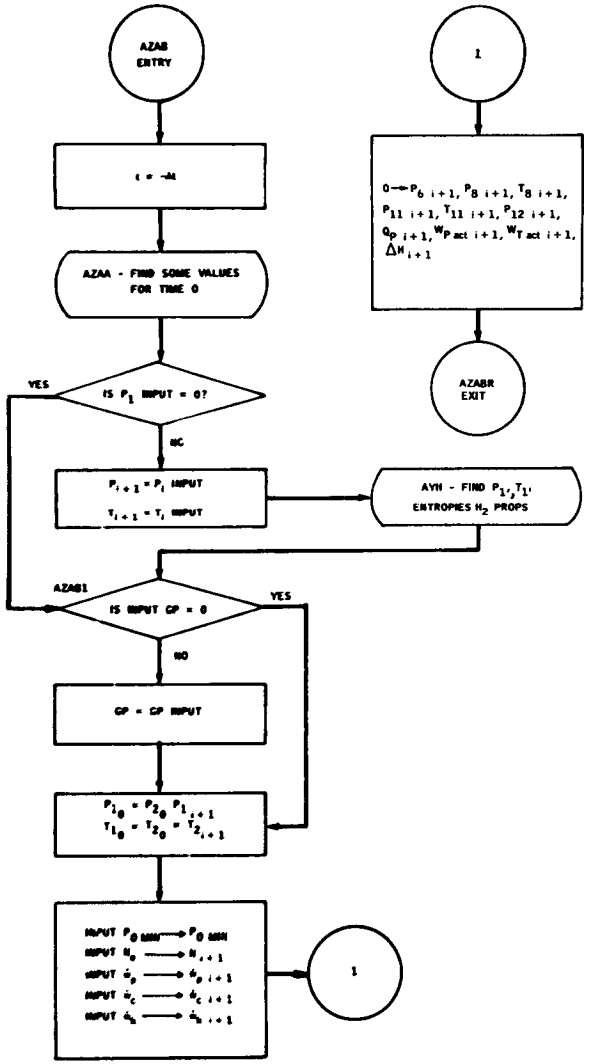

Figure 18
AZAB
Find Values at Zero Time

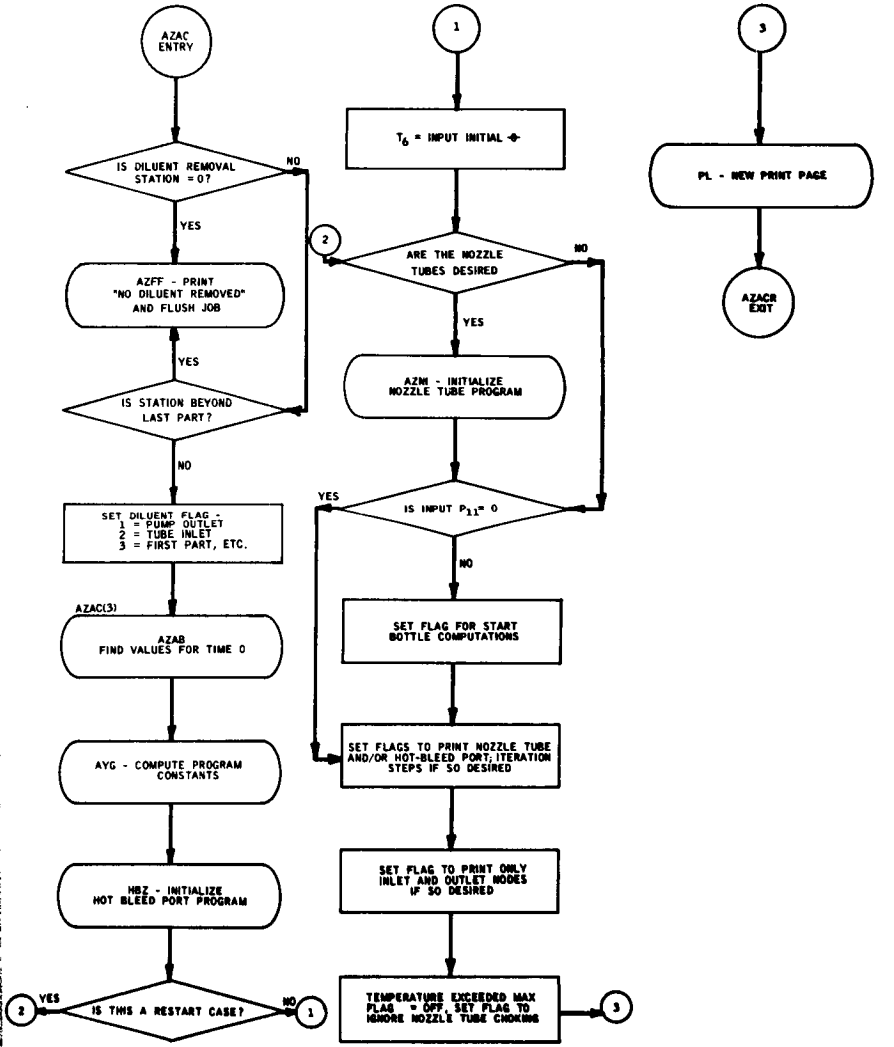

Figure 19
AZAC
Initialize Program

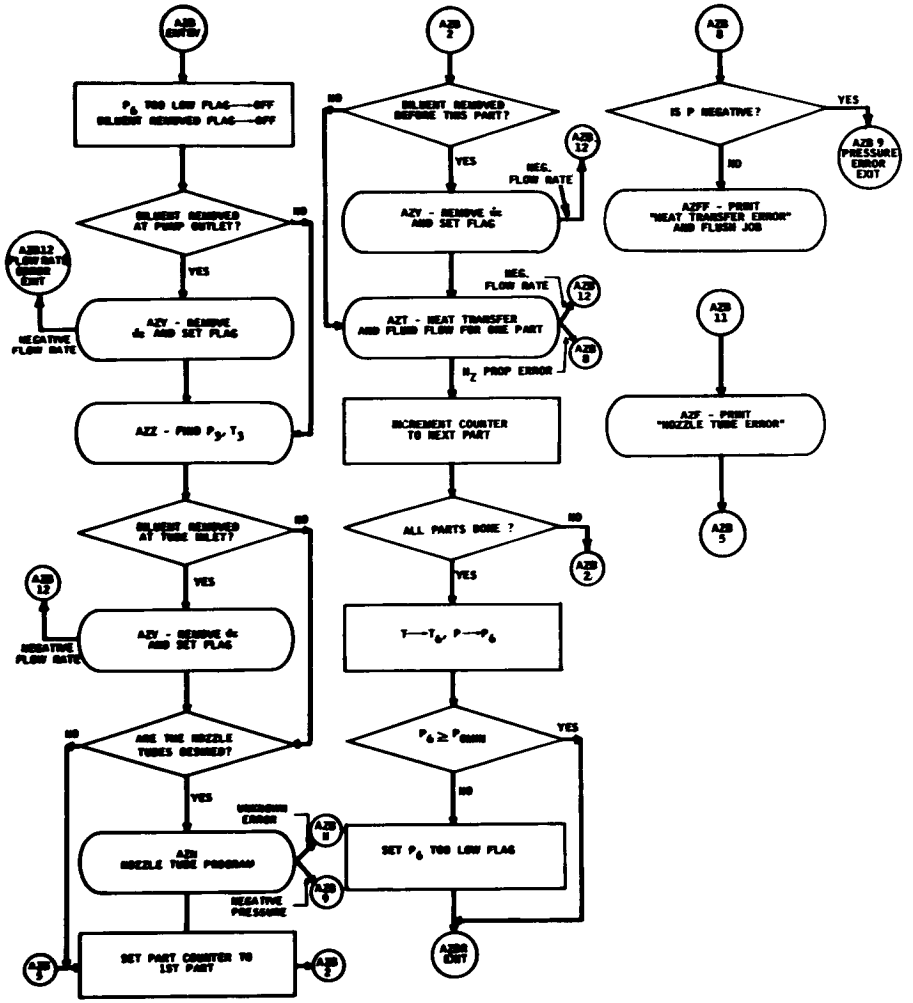

Figure 20
AZB
Main Engine Heat Transfer and Fluid Flow

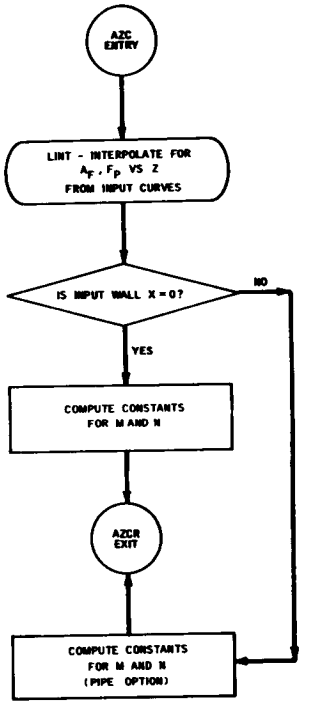

Figure 21
AZC
Compute Some Values for One-Node Metal Temp

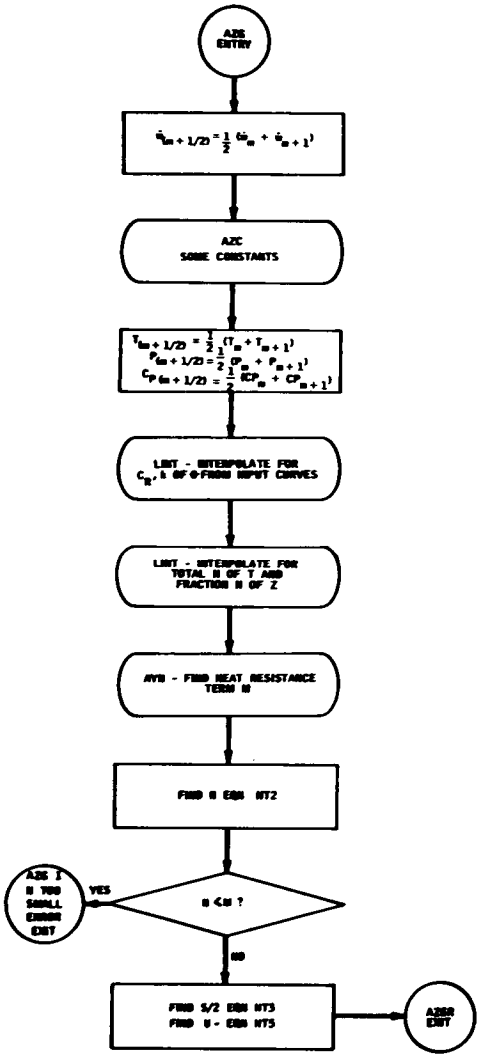

Figure 22
AZG
Compute Some Values for One-Node Metal Temps

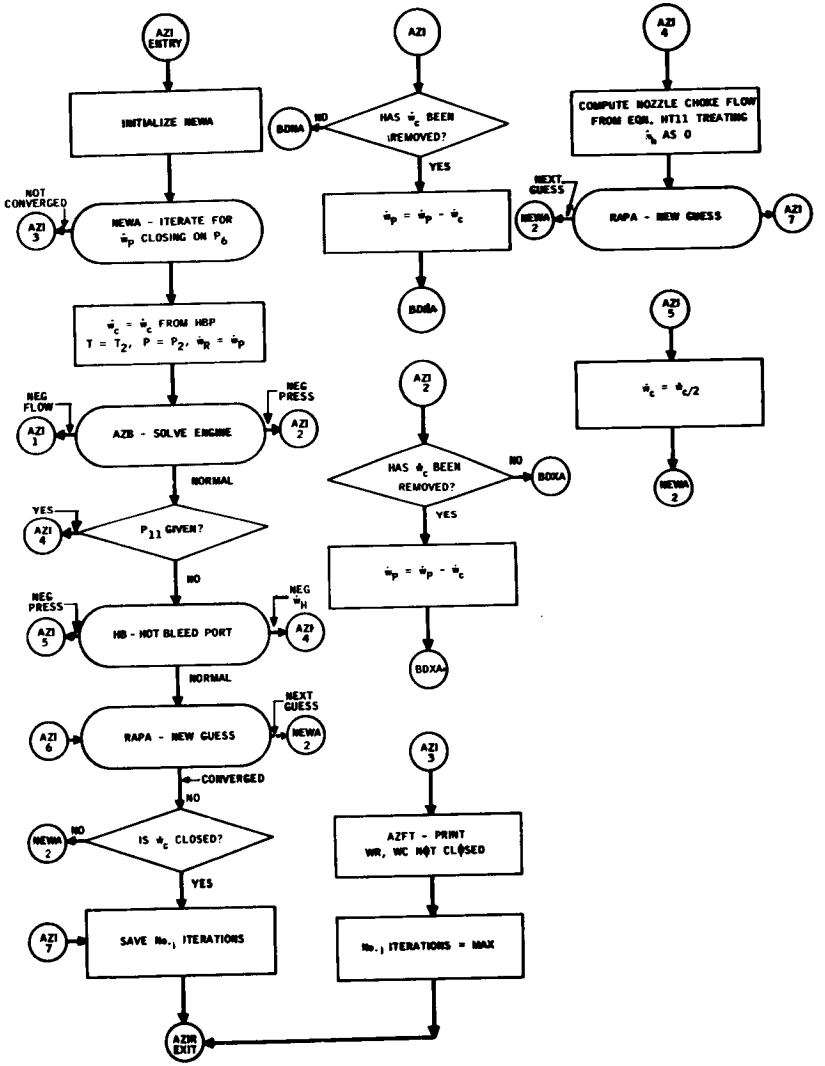

Figure 23
AZI
Heat-Transfer Iteration Master Control

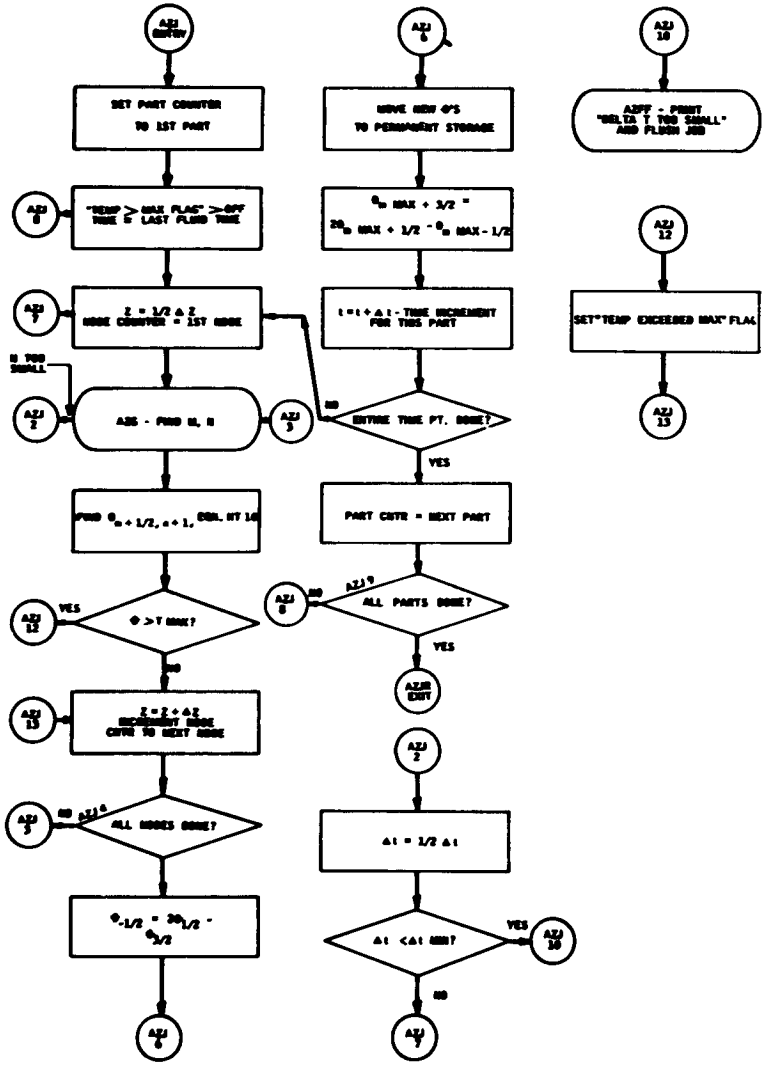

Figure 24
AZJ
Compute Metal Temps for One Time Point

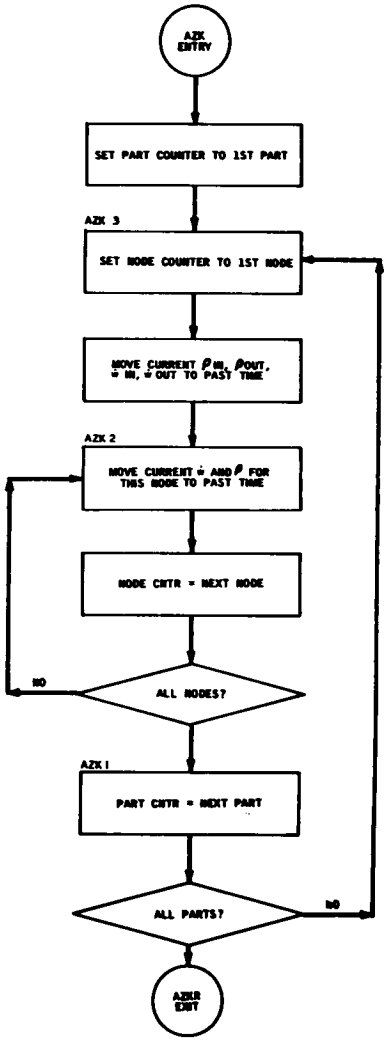

Figure 25
AZK
Move Current Values to Past Time Values for Each Part

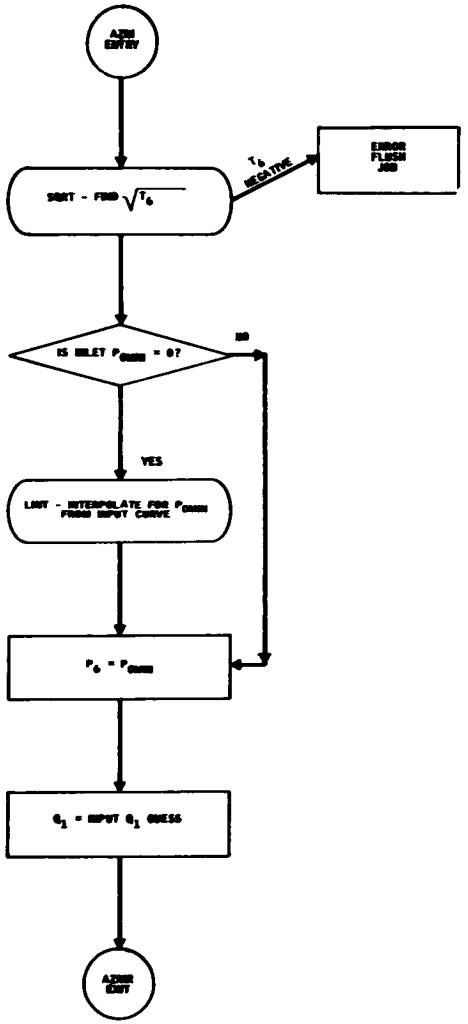

Figure 26
AZNI
Initialize Nozzle Tube Program

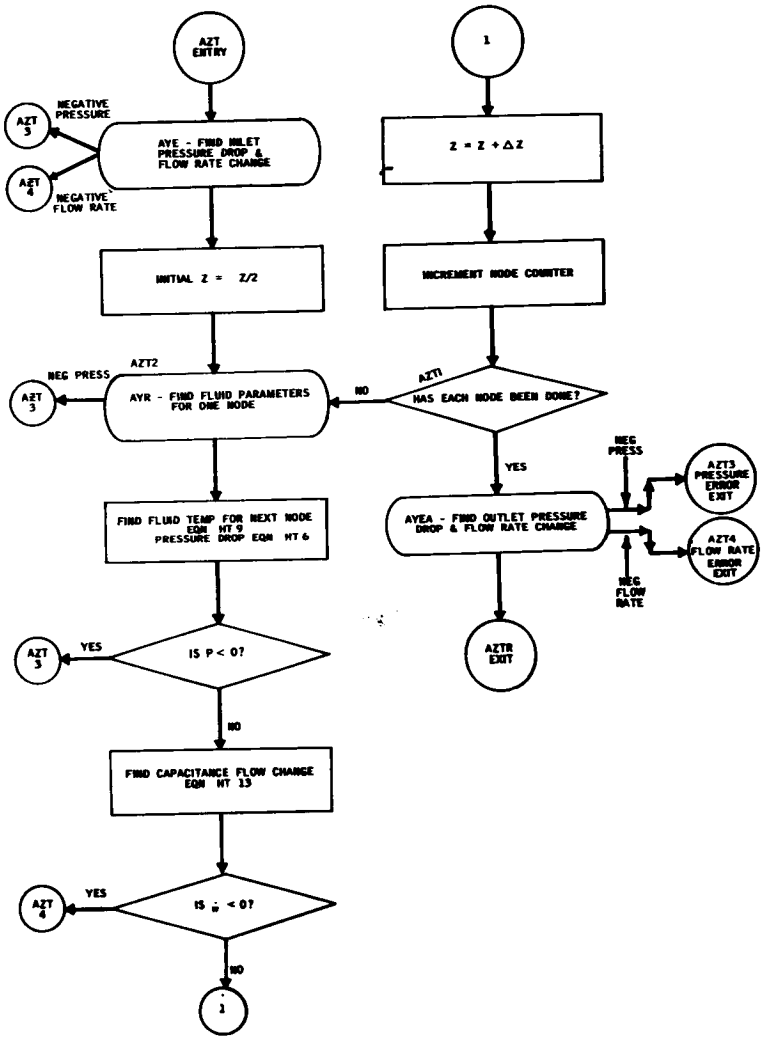

Figure 27
AZT
Fluid Node Corrections

APPENDIX A

NERVA ENGINE TRANSIENT PROGRAM

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A. INPUT

1. General Input

VALUES ARE ENTERED ON DATA CARDS ANYWHERE BETWEEN COLUMNS 1 AND 72 INCLUSIVE. EACH VALUE MUST BE PRECEEDED BY A SIGN (+ OR -). THE FOLLOWING ARE THE ONLY ALLOWABLE SYMBOLS ON DATA CARDS.

0-9 THE INTERGERS. NOTE THAT THE ZERO IS PUNCHED WITH THE (0,/) KEY

. THE DECIMAL POINT IS PERMITTED BUT NOT NECESSARY. FOR EXAMPLE +10=+10.=+10.0

+ OR - EACH VALUE MUST BE PRECEEDED BY A SIGN. NOTE THAT THE MINUS SIGN IS PUNCHED WITH THE (-SKIP.-) KEY.

E THIS IS USED TO INDICATE A POWER OF TEN. FOR EXAMPLE, +1000=+1E3 =+10000E-1=.1E4

L THIS INDICATES A RELATIVE LOCATION. IF NO L IS SUPPLIED, THE RELATIVE LOCATION IS ASSUMED TO BE ZERO. ALL SUCCESSIVE VALUES AFTER AN L ARE ASSUMED TO BE IN SEQUENCE, THE LOCATION INCREASING BY 1. IF TWO OR MORE VALUES ARE SUPPLIED WITH THE SAME RELATIVE LOCATION, THE LAST ONE ENCOUNTERED IS THE ONE USED. FOR EXAMPLE IF THE SIXTH AND SEVENTH INPUT VALUES (RELATIVE LOCATIONS = 5 AND 6) WERE 21 AND 13.5, THESE VALUES WOULD BE ENTERED AS L5+21+13.5

BLANKS ARE COMPLETELY IGNORED EXCEPT BETWEEN THE DIGITS OF A SINGLE NUMBER.

EXCEPT FOR SPECIFIED COLUMNS, THERE ARE NO ILLEGAL SYMBOLS ON T CARDS.

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2. Cases

a. Input Case

AN INPUT CASE CONSISTS OF DATA FOR EACH PART FOLLOWED BY THE NOZZLE DATA INPUT (IF ANY), AND A FINAL T CARD.
THE DATA FOR EACH PART CONSISTS OF THE DATA CARDS FOR THAT PART FOLLOWED BY A PART T CARD. THE PART T CARD CONSISTS OF (1) T IN COL 1, (2) PART NAME IN COL 2-7, (3) ANY IDENTIFYING INFORMATION IN COL 8-72. THE FINAL INPUT WITH TWO EXCEPTIONS. (1) WHEN USING THE STANDARD CASE THE NUMBER OF PARTS MUST BE THE SAME AS IN THE STANDARD CASE. NOTE- SOME PARTS MAY BE IGNORED BY SETTING THE NUMBER OF NODES TO ZERO. (2) THE REQUIRED AMOUNT OF STORAGE MUST NOT EXCEED THE CAPACITY OF THE MACHINE. THE PROGRAM PRINTS A MESSAGE AND STOPS WHEN THIS OCCURS.

b. Standard Case

THE STANDARD CASE IS A FOUR PART CASE. INFORMATION IN THE INPUT CASE OVERRIDES THE STANDARD CASE BUT THE STANDARD CASE VALUES ARE RESET AT THE BEGINNING OF EACH NEW CASE. THOSE VALUES NOT IN THE STANDARD CASE ARE NOT RESET. IF THE STANDARD CASE IS NOT DESIRED, A CARD WHICH IS BLANK EXCEPT FOR AN N IN COL 1 AND T BE THE FIRST CARD OF THE INPUT CASE. THE PROGRAM PRINTS A MESSAGE AND STOPS WHEN THE STANDARD CASE IS USED WITH OTHER THAN A FOUR PART CASE.

3. Description

$ = THIS VALUE IS SUPPLIED BY THE STANDARD CASE
* = THIS VALUE AFFECTS THE LOGICAL SEQUENCE OF THE PROGRAM

4. Input

a. Input for Each Part

	SYMBOL	UNITS	DESCRIPTION
L0	DELTA Z	IN	$DISTANCE INCREMENT.
L1	N MAX	NONE	$*NO. DELTA Z STEPS. IF THIS VALUE IS 0 THIS PART WILL BE IGNORED.
L2	PHI	NONE	$FRICTION FACTOR.
L3	F	NONE	$VOID FRACTIO ,
L4	RHO R	LB/IN3	$METAL DENSITY.
L5	X	IN	$*WALL THICKNESS. IF THIS VALUE IS NOT 0 THE PIPE OPTION WILL BE USED.
	KPRESS IN	I/IN4	$PRESSURE DROP K FOR INLET ORFICE.
	KPRESS OUT	I/IN4	$PRESSURE DROP K FOR OUTLET ORFICE.
	V INLET	IN3	$INLET PLENUM VOLUME.
	V OUTLET	IN3	$OUTLET PLENUM VOLUME.

b. Input for Entire System

L10	PRINT INTL	NONE	$*PRINT INTERVAL. THIS VALUE IS OF THE FORM 1000A+B. IF A IS 0 EACH NODE WILL BE PRINTED. IF A IS NOT 0 ONLY THE FIRST AND LAST NODES FOR EACH PART WILL BE PRINTED. A PRINTOUT WILL BE MADE EVERY B TIMES DELTA T SECONDS.
	TIME 0	SEC	$*INITIAL TIME. IF THIS VALUE IS NOT 0 THIS CASE WILL BE TREATED AS A RESTART CASE AND ADDITIONAL INPUT WILL BE REQUIRED.
	DELTA T	SEC	$TIME INCREMENT.
	NO. DEL T	NONE	NUMBER OF TIME POINTS DESIRED.
	DEL T MIN	SEC	$MINIMUM ALLOWABLE TIME INCREMENT.

	THETA 0	DEGR	$0*INITIAL METAL TEMP. IF THIS VALUE IS NEGATIVE. THE PROGRAM WILL EXPECT METAL TEMPS TO BE INPUT FOR EACH NODE. METAL TEMPS ARE INPUT AS SPECIFIED FOR THE RESTART CASE.
	T MIN	DEGR	$MINIMUM ALLOWABLE FLUID OUTLET TEMP.
	T MAX	DEGR	$MAXIMUM ALLOWABLE TEMPERATURE.
	DIL STA	NONE	$*POSITION OF INLET TO DILUENT LINE. 1=AT PUMP DISCHARGE, 2=AT NOZZLE TUBE INLET, 3=AT FIRST PART INLET, ETC.
	P1	PSIA	$*TANK PRESSURE. IF THIS VALUE IS ZERO, THE PROGRAM WILL USE THE INLET PRESSURE AND TEMPERATURE CURVES.
	T1	DEGR	$TANK TEMP.
	P OUT MIN	PSIA	$*MINIMUM ALLOWABLE OUTLET PRESSURE. IF THIS VALUE IS 0 THE PROGRAM WILL USE THE P OUT MIN CURVE WHICH IN THIS CASE, MUST BE INPUT
	EPS P8	NONE	$HOT BLEED PORT OUTLET PRESSURE CLOSURE TOLERANCE.
	EPS P12	NONE	$TURBINE OUTLET PRESSURE CLOSURE TOLERANCE.
	WDOTP GUESS	LB/SEC	$INITIAL PUMP FLOW RATE GUESS.
	WDOTC GUESS	LB/SEC	$INITIAL DILUENT FLOW RATE GUESS.
	WDOTH GUESS	LB/SEC	$INITIAL HOT BLEED PORT FLOW RATE GUESS.
	EPS WDOTC	NONE	$DILUENT FLOW RATE CLOSURE TOLERANCE.
	EPS WDOTR	NONE	$CORE OUTLET FLOW RATE CLOSURE TOLERANCE.
	A6	IN2	$AREA OF CORE OUTLET.
	A STAR	IN2	$MINIMUM NOZZLE THROAT AREA.
	PHI(NT)	NONE	$*NOZZLE TUBE FRICTION FACTOR. IF THIS VALUE IS 0 THE NOZZLE TUBES WILL BE IGNORED.
	NO. PARTS	NONE	$NO. OF SEGMENTS IN NOZZLE TUBES (DISTANCE NODES).
	NT WAL. X	IN	$NOZZLE TUBE WALL THICKNESS.
	QI INIT	BTU/SEC-IN2	$INITIAL HEAT TRANSFER GUESS FOR NOZZLE TUBES.

	ITER FLAG	NONE	$*THIS VALUE IS OF THE FORM 1000A+B. IF A IS NOT ZERO, EACH NOZZLE TUBE ITERATION STEP WILL BE PRINTED. IF B IS NOT ZERO, EACH HOT BLEED PORT ITERATION STEP WILL BE PRINTED.
	GATE POS	PERCENT	$*TURBINE LINE VALVE GATE POSITION. IF THIS VALUE IS ZERO, THE PROGRAM WILL USE THE GATE POSITION CURVE.
	A(KV)	NONE	$CONSTANT FOR K SUB V.
	B(KV)	NONE	$CONSTANT FOR K SUB V.
	GAMMA	NONE	$RATIO OF SPECIFIC HEATS.
	K2	NONE	$K FOR NOZZLE TUBE INLET LINE PRESSURE DROP.
	D2	IN	$DIAMETER OF NOZZLE TUBE INLET LINE.
	DH	IN	$DIAMETER OF HOT BLEED PORT.
	DTL	IN	$DIAMETER OF TURBINE LINE
	DTN	IN	$DIAMETER OF TURBINE NOZZLE.
	DRN	IN	$DIAMETER OF ROLL CONTROL NOZZLE.
	IPT	LB-IN2	$MOMENT OF PUMP AND TURBINE ROTOR.
	N INIT	RPM	$INITIAL TURBINE SPEED.
	EPS H	NONE	$PUMP HEAD RISE CLOSURE TOLERANCE.
	EPS HP ACT	NONE	$PUMP ACTUAL WORK CLOSURE TOLERANCE.
	L	IN	$LENGTH OF HOT BLEED PORT.
	N	NONE	$NUMBER OF POSITION STEPS IN HOT BLEED PORT.
	DCO	IN	$DIAMETER OF HOT BLEED PORT COLD FLOW HOLES.
	NCO	NONE	$NUMBER OF HOT BLEED PORT COLD FLOW HOLES.
	T	IN	$THICKNESS OF HOT BLEED PORT COLD FLOW ANNULUS.
	R	IN	$THICKNESS OF METAL BETWEEN HOT AND COLD FLOWS IN HOT BLEED PORT.
	THETA	DEG	$DILUENT IMPINGENT ANGLE.
	A COLD	NONE	$HOT BLEED PORT COLD FLOW FILM COEFF PARAMETER.
	B COLD	NONE	$HOT BLEED PORT COLD FLOW FILM COEFF PARAMETER.

[illegible]	C COLD	NONE	$HOT BLEED PORT COLD FLOW FILM COEFF PARAMETER.
	A HOT	NONE	$HOT BLEED PORT HOT FLOW FILM COEFF PARAMETER.
	B HOT	NONE	$HOT BLEED PORT HOT FLOW FILM COEFF PARAMETER.
	C HOT	NONE	$HOT BLEED PORT HOT FLOW FILM COEFF PARAMETER.
	F COLD	NONE	$HOT BLEED PORT COLD FLOW FRICTION FACTOR.
[illegible]	F HOT	NONE	$HOT BLEED PORT HOT FLOW FRICTION FACTOR.
[illegible]	K PHN	NONE	$K FOR PHN.PDB.CHN.CC.
	K PCN	NONE	$K FOR PCN. CC.
	K IN	NONE	$K FOR HOT BLEED PORT INLET PRESSURE DROP.
[illegible]	K CC	NONE	$COMPRESSIBLE FLOW K.
	K CI	NONE	$INCOMPRESSIBLE FLOW K.
	R COLD	FT-LBF/LB-DEGR	$COLD GAS CONSTANT.
	R HOT	FT-LBF/LB-DEGR	$HOT GAS CONSTANT.
	K 11	NONE	$K FOR PDB.
[illegible]	K 9	NONE	$K FOR PDB.
	K E	NONE	$K FOR PDB.
	P 11	PSIA	$PRESSURE IN TURBINE INLET START BOTTLE. IF THIS VALUE IS ZERO. THE PROGRAM WILL ASSUME THAT THERE IS NO START BOTTLE.
	T 11	DEGR	$TURBINE START BOTTLE TEMPERATURE.
	BELLOWS FLAG	NONE	$IF THIS VALUE IS ZERO. THE BELLOWS SECTIONS WILL BE IGNORED.
[illegible]	BELLOWS K	NONE	$TABLE OF BELLOWS SECTION PRESSURE DROP K VALUES VS DISTANCE (IN) INPUT AS +Z+K. A MAXIMUM OF TEN PAIRS OF VALUES IS ALLOWED. THE DISTANCES MUST BE IN ASCENDING ORDER AND THE LAST DISTANCE SHOULD BE GREATER THAN OR EQUAL TO THE LENGTH OF THE HOT BLEED PORT.

5. Input Curves

a. General

EACH CURVE IS INPUT AS A SERIES OF NUMBERS, EACH PRECEEDED BY A SIGN. THE FIRST NUMBER IS THE NUMBER OF POINTS IN THE CURVE. EACH FOLLOWING PAIR OF NUMBERS REPRESENTS A POINT ON THE CURVE. THE INDEPENDENT VARIABLE FIRST. FOR EXAMPLE. THE POINTS (1,10),(2,20) ARE INPUT AS +2+1+10+2+20. THE NUMBER OF POINTS PER CURVE MUST BE GREATER THAN OR EQUAL TO 2, OR EQUAL TO -1. IF THE NUMBER OF POINTS IS -1 THE CURVE WILL BE IGNORED. NOTE THAT A CURVE WHICH IS IGNORED IS NOT THE SAME AS A CURVE WHOSE DEPENDENT VARIABLE IS EVERYWHERE 0. A MAXIMUM NO. OF POINTS IS GIVEN FOR EACH CURVE. ALL CURVES MUST BE IN ASCENDING ORDER OF THE INDEPENDENT VARIABLE.

b. For Each Part

L100	A SUB F	IN2	$FLOW AREA VS DISTANCE (IN) 10
L200	F SUB P	IN	$WETTED PERIMETER VS DISTANCE (IN) 10
L300	FRACT H	NONE	$FRACTION (PERCENT/100) OF INTERNAL HEAT GENERATION VS DISTANCE (IN) 10
L400	H	BTU/IN3-SEC	INTERNAL HEAT GENERATION COEFF VS TIME (SEC) 49
L500	K SUB R	BTU/SEC-IN-DEGR	$METAL THERMAL CONDUCTIVITY VS TEMP (DEGR) 49
L600	C SUB R	BTU/LB-DEGR	$METAL HEAT CAPACITY VS TEMP (DEGR) 49

c. For Entire System

[illegible]	TI	DEGR	$TANK TEMP VS TIME (SEC) 49
[illegible]	PI	PSIA	$TANK PRESSURE VS TIME (SEC) 49
[illegible]	P OUT MIN	PSIA	$MINIMUM OUTLET PRESSURE VS TIME (SEC) 49
[illegible]	GP	PERCENT	$GATE POSITION OF TURBINE LINE VALVE VS TIME (SEC)10

6. Nozzle Tube Input

A SET OF NOZZLE TUBE INPUT VALUES IS CONTAINED IN THE STANDARD CASE BUT IS NOT RESET FOR EACH INPUT CASE. THE DATA CARDS FOR NOZZLE TUBE INPUT VALUES ARE PLACED BETWEEN THE LAST PART T CARD AND THE FINAL T CARD OF AN INPUT CASE.

IC	AF COLD	IN2	TABLE OF COLD FLOW AREA VS DISTANCE (IN) INPUT AS SEVEN PAIRS OF VALUES OF THE FORM +Z+AF.
114	FP COLD	IN	TABLE OF COLD FLOW WETTED PERIMETER VS DISTANCE (IN) INPUT AS SEVEN PAIRS OF VALUES OF THE FORM +Z+FP.
128	D	IN	TABLE OF DIAMETER VS DISTANCE (IN) INPUT AS FOUR PAIRS OF VALUES OF THE FORM +Z+D.
136	RF	NONE	TABLE OF RECOVERY FACTOR VS DISTANCE (IN) INPUT AS FOUR PAIRS OF VALUES OF THE FORM +Z+RF.
144	AF HOT	IN2	TABLE OF HOT FLOW AREA VS DISTANCE (IN) INPUT AS SEVEN PAIRS OF VALUES OF THE FORM +Z+AF.
158	SIGMA	NONE	TABLE OF STATIC TO STAGNATION TEMP RATIO VS DISTANCE (IN) INPUT AS NINE PAIRS OF VALUES OF THE FORM +Z+SIGMA.

NOTE- THE ABOVE TABLES MUST BE IN ASCENDING ORDER OF DISTANCE.

175	K(P IN)	NONE	INLET PRESSURE DROP K
177	LENGTH	IN	LENGTH OF NOZZLE TUBES
178	A(K)	NONE	THERMAL CONDUCTIVITY CONSTANT
179	B(KN)	NONE	THERMAL CONDUCTIVITY CONSTANT
180	C(KN)	NONE	THERMAL CONDUCTIVITY CONSTANT
181	A(HF)	NONE	FILM COEFF CONSTANT
182	B(HF)	NONE	FILM COEFF CONSTANT
183	TEXIT BUMP	NONE	INITIAL EXIT TEMP GUESS BUMPER
184	Z THROAT	IN	DISTANCE TO MINIMUM THROAT AREA
185	A THROAT	IN2	MINIMUM THROAT AREA

B. RESTARTING PROGRAM

AT THE PRESENT TIME, THE PROGRAM MAY NOT BE RESTARTED. THE FORMAT FOR INPUTING METAL TEMPERATURES FOLLOWS.

LOC	SYMBOL	UNITS	DESCRIPTION
1-150	TMETA	DEGR	METAL TEMPS FOR EACH NODE. THE FIRST VALUE IS A LINEAR EXTRAPOLATION OF THE FIRST TWO PRINTED NODES. THE SECOND VALUE IS EQUAL TO THE PRINTED TEMP FOR THE FIRST NODE. THE THIRD VALUE IS THE TEMP FOR THE SECOND NODE, ETC. THE LAST VALUE IS A LINEAR EXTRAPOLATION OF THE LAST TWO PRINTED NODES. TOTAL OF NMAX+2 VALUES.

C. [illegible]

BAD FLUID TMP.PRS	FLUID TEMP OR PRESSURE OUTSIDE RANGE OF HYDROGEN PROPERTY ROUTINES. USUALLY INDICATES DRASTIC ERROR IN INPUT OR CONVERGENCE
BAD TANK PRS. TMP	PI OR TI NOT IN RANGE OF HYDROGEN PROPERTY ROUTINE
BAD TAPE- PLUGH	RTT CHECK ON INPUT TAPE
CHECK DUMP FOR NEG	SOME QUANTITY NEGATIVE. DRASTIC ERROR IN INPUT OR CONVERGENCE
CCOLDCUM REACHED	OUTLET METAL TEMP LESS THAN THETA MIN
DELTA T TOO SMALL	TIME INCREMENT LESS THAN MIN
END OF INPUT	NO CASES REMAINING OR TCARD MISSING
ERROR IN PTS/CURVE	NUMBER OF POINTS MUST BE GREATER THAN 1 AND LESS THAN MAXIMUM. CURVE MAY BE MISSING ALTOGETHER
ERROR IN STD INPUT	TOO MANY CARDS OR TCARD MISSING IN STANDARD CASE
GAS AT PUMP INLET	PRESSURE AND TEMP AT PUMP INLET DETERMINE GAS. PUMP OVERSPEEDS. HSV IS NEGATIVE
HEAT TRANSFER ERROR	ERROR IN HEAT TRANSFER OTHER THAN NEGATIVE PRESSURE OR FLOW
HELP HELP HEELLLLP	SOMETHING DRASTICALLY WRONG WITH INPUT OR INPUT TAPE-- SEE PROGRAMMER.
ILLEGAL CHARACTER	ILLEGAL CHARACTER ON ONE OR MORE DATA CARDS. CARDS WITH ERRORS WILL BE PRINTED OUT. IF NO ILLEGAL CHARACTERS ARE FOUND. SEE PROGRAMMER.
LIQ IN TUBE THROAT	FLUID IN NOZZLE TUBE THROAT WAS LIQUID ON LAST PASS PRINTS ONLY AT PRINTED TIME POINTS
M TOO SMALL	M LESS THAN 1/2 AT SOME NODE. PRINTED AT END OF PART WHERE OCCURED. MAY HAVE OCCURED AT SOME TIME POINT BETWEEN PRINTING BUT PRINTED AT LATER POINT
NO DILUENT REMOVED	NO INPUT DILUENT REMOVAL STATION
NOZZLE TUBE ERROR	ERROR ON LAST PASS THROUGH NOZZLE TUBES. TUBES THEREFORE IGNORED.
PO TOO LOW	PO LESS THAN POMIN
PREDICTOR FAILED	SOME ITERATION FAILED TO CLOSE IN TURBOPUMP PREDICT
TEMP EXCEEDED MAX	METAL OR FLUID TEMPERATURE GREATER THAN TMAX. PRINTED AFTER PART WHERE OCCURED. MAY HAVE OCCURED BETWEEN PRINTED TIME POINTS BUT PRINTED LATER
TOO MANY NODES	NUMBER OF NODES EXCEEDS MAXIMUM IN ONE OR MORE PART
TOO MANY PARTS	NOT ENOUGH STORAGE AVAILABLE FOR THIS MANY PARTS
WR. WC NOT CLOSED	MAX ITERATIONS IN HEAT TRANSFER EXCEEDED
ZERO TCARD MISSING	OCCURS ONLY WITH CASE USING STANDARD INPUT. TCARD LEFT OFF OR MORE PARTS THAN STANDARD CASE
****** NOT CLOSED	THE SPECIFIED NOT BLEED PORT ITERATION DIDNT CLOSE

APPENDIX B

SAMPLE CASE - NERVA ENGINE TRANSIENT PROGRAM

PROGRAM INPUT

DEL Z 1.000000	Z PTS 1.000000	FRICT 1.000000	VOID F 1.000000	RHO R 1.000000	WALL K 1.000000	ENTY K 1.000000	EXIT K 1.000000	INLT V 1.000000	OTLT V 1.000000
PRIMP 1.000000	TIME 0 1.000000	DEL T 1.000000	T PTS 1.000000	DT MIN 1.000000	ATL TO 1.000000	PR TMP 1.000000	RX TMP 1.000000	DILUNT 1.000000	PI 1.000000
TI 1.000000	PO MIN 1.000000	P2 CLS 1.000000	P0 CLS 1.000000	WDOT P 1.000000	WDOT C 1.000000	WDOT H 1.000000	WC CLS 1.000000	WR CLS 1.000000	A 6 1.000000
A STAR 1.000000	NTB FF 1.000000	PARTS 1.000000	WALL T 1.000000	QI INT 1.000000	SWT 1.000000	GATE P 1.000000	AIRV1 1.000000	DIRV1 1.000000	KINT1 1.000000
K 2 1.000000	D 2 1.000000	D M 1.000000	D TL 1.000000	D TN 1.000000	D RN 1.000000	I PT 1.000000	SPEED 1.000000	M CLS 1.000000	WP CL 1.000000
NB LTH 1.000000	NO X 1.000000	Q CO 1.000000	NO NLS 1.000000	T 1.000000	R 1.000000	THETA 1.000000	000000	A COLD 1.000000	B COLD 1.000000
C COLD 1.000000	A HOT 1.000000	B HOT 1.000000	C HOT 1.000000	FRCT C 1.000000	FRCT H 1.000000	000000	KIPMIN 1.000000	KIPCMU 1.000000	KIDLPI 1.000000
KC CMP 1.000000	KC INC 1.000000	R COLD 1.000000	R HOT 1.000000	K 11 1.000000	K 9 1.000000	K E 1.000000	P 11 1.000000	T 11 1.000000	0=NO D 1.000000
SEC 1 1.000000	K 1 1.000000	SEC 2 1.000000	K 2 1.000000	SEC 3 1.000000	K 3 1.000000	SEC 4 1.000000	K 4 1.000000	SEC 5 1.000000	K 5 1.000000
SEC 6 1.000000	K 6 1.000000	SEC 7 1.000000	K 7 1.000000	SEC 8 1.000000	K 8 1.000000	SEC 9 1.000000	K 9 1.000000	SEC 10 1.000000	K 10 1.000000
FLOW AREA VS DISTANCE 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
WETTED PERIMETER VS Z 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
FRACT HEAT GEN VS DIST 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
INT HEAT GEN VS TIME 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
THERMAL CONDUCTIVITY 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
C SUB R VS TEMPERATURE 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
INLET TEMP VS TIME 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
INLET PRESSURE VS TIME 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
OUTLET PRESSURE VS TIME 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
GATE POSITION VS TIME 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000

PROGRAM INPUT

DEL Z 1.000000	Z PTS 1.000000	FRICT 1.000000	VOID F 1.000000	RHO R 1.000000	WALL K 1.000000	ENTY K 1.000000	EXIT K 1.000000	INLT V 1.000000	OTLT V 1.000000
FLOW AREA VS DISTANCE 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
WETTED PERIMETER VS Z 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
FRACT HEAT GEN VS DIST 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
INT HEAT GEN VS TIME 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
THERMAL CONDUCTIVITY 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000
C SUB R VS TEMPERATURE 1.000000	000000	000000	000000	000000	1 POINTS 000000	000000	000000	000000	000000

APPENDIX C

TYPICAL PROGRAM PRINTOUT

```
NOZZLE TUBE INPUT  TEMP=    000000  PRESS=    000000  TIME=    000000  FLOW=    000000  CHOKE FLOW=    000000

000000  INLET PRESSURE DROP=    000000 PSIA, PRESSURE=    000000 PSIA FLOW RATE =    000000 LB/SEC RHO=    000000 LB/IN3
          Z DIST    METL T    FLUD T    PRESS     FILM C    RHO       WDOT R
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
000000 OUTLET PRESSURE DROP=    000000 PSIA, PRESSURE=    000000 PSIA FLOW RATE =    000000 LB/SEC RHO=    000000 LB/IN3

000000  INLET PRESSURE DROP=    000000 PSIA, PRESSURE=    000000 PSIA FLOW RATE =    000000 LB/SEC RHO=    000000 LB/IN3
          Z DIST    METL T    FLUD T    PRESS     FILM C    RHO       WDOT R
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
          000000    000000    000000    000000    000000    000000    000000
000000 OUTLET PRESSURE DROP=    000000 PSIA, PRESSURE=    000000 PSIA FLOW RATE =    000000 LB/SEC RHO=    000000 LB/IN3

NOZZLE FLOW=    000000  NOZZLE CHOKE FLOW=    000000    ITERATIONS  ERROR=   .000000  TIME=    .000 SEC


                                        PREDICTED VALUES
W P       W C       W H       W N        W T       P 6       P 8       T 8       P 11      T 11
000000    000000    000000    -000000    000000    000000    000000    000000    000000    000000
P 12      U P       WP ACT    WT ACT
000000    000000    000000    000000

                                        CORRECTED VALUES
W P       W C       W H       W N        W T       P 6       P 8       T 8       P 11      T 11
000000    000000    000000    -000000    000000    000000    000000    000000    000000    000000
P 12      U P       WP ACT    WT ACT
000000    000000    000000    000000
                                        END OF INPUT
```


APPENDIX D

PROGRAM LISTING

The transient engine simulation program is coded in standard IBM SCAT symbolic machine language; the program is, however, set up to operate with an Aerojet-General KISMET monitor.

If the program is to be run from the following listing, the Systems Analysis Department of REON should be contacted to obtain a KISMET monitor control tape.

```
                   1           LBR   KISNET            TAPE ROUTINES
                                                 49 WORDS
       00121           KDATEN  EQU   81
       12574       2           ORG   5500
                   3*THE ABSOLUTE LOCATIONS OF PRPTY,EXP,LN,SQRT MUST NOT BE CHANGED
       12574       4   PRPTY   BSS   69,S
       12701       5   PSQRT   BSS   5,S
       12706       6   PEXP    BSS   5,S
       12713       7   PLOG    BSS   5,S
       12720       8   EXP13   BSS   8,S                  POWER ROUTINE (AZE)
       12730       9   PRPT1   BSS   21,F
       12755      10   DENT    BSS   7,S                  DEN CALLS
       12764      11   DEN     BSS   145,S
       13205      12   DEN1    BSS   33,F
       13246      13   THALT   BSS   9,S
       13257      14   THAL    BSS   401,S
       14100      15   THAL1   BSS   63,F
       14177      16   PVTT    BSS   11,S
       14212      17   PVT     BSS   255,S
       14611      18   PVT1    BSS   64,F
       14711      19   NRAT    BSS   1,S
       14712      20   NRA     BSS   111,S
       15071      21   PSTT    BSS   5,S
       15076      22   PST     BSS   116,S
       15262      23   DSAT    BSS   5,S
       15267      24   DSA     BSS   96,S
       15427      25   DSTT    BSS   5,S
       15434      26   DST     BSS   79,S
       15553      27   PNBT    BSS   5,S
       15560      28   PNB     BSS   216,S
       16110      29   PNB1    BSS   85,S
       16235      30   DPDT    BSS   5,S
       16242      31   DPD     BSS   245,S
       16627      32   DPD1    BSS   95,F
       16766      33   CPHT    BSS   9,S
       16777      34   CPH     BSS   365,S
       17554      35   CPH1    BSS   81,F
       17675      36   ENTT    BSS   7,S
       17704      37   ENT     BSS   387,S
       20507      38   ENT1    BSS   135,F
       20716      39   CP3T    BSS   6,S
       20724      40   CP3     BSS   370,S
       21506      41   CP31    BSS   201,F
       22017      42   VIST    BSS   8,S
       22027      43   VIS     BSS   391,S
       22636      44   VIS1    BSS   154,S
       23070      45   INT     BSS   501,S
       24055      46   XLCT    BSS   2,S
       24057      47   XLC     BSS   11,S
       24072      48   XLC1    BSS   102,F
                  49*EXP, LN, SQRT FOLLOW RESPECTIVELY
24240  0 24100 0 24277  50   EXP     FDP   EXP+31          /LN 2
                  51           UNLIST
                 161           LIST
```

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```
                                    163*MASTER CONTROL REGION
24416   0 60000 0 40316     164     BEGIN   STZ     PP41
24417   0 76000 0 00016     165             +1      LMTM
24420   0 07401 4 00053     166             +2      TSX     KBINLD,4,1              READ IN PRPTY
24421   0 07400 4 40710     167             +3      TSX     ICURV,4
24422   0 00061 0 00005     168             +4      PZE     5,,49
24423   0 00000 0 00020     169             +5      PZE     16
24424   0 00000 0 31113     170             +6      PZE     AYK01
24425  -0 50000 0 32576     171             +7      CAL     ENDO
24426   0 60200 0 00056     172             +8      SLW     KERROR
24427   0 07400 4 27323     173             +9      TSX     AZXC,4                  READ STANDARD CASE
24430   0 63400 0 24603     174     START   SXA     AZM10,0
24431   0 60000 0 32721     175             +1      STZ     X+3
24432   0 07400 4 27161     176             +2      TSX     AZX,4                   TEST INPUT FOR NEW CASE
24433   0 07400 4 27236     177     GO      TSX     AZXA,4                  INPUT
24434  -0 52000 0 32612     178             +1      NZT     TCARD+11
24435   0 02000 0 24615     179             +2      TRA     AZM12                   END OF CASE
24436  -0 50000 0 32577     180             +3      CAL     TCARD
24437   0 56000 0 32600     181             +4      LDQ     TCARD+1
2444C  -0 76300 0 00006     182             +5      LGL     6
24441   0 60200 0 34555     183             +6      SLW     FX                      PART NAME
24442   0 07400 4 32113     184             +7      TSX     PRTD,4
24443   0 63400 0 24500     185             +8      SXA     AZM8,0
24444  -0 77400 1 00006     186             +9      AXC     NCTMP,1
24445  -0 52000 0 32721     187             +10     NZT     X+3                     0= 1ST PART
24446  -0 77400 1 00012     188             +11     AXC     NCURV,1
24447   0 77400 2 00000     189             +12     AXT     0,2
24450  -0 63400 1 24507     190             +13     SXD     AZM32,1
24451   0 77400 1 00000     191             +14     AXT     0,1
24452  -0 50000 1 24703     192     AZM7    CAL     AZM01,1
24453   0 62100 0 24472     193             +1      STA     AZM24                   TABLE STORAGE ADDRESS
24454   0 62100 0 24502     194             +2      STA     AZM6                    LINTS
24455   0 62200 0 24465     195             +3      STD     AZM26
24456   0 36100 0 40200     196             +4      ACL     FX1
24457   0 62100 0 24474     197             +5      STA     AZM25
24460   0 63400 1 24505     198             +6      SXA     AZM28,1
24461   0 50000 2 36230     199             +7      CLA     AZD,2                   NO. PTS
24462  -0 12000 0 24503     200             +8      TNI     AZM27                   -= CURVE NOT NEEDED
24463  -0 30000 0 40306     201             +9      UFA     FIX
24464   0 73400 4 00000     202             +10     PAX     ,4
24465   3 00000 4 24676     203     AZM26   TXH     AZM22,4,**0             TOO MANY PTS
24466  -3 00001 4 24676     204             +1      TXL     AZM22,4,1               TOO FEW PTS.
24467  -0 63400 4 24502     205             +2      SXD     AZM6,4
2447C   0 77400 1 00000     206             +3      AXT     0,1
24471   0 50000 2 36231     207     AZM5    CLA     AZD+1,2
24472   0 60100 1 00000     208     AZM24   STO     **0,1
24473   0 50000 2 36232     209             +1      CLA     AZD+2,2
24474   0 60100 1 00000     210     AZM25   STO     **0,1
24475   1 77776 1 24476     211             +1      TXI     *+1,1,-2
24476   1 77776 2 24477     212             +2      TXI     *+1,2,-2
24477   2 00001 4 24471     213             +3      TIX     AZM5,4,1
[redacted]                  21[redacted]    AZM[redacted]   A[redacted]     [redacted]2 [redacted]

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24501   0 07400 4 42511     215             +1      TSX     LINTS,4
24502   0 00000 0 00000     216     AZM6    PZE     **0,,**0
24503   1 77634 2 24504     217     AZM27   TXI     *+1,2,-100
24504   0 63400 2 24500     218             +1      SXA     AZM8,2
24505   0 77400 1 00000     219     AZM28   AXT     **0,1
24506   1 77777 1 24507     220             +1      TXI     *+1,1,-1
24507   3 00000 1 24452     221     AZM32   TXH     AZM7,1,**0
2451C   0 50000 0 36065     222     AZM1    CLA     DMMAX
24511  -0 30000 0 40306     223             +1      UFA     FIX
24512   0 62100 0 34556     224             +2      STA     FX+1                    NO. DEL Z PTS
24513   0 50000 0 40200     225             +3      CLA     FX1
24514   0 60100 0 34562     226             +4      STO     FX+5
24515   0 50000 0 36100     227             +5      CLA     DELT
24516   0 60100 0 35625     228             +6      STO     PT+11
24517   0 60000 0 35616     229             +7      STZ     PT+4
24520   0 60000 0 35617     230             +8      STZ     PT+5
24521   0 77400 2 00000     231             +9      AXT     0,2
24522   0 53400 1 34556     232             +10     LXA     FX+1,1
24523  -3 00060 1 24526     233             +11     TXL     *+3,1,NZMAX-2
24524  -1 24670 0 25421     234             +12     STR     AZF,,AZM11              TOO MANY NODES
24525   0 02000 0 24654     235             +13     TRA     AZM4                    FLUSH CASE
24526   1 00001 1 24527     236             +14     TXI     *+1,1,1
24527   0 52000 0 36077     237             +15     ZET     DTMI                    INITIAL TIME
24530   0 02000 0 24573     238             +16     TRA     AZM19
                            239*RESTART CASE TRANSFERS AROUND HERE
24531   0 50000 0 32640     240             +17     CLA     P+18                    POMIN
24532   0 52000 0 32721     241             +18     ZET     X+3                     0=1ST PART
24533   0 02000 0 24542     242             +19     TRA     AZM17
24534   0 50000 0 36111     243             +20     CLA     DPO
24535  -0 10000 0 24541     244             +21     TNZ     AZM17-1                 POMIN INPUT
24536   0 75400 0 00000     245             +22     PXA     ,0
24537   0 07400 4 42437     246             +23     TSX     LINT,4
24540   0 00000 0 33441     247             +24     PZE     WPO
24541   0 60100 0 32640     248             +25     STO     P+18                    POMIN
24542   0 50000 0 36103     249     AZM17   CLA     DTHO
24543   0 12000 0 24546     250             +1      TPL     *+3
24544   0 50000 2 35636     251             +2      CLA     AZ01,2
24545   0 02000 0 24547     252             +3      TRA     *+2
24546   3 00000 2 24556     253             +4      TXH     AZM9,2,0
24547   0 56000 0 32640     254             +5      LDQ     P+18
2455C   0 07400 4 25564     255             +6      TSX     AZH,4
24551   0 07400 4 42602     256             +7      TSX     ERROR,4
24552   0 56000 0 33730     257             +8      LDQ     WPR+6                   RHO
24553   0 50000 0 36103     258             +9      CLA     DTHO
24554   3 00000 2 24556     259             +10     TXH     AZM9,2,0
24555  -0 60000 0 35620     260             +11     STO     PT+6                    INLET
24556  -0 60000 2 35720     261     AZM9    STO     AZ06,2
24557  -0 12000 0 24561     262             +1      TMI     *+2
24560   0 60100 2 35636     263             +2      STO     AZ01,2
24561   0 60000 2 36002     264             +3      STZ     AZ08,2
24562   1 77777 2 24563     265             +4      TXI     *+1,2,-1
24563   2 00001 1 24542     266             +5      TIX     AZM17,1,1
24564  -0 60000 0 35634     267             +6      STO     PT+18                   OUTLET DENSITY
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24566   0 60100 2 35636     269         +8  STO    AZ01,2
24567   0 50000 2 35636     270         +9  CLA    AZ01,2
24570   0 60100 0 32633     271        +10  STO    P+13                    T6
24571   0 60000 0 35626     272        +11  STZ    PT+12
24572   0 60000 0 35627     273        +12  STZ    PT+13
24573   0 50200 0 36064     274    AZM19    CLS    DELZ
24574   0 24100 0 40214     275         +1  FDP    FL2
24575  -0 60000 0 35615     276         +2  STQ    PT+3
24576   0 50000 0 36065     277         +3  LDQ    DMMAX
24577   0 26000 0 36064     278         +4  FMP    DELZ
24600   0 30000 0 35615     279         +5  FAD    PT+3
24601   0 60100 0 35615     280         +6  STO    PT+3                    MAXIMUM Z
                            281*MOVE DATA TO STORAGE
24602   0 77400 2 01775     282         +7  AXT    AZMTS,2
24603   0 77400 4 00000     283    AZM10    AXT    **0,4
24604  -3 00000 4 24606     284         +1  TXL    *+2,4,0
24605  -3 53475 4 24653     285         +2  TXL    AZM20,4,AZMT+AZMTS+206
24606   0 50000 2 36076     286         +3  CLA    AZMTE,2
24607   0 60100 4 51162     287         +4  STO    AZMT,4
24610   1 77777 4 24611     288         +5  TXI    *+1,4,-1
24611   2 00001 2 24606     289         +6  TIX    *-3,2,1
24612   0 63400 4 24603     290         +7  SXA    AZM10,4
24613  -0 62500 0 32721     291         +8  STL    X+3
24614   0 02000 0 24433     292         +9  TRA    GO                      READ IN NEXT PART
                            293*END OF MULTI-PHASE INPUT
24615   0 52200 0 24603     294    AZM12    XEC    AZM10
24616  -3 00000 4 42602     295         +1  TXL    ERROR,4,0               NO INPUT
24617   1 62717 4 24620     296         +2  TXI    *+1,4,-AZMTG
24620  -0 63400 4 25321     297         +3  SXD    AZB3,4
24621  -0 63400 4 26543     298         +4  SXD    AZPI4,4
24622  -0 63400 4 26217     299         +5  SXD    AZK4,4
24623  -0 63400 4 26056     300         +6  SXD    AZJ9,4
24624  -0 63400 4 25217     301         +7  SXD    AZAC7,4
24625  -0 50000 0 40304     302         +8  CAL    BLANK
24626   0 60200 0 32612     303         +9  SLW    TCARD+11
                            304*INITIALIZE FOR SINGLE AND MULTIPLE PARTS
24627   0 50000 0 36101     305    AZM29    CLA    DNDT                    NO. TIME POINTS
24630  -0 30000 0 40306     306         +1  UFA    FIX
24631   0 36100 0 40200     307         +2  ACL    FX1
24632   0 73400 1 00000     308         +3  PAX    ,1
24633   0 07400 4 25201     309         +4  TSX    AZAC,4
24634   0 07400 4 25034     310    AZM31    TSX    AZA,4
24635   0 07400 4 26324     311         +1  TSX    AZPC,4
24636   0 07400 4 25633     312         +2  TSX    AZI,4                   HEAT TRNS AND HBP ITERATION
24637   0 07400 4 26462     313         +3  TSX    AZPI,4                  PRINT HT TRNS
24640   0 07400 4 26170     314         +4  TSX    AZK,4                   MOVE METAL TMPS TO PERM STO
24641   0 07400 4 26664     315         +5  TSX    AZPP,4                  PRINT PREDICTED VALUES
24642   0 07400 4 31601     316         +6  TSX    AYPA,4                  I TURBO-PUMP VALUES
24643   0 07401 4 26664     317         +7  TSX    AZPP,4,1                PRINT CORRECTED VALUES
24644   0 07400 4 26617     318         +8  TSX    AZPIB,4                 BUMP PRINT COUNTER
24645  -2 00001 1 24430     319         +9  TNX    START,1,1
24646   0 07400 4 25752     320    AZM2     TSX    AZJ,4                   COMPUTE METAL TEMPS FOR NWXT TIME
24647   0 07400 4 32006     321         +1  TSX    AYT,4                   TEST FOR COOLDOWN REACHED
[illegible]                 [illegible]                                    INLET CONDITIONS FOR TIME I+1

24651   0 07400 4 31627     323         +3  TSX    AYPB,4                  TURBOPUMP PREDICTOR
24652   0 02000 0 24634     324         +4  TRA    AZM31
                            325*EL FLUSHO FOR INPUT ERRORS-- TOO MANY PARTS
24653  -1 24665 0 25421     326    AZM20    STR    AZF,,AZM21
24654   0 07476 4 00101     327    AZM4     TSX    KMOVEB,4,62
24655  -1 00014 0 32577     328         +1  FVE    TCARD,,12
24656   0 16200 0 24664     329         +2  TQP    AZM3
24657   0 12000 0 24661     330         +3  TPL    *+2
24660   0 07400 4 00076     331         +4  TSX    KFINIS,4
24661  -0 50000 0 32612     332         +5  CAL    TCARD+11                PART FLAG
24662  -0 10000 0 24654     333         +6  TNZ    AZM20+1
24663   0 02000 0 24430     334         +7  TRA    START                   NEW CASE
24664  -1 24673 0 25417     335    AZM3     STR    AZFF,,AZM30
24665  -2 34646 6 04421     336    AZM21    BCI    3,TOO MANY PARTS
24670  -2 34646 6 04421     337    AZM11    BCI    3,TOO MANY NODES
24673   3 02543 4 76030     338    AZM30    BCI    3,HELP HELP HEELLLLP
                            339*EL FLUSHO FOR MISSING CURVE OR TOO MANY POINTS
24676  -1 24700 0 25421     340    AZM22    STR    AZF,,AZM23
24677   0 02000 0 24654     341         +1  TRA    AZM20+1                 MULTI-PART
24700   2 55151 4 65160     342    AZM23    BCI    3,ERROR IN PTS/CURVE
24703   0 00012 0 34567     343    AZM01    PZE    WAF,,10
24704   0 00012 0 34625     344         +1  PZE    WFP,,10
24705   0 00012 0 34663     345         +2  PZE    WH,,10
24706   0 00061 0 34721     346         +3  PZE    WHT,,49
24707   0 00061 0 35144     347         +4  PZE    WK,,49
24710   0 00061 0 35367     348         +5  PZE    WCR,,49
24711   0 00061 0 32773     349         +6  PZE    WTI,,49
24712   0 00061 0 33216     350         +7  PZE    WPI,,49
24713   0 00061 0 33441     351         +8  PZE    WPO,,49
24714   0 00012 0 33664     352         +9  PZE    WGP,,10


                            354*REGION TO EVALUATE FINITE DIFFERENCE TEMPERATURE EQUATIONS
24715   0 63400 4 25025     355    AZT      SXA    AZTR,4
24716   0 63400 2 25026     356         +1  SXA    AZTR+1,2
24717   0 50000 1 36556     357         +2  CLA    FX+1,1
24720   0 73700 4 00000     358         +3  PAC    ,4
24721  -0 63400 1 24722     359         +4  SXD    *+1,1
24722   1 00000 4 24723     360         +5  TXI    *+1,4,**0
24723   0 75400 1 00000     361         +6  PXA    ,1
24724   0 73400 2 00000     362         +7  PAX    ,2
24725  -0 63400 4 25017     363         +8  SXD    AZTI,4
24726   0 07400 4 30155     364         +9  TSX    AYE,4
24727   0 02000 0 25032     365        +10  TRA    AZT3                    ERROR
24730   0 02000 0 25030     366        +11  TRA    AZT4                    ERROR
24731   0 50000 0 32620     367        +12  CLA    P+2                     INLET TEMP
24732   0 60100 2 34163     368        +13  STO    AZ03,2
24733   0 50000 0 32631     369        +14  CLA    P+11                    WDOT
24734   0 60100 2 34101     370        +15  STO    AZ02,2
24735   0 50000 0 32621     371        +16  CLA    P+3                     INLET PRESS
24736   0 60100 2 34245     372        +17  STO    AZ04,2
24737   0 50000 1 36064     373        +18  CLA    DELZ,1
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24741  0 13100 0 00000    375       +20  XCA                          INITIAL Z IN AC
24742  0 60100 0 32616    376  AZT2   STO  P                           Z
24743  0 50000 2 35637    377       +1   CLA  AZ01+1,2
24744  0 60100 0 32617    378       +2   STO  P+1
24745  0 07400 4 31722    379       +3   TSX  AYR,4
24746  0 02000 0 25032    380       +4   TRA  AZT3
24747  0 56000 0 33746    381       +5   LDQ  TP+9                    2M-1
24750  0 26000 0 32620    382       +6   FMP  P+2                     T
24751  0 30000 0 32617    383       +7   FAD  P+1                     METAL TEMP
24752  0 30000 0 32617    384       +8   FAD  P+1
24753  0 24100 0 33745    385       +9   FDP  TP+8
24754  0 13100 0 00000    386       +10  XCA
24755  0 60100 2 34164    387       +11  STO  AZ03+1,2                T M+1,N
24756  0 60100 0 32620    388       +12  STO  P+2
24757  0 30200 2 34163    389       +13  FSB  AZ03,2
24760  0 24100 2 34163    390       +14  FDP  AZ03,2
24761  0 13100 0 00000    391       +15  XCA
24762  0 30000 0 33766    392       +16  FAD  TP+25
24763  0 13100 0 00000    393       +17  XCA
24764  0 26000 0 34002    394       +18  FMP  TP+37
24765  0 60100 0 33772    395       +19  STO  TP+29                   PRESSURE DROP TERM
24766  0 50000 0 32621    396       +20  CLA  P+3
24767  0 30200 0 33772    397       +21  FSB  TP+29
24770  0 60100 0 32621    398       +22  STO  P+3                     PRESSURE
24771  0 60100 2 34246    399       +23  STO  AZ04+1,2                P M+1,N
24772 -0 12000 0 25032    400       +24  TMI  AZT3
24773  0 50000 0 32623    401       +25  CLA  P+5                     RHO M,N        EQN HT13
24774  0 60100 2 34411    402       +26  STO  AZ07,2
24775  0 30200 2 35720    403       +27  FSB  AZ06,2                  RHO M,N-1
24776  0 13100 0 00000    404       +28  XCA
24777  0 26000 0 34074    405       +29  FMP  TP+95
25000  0 30000 0 32631    406       +30  FAD  P+11
25001  0 30200 2 36003    407       +31  FSB  AZ08+1,2
25002  0 30000 2 36002    408       +32  FAD  AZ08,2
25003 -3 62716 1 25005    409       +33  TXL  **2,1,-AZMTG-1          ************************************
25004  0 50000 0 32631    410       +34  CLA  P+11
25005  0 60100 2 34102    411       +35  STO  AZ02+1,2
25006  0 60100 0 32631    412       +36  STO  P+11                    WDOT M+1,N
25007 -0 12000 0 25030    413       +37  TMI  AZT4
25010  0 50000 0 32622    414       +38  CLA  P+4                     HF
25011  0 60100 2 34327    415       +39  STO  AZ05,2
25012  0 50000 0 33731    416       +40  CLA  WPR+7
25013  0 60100 2 34473    417       +41  STO  AZ09,2
25014  0 50C00 0 32616    418       +42  CLA  P
25015  0 30000 1 36064    419       +43  FAD  DELZ,1
25016  1 77777 2 25017    420       +44  TXI  *+1,2,-1
25017  3 00000 2 24742    421  AZT1   TXH  AZT2,2,**0
25020  0 07400 4 30201    422       +1   TSX  AYEA,4
25021  0 02C00 0 25032    423       +2   TRA  AZT3                    ERROR
25022  0 02000 0 25030    424       +3   TRA  AZT4                    ERROR
25023  0 50C00 0 33731    425       +4   CLA  WPR+7
25024  0 60100 2 34473    426       +5   STO  AZ09,2
25025  0 77400 4 00000    427  AZTR   AXT  **0,4
[redacted]

25027  0 02000 4 00003    429       +2   TRA  3,4
25030  0 52200 0 25025    430  AZT4   XEC  AZTR
25031  1 00002 4 25026    431       +1   TXI  AZTR+1,4,2              ERROR EXIT FOR NEGATIVE FLOW RATE
25032  0 52200 0 25025    432  AZT3   XEC  AZTR                             ERROR EXIT
25033  1 00001 4 25026    433       +1   TXI  AZTR+1,4,1


                          435*REGION TO COMPUTE CONSTANTS FOR ONE TIME STEP
25034  0 50000 0 34072    436  AZA    CLA  TP+93
25035  0 60100 0 32630    437       +1   STO  P+10                    NEW TIME
25036  0 52000 0 36111    438       +2   ZET  DPO
25037  0 02000 0 25046    439       +3   TRA  AZA1+1
25040  0 63400 4 25045    440       +4   SXA  AZA1,4                  NEW POMIN
25041  0 50000 0 32630    441       +5   CLA  P+10
25042  0 07400 4 42437    442       +6   TSX  LINT,4
25043  0 00000 0 33441    443       +7   PZE  WPO
25044  0 60100 0 32640    444       +8   STO  P+18
25045  0 77400 4 00000    445  AZA1   AXT  **0,4
25046  0 50000 0 34064    446       +1   CLA  TP+87                   P1
25047  0 60100 0 32652    447       +2   STO  P+28
2505C  0 50000 0 34065    448       +3   CLA  TP+88                   T1
25051  0 60100 0 32653    449       +4   STO  P+29
25052  0 50000 0 32674    450       +5   CLA  P+46                    P2
25053  0 60100 0 32654    451       +6   STO  P+30
25054  0 50000 0 32675    452       +7   CLA  P+47                    T2
25055  0 60100 0 32655    453       +8   STO  P+31
25056  0 50000 0 34073    454       +9   CLA  TP+94                   GP
25057  0 60100 0 32657    455       +10  STO  P+33
2506C  0 50000 0 32666    456       +11  CLA  P+40                    N
25061  0 60100 0 32665    457       +12  STO  P+39
25062  0 50000 0 34017    458       +13  CLA  TP+50                   RHO 1
25063  0 60100 0 34060    459       +14  STO  TP+83
25064  0 50000 0 34056    460       +15  CLA  TP+81                   DELH (BTU/LB)
25065  0 60100 0 34066    461       +16  STO  TP+89
25066  0 50000 0 32677    462       +17  CLA  P+49                    WDOTP
25067  0 60100 0 32643    463       +18  STO  P+21
2507C  0 50000 0 34046    464       +19  CLA  TP+73                   WDOTC
25071  0 60100 0 32644    465       +20  STO  P+22
25072  0 50000 0 32636    466       +21  CLA  P+16                    HSV
25073  0 60100 0 32635    467       +22  STO  P+15
25074  0 02000 4 00001    468       +23  TRA  1,4


                          470*REGION TO OBTAIN CONSTANTS FOR TIME I+1
25075  0 50000 0 32630    471  AZAA   CLA  P+10
25076  0 30000 0 32637    472       +1   FAD  P+17
25077  0 60100 0 34072    473       +2   STO  TP+93                   NEW TIME
25100  0 63400 4 25122    474       +3   SXA  AZAAR,4
25101  0 52000 0 36107    475       +4   ZET  DPI
251C2  0 02000 0 25114    476       +5   TRA  AZAA1
25103  0 50000 0 34072    477       +6   CLA  TP+93
25104  0 07400 4 42437    478       +7   TSX  LINT,4
251C5  0 00000 0 33216    479       +8   PZE  WPI
25106  0 60100 0 34064    480       +9   STO  [illegible]
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25110  0 07400 4 42437    482        +11  TSX   LINT,4
25111  0 00000 0 32773    483        +12  PZE   WTI
25112  0 60100 0 34069    484        +13  STO   TP+88                 T1
25113  0 07400 4 30453    485        +14  TSX   AYII,4
25114  0 52000 0 36130    486    AZAA1   ZET   OGP
25115  0 02000 0 25122    487         +1  TRA   AZAAR
25116  0 50000 0 34072    488         +2  CLA   TP+93
25117  0 07400 4 42437    489         +3  TSX   LINT,4
25120  0 00000 0 33644    490         +4  PZE   WGP
25121  0 60100 0 34073    491         +5  STO   TP+94                 GP
25122  0 77400 4 00000    492    AZAAR   AXT   **0,4
25123  0 02000 4 00001    493         +1  TRA   1,4

                          495*REGION TO FIND VALUES AT ZERO TIME
25124  0 63400 4 25174    496    AZAB    SXA   AZABR,4
25125  0 50200 0 36100    497         +1  CLS   DELT
25126  0 60200 0 32637    498         +2  SLW   P+17
25127  0 60100 0 32630    499         +3  STO   P+10
25130  0 07400 4 25075    500         +4  TSX   AZAA,4                 READ CURVES
25131  0 50000 0 36107    501         +5  CLA   DPI
25132  0 10000 0 25137    502         +6  TZE   AZAB1
25133  0 60100 0 34064    503         +7  STO   TP+87                 P1
25134  0 50000 0 36110    504         +8  CLA   DTI
25135  0 60100 0 34065    505         +9  STO   TP+88                 T1
25136  0 07400 4 30453    506        +10  TSX   AYII,4
25137  0 50000 0 36130    507    AZAB1   CLA   OGP
25140  0 10000 0 25142    508         +1  TZE   **+2
25141  0 60100 0 34073    509         +2  STO   TP+94                 GP
25142  0 50000 0 34064    510         +3  CLA   TP+87                 P1
25143  0 60100 0 32674    511         +4  STO   P+46
25144  0 60100 0 32652    512         +5  STO   P+28
25145  0 50000 0 34065    513         +6  CLA   TP+88
25146  0 60100 0 32675    514         +7  STO   P+47
25147  0 60100 0 32653    515         +8  STO   P+29
25150  0 50000 0 36111    516         +9  CLA   DPD
25151  0 60100 0 32640    517        +10  STO   P+18
25152  0 50000 0 36143    518        +11  CLA   DNI
25153  0 60100 0 32666    519        +12  STO   P+40
25154  0 50000 0 36114    520        +13  CLA   DWP
25155  0 60100 0 32677    521        +14  STO   P+49
25156  0 50000 0 36115    522        +15  CLA   DWC
25157  0 60100 0 34046    523        +16  STO   TP+73
25160  0 50000 0 36116    524        +17  CLA   DWH
25161  0 60100 0 34045    525        +18  STO   TP+72
25162  0 60000 0 34042    526        +19  STZ   TP+69
25163  0 60000 0 34043    527        +20  STZ   TP+70
25164  0 60000 0 34052    528        +21  STZ   TP+77
25165  0 60000 0 32662    529        +22  STZ   P+36
25166  0 60000 0 34053    530        +23  STZ   TP+78
25167  0 60000 0 32664    531        +24  STZ   P+38
25170  0 60000 0 32700    532        +25  STZ   P+50
25171  0 60000 0 32670    533        +26  STZ   P+42
25172  0 60000 0 32672    534        +27  STZ   P+44
25[illegible]  0[illegible]00 [illegible]67  53[illegible]  [illegible]

25174  0 77400 4 00000    536    AZABR   AXT   **0,4
25175  0 02000 4 00001    537         +1  TRA   1,4
25176  2 22124 6 06321    538    AZAB2   BCI   3,BAD TANK PRS, TMP

                          540*REGION TO INITIALIZE PROGRAM
25201  0 63400 4 25260    541    AZAC    SXA   AZACR,4
25202  0 63400 1 25261    542         +1  SXA   AZACR+1,1
25203  0 50000 0 36106    543         +2  CLA   DDIL                 DILUENT REMOVAL FLAG
25204 -0 30000 0 40306    544         +3  UFA   FIX
25205  0 73700 4 00000    545         +4  PAC   ,4
25206  3 00000 4 25210    546         +5  TXH   **+2,4,0
25207 -1 25263 0 25417    547    AZAC5   STR   AZFF,,AZAC4
25210 -3 77775 4 25213    548         +1  TXL   AZAC1,4,-3
25211 -0 62500 4 32715    549         +2  STL   X-1,4
25212  0 02000 0 25222    550         +3  TRA   AZAC3
25213 -0 77400 1 15061    551    AZAC1   AXC   AZMTG,1
25214  1 00003 4 25215    552         +1  TXI   **+1,4,3
25215 -3 00000 4 25221    553    AZAC6   TXL   AZAC2,4,0
25216  1 76003 1 25217    554         +1  TXI   **+1,1,-AZMTS
25217 -3 00000 1 25207    555    AZAC7   TXL   AZAC5,1,**0
25220  1 00001 4 25215    556         +1  TXI   AZAC6,4,1
25221 -0 62500 1 36557    557    AZAC2   STL   FX+2,1                 IN CORRECT PART
25222  0 07400 4 25124    558    AZAC3   TSX   AZAB,4
25223  0 07400 4 27657    559         +1  TSX   AYC,4
25224  0 07400 4 44724    560         +2  TSX   HBZ,4
25225  0 50000 0 36077    561         +3  CLA   DTMI
25226  0 10000 0 25231    562         +4  TZE   **+3
25227  0 50000 0 36103    563         +5  CLA   DTHO
25230  0 60100 0 32633    564         +6  STO   P+13                  T6
25231  0 52000 0 36123    565         +7  ZET   DNZFF
25232  0 07400 4 26247    566         +8  TSX   AZNI,4
25233  0 50000 0 36201    567         +9  CLA   DP11
25234  0 60100 0 32742    568        +10  STO   X+20
25235  0 50000 0 36127    569        +11  CLA   DSMT
25236 -0 30000 0 40306    570        +12  UFA   FIX
25237  0 32200 0 40306    571        +13  ERA   FIX
25240  0 13100 0 00000    572        +14  XCA
25241  0 75400 0 00000    573        +15  PXA   ,0
25242  0 22100 0 40212    574        +16  DVP   FX1E3
25243  0 60100 0 47714    575        +17  STO   HB6                   PRINT HOT BLEED PORT
25244 -0 60000 0 44475    576        +18  STQ   AZN5                  PRINT NOZZLE TUBES
25245  0 50000 0 36076    577        +19  CLA   DPRI
25246 -0 30000 0 40306    578        +20  UFA   FIX
25247  0 32200 0 40306    579        +21  ERA   FIX
25250  0 13100 0 00000    580        +22  XCA
25251  0 75400 0 00000    581        +23  PXA   ,0
25252  0 22100 0 40212    582        +24  DVP   FX1E3
25253 -0 60000 0 32725    583        +25  STQ   X+7                   SKIP PRINT FLAG
25254  0 62100 0 32726    584        +26  STA   X+8
25255  0 60000 0 32727    585        +27  STZ   X+9
25256 -0 62500 0 32737    586        +28  STL   X+17
25257  0 07401 4 32541    587        +29  TSX   PL,4,1                RESTORE PAGE
25260  0 77400 4 00000    588    AZACR   AXT   **0,4
25261  0 77400 1 00000    589         +1  AXT   **0,1
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25262  0 02000 4 00001      590          +2  TRA     1,4
25263 -0 54660 2 43143      591     AZAC4    BCI     3,NO DILUENT REMOVED

                            593*REGION TO COMPUTE MAIN ENGINE HEAT TRANSFER
25264  0 63400 4 25331      594     AZB      SXA     AZBR,4
25265  0 63400 1 25332      595          +1  SXA     AZBR+1,1
25270  0 60000 0 32722      596          +2  STZ     X+4
25271  0 60000 0 32744      597          +3  STZ     X+22
25272 -0 52000 0 32716      598          +4  NZT     X
25273  0 02000 0 25276      599          +5  TRA     *+3
25274  0 07400 4 27353      600          +6  TSX     AZY,4                DILUENT AT PUMP DISCHARGE
25275  0 02000 0 25337      601          +7  TRA     AZB12                WDOTR -
25276  0 07400 4 27367      602          +8  TSX     AZZ,4                P3 AND T3
25277 -0 52000 0 32717      603          +9  NZT     X+1
25300  0 02000 0 25303      604          +10 TRA     *+3
25301  0 07400 4 27353      605          +11 TSX     AZY,4                DILUENT AT TUBE INLET
25302  0 02000 0 25337      606          +12 TRA     AZB12
25303 -0 52000 0 36123      607          +13 NZT     DNZFF
25304  0 02000 0 25310      608          +14 TRA     AZB5
25305  0 07400 4 42636      609          +15 TSX     AZN,4
25306  0 02000 0 25343      610          +16 TRA     AZB11
25307  0 02000 0 25341      611          +17 TRA     AZB9                 NEG PRESS
25310 -0 77400 1 15061      612     AZB5     AXC     AZMTG,1
25311 -0 52000 1 34557      613     AZB2     NZT     FX+2,1
25312  0 02000 0 25315      614          +1  TRA     *+3
25313  0 07400 4 27353      615          +2  TSX     AZY,4
25314  0 02000 0 25337      616          +3  TRA     AZB12
25315  0 07400 4 24715      617          +4  TSX     AZT,4                HEAT TRANS
25316  0 02000 0 25337      618          +5  TRA     AZB12
25317  0 02000 0 25334      619          +6  TRA     AZB8
25320  1 76003 1 25321      620          +7  TXI     *+1,1,-AZMTS
25321  3 00000 1 25311      621     AZB3     TXH     AZB2,1,**0
25322  0 50000 0 32620      622          +1  CLA     P+2                  T
25323  0 60100 0 32633      623          +2  STO     P+13
25324  0 50000 0 32621      624          +3  CLA     P+3                  P6
25325  0 60100 0 32656      625          +4  STO     P+32
25326  0 56000 0 32640      626          +5  LDQ     P+18                 MIN PO
25327  0 04000 0 25331      627          +6  TLQ     *+2
25330 -0 62500 0 32722      628          +7  STL     X+4                  P6 TOO LOW
25331  0 77400 4 00000      629     AZBR     AXT     **0,4
25332  0 77400 1 00000      630          +1  AXT     **0,1
25333  0 02000 4 00003      631          +2  TRA     3,4
25334  0 50000 0 32621      632     AZB8     CLA     P+3
25335 -0 12000 0 25341      633          +1  TMI     AZB9
25336 -1 25345 0 25417      634          +2  STR     AZFF,,AZB7
25337  0 52200 0 25331      635     AZB12    XEC     AZBR
25340  1 00002 4 25332      636          +1  TXI     AZBR+1,4,2
25341  0 52200 0 25331      637     AZB9     XEC     AZBR
25342  1 00001 4 25332      638          +1  TXI     AZBR+1,4,1           NEG PRESSURE
25343 -1 43573 0 25421      639     AZB11    STR     AZF,,BUG1
25344  0 02000 0 25310      640          +1  TRA     AZB5
25345  3 02521 6 36063      641     AZB7     BCI     3,HEAT TRANSFR ERROR
253[illegible] -0[illegible]60 [illegible]64[illegible]  64[illegible] AZ[illegible]   [illegible]  [illegible] TO[illegible]W [illegible]

                            644*REGION TO COMPUTE SOME CONSTANTS
25353  0 63400 4 25377      645     AZC      SXA     AZCR,4
25354  0 50000 0 32616      646          +1  CLA     P                    Z
25355  0 07400 4 42437      647          +2  TSX     LINT,4
25356  0 00000 1 34567      648          +3  PZE     WAF,1
25357  0 60100 0 33757      649          +4  STO     TP+18                AF
25360  0 50000 0 32616      650          +5  CLA     P
25361  0 07400 4 42437      651          +6  TSX     LINT,4
25362  0 00000 1 34625      652          +7  PZE     WFP,1
25363  0 60100 0 33760      653          +8  STO     TP+19                FP
                            654*PIPE OPTION BRANCHES OUT HERE TO AZC1
25364  0 52000 1 36071      655          +9  ZET     DPX,1                NOT 0=PIPE OPTION
25365  0 02000 0 25401      656          +10 TRA     AZC2
25366  0 50000 0 40213      657          +11 CLA     FL1
25367  0 30200 1 36067      658          +12 FSB     DVF,1
25370  0 24100 1 36067      659          +13 FDP     DVF,1
25371  0 26000 1 36064      660          +14 FMP     DELZ,1
25372  0 24100 1 35625      661          +15 FDP     PT+11,1
25373  0 26000 0 33757      662          +16 FMP     TP+18
25374  0 60100 0 33765      663     AZC1     STO     TP+24
25375  0 24100 0 32631      664          +1  FDP     P+11
25376 -0 60000 0 33771      665          +2  STQ     TP+28
25377  0 77400 4 00000      666     AZCR     AXT     **0,4
25400  0 02000 4 00001      667          +1  TRA     1,4
25401  0 50000 0 33757      668     AZC2     CLA     TP+18                AF -- PIPE OPTION
25402  0 24100 0 40275      669          +1  FDP     PI
25403  0 26000 0 40216      670          +2  FMP     FL4
25404  0 07400 4 24364      671          +3  TSX     SQRT,4
25405  0 07400 4 42602      672          +4  TSX     ERROR,4
25406  0 60100 0 33735      673          +5  STO     TP                   DI
25407  0 30200 1 36071      674          +6  FSB     DPX,1
25410  0 24100 1 35625      675          +7  FDP     PT+11,1              DELT
25411  0 26000 1 36071      676          +8  FMP     DPX,1
25412  0 13100 0 00000      677          +9  XCA
25413  0 26000 0 40275      678          +10 FMP     PI
25414  0 13100 0 00000      679          +11 XCA
25415  0 26000 1 36064      680          +12 FMP     DELZ,1
25416  0 02000 0 25374      681          +13 TRA     AZC1

                            683*REGION TO PRINT ERROR MESSAGES
25417 -0 50000 0 25437      684     AZFF     CAL     AZF2                 PRINT AND FLUSH
25420  0 02000 0 25422      685          +1  TRA     *+2

                            687*PRINT MESSAGE AND RETURN
25421 -0 50000 0 00000      688     AZF      CAL     0                    PRINT AND RETURN
25422  0 60000 0 25432      689          +1  STZ     AZF1+1
25423  0 62100 0 25436      690     AZF3     STA     AZFR+1
25424  0 63400 4 25435      691          +1  SXA     AZFR,4
25425 -0 50060 0 00046      692          +2  CAL*    KICSTR
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25430  0 07400 4 00052   695        +5  TSX   DOUT,4
25431  3 06000 C 00000   696   AZF1     PTH   **0,,3072
25432  0 00000 0 00000   697        +1  PZE   **0
25433 -1 00012 0 00012   698        +2  FVE   10,,10
25434  0 07401 4 32541   699        +3  TSX   PL,4,1
25435  0 77400 4 00000   700   AZFR     AXT   **0,4
25436  0 02C00 0 00000   701        +1  TRA   **0
25437  0 00000 0 42602   702   AZF2     PZE   ERROR

                         704*PRINT TIME WITH MESSAGE
25440 -0 50000 0 25444   705   AZFT     CAL   AZFT1
25441  0 60200 0 25432   706        +1  SLW   AZF1+1
25442 -0 50000 C 00000   707        +2  CAL   0
25443  0 02000 0 25423   708        +3  TRA   AZF3
25444 -2 13702 0 32630   709   AZFT1    SIX   P+10,,6082


                         711*REGION TO COMPUTE CONSTANTS FOR ONE POSITION STEP
25445  0 63400 4 25560   712   AZG      SXA   AZGR,4
25446  0 50000 2 34101   713        +1  CLA   AZ02,2
25447  0 30000 2 34102   714        +2  FAD   AZ02+1,2
25450  C 24100 0 40214   715        +3  FDP   FL2
25451 -0 60000 0 32631   716        +4  STQ   P+11
25452  C 07400 4 25353   717        +5  TSX   AZC,4
25453  0 50000 2 34163   718        +6  CLA   AZ03,2
25454  0 30000 2 34164   719        +7  FAD   AZ03+1,2
25455  C 24100 0 40214   720        +8  FDP   FL2
25456 -0 60000 0 32620   721        +9  STQ   P+2
25457  0 50000 2 34245   722       +10  CLA   AZ04,2
25460  C 30000 2 34246   723       +11  FAD   AZ04+1,2
25461  0 24100 0 40214   724       +12  FDP   FL2
25462 -0 60000 0 32621   725       +13  STQ   P+3
25463  0 50000 2 34473   726       +14  CLA   AZ09,2
25464  0 30000 2 34474   727       +15  FAD   AZ09+1,2
25465  0 24100 0 40214   728       +16  FDP   FL2
25466 -0 60000 0 33731   729       +17  STQ   WPR+7               CSUBP
25467  0 50000 2 35637   730       +18  CLA   AZ01+1,2            METAL TEMP
25470  0 07400 4 42437   731       +19  TSX   LINT,4
25471  C 00000 1 35367   732       +20  PZE   WCR,1
25472  0 13100 0 00000   733       +21  XCA
25473  0 26000 1 36070   734       +22  FMP   DRHOR,1
25474  0 60100 0 33776   735       +23  STO   TP+33               RHO SUB R * C SUB R
25475  0 50000 2 35637   736       +24  CLA   AZ01+1,2
25476  0 07400 4 42437   737       +25  TSX   LINT,4
25477  0 00000 1 35144   738       +26  PZE   WK,1
2550C  0 60100 0 33761   739       +27  STO   TP+20               K
25501  0 50000 0 33736   740       +28  CLA   TP+1
25502  0 07400 4 42437   741       +29  TSX   LINT,4
25503  0 00000 1 34721   742       +30  PZE   WHT,1
25504  0 60100 0 34075   743       +31  STO   TP+96
255C5  0 50000 0 32616   744       +32  CLA   P                   Z, IN
25506  0 07400 4 42437   745       +33  TSX   LINT,4
25507  0 00000 1 34663   746       +34  PZE   WH,1
[illegible]              747       +35  [illegible]

25511  C 26C00 0 34075   748       +36  FMP   TP+96               FRACTION OF HEAT GEN COEFF
25512  0 60100 0 33777   749       +37  STO   TP+34               H
25513  0 50000 2 34327   750       +38  CLA   AZ05,2
25514  0 60100 0 32622   751       +39  STO   P+4
25515  C 07400 4 31545   752       +40  TSX   AYN,4
25516  0 50000 0 33776   753       +41  CLA   TP+33               RHO C R
25517  0 24100 0 33731   754       +42  FDP   WPR+7               C P
25520  0 26C00 0 33771   755       +43  FMP   TP+28
25521  0 60100 0 32624   756       +44  STO   P+6
25522  0 34C00 0 32627   757       +45  CAS   P+9                 M
25523  0 02C00 0 25526   758       +46  TRA   *+3
25524  C 02C00 0 25526   759       +47  TRA   *+2
25525  0 02C00 0 25562   760       +48  TRA   AZG1
25526  0 50000 0 33761   761       +49  CLA   TP+20               K
25527  0 24100 0 33776   762       +50  FDP   TP+33
25530  0 26000 1 35625   763       +51  FMP   PT+11,1             DELT
25531  0 24100 1 36064   764       +52  FDP   DELZ,1
25532  0 13100 0 00000   765       +53  XCA
25533  0 24100 1 36064   766       +54  FDP   DELZ,1
25534  0 13100 0 00000   767       +55  XCA
25535  0 24100 0 40214   768       +56  FDP   FL2
25536 -0 60C00 0 32625   769       +57  STQ   P+7                 S/2
25537  0 50000 0 33777   770       +58  CLA   TP+34               H
25540  0 24100 0 33776   771       +59  FDP   TP+33
25541  0 26000 1 35625   772       +60  FMP   PT+11,1
25542  0 60100 0 32626   773       +61  STO   P+8
25543  0 50200 0 33746   774       +62  CLS   TP+9
25544  0 24100 0 33745   775       +63  FDP   TP+8
25545  0 13100 0 00000   776       +64  XCA
25546  0 30000 0 40213   777       +65  FAD   FL1
25547  0 24100 0 32624   778       +66  FDP   P+6
25550 -0 60000 0 33747   779       +67  STQ   TP+10
25551  0 50200 0 40214   780       +68  CLS   FL2
25552  0 24100 0 33745   781       +69  FDP   TP+8
25553  0 13100 0 00000   782       +70  XCA
25554  0 24100 0 32624   783       +71  FDP   P+6
25555  0 13100 0 00000   784       +72  XCA
25556  0 30000 0 40213   785       +73  FAD   FL1
25557  0 60100 0 33744   786       +74  STO   TP+7
25560  0 77400 4 00000   787   AZGR     AXT   **0,4
25561  0 02000 4 00002   788        +1  TRA   2,4
25562  0 52200 0 25560   789   AZG1     XEC   AZGR
25563  0 02000 4 00001   790        +1  TRA   1,4


                         792*REGION TO COMPUTE PARA HYDROGEN PROPERTIES, TEMP IN AC, PRESS IN MQ
25564  0 63400 4 25625   793   AZH      SXA   AZHR,4
25565 -0 12000 4 00001   794        +1  TMI   1,4
25566  0 16200 0 25571   795        +2  TQP   AZH2
25567  0 52200 0 25625   796   AZH3     XEC   AZHR
25570  0 02000 4 00001   797        +1  TRA   1,4
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25574  0 02000 0 25602    801          +3  TRA   AZH4
25575  0 13100 0 00000    802          +4  XCA
25576  0 34000 0 33722    803          +5  CAS   WPR
25577  0 02000 0 25601    804          +6  TRA   *+2
25600  0 02000 0 25625    805          +7  TRA   AZHR                  SAME PRESSURE
25601  0 13100 0 00000    806          +8  XCA
25602  0 77400 4 00012    807    AZH4      AXT   10,4
25603  0 60000 4 33734    808          +1  STZ   WPR+10,4
25604  2 00001 4 25603    809          +2  TIX   *-1,4,1
25605  0 60100 0 33727    810          +3  STO   WPR+5                   TEMP
25606 -0 60000 0 33722    811          +4  STQ   WPR                     PRESS
25607  0 07400 4 32022    812          +5  TSX   PRP,4
25610  0 02000 0 25567    813          +6  TRA   AZH3
25611  0 56000 0 33723    814          +7  LDQ   WPR+1                   SP VOL FT**3/LB
25612  0 26000 0 40245    815          +8  FMP   FLCUF                   IN3/FT3
25613  0 60100 0 33723    816          +9  STO   WPR+1                   IN**3/LB
25614  0 50000 0 25627    817         +10  CLA   AZH1
25615  0 56000 0 33727    818         +11  LDQ   WPR+5
25616  0 04000 0 25625    819         +12  TLQ   AZHR
25617  0 50000 0 25630    820         +13  CLA   AZH1+1
25620  0 04000 0 25622    821         +14  TLQ   *+2
25621  0 02000 0 25625    822         +15  TRA   AZHR
25622  0 26000 0 25631    823         +16  FMP   AZH1+2
25623  0 30000 0 25632    824         +17  FAD   AZH1+3
25624  0 60100 0 33731    825         +18  STO   WPR+7
25625  0 77400 4 00000    826    AZHR      AXT   **0,4
25626  0 02000 4 00002    827          +1  TRA   2,4
25627  2 10550 0 00000    828    AZH1
25630  2 11404 0 00000    829          +1
25631  1 71763 5 54427    830          +2
25632  2 01755 3 41217    831          +3


                          833*REGION TO ITERATE ON FLOW RATE FOR MULTIPLE PART CASE AT ONE TIME PT.
25633  0 63400 4 25705    834    AZI       SXA   AZIR,4
25634  0 50000 0 40305    835          +1  CLA   BIG
25635  0 60100 0 40471    836          +2  STO   NEWA9
25636  0 60000 0 40472    837          +3  STZ   NEWA9+1
25637  0 50000 0 32644    838          +4  CLA   P+22
25640  0 60100 0 47403    839          +5  STO   PR+50                   INITIAL WDOTC GUESS
25641  0 50000 0 36120    840          +6  CLA   DWRE                    WDOTR CLOSURE
25642  0 07400 4 40407    841          +7  TSX   NEWA,4
25643  0 47406 0 32643    842          +8  PZE   P+21,,PR+53
25644  0 00024 0 32631    843          +9  PZE   P+11,,NHIT
25645  0 02000 0 25723    844         +10  TRA   AZI3                    NIT CONVERGED
25646  0 50000 0 47403    845         +11  CLA   PR+50
25647  0 60100 0 32644    846         +12  STO   P+22                    WDOTC= VALUE OBTAINED BY HOT BLEED P
25650  0 50000 0 32655    847         +13  CLA   P+31
25651  0 60100 0 32620    848         +14  STO   P+2                     T2
25652  0 50000 0 32654    849         +15  CLA   P+30
25653  0 60100 0 32621    850         +16  STO   P+3                     P2
25654  0 50000 0 32643    851         +17  CLA   P+21
25655  0 60100 0 32631    852         +18  STO   P+11                    WDOTR=WDOTP
[illegible]
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25657  0 02000 0 25707    854         +20  TRA   AZI1                    NEG FLOW
25660  0 02000 0 25715    855         +21  TRA   AZI2                    NEG PRESS
25661  0 52000 0 32742    856         +22  ZET   X+20
25662  0 02000 0 25732    857         +23  TRA   AZI4                    P11, T11 GIVEN- SKIP HOT BLEED PORT
25663  0 07400 4 44757    858         +24  TSX   HB,4                    HOT PLEED PORT PROGRAM
25664  0 02000 0 25732    859         +25  TRA   AZI4                    WDOTH NEG, TREAT AS ZERO THIS PASS
25665  0 02000 0 25746    860         +26  TRA   AZI5                    NEG PRESSURE, LOWER WDOTC
25666  0 07400 4 40477    861    AZI6      TSX   RAPA,4                  CLOSE
25667  0 50000 0 32644    862          +1  CLA   P+22
25670  0 56000 0 47403    863          +2  LDQ   PR+50
25671 -0 60000 0 32644    864          +3  STQ   P+22
25672  0 30200 0 47403    865          +4  FSB   PR+50
25673  0 24100 0 47403    866          +5  FDP   PR+50
25674  0 76000 0 00012    867          +6  DCT
25675  0 07400 4 42602    868          +7  TSX   ERROR,4                 WDOTC IN HBP=0
25676  0 13100 0 00000    869          +8  XCA
25677 -0 34000 0 36117    870          +9  LAS   DWCE
25700  0 02000 0 40427    871         +10  TRA   NEWA2+1                 NOT CONVERGED TRY AGAIN WITH SAME WP
25701  0 02000 0 25702    872         +11  TRA   *+1
25702  0 52200 0 40427    873    AZI7      XEC   NEWA2+1
25703  1 77754 4 25704    874          +1  TXI   *+1,4,-NHIT
25704  0 63600 4 32732    875          +2  SCA   X+12,4                   NO. ITERATIONS
25705  0 77400 4 00000    876    AZIR      AXT   **0,4
25706  0 02000 4 00001    877          +1  TRA   1,4                     EXIT
                          878*NEGATIVE FLOW RATE- WDOTP TOO SMALL
25707 -0 52000 0 32744    879    AZI1      NZT   X+22
25710  0 02000 0 40466    880          +1  TRA   BDNA
25711  0 50000 0 32643    881          +2  CLA   P+21                    IF WDOTC HAS BEEN REMOVED LOWER
25712  0 30200 0 32644    882          +3  FSB   P+22                          MINIMUM BY WDOTC
25713  0 60100 0 32643    883          +4  STO   P+21
25714  0 02000 0 40466    884          +5  TRA   BDNA
                          885*NEGATIVE PRESSURE- WDOTP TOO BIG
25715 -0 52000 0 32744    886    AZI2      NZT   X+22
25716  0 02000 0 40463    887          +1  TRA   BDXA
25717  0 50000 0 32643    888          +2  CLA   P+21                    IF DILUENT HAS BEEN REMOVED RAISE
25720  0 30000 0 32644    889          +3  FAD   P+22                          NEW MAXIMUM BY WDOTC
25721  0 60100 0 32643    890          +4  STO   P+21
25722  0 02000 0 40463    891          +5  TRA   BDXA
                          892*NOT CONVERGED
25723 -1 25727 0 25440    893    AZI3      STR   AZFT,,AZI01
25724  0 77400 4 00024    894          +1  AXT   NHIT,4
25725  0 63400 4 32732    895          +2  SXA   X+12,4
25726  0 02000 0 25705    896          +3  TRA   AZIR
25727 -2 65173 6 06623    897    AZI01     BCI   3,HR, WC NOT CLOSED
                          898*P11, T11 GIVEN- WDOTC =0, HOT BLEED PORT CLOSED
25732  0 50000 0 32620    899    AZI4      CLA   P+2
25733  0 07400 4 24364    900          +1  TSX   SQRT,4
25734  0 07400 4 42602    901          +2  TSX   ERROR,4
25735  0 60100 0 12512    902          +3  STO   COMMON                  ROOT T6
25736  0 56000 0 36122    903          +4  LDQ   DASTR
25737  0 26000 0 32621    904          +5  FMP   P+3                     P6
25740  0 24100 0 12512    905          +6  FDP   COMMON
25741  0 76000 0 40241    906          +7  FMP   FL139
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25743  0 60100 0 34007    908        +9  STO   TP+42                    WDOTN CHOKE
25744  0 07400 4 40477    909       +10  TSX   RAPA,4
25745  0 02000 0 25702    910       +11  TRA   AZI7
                           911*NEG PRESSURE IN HOT BLEED PORT, LOWER WDOTC
25746  0 50000 0 32644    912   AZI5     CLA   P+22                     NEW          WDOTC= .5 WDOTC
25747  0 24100 0 40214    913        +1  FDP   FL2
2575C -0 60000 0 32644    914        +2  STO   P+22
25751  0 02000 0 40427    915        +3  TRA   NEWA2+1


                           917*REGION TO COMPUTE MAIN ENGINE METAL TEMPS
25752  0 63400 4 26057    918   AZJ      SXA   AZJR,4
25753  0 63400 1 26060    919        +1  SXA   AZJR+1,1
25754  0 63400 2 26061    920        +2  SXA   AZJR+2,2
25755  0 63400 3 26062    921        +3  SXA   AZJR+3,3
25756  0 63400 5 26063    922        +4  SXA   AZJR+4,5
25757 -0 77400 1 15061    923        +5  AXC   AZMTG,1
25760  0 60000 1 34561    924   AZJ8     STZ   FX+4,1                   TEMP EXCEEDED MAX FLAG
25761  0 50000 1 34562    925        +1  CLA   FX+5,1                   NO. TIME STEPS
25762  0 73400 5 00000    926        +2  PAX   ,5
25763  0 50000 0 32630    927        +3  CLA   P+10
25764  0 60100 0 33736    928        +4  STO   TP+1                     TIME
25765  0 77400 3 00000    929   AZJ7     AXT   0,3
25766  0 75400 1 00000    930        +1  PXA   ,1
25767  0 73400 2 00000    931        +2  PAX   ,2
2577C  0 50000 1 34556    932        +3  CLA   FX+1,1                   NO. Z STEPS
25771  0 73700 4 00000    933        +4  PAC   ,4
25772 -0 63400 4 26030    934        +5  SXD   AZJ4,4
25773 -0 63400 4 26044    935        +6  SXD   AZJ5,4
25774  0 50000 1 36064    936        +7  CLA   DELZ,1
25775  0 24100 0 40214    937        +8  FDP   FL2
25776  0 13100 0 00000    938        +9  XCA
25777  0 60100 0 32616    939   AZJ3     STO   P                        Z
26000  0 07400 4 25445    940        +1  TSX   AZG,4                    M,N FOR THIS NODE
26001  0 02000 0 26065    941        +2  TRA   AZJ2                     N TOO SMALL, HALVE DELT
26002  0 50000 2 35640    942        +3  CLA   AZ01+2,2
26003  0 30000 2 35636    943        +4  FAD   AZ01,2
26004  0 30200 2 35637    944        +5  FSB   AZ01+1,2
26005  0 30200 2 35637    945        +6  FSB   AZ01+1,2
26006  0 13100 0 00000    946        +7  XCA
26007  0 26000 0 32625    947        +8  FMP   P+7                      S/2
26010  0 60100 0 12512    948        +9  STO   COMMON
26011  0 56000 2 35637    949       +10  LDQ   AZ01+1,2
26012  0 26000 0 33744    950       +11  FMP   TP+7
26013  0 60100 0 12513    951       +12  STO   COMMON+1
26014  0 56000 2 34163    952       +13  LDQ   AZ03,2                   T M,N
26015  0 26000 0 33747    953       +14  FMP   TP+10
26016  0 30000 0 12512    954       +15  FAD   COMMON
26017  0 30000 0 12513    955       +16  FAD   COMMON+1
2602C  0 30000 0 32626    956       +17  FAD   P+8                      U
26021  0 56000 0 36105    957       +18  LDQ   DTMAX
26022  0 04000 0 26100    958       +19  TLQ   AZJ12
26023  0 60100 3 26106    959   AZJ13    STO   AZJ1,3
[redacted]
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26025  0 30000 1 36064    961        +2  FAD   DELZ,1
26026  1 77777 2 26027    962        +3  TXI   **1,2,-1
26027  1 77777 3 26030    963        +4  TXI   **1,3,-1
2603C  3 00000 3 25777    964   AZJ4     TXH   AZJ3,3,**0
26031  0 77400 3 00000    965        +1  AXT   0,3
26032  0 75400 1 00000    966        +2  PXA   ,1
26033  0 73400 2 00000    967        +3  PAX   ,2
26034  0 50000 0 26106    968        +4  CLA   AZJ1
26035  0 36100 0 40301    969        +5  ACL   188
26036  0 30200 0 26107    970        +6  FSB   AZJ1+1
26037  0 60100 2 35636    971        +7  STO   AZ01,2                   LOWER EXTREME THETA = NEXT NODE
26040  0 50000 3 26106    972   AZJ6     CLA   AZJ1,3
26041  0 60100 2 35637    973        +1  STO   AZ01+1,2
26042  1 77777 2 26043    974        +2  TXI   **1,2,-1
26043  1 77777 3 26044    975        +3  TXI   **1,3,-1
26044  3 00000 3 26040    976   AZJ5     TXH   AZJ6,3,**0
26045  0 50000 2 35636    977        +1  CLA   AZ01,2
26046  0 30000 2 35636    978        +2  FAD   AZ01,2
26047  0 30200 2 35635    979        +3  FSB   AZ01-1,2
26050  0 60100 2 35637    980        +4  STO   AZ01+1,2                 UPPER EXTREME THETA BY LINEAR EXTRAP
26051  0 50000 0 33736    981        +5  CLA   TP+1
26052  0 30000 1 35625    982        +6  FAD   PT+11,1
26053  0 60100 0 33736    983        +7  STO   TP+1
26054  2 00001 5 25765    984        +8  TIX   AZJ7,5,1
26055  1 76003 1 26056    985        +9  TXI   **+1,1,-AZMTS
26056  3 00000 1 25760    986   AZJ9     TXH   AZJ8,1,**0
26057  0 77400 4 00000    987   AZJR     AXT   **0,4
26060  0 77400 1 00000    988        +1  AXT   **0,1
26061  0 77400 2 00000    989        +2  AXT   **0,2
26062  0 77400 3 00000    990        +3  AXT   **0,3
26063  0 77400 5 00000    991        +4  AXT   **0,5
26064  0 02000 4 00001    992        +5  TRA   1,4
26065  0 50000 1 35625    993   AZJ2     CLA   PT+11,1                  DELT
26066  0 24100 0 40214    994        +1  FDP   FL2
26067 -0 60000 1 35625    995        +2  STO   PT+11,1
2607C  0 50000 0 36102    996        +3  CLA   DMDT
26071  0 04000 0 26102    997        +4  TLQ   AZJ10                    DELT T TOO SMALL
26072  0 75400 5 00000    998        +5  PXA   ,5
26073  0 56000 1 34562    999        +6  LDQ   FX+5,1
26074  0 76300 0 00001   1000        +7  LLS   1
26075  0 73400 5 00000   1001        +8  PAX   ,5
26076 -0 60000 1 34562   1002        +9  STO   FX+5,1
26077  C 02000 0 25765   1003       +10  TRA   AZJ7
26100 -0 62500 1 34561   1004   AZJ12    STL   FX+4,1
26101  0 02000 0 26023   1005        +1  TRA   AZJ13
26102 -1 26103 0 25417   1006   AZJ10    STR   AZFF,,AZJ11
26103  2 42543 6 32160   1007   AZJ11    BCI   3,DELTA T TOO SMALL
              26106   1008   AZJ1     BSS   NZMAX,F


                          1010*REGION TO MOVE METAL TEMPS FROM TEMPORARY TO PERMENANT STORAGE
26170  0 63400 4 26220   1011   AZK      SXA   AZKR,4
26171  0 63400 2 26221   1012        +1  SXA   AZKR+1,2
26172  0 77400 4 62717   1013        +2  AXT   AZMTR-AZMT,4              REFERENCE TO PART STORAGE
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26173  0 63400 4 26215   1014    AZK3     SXA    AZK1,4
26174  0 50000 4 34556   1015       +1    CLA    FX+1,4                 NO. DELZ POINTS
26175  0 73400 2 00000   1016       +2    PAX    ,2
26176  1 00001 2 26177   1017       +3    TXI    **1,2,1
26177  0 50000 4 35621   1018       +4    CLA    PT+7,4
26200  0 60100 4 35620   1019       +5    STO    PT+6,4
26201  0 50000 4 35623   1020       +6    CLA    PT+9,4
26202  0 60100 4 35622   1021       +7    STO    PT+8,4
26203  0 50200 4 35630   1022       +8    CLS    PT+14,4
26204  0 60100 4 35626   1023       +9    STO    PT+12,4
26205  0 50200 4 35631   1024      +10    CLS    PT+15,4
26206  0 60100 4 35627   1025      +11    STO    PT+13,4
26207  0 50000 4 34101   1026    AZK2     CLA    AZ02,4                 TEMPORARY
26210  0 60100 4 36002   1027       +1    STO    AZ08,4                 PERMENANT
26211  0 50000 4 34411   1028       +2    CLA    AZ07,4
26212  0 60100 4 35720   1029       +3    STO    AZ06,4
26213  1 77777 4 26214   1030       +4    TXI    **1,4,-1
26214  2 00001 2 26207   1031       +5    TIX    AZK2,2,1
26215  0 77400 4 00000   1032    AZK1     AXT    **0,4
26216  1 76003 4 26217   1033       +1    TXI    **1,4,-AZMTS
26217  3 00000 4 26173   1034    AZK4     TXH    AZK3,4,**0             PRESET TO MAX STOR+1+AZMTB-AZMT
26220  0 77400 4 00000   1035    AZKR     AXT    **0,4
26221  0 77400 2 00000   1036       +1    AXT    **0,2
26222  0 02000 4 00001   1037       +2    TRA    1,4

                         1039*REGION TO COMPUTE HEAT TRANSFER COEFFICIENT,L
26223  0 63400 4 26245   1040    AZL      SXA    AZLR,4
26224  0 50000 0 33731   1041       +1    CLA    WPR+7                  C P
26225  0 24100 0 33732   1042       +2    FDP    WPR+8                  K
26226  0 26000 0 33733   1043       +3    FMP    WPR+9
26227  0 56000 0 40226   1044       +4    LDQ    FL.4
26230  0 07400 4 27021   1045       +5    TSX    AZE,4
26231  0 60100 0 12524   1046       +6    STO    COMMON+10
26232  0 50000 0 40216   1047       +7    CLA    FL4
26233  0 24100 0 40275   1048       +8    FDP    PI
26234  0 13100 0 00000   1049       +9    XCA
26235  0 24100 0 33733   1050      +10    FDP    WPR+9
26236  0 13100 0 00000   1051      +11    XCA
26237  0 56000 0 40256   1052      +12    LDQ    FL.8
26240  0 07400 4 27021   1053      +13    TSX    AZE,4
26241  0 13100 0 00000   1054      +14    XCA
26242  0 26000 0 33732   1055      +15    FMP    WPR+8                  K
26243  0 13100 0 00000   1056      +16    XCA
26244  0 26000 0 12524   1057      +17    FMP    COMMON+10
26245  0 77400 4 00000   1058    AZLR     AXT    **0,4
26246  0 02000 4 00001   1059       +1    TRA    1,4

                         1061*NOZZLE TUBE ROUTINES
                         1062*NOZZLE TUBE INITIALIZATION REGION
26247  0 63400 4 26264   1063    AZNI     SXA    AZNIR,4
26250  0 50000 0 32633   1064       +1    CLA    P+13                   T6
[illegible]              1065       +2    [illegible]

26252  0 07400 4 42602   1066       +3    TSX    ERROR,4                BAD THETA 0
26253  0 60100 0 32634   1067       +4    STO    P+14
26254  0 50000 0 36111   1068       +5    CLA    DPO
26255 -0 10000 0 26261   1069       +6    TNZ    AZNI1
26256  0 50000 0 36077   1070       +7    CLA    DTMI
26257  0 07400 4 42437   1071       +8    TSX    LINT,4
26260  0 00000 0 33441   1072       +9    PZE    WPO
26261  0 60100 0 32656   1073    AZNI1    STO    P+32
26262  0 50000 0 36126   1074       +1    CLA    DQINT
26263  0 60100 0 32641   1075       +2    STO    QIINT
26264  0 77400 4 00000   1076    AZNIR    AXT    **0,4
26265  0 02000 4 00001   1077       +1    TRA    1,4
                         1079*REGION TO COMPUTE CRITICAL FLOW IN NOZZLE TUBES
26266  0 63400 4 26321   1080    AZNW     SXA    AZNWR,4
26267  0 50000 0 44463   1081       +1    CLA    AZN2
26270  0 30200 0 44233   1082       +2    FSB    AZN3                   Z
26271  0 60100 0 33743   1083       +3    STO    TP+6
26272  0 50000 0 44442   1084       +4    CLA    PSUBC                  P1
26273  0 30200 0 44443   1085       +5    FSB    PSUBC+1                P2
26274  0 24100 0 44461   1086       +6    FDP    DELTAZ
26275  0 26000 0 33743   1087       +7    FMP    TP+6                   Z-Z1
26276  0 30000 0 44442   1088       +8    FAD    PSUBC                  P1
26277  0 60100 0 33752   1089       +9    STO    TP+13
26300  0 50000 0 44444   1090      +10    CLA    TSUBC                  T1
26301  0 30200 0 44445   1091      +11    FSB    TSUBC+1                T2
26302  0 24100 0 44461   1092      +12    FDP    DELTAZ
26303  0 26000 0 33743   1093      +13    FMP    TP+6
26304  0 30000 0 44444   1094      +14    FAD    TSUBC                  T1
26305  0 56000 0 26323   1095      +15    LDQ    AZNW1                  H2 CRITICAL TEMP
26306  0 60000 0 32737   1096      +16    STZ    X+17
26307  0 04000 0 26311   1097      +17    TLQ    AZNW2                  H2 GAS
26310 -0 62500 0 32737   1098      +18    STL    X+17                   FLAG TO IGNORE NOZZLE TUBE CHOKE
26311  0 07400 4 24364   1099    AZNW2    TSX    SQRT,4
26312  0 07400 4 42602   1100       +1    TSX    ERROR,4
26313  0 60100 0 33756   1101       +2    STO    TP+17
26314  0 56000 0 44234   1102       +3    LDQ    AZN3+1                 AREA OF NOZZLE TUBE THROAT
26315  0 26000 0 33752   1103       +4    FMP    TP+13
26316  0 24100 0 33756   1104       +5    FDP    TP+17
26317  0 26000 0 40241   1105       +6    FMP    FL139                  .1396
26320  0 60100 0 32651   1106       +7    STO    P+27
26321  0 77400 4 00000   1107    AZNWR    AXT    **0,4
26322  0 02000 4 00001   1108       +1    TRA    1,4
26323  2 06740 0 00000   1109    AZNW1    DEC       60.

                         1111*PRINT REGIONS
                         1112*REGION TO PRINT INLET CONDITIONS
26324  0 52000 0 32727   1113    AZPC     ZET    X+9
26325  0 02000 4 00001   1114       +1    TRA    1,4
26326  0 63400 4 26365   1115       +2    SXA    AZPCR,4
26327  0 07412 4 32541   1116       +3    TSX    PL,4,10
26330  0 07400 4 00052   1117       +4    TSX    DOUT,4
26331  3 02033 0 26372   1118       +5    PTH    AZPC3,,1051
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26332  0 11616 0 00000   1119          +6  PZE   0,,5006
26333 -1 47064 0 00012   1120          +7  FVE   KPRINT,,20020
26334  0 07400 4 00052   1121          +8  TSX   DOUT,4
26335  3 05772 0 26357   1122          +9  PTH   AZPC1,,3066
26336  3 02066 0 26455   1123         +10  PTH   AZPS1+2,,1078
26337 -2 13672 0 3263C   1124         +11  SIX   P+10,,6074
26340 -1 00024 0 00012   1125         +12  FVE   10,,20
26341  0 07400 4 00052   1126         +13  TSX   DOUT,4
26342  3 01765 0 26362   1127         +14  PTH   AZPC2,,1013
26343  0 15545 0 00001   1128         +15  PZE   1,,7013
26344 -1 00012 0 00012   1129         +16  FVE   10,,10
26345  0 07400 4 00052   1130         +17  TSX   DOUT,4
26346 -2 13576 0 32652   1131         +18  SIX   P+28,,6014
26347  0 05705 0 00001   1132         +19  PZE   1,,3013
26350 -2 13662 0 32665   1133         +20  SIX   P+39,,6066
26351 -2 13677 0 32657   1134         +21  SIX   P+33,,6079
26352 -2 13714 0 32676   1135         +22  SIX   P+48,,6092
26353 -2 13731 0 32637   1136         +23  SIX   P+17,,6105
26354 -1 47052 0 00012   1137         +24  FVE   KPRINT,,20010
26355  0 77400 4 00000   1138   AZPCR      AXT   **0,4
26356  0 02000 4 00001   1139          +1  TRA   1,4
26357  3 14543 2 56360   1140   AZPC1      BCI   3,INLET CONDITIONS
26362 -2 04760 0 16060   1141   AZPC2      BCI   8, P 1   T 1   P 2   T 2    N    G P  DEL H DEL T
26372 -1 45454 5 45454   1142   AZPC3      BCI   1,******

                         1144*REGICN TO PRINT INLET AND OUTLET PRESSURE DROPS
26373  0 63400 4 26424   1145   AZPD       SXA   AZPDR,4
26374  0 44100 4 00000   1146          +1  LDI   0,4
26375 -0 05700 7 77774   1147          +2  RIL   777774
26376  0 60400 0 00061   1148          +3  STI   KINDX4
26377  0 07400 4 00052   1149          +4  TSX   DOUT,4
26400  3 01772 1 34555   1150          +5  PTH   FX,1,1018                PART NAME
26401  3 02001 4 26430   1151          +6  PTH   AZPD1+2,4,1025           IN OR OUT
26402  3 05744 C 26430   1152          +7  PTH   AZPD2,,3044
26403  3 05773 0 26435   1153          +8  PTH   AZPD4,,3067
26404  3 02071 0 26435   1154          +9  PTH   AZPD4,,1081
26405  3 04056 C 26456   1155         +10  PTH   AZPS3,,2094
26406  3 04104 0 26444   1156         +11  PTH   AZPD7,,2116
26407  3 02154 0 26446   1157         +12  PTH   AZPD7+2,,1132
26410  1 13674 4 26442   1158         +13  PON   AZPD5+2,4,6076
26411  1 13642 4 26435   1159         +14  PON   AZPD3+2,4,6050           DROP
26412  1 13727 4 26451   1160         +15  PON   AZPD8+2,4,6103           FLOW
26413  1 13755 4 26453   1161         +16  PON   AZPD9+2,4,6125           RHO
26414  1 00000 4 26444   1162         +17  PON   AZPD6+2,4                FVE
26415  0 07401 4 32541   1163         +18  TSX   PL,4,1
26416  0 44100 0 00061   1164         +19  LDI   KINDX4
26417 -0 05400 0 00001   1165         +20  LFT   1
26420  0 02C00 0 26424   1166         +21  TRA   AZPDR
26421  0 07402 4 32541   1167         +22  TSX   PL,4,2
26422  0 07400 4 32563   1168         +23  TSX   PC,4
26423 -1 00C12 0 00012   1169         +24  FVE   KPRINT,,10
26424  0 77400 4 00000   1170   AZPDR      AXT   **0,4
26425  0 02000 4 00001   1171          +1  TRA   1,4
26[illegible] -2 [illegible]5 [illegible]563   1172   AZ[illegible]   B[illegible]   2,[illegible]NLE[illegible]LET
```



```
26430 -0 75125 6 26264   1173   AZPD2      BCI   3,PRESSURE DROP=
26433 -2 00000 1 35616   1174   AZPD3      SIX   PT+4,1
26434 -2 00000 1 35617   1175          +1  SIX   PT+5,1
26435 -2 06047 6 23121   1176   AZPD4      BCI   3,  PSIA, PRESSURE=
26440 -2 00000 1 35612   1177   AZPD5      SIX   PT,1
26441 -2 00000 1 35613   1178          +1  SIX   PT+1,1
26442 -1 00024 0 00012   1179   AZPD6      FVE   10,,20
26443 -1 00012 0 00012   1180          +1  FVE   10,,10
26444 -0 32261 6 22523   1181   AZPD7      BCI   3,LB/SEC RHO= LB/IN3
26447 -2 00000 1 35624   1182   AZPD8      SIX   PT+10,1                  FLOW
26450 -2 00000 1 35614   1183          +1  SIX   PT+2,1
26451 -2 00000 1 35621   1184   AZPD9      SIX   PT+7,1                   RHO
26452 -2 00000 1 35623   1185          +1  SIX   PT+9,1
26453 -2 33144 2 51360   1186   AZPS1      BCI   3,TIME=          SEC
26456  2 64346 6 66051   1187   AZPS3      BCI   2,FLOW RATE =
26460  2 33046 4 22560   1188   AZP3       BCI   2,CHOKE FLOW=

                         1190*ITERATION PRINT REGION
26462  0 52000 0 32727   1191   AZPI       ZET   X+9
26463  0 02000 4 00001   1192          +1  TRA   1,4
26464  0 63400 1 26573   1193          +2  SXA   AZPIR,1
26465  0 63400 2 26574   1194          +3  SXA   AZPIR+1,2
26466  0 63400 4 26575   1195          +4  SXA   AZPIR+2,4
26467  0 52000 0 36123   1196          +5  ZET   DNZFF
26470  0 07400 4 26625   1197          +6  TSX   AZPN,4
26471  0 77400 1 62717   1198          +7  AXT   AZMTB-AZMT,1
26472  0 63400 1 26534   1199   AZPI3      SXA   AZPI1,1
26473  0 07402 4 26373   1200          +1  TSX   AZPD,4,2
26474  0 50000 1 34556   1201          +2  CLA   FX+1,1                   NO. Z POINTS THIS PART
26475  0 73400 2 00000   1202          +3  PAX   ,2
26476  0 50000 1 36064   1203          +4  CLA   DELZ,1
26477  0 60100 0 26610   1204          +5  STO   AZPI6
26500  0 24100 0 40214   1205          +6  FDP   FL2
26501 -0 60000 0 32616   1206          +7  STQ   P
26502  0 50000 1 35637   1207   AZPI2      CLA   AZ01+1,1                 METAL TEMP
26503  0 60100 0 32617   1208          +1  STO   P+1
26504  0 50000 1 34163   1209          +2  CLA   AZ03,1                   METAL TEMP
26505  0 30000 1 34164   1210          +3  FAD   AZ03+1,1
26506  0 24100 0 40214   1211          +4  FDP   FL2
26507 -0 60000 0 32620   1212          +5  STQ   P+2
2651C  0 50000 1 34245   1213          +6  CLA   AZ04,1                   PRESSURE
26511  0 30000 1 34246   1214          +7  FAD   AZ04+1,1
26512  0 24100 0 40214   1215          +8  FDP   FL2
26513 -0 60000 0 32621   1216          +9  STQ   P+3
26514  0 50000 1 34327   1217         +10  CLA   AZ05,1
26515  C 60100 0 32622   1218         +11  STO   P+4                      HF
26516  0 50C00 1 34411   1219         +12  CLA   AZ07,1
26517  0 60100 0 32623   1220         +13  STO   P+5                      RHO
26520  0 50000 1 34101   1221         +14  CLA   AZ02,1
26521  C 30000 1 34102   1222         +15  FAD   AZ02+1,1
26522  0 24100 0 40214   1223         +16  FDP   FL2
26523 -0 60000 0 32631   1224         +17  STQ   P+11                     FLOW RATE
26524  0 07400 4 32442   1225         +18  TSX   PRINT,4
26525  C 52000 0 32725   1226         +19  ZET   X+7
```

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26526  1 77777 2 26577   1227        +20  TXI   AZPI8,2,-1
26527  0 50000 0 32616   1228        +21  CLA   P
26530  0 30000 0 26610   1229        +22  FAD   AZPI6                    DEL Z
26531  0 60100 0 32616   1230        +23  STO   P
26532  1 77777 1 26533   1231        +24  TXI   **1,1,-1
26533  2 00001 2 26502   1232        +25  TIX   AZPI2,2,1
26534  0 77400 1 00000   1233    AZPI1   AXT   **0,1
26535  0 07401 4 26373   1234         +1  TSX   AZPD,4,1                  OUTLET PRES DROP
26536  0 52000 1 34560   1235         +2  ZET   FX+3,1
26537 -1 26611 0 25421   1236         +3  STR   AZF,,AZPI7
26540  0 52000 1 34561   1237         +4  ZET   FX+4,1
26541 -1 26614 0 25421   1238         +5  STR   AZF,,AZPI9
26542  1 76003 1 26543   1239         +6  TXI   **+1,1,-AZMTS
26543  3 00000 1 26472   1240    AZPI4   TXH   AZPI3,1,**0                PRESET TO MAX STOR+1+D-AZMT
26544  0 50000 0 32631   1241         +1  CLA   P+11                      WDOTR
26545  0 30200 0 32644   1242         +2  FSB   P+22                      WDOTC
26546  0 30200 0 32645   1243         +3  FSB   P+23                      WDOTH
26547  0 60100 0 32646   1244         +4  STO   P+24                      WDOTN
2655C  0 30200 0 34007   1245         +5  FSB   TP+42                     WDOTNCHOKE
2655i  0 24100 0 34007   1246         +6  FDP   TP+42
26552 -0 60000 0 34024   1247         +7  STO   TP+55                     ERROR
26553  0 07400 4 00052   1248         +8  TSX   DOUT,4
26554  3 01772 0 26647   1249         +9  PTH   AZPN1,,1018
26555  3 02001 0 26461   1250        +10  PTH   AZP3+1,,1025
26556  3 02022 0 26647   1251        +11  PTH   AZPN1,,1042
 4557  3 04007 C 26460   1252        +12  PTH   AZP3,,2055
  60   3 06017 0 26605   1253        +13  PTH   AZPI5,,3087
  51   3 06055 0 26453   1256        +14  PTH   AZPS1,,3117
 .562 -2 13622 0 32646   1255        +15  SIX   P+24,,6034                 FLOW
.6563 -2 13660 C 34007   1256        +16  SIX   TP+42,,6064               CHOKE FLOW
26564 -0 00104 0 32732   1257        +17  FOR   X+12,,68
26565 -3 13721 0 34024   1258        +18  SVN   TP+55,,6097               ERROR
26566 -3 06051 0 32630   1259        +19  SVN   P+10,,3113
26567 -1 23444 0 00012   1260        +20  FVE   10,,10020
26570  0 07403 4 32541   1261        +21  TSX   PL,4,3
26571  0 52000 0 32722   1262        +22  ZET   X+4
26572 -1 25350 0 25421   1263        +23  STR   AZF,,AZ810                P6 TOO LOW
26573  0 77400 1 00000   1264    AZPIR   AXT   **0,1
26574  0 77400 2 00000   1265         +1  AXT   **0,2
26575  0 77400 4 00000   1266         +2  AXT   **0,4
26576  0 02000 4 00001   1267         +3  TRA   1,4
                         1268*PRINT ONLY INLET AND OUTLET
26577 -3 00000 2 26534   1269    AZPI8   TXL   AZPI1,2,0
2660C  0 50000 1 35615   1270         +1  CLA   PT+3,1                   M MAX
26601  0 60100 0 32616   1271         +2  STO   P
26602 -0 63600 2 26604   1272         +3  SCD   **+2,2
26603  0 77400 2 00001   1273         +4  AXT   1,2
26604  1 00000 1 26502   1274         +5  TXI   AZPI2,1,**0
26605  3 16325 5 12163   1275    AZPI5   BCI   2,ITERATIONS
26607  2 55151 4 65113   1276         +2  BCI   1,ERROR=
                  26610   1277    AZPI6   BSS   1,F
26611 -0 46063 4 64660   1278    AZPI7   BCI   3,M TOO SMALL
26614 -2 32544 4 76025   1279    AZPI9   BCI   3,TEMP EXCEEDED MAX
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                         1281*ENTRY TO BUMP PRINT COUNTER
26617  0 50000 0 32727   1282    AZPI8   CLA   X+9
2662C -0 10000 0 26622   1283         +1  TNZ   **+2
26621  0 50000 0 32726   1284         +2  CLA   X+8
26622  0 40200 0 40200   1285         +3  SUB   FX1
26623  0 60100 0 32727   1286         +4  STO   X+9
26624  0 02C00 4 00001   1287         +5  TRA   1,4

                         1289*NOZZLE TUBE PRINT
26625  0 63400 4 26645   1290    AZPN    SXA   AZPNR,4
26626  0 07402 4 32541   1291         +1  TSX   PL,4,2
26627  0 07400 4 00052   1292         +2  TSX   DOUT,4
26630  3 23530 0 26647   1293         +3  PTH   AZPN1,,10072
26631  3 02101 0 26461   1294         +4  PTH   AZP3+1,,1089
26632  3 04100 0 26460   1295         +5  PTH   AZP3,,2112
26633 -2 13636 0 32703   1296         +6  SIX   P+53,,6046
26634 -2 13660 0 32702   1297         +7  SIX   P+52,,6064
26635 -2 13701 0 32630   1298         +8  SIX   P+10,,6081
26636 -2 13751 C 32651   1299         +9  SIX   P+27,,6121                CHOKE FLOW
26637 -2 13722 0 34063   1300        +10  SIX   TP+86,,6098
26640 -1 00024 0 00012   1301        +11  FVE   10,,20
26641  0 52000 0 32724   1302        +12  ZET   X+6
26642 -1 43573 0 25421   1303        +13  STR   AZF,,BUG1                 NOZZLE TUBE ERROR
26643  0 52000 0 32737   1304        +14  ZET   X+17
26644 -1 26661 0 25421   1305        +15  STR   AZF,,AZPN2
26645  0 77400 4 00000   1306    AZPNR   AXT   **0,4
26646  0 02000 4 00001   1307         +1  TRA   1,4
26647 -0 54671 7 14325   1308    AZPN1   BCI    ,NOZZLE TUBE INPUT  TEMP=          PRESS=          TIME=
26661 -0 33150 6 03145   1309    AZPN2   BCI   3,LIQ IN TUBE THROAT

                         1311*REGION TO PRINT PREDICTED AND CORRECTED VALUES, 0= PRED, 1= CORR
26664  0 52000 0 32727   1312    AZPP    ZET   X+9
26665  0 02000 4 00001   1313         +1  TRA   1,4
26666  0 63400 4 26740   1314         +2  SXA   AZPPR,4
26667  0 63400 1 26741   1315         +3  SXA   AZPPR+1,1
2667C  0 44100 4 00000   1316         +4  LDI   0,4
26671 -0 05700 7 77776   1317         +5  RIL   777776
26672 -0 04600 0 00000   1318         +6  PIA
26673 -0 73700 1 00000   1319         +7  PDC   ,1                        PRED OR CORR
26674  0 07406 4 32541   1320         +8  TSX   PL,4,6
26675  0 50260 1 26767   1321         +9  CLS*  AZPP6+2,1                  WC
26676  0 30260 1 26771   1322        +10  FSB*  AZPP6+4,1                  WH
26677  0 60260 1 26775   1323        +11  SLW*  AZPP6+8,1                  WT
267CC  C 30000 0 32631   1324        +12  FAD   P+11                       WDOTR
267C1  0 60160 1 26773   1325        +13  STO*  AZPP6+6,1                  WN
26702  C 07400 4 00052   1326        +14  TSX   DOUT,4
26703  3 02044 1 26743   1327        +15  PTH   AZPP1,1,1060
26704  3 04030 0 26745   1328        +16  PTH   AZPP2,,2072
26705 -1 00024 0 00012   1329        +17  FVE   10,,20
26706  0 07400 4 00052   1330        +18  TSX   DOUT,4
26707  3 01765 C 26747   1331        +19  PTH   AZPP4,,1013
```

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26713  1 13576 1 26765   1335        +23  PON    AZPP6,1,6014
26714  1 13613 1 26767   1336        +24  PON    AZPP6+2,1,6027
26715  1 13630 1 26771   1337        +25  PON    AZPP6+4,1,6040
26716  1 13645 1 26773   1338        +26  PON    AZPP6+6,1,6053
26717  1 13662 1 26775   1339        +27  PON    AZPP6+8,1,6066
26720  1 13677 1 26777   1340        +28  PON    AZPP6+10,1,6079
26721  1 13714 1 27001   1341        +29  PON    AZPP6+12,1,6092
26722  1 13731 1 27003   1342        +30  PON    AZPP6+14,1,6105
26723  1 13746 1 27005   1343        +31  PON    AZPP6+16,1,6118
26724  1 13763 1 27007   1344        +32  PON    AZPP6+18,1,6131
26725 -1 00012 0 00012   1345        +33  PVE    10,,10
26726  0 07400 4 00052   1346        +34  TSX    DOUT,4
26727  3 01765 0 26761   1347        +35  PTM    AZPP5,,1013
26730  0 05705 0 00001   1348        +36  PZE    1,,3013
26731 -1 00012 0 00012   1349        +37  PVE    10,,10
26732  0 07400 4 00052   1350        +38  TSX    DOUT,4
26733  1 13576 1 27011   1351        +39  PON    AZPP7,1,6014
26734  1 13613 1 27013   1352        +40  PON    AZPP7+2,1,6027
26735  1 13630 1 27015   1353        +41  PON    AZPP7+4,1,6040
26736  1 13645 1 27017   1354        +42  PON    AZPP7+6,1,6053
26737 -1 00012 0 00012   1355        +43  PVE    10,,10
26740  0 77400 4 00000   1356    AZPPR   AXT    **0,4
26741  0 77400 1 00000   1357        +1  AXT    **0,1
26742  0 02000 4 00001   1358        +2  TRA    1,4
26743 -0 75125 2 43123   1359    AZPP1   BCI    2,PREDICCORREC
26745 -0 32524 6 06521   1360    AZPP2   BCI    2,TED VALUES
26747 -2 06660 4 76060   1361    AZPP4   BCI     , W P   W C   W H   W N   W T   P 6   P 8   T 8   P 11  T 11
26761 -2 04760 0 10260   1362    AZPP5   BCI    4, P 12  Q P  WP ACTWT ACT
26765 -2 00000 0 32677   1363    AZPP6   SIX    P+49                  WP
26766 -2 00000 0 32643   1364        +1  SIX    P+21
26767 -2 00000 0 34046   1365        +2  SIX    TP+73                 WC
26770 -2 00000 0 32644   1366        +3  SIX    P+22
26771 -2 00000 0 34045   1367        +4  SIX    TP+72                 WH
26772 -2 00000 0 32645   1368        +5  SIX    P+23
26773 -2 00000 0 12513   1369        +6  SIX    COMMON+1              WN
26774 -2 00000 0 32646   1370        +7  SIX    P+24
26775 -2 00000 0 12512   1371        +8  SIX    COMMON                WT
26776 -2 00000 0 32647   1372        +9  SIX    P+25
26777 -2 00000 0 34042   1373       +10  SIX    TP+69                 P6
27000 -2 00000 0 32656   1374       +11  SIX    P+32
27001 -2 00000 0 34043   1375       +12  SIX    TP+70                 P8
27002 -2 00000 0 32660   1376       +13  SIX    P+34
27003 -2 00000 0 34052   1377       +14  SIX    TP+77                 T8
27004 -2 00000 0 32661   1378       +15  SIX    P+35
27005 -2 00000 0 32662   1379       +16  SIX    P+36                  P11
27006 -2 00000 0 32662   1380       +17  SIX    P+36
27007 -2 00000 0 34053   1381       +18  SIX    TP+78
27010 -2 00000 0 32663   1382       +19  SIX    P+37
27011 -2 00000 0 32664   1383    AZPP7   SIX    P+38                  P12
27012 -2 00000 0 32664   1384        +1  SIX    P+38
27013 -2 00000 0 32700   1385        +2  SIX    P+50
27014 -2 00000 0 34061   1386        +3  SIX    TP+84
27015 -2 00000 0 32670   1387        +4  SIX    P+42                  WPACT
27[illegible]-2 [illegible]00 [illegible]667[illegible]38[illegible]
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27017 -2 00000 0 32672   1389        +6  SIX    P+44                  WTACT
27020 -2 00000 0 32671   1390        +7  SIX    P+43


                         1392*POWER ROUTINE  X IN AC, B IN MQ - EXIT WITH X**B IN AC
27021  0 63400 4 27031   1393    AZE     SXA    AZER,4
27022 -0 60000 0 27033   1394        +1  STQ    AZE1
27023  0 07400 4 24307   1395        +2  TSX    LN,4
27024  0 07400 4 42602   1396        +3  TSX    ERROR,4
27025  0 13100 0 00000   1397        +4  XCA
27026  0 26000 0 27033   1398        +5  FMP    AZE1
27027  0 07400 4 24240   1399        +6  TSX    EXP,4
27030  0 07400 4 42602   1400        +7  TSX    ERROR,4
27031  0 77400 4 00000   1401    AZER    AXT    **0,4
27032  0 02000 4 00001   1402        +1  TRA    1,4
                27033     1403    AZE1    BSS    1,F


                         1405*REGION TO COMPUTE P8, STATIC PRESSURE AT HOT BLEED PORT OUTLET
27034  0 63400 4 27073   1406    AZQ     SXA    AZQR,4
27035  0 50000 0 32763   1407        +1  CLA    C+12
27036  0 24160 4 00001   1408        +2  FDP*   1,4                   R
27037  0 26000 0 47647   1409        +3  FMP    PR+86                 V8
27040  0 24100 0 47355   1410        +4  FDP    PR+28                 T8
27041  0 26000 0 47647   1411        +5  FMP    PR+86                 V8
27042  0 30000 0 32761   1412        +6  FAD    C+10
27043  0 60100 0 12512   1413        +7  STO    COMMON                DENOM
27044  0 56000 0 47333   1414        +8  LDQ    PR+10                 PHM
27045  0 26000 0 32761   1415        +9  FMP    C+10
27046  0 60100 0 12513   1416       +10  STO    COMMON+1
27047  0 50000 0 47333   1417       +11  CLA    PR+10                 PHM
27050  0 30200 0 47332   1418       +12  FSB    PR+9
27051  0 13100 0 00000   1419       +13  XCA
27052  0 26000 0 32762   1420       +14  FMP    C+11
27053  0 60100 0 12514   1421       +15  STO    COMMON+2
27054  0 56000 0 47645   1422       +16  LDQ    PR+84                 VCM
27055  0 26000 0 32765   1423       +17  FMP    C+14
27056  0 30200 0 47647   1424       +18  FSB    PR+86                 V8
27057  0 13100 0 00000   1425       +19  XCA
27060  0 26000 0 47403   1426       +20  FMP    PR+50
27061  0 60100 0 12515   1427       +21  STO    COMMON+3
27062  0 50000 0 47646   1428       +22  CLA    PR+85                 VHM
27063  0 30200 0 47647   1429       +23  FSB    PR+86                 V8
27064  0 13100 0 00000   1430       +24  XCA
27065  0 26000 0 47404   1431       +25  FMP    PR+51                 WDOTH
27066  0 30000 0 12515   1432       +26  FAD    COMMON+3
27067  0 30000 0 12514   1433       +27  FAD    COMMON+2
27070  0 30000 0 12513   1434       +28  FAD    COMMON+1
27071  0 24100 0 12512   1435       +29  FDP    COMMON
27072 -0 60000 0 47324   1436       +30  STQ    PR+3                  P8 -- STATIC PRESSURE
27073  0 77400 4 00000   1437    AZQR    AXT    **0,4
27074  0 02000 4 00002   1438        +1  TRA    2,4
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                                *REGION TO COMPUTE INLET AND OUTLET CAPACITANCE FLOW RATE CHANGE
27075  0 63400 4 27123    AZU     SXA   AZUR,4
27076  0 63400 2 27124      +1    SXA   AZUR+1,2
27077  0 56000 0 32621      +2    LDQ   P+3
27100  0 16200 0 27102      +3    TQP   *+2
27101  0 02000 4 00001      +4    TRA   1,4                      NEGATIVE PRESSURE
27102  0 44100 4 00000      +5    LDI   0,4
27103 -0 05700 7 77776      +6    RIL   777776
27104 -0 04600 0 00000      +7    PIA
27105 -0 73700 2 00000      +8    PDC   ,2
27106  0 50000 0 32620      +9    CLA   P+2                      T
27107  0 07400 4 25564      +10   TSX   AZH,4
27110  0 07400 4 42602      +11   TSX   ERROR,4
27111  0 50200 0 33730      +12   CLS   WPR+6                    NEW RHO        EQN HT13
27112  0 60260 2 27130      +13   SLW*  AZU1,2
27113  0 30060 2 27132      +14   FAD*  AZU2,2                   OLD RHO
27114  0 24100 0 32637      +15   FDP   P+17                     DELT
27115  0 26060 2 27134      +16   FMP*  AZU3,2                   PLENUM VOLUME
27116  0 30060 2 27136      +17   FAD*  AZU5,2                   OLD DELWDOT
27117  0 60160 2 27140      +18   STO*  AZU6,2                   -CURRENT DELWDOT
27120  0 30000 0 32631      +19   FAD   P+11
27121  0 60100 0 32631      +20   STO   P+11
27122 -0 12000 0 27126      +21   TMI   AZU4                     NEGATIVE FLOW RATE
27123  0 77400 4 00000    AZUR    AXT   **0,4
27124  0 77400 2 00000      +1    AXT   **0,2
27125  0 02000 4 00003      +2    TRA   3,4
27126  0 52200 0 27123    AZU4    XEC   AZUR
27127  1 00001 4 27124      +1    TXI   AZUR+1,4,1               ERROR RETURN
27130  0 00000 1 35621    AZU1    PZE   PT+7,1
27131  0 00000 1 35623      +1    PZE   PT+9,1
27132  0 00000 1 35620    AZU2    PZE   PT+6,1
27133  0 00000 1 35622      +1    PZE   PT+8,1
27134  0 00000 1 36074    AZU3    PZE   DVI,1
27135  0 00000 1 36075      +1    PZE   DVO,1
27136  0 00000 1 35626    AZU5    PZE   PT+12,1                  PAST TIME DELWDOT
27137  0 00000 1 35627      +1    PZE   PT+13,1
27140  0 00000 1 35630    AZU6    PZE   PT+14,1                  -CURRENT DELWDOT
27141  0 00000 1 35631      +1    PZE   PT+15,1

                                *REGION TO COMPUTE VAPOR PRESSURE VS TEMP
27142  0 63400 4 27152    AZV     SXA   AZVR,4
27143  0 77400 4 00005      +1    AXT   5,4
27144  0 75400 0 00000      +2    PXA   ,0
27145  0 30000 4 27161    AZV2    FAD   AZV1+5,4
27146 -2 00001 4 27152      +1    TNX   AZVR,4,1
27147  0 13100 0 00000      +2    XCA
27150  0 26000 0 33742      +3    FMP   TP+5
27151  0 02000 0 27145      +4    TRA   AZV2
27152  0 77400 4 00000    AZVR    AXT   **0,4
27153  0 02000 4 00001      +1    TRA   1,4
27154  1 62526 4 30773    AZV1    DEC      40835E-9,-.0037617,.238625,-7.92,96.38
```

```
                                *INPUT SUBROUTINES
                                *TEST NEXT CASE FOR STANDARD INPUT DESIRED
27161  0 63400 4 27177    AZX     SXA   AZXR,4
27162  0 63400 0 27304      +1    SXA   AZXB2,0                  INITIALIZE XR FOR NEW CASE
27163  0 07476 4 00102      +2    TSX   KTAKEB,4,62
27164 -1 00001 0 27215      +3    FVE   AZX1,,1
27165  0 12000 0 27170      +4    TPL   *+3
27166 -1 27217 0 25421    AZX6    STR   AZF,,AZX3
27167  0 07400 4 00076      +1    TSX   KFINIS,4
27170  0 16200 0 27201      +2    TQP   AZX4
27171 -0 50000 0 27215      +3    CAL   AZX1
27172  0 32200 0 27216      +4    ERA   AZX2
27173  0 60200 0 27215      +5    SLW   AZX1
27174 -0 10000 0 27177      +6    TNZ   AZXR                     N CARD SAYS IGNORE STD INPUT
27175  0 07476 4 00101      +7    TSX   KMOVEB,4,62              PASS N CARD
27176 -1 00016 0 00000      +8    FVE   0,,14
27177  0 77400 4 00000    AZXR    AXT   **0,4
27200  0 02000 4 00001      +1    TRA   1,4
27201 -1 27222 0 25421    AZX4    STR   AZF,,AZX5
27202  0 07400 4 00052      +1    TSX   DOUT,4
27203  3 21544 0 27225      +2    PTH   AZX7,,9060
27204 -1 00024 0 00000      +3    FVE   KONLIN,,20
27205  0 07400 4 00076      +4    TSX   KFINIS,4
27206  0 07400 4 00055    AZX8    TSX   KDEBUG,4
27207  0 16200 0 27201      +1    TQP   AZX4
27210 -1 27212 0 25421      +2    STR   AZF,,AZX9
27211  0 02000 0 24654      +3    TRA   AZH4
27212  3 14343 2 92721    AZX9    BCI   3,ILLEGAL CHARACTER
                 27215    AZX1    BSS   1,0                      NOT 0= STD CASE
27216 -0 56060 6 06060    AZX2    BCI   1,N
27217  2 54524 6 04626    AZX3    BCI   3,END OF INPUT
27222  2 22124 6 06321    AZX5    BCI   3,BAD TAPE- FLUSH
27225 -2 32147 2 56023    AZX7    BCI   9,TAPE CHECK ON KISNET INPUT TAPE, PLEASE SAVE TAPE

                                *READ IN ONE PART
27236  0 63400 4 27257    AZXA    SXA   AZXAR,4
27237 -0 52000 0 27215      +1    NZT   AZX1
27240  0 02000 0 27250      +2    TRA   AZXA1                    IGNORE STD CASE
27241 -0 62500 0 27322      +3    STL   AZXB1                    INPUT FROM CORE
27242  0 07400 4 41664      +4    TSX   AS58,4
27243  0 32577 0 36064      +5    PZE   D,,TCARD
27244  0 07400 4 00056      +6    TSX   KERROR,4
27245  0 07400 4 00056      +7    TSX   KERROR,4
27246 -0 52000 0 32612      +8    NZT   TCARD+11
27247  0 02000 0 27261      +9    TRA   AZXA2
27250  0 60000 0 27322    AZXA1   STZ   AZXB1                    INPUT FROM TAPE
27251  0 07400 4 41664      +1    TSX   AS58,4
27252  0 32577 C 36064      +2    PZE   D,,TCARD
27253  C 02000 0 27206      +3    TRA   AZX8
27254  0 02000 0 27166      +4    TRA   AZX6                     EOF
27255 -0 52000 C 36065      +5    NZT   DMMAX                    0= IGNORE THIS PART
27256  0 02000 0 27237      +6    TRA   AZXA+1
27257  0 77400 4 00000    AZXAR   AXT   **0,4
27260  0 02000 4 00001      +1
```

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27261   0 60000 0 27322   1546     AZXA2   STZ     AZXB1
27262   0 07400 4 41664   1547         +1  TSX     AS50,4                  READ TUBE INPUT, IF ANY
27263   0 32577 0 44107   1548         +2  PZE     LVSAC,,TCARD
27264   0 02000 0 27206   1549         +3  TRA     AZXB
27265   0 02000 0 27166   1550         +4  TRA     AZXA
27266  -0 50000 0 27277   1551         +5  CAL     AZXA4
27267   0 32000 0 32577   1552         +6  ANS     TCARD
27270  -0 52000 0 32612   1553         +7  NZT     TCARD+11
27271   0 02000 0 27257   1554         +8  TRA     AZXAR
27272  -1 27274 0 29421   1555     AZXA5   STR     AZF,,AZXA3
27273   0 07400 4 00076   1556         +1  TSX     KFINIS,4
27274  -3 12551 4 64063   1557     AZXA3   BCI     3,ZERO TCARD MISSING
27277  -2 07777 7 77777   1558     AZXA4   OCT     -207777777777

                          1560*READ ONE CARD FROM CORE
27300  -0 52000 0 27322   1561     AZXB    NZT     AZXB1
27301   0 02000 0 00101   1562         +1  TRA     KMOVE8                  INPUT FROM TAPE
27302   0 63400 4 27317   1563         +2  SXA     AZXBR,4
27303   0 63400 1 27320   1564         +3  SXA     AZXBR+1,1
27304   0 77400 4 00000   1565     AZXB2   AXT     **0,4
27305   0 77400 1 00000   1566         +1  AXT     0,1
27306  -0 50000 4 50032   1567     AZXB3   CAL     AZXI,4
27307   0 60200 1 32577   1568         +1  SLW     TCARD,1
27310   1 77777 4 27311   1569         +2  TXI     *+1,4,-1
27311   1 77777 1 27312   1570         +3  TXI     **+1,1,-1
27312   3 77764 1 27306   1571         +4  TXH     AZXB3,1,-12
27313   0 63400 4 27304   1572         +5  SXA     AZXB2,4                 ADDRESS FOR NEXT CARD
27314  -0 76000 0 00003   1573         +6  SSM
27315   0 13100 0 00000   1574         +7  XCA
27316   0 76000 0 00003   1575         +8  SSP                             TO SIMULATE KMOVE8
27317   0 77400 4 00000   1576     AZXBR   AXT     **0,4
27320   0 77400 1 00000   1577         +1  AXT     **0,1
27321   0 02000 4 00002   1578         +2  TRA     2,4
                  27322   1579     AZXB1   BSS     1,0                     NOT 0= INPUT FROM CORE

                          1581*READ IN STANDARD CASE AS BCD
27323   0 63400 4 27345   1582     AZXC    SXA     AZXCR,4
27324   0 63400 1 27346   1583         +1  SXA     AZXCR+1,1
27325   0 77400 1 00000   1584         +2  AXT     0,1
27326   0 07476 4 00101   1585     AZXC2   TSX     KMOVE8,4,62
27327  -1 00014 1 50032   1586         +1  FVE     AZXI,1,12               INPUT STORAGE
27330   0 16200 0 27201   1587         +2  TQP     AZX4
27331  -0 12000 0 27336   1588         +3  TMI     AZXC1
27332  -0 50000 1 50045   1589         +4  CAL     AZXI+11,1               COL 67-72
27333   0 10000 0 27340   1590         +5  TZE     AZXC4
27334   1 77764 1 27335   1591         +6  TXI     **+1,1,-12
27335   3 76650 1 27326   1592         +7  TXH     AZXC2,1,-12*CARDS       TEST CARDS VS AVAILABLE STORAGE
27336  -1 27350 0 25421   1593     AZXC1   STR     AZF,,AZXC3
27337   0 07400 4 00076   1594         +1  TSX     KFINIS,4
27340   0 60000 0 27322   1595     AZXC4   STZ     AZXB1
27341   0 07400 4 41664   1596         +1  TSX     AS50,4
27342   0 32577 0 44107   1597         +2  PZE     LVSAC,,TCARD            NOZZLE TUBE PARAMETERS
27343   0 02000 0 27334   1598         +3  TRA     AZXC1
27346   0 02000 0 27334   1599         +4  TRA     AZXC1

27345   0 77400 4 00000   1600     AZXCR   AXT     **0,4
27346   0 77400 1 00000   1601         +1  AXT     **0,1
27347   0 02000 4 00001   1602         +2  TRA     1,4
27350   2 55151 4 65160   1603     AZXC3   BCI     3,ERROR IN STD INPUT

                          1605*REGION TO STORE DILUENT TEMP AND PRESS
27353   0 52000 0 32742   1606     AZY     ZET     X+20
27354   0 02000 4 00002   1607         +1  TRA     2,4                     DILUENT SET TO ZERO
27355   0 56000 0 32620   1608         +2  CLA     P+2
27356   0 60100 0 32705   1609         +3  STO     P+55                    TC
27357   0 56000 0 32621   1610         +4  CLA     P+3
27360   0 60100 0 32704   1611         +5  STO     P+54                    PC
27361   0 56000 0 32631   1612         +6  CLA     P+11
27362   0 30200 0 32644   1613         +7  FSB     P+22                    WDOTC
27363   0 60100 0 32631   1614         +8  STO     P+11                    WDOTR
27364  -0 62500 0 32744   1615         +9  STL     X+22                    DILUENT REMOVED FLAG
27365  -0 12000 4 00001   1616        +10  TMI     1,4                     ERROR RETURN FOR NEGATIVE WDOTR
27366   0 02000 4 00002   1617        +11  TRA     2,4

                          1619*REGION TO COMPUTE P3 AND T3, NOZZLE TUBE INLET
27367   0 50000 0 32655   1620     AZZ     CLA     P+31                    T2              EQN T1
27370   0 60100 0 32703   1621         +1  STO     P+53                    T3
27371   0 60100 0 32620   1622         +2  STO     P+2                     CURRENT FLUID TEMP
27372   0 56000 0 32757   1623         +3  LDQ     C+8                             EQN T2
27373   0 26000 0 32631   1624         +4  FMP     P+11                    WDOTR
27374   0 24100 0 34071   1625         +5  FDP     TP+92                   RHO2 PREDICTED
27375   0 26000 0 32631   1626         +6  FMP     P+11
27376   0 30000 0 32654   1627         +7  FAD     P+30
27377   0 60100 0 32702   1628         +8  STO     P+52                    P3
27400   0 60100 0 32621   1629         +9  STO     P+3                     CURRENT PRESSURE
27401   0 02000 4 00001   1630        +10  TRA     1,4

                          1632*REGION TO ITERATE FOR WDOTH, CLOSING ON P8
27402   0 63400 4 27525   1633     AYA     SXA     AYAR,4
27403   0 60000 0 32733   1634         +1  STZ     X+13                    ERROR FLAG
27404   0 56000 0 32677   1635         +2  LDQ     P+49                    WDOTP           EQN PT24
27405   0 26000 0 32432   1636         +3  FMP     P+12
27406   0 60100 0 34042   1637         +4  STO     TP+69                   P6
27407   0 60000 0 40633   1638         +5  STZ     NEWB9+1                 MINWDOTH
27410   0 50000 0 40305   1639         +6  CLA     BIG
27411   0 60100 0 40632   1640         +7  STO     NEWB9                   MAX WDOTH
27412   0 56000 0 32645   1641         +8  CLA     P+23
27413   0 60100 0 34045   1642         +9  STO     TP+72                   WDOTH(I+1) GUESS = WDOTH(I)
27414   0 50000 0 36112   1643        +10  CLA     DP8E
27415   0 07400 4 40547   1644        +11  TSX     NEWB,4
27416   0 34043 0 34045   1645        +12  PZE     TP+72,,TP+70
27417   0 00017 0 34044   1646        +13  PZE     TP+71-,15
27420   0 02000 0 27527   1647        +14  TRA     AYA1                    NON CONVERGENCE
27421   0 50000 0 34045   1648        +15  CLA     TP+72                   WDOTH           EQN PT35
27422   0 24100 0 33753   1649        +16  FDP     TP+14
27423  -0 60C00 0 12512   1650        +17  STO     COMMON
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27424  0 26000 0 12512   1691        +18  FMP   COMMON
27425  0 30200 0 34042   1692        +19  FSB   TP+69
27426  0 12000 0 40624   1693        +20  TPL   BDXB                 WDOTH TOO BIG
27427  0 60200 0 47333   1694        +21  SLW   PR+10                PHH
27430  0 50000 0 32674   1695        +22  CLA   P+46                 P2              EQN PT36
27431  0 30200 0 47333   1696        +23  FSB   PR+10                PHH
27432  0 07400 4 24364   1697        +24  TSX   SQRT,4
27433  0 07400 4 42602   1698        +25  TSX   ERROR,4
27434  0 13100 0 00000   1699        +26  XCA
27435  0 26000 0 33740   1700        +27  FMP   TP+3
27436  0 60100 0 34046   1701        +28  STO   TP+73                WDOTC
27437  0 60100 0 47403   1702        +29  STO   PR+50
27440  0 30000 0 34045   1703        +30  FAD   TP+72                WDOTH           EQN PT27A
27441  0 60100 0 34051   1704        +31  STO   TP+76                WDOTT
27442  0 24100 0 33754   1705        +32  FDP   TP+15                K12             EQN PT37
27443 -0 60000 0 47447   1706        +33  STQ   PR+86                V8
27444  0 50000 0 34045   1707        +34  CLA   TP+72                WDOTH           EQN PT38
27445  0 60100 0 47404   1708        +35  STO   PR+51
27446  0 24100 0 33755   1709        +36  FDP   TP+16
27447 -0 60000 0 47446   1710        +37  STQ   PR+85                VMH
27450  0 50000 0 34046   1711        +38  CLA   TP+73                WDOTC           EQN PT39
27451  0 24100 0 33762   1712        +39  FDP   TP+21
27452 -0 60000 0 47445   1713        +40  STQ   PR+84                VCH
27453  0 50000 0 34046   1714        +41  CLA   TP+73                WDOTC           EQN PT40
27454  0 24100 0 33763   1715        +42  FDP   TP+22
27455 -0 60000 0 12513   1716        +43  STQ   COMMON+1
27456  0 26000 0 12513   1717        +44  FMP   COMMON+1
27457  0 30200 0 32674   1718        +45  FSB   P+46                 P2
27460  0 12000 0 40624   1719        +46  TPL   BDXB                 WDOTC, THEREFORE WDOTH TOO BIG
27461  0 60200 0 47332   1720        +47  SLW   PR+9                 PCH
27462  0 50000 0 32633   1721        +48  LDQ   P+13                T6(I)           EQN PT28
27463  0 26000 0 34045   1722        +49  FMP   TP+72                WDOTH
27464  0 60100 0 12514   1723        +50  STO   COMMON+2
27465  0 56000 0 32675   1724        +51  LDQ   P+47
27466  0 26000 0 34046   1725        +52  FMP   TP+73
27467  0 30000 0 12514   1726        +53  FAD   COMMON+2
27470  0 24100 0 34051   1727        +54  FDP   TP+76
27471  0 26000 0 34036   1728        +55  FMP   TP+65
27472  0 60100 0 34052   1729        +56  STO   TP+77                T8
27473  0 60100 0 34053   1730        +57  STO   TP+78                T11
27474  0 56000 0 47400   1731        +58  LDQ   PR+47                MH8(I)          EQN PT41
27475  0 26000 0 47400   1732        +59  FMP   PR+47
27476  0 13100 0 00000   1733        +60  XCA
27477  0 26000 0 32760   1734        +61  FMP   C+9
27500  0 30000 0 40213   1735        +62  FAD   FL1
27501  0 60100 0 33737   1736        +63  STO   TP+2
27502  0 50000 0 34052   1737        +64  CLA   TP+77
27503  0 24100 0 33737   1738        +65  FDP   TP+2
27504 -0 60000 0 47355   1739        +66  STQ   PR+28                T8 STATIC, ASSUME MH8 SAME AS TIME I
27505  0 07400 4 27034   1740        +67  TSX   AZQ,4                P8 STATIC       EQN PT42
27506  0 00000 0 36175   1741        +68  PZE   ORH
27507  0 50000 0 33737   1742        +69  CLA   TP+2                 MACH NO. TERM EQN PT43
27510  0 56000 0 32764   1743        +70  LDQ   C+13
27511  0 07400 4 27021   1744        +71  TSX   AZE,4

27512  0 13100 0 00000   1745        +72  XCA
27513  0 26000 0 47324   1746        +73  FMP   PR+3                 P8 STATIC
27514  0 60100 0 34043   1747        +74  STO   TP+70                P8 STAGNATION
27515  0 56000 0 34052   1748        +75  LDQ   TP+77                T8              EQN PT29
27516  0 26000 0 34033   1749        +76  FMP   TP+62
27517  0 07400 4 24364   1750        +77  TSX   SQRT,4
27520  0 07400 4 42602   1751        +78  TSX   ERROR,4
27521  0 13100 0 00000   1752        +79  XCA
27522  0 26000 0 34051   1753        +80  FMP   TP+76
27523  0 60100 0 34044   1754        +81  STO   TP+71                P8 PRIME
27524  0 07400 4 40640   1755        +82  TSX   RAPB,4
27525  0 77400 4 00000   1756   AYAR     AXT   **0,4
27526  0 02000 4 00001   1757        +1   TRA   1,4
27527 -0 62500 0 32733   1758   AYA1     STL   X+13
27530  0 02000 0 27525   1759        +1   TRA   AYAR

                         1761*REGION TO SOLVE FOR ACTUAL WORK IN THE PUMP AND TURBINE
27531  0 63400 4 27641   1762   AYB      SXA   AYBR,4
27532  0 50060 1 27643   1763        +1   CLA*  AYBT,1                T11             EQN PT7
27533  0 07400 4 24364   1764        +2   TSX   SQRT,4
27534  0 07400 4 42602   1765        +3   TSX   ERROR,4
27535  0 60100 0 34006   1766        +4   STO   TP+41
27536  0 52000 0 32742   1767        +5   ZET   X+20
27537  0 02000 0 27647   1768        +6   TRA   AYB2                  P11 GIVEN
27540  0 24100 0 34037   1769        +7   FDP   TP+66                K T
27541  0 26060 1 27645   1770        +8   FMP*  AYBW,1                WDOTT
27542  0 60100 0 32662   1771        +9   STO   P+36                 P11
27543  0 60000 1 32740   1772   AYB1     STZ   X+18,1                ERROR FLAGS
27544  0 24100 0 40224   1773        +1   FDP   FL10
27545 -0 60000 0 32664   1774        +2   STQ   P+38                 P12 GUESS = P11/10
27546  0 50000 1 32665   1775        +3   CLA   P+39,1                N               EQN PT8
27547  0 24100 0 34006   1776        +4   FDP   TP+41
27550  0 13100 0 00000   1777        +5   XCA
27551  0 07400 4 30516   1778        +6   TSX   AYJ,4
27552  0 60100 0 34003   1779        +7   STO   TP+38                ETAT PRIME
27553  0 50060 1 27643   1780        +8   CLA*  AY[illegible]        T11             EQN PT9A
27554  0 56000 0 32662   1781        +9   LDQ   P+[illegible]        P11
27555 -0 60000 0 40632   1782        +10  STQ   NEWJ9
27556  0 60000 0 40633   1783        +11  STZ   NEWB9+1
27557  0 07400 4 25564   1784        +12  TSX   AZH,4
27560  0 07400 4 42602   1785        +13  TSX   ERROR,4
27561  0 50000 0 32750   1786        +14  CLA   C+1                  R/776
27562  0 24100 0 33731   1787        +15  FDP   MPR+7                CP(T11,P11)
27563 -0 60000 0 34012   1788        +16  STQ   TP+45
27564  0 50000 0 36113   1789        +17  CLA   DP12E                P12 EPSILON
27565  0 07400 4 40547   1790        +18  TSX   NEWB,4
27566  0 34011 0 32664   1791        +19  PZE   P+38,,TP+44
27567  0 00062 0 34013   1792        +20  PZE   TP+46,,50
27570  0 02000 0 27655   1793        +21  TRA   AYB3
27571  0 50000 0 32664   1794        +22  CLA   P+38                 P12
27572  0 24100 0 32662   1795        +23  FDP   P+36                 P11
27573 -0 60000 0 34013   1796        +24  STQ   TP+46
27574  0 13100 0 00000   1797        +25  XCA
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27575  0 56000 0 34012  1758      +26  LDQ   TP+45
27576  0 07400 4 27021  1759      +27  TSX   AZE,4
27577  0 60100 0 12512  1760      +28  STO   COMMON        PRESS RATIO    EQN PT44
27600  0 13100 0 00000  1761      +29  XCA
27601  0 26060 1 27643  1762      +30  FMP*  AVBT,1        T11
27602  0 60100 0 34001  1763      +31  STO   TP+36         T12
27603  0 30260 1 27643  1764      +32  FSB*  AVBT,1        T11            EQN PT45
27604  0 60100 0 12513  1765      +33  STO   COMMON+1      T12-T11
27605  0 50200 0 32766  1766      +34  CLS   C+15
27606  0 24100 0 12513  1767      +35  FDP   COMMON+1
27607  0 26000 0 40240  1768      +36  FMP   FLR8
27610  0 24100 0 33731  1769      +37  FDP   WPR+7         CSUBP
27611  0 26000 0 34001  1770      +38  FMP   TP+36         T12
27612  0 30000 0 40213  1771      +39  FAD   FL1
27613  0 13100 0 00000  1772      +40  XCA
27614  0 26000 0 34003  1773      +41  FMP   TP+38
27615  0 60100 0 34010  1774      +42  STO   TP+43         ETAT
27616  0 50000 0 12512  1775      +43  CLA   COMMON        PRESS RATIO    EQN PT9
27617  0 30200 0 40213  1776      +44  FSB   FL1
27620  0 13100 0 00000  1777      +45  XCA
27621  0 26000 0 34010  1778      +46  FMP   TP+43         ETA T
27622  0 60100 0 34014  1779      +47  STO   TP+47
27623  0 30000 0 40213  1780      +48  FAD   FL1
27624  0 07400 4 24364  1781      +49  TSX   SQRT,4
27625  0 07400 4 42602  1782      +50  TSX   ERROR,4
27626  0 24100 0 32747  1783      +51  FDP   C             K T TERM
27627 -0 60000 0 34011  1784      +52  STQ   TP+44         P12/P11 PRIME
27630  0 07400 4 40640  1785      +53  TSX   RAPB,4
27631  0 50200 0 34014  1786  AVB4     CLS   TP+47
27632  0 13100 0 00000  1787      +1   XCA
27633  0 26060 1 27645  1788      +2   FMP*  AVBW,1        WDOTT
27634  0 13100 0 00000  1789      +3   XCA
27635  0 26000 0 33731  1790      +4   FMP   WPR+7         CP(T11,P11)
27636  0 13100 0 00000  1791      +5   XCA
27637  0 26060 1 27643  1792      +6   FMP*  AVBT,1
27640  0 60100 1 32671  1793      +7   STO   P+43,1        WTACT
27641  0 77400 4 00000  1794  AVBR     AXT   **0,4
27642  0 02000 4 00001  1795      +1   TRA   1,4
27643  0 00000 0 32663  1796  AVBT     PZE   P+37
27644  0 00000 0 34053  1797      +1   PZE   TP+78
27645  0 00000 0 32647  1798  AVBW     PZE   P+25
27646  0 00000 0 34051  1799      +1   PZE   TP+76
27647  0 50000 0 32662  1800  AVB2     CLA   P+36          P11
27650  0 24100 0 34006  1801      +1   FDP   TP+41
27651  0 26000 0 34037  1802      +2   FMP   TP+66         KT
27652  0 60160 1 27645  1803      +3   STO*  AVBW,1        WDOT
27653  0 50000 0 32662  1804      +4   CLA   P+36
27654  0 02000 0 27543  1805      +5   TRA   AVB1
27655 -0 62500 1 32740  1806  AVB3     STL   X+18,1
27656  0 02000 0 27631  1807      +1   TRA   AVB4

                        1809*REGION TO COMPUTE PROGRAM CONSTANTS
[illegible] 27[illegible] 0 [illegible]0 [illegible]045[illegible]81C[illegible] AY[illegible] S[illegible] [illegible].4 [illegible]
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27660  0 50000 0 36133  1811      +1   CLA   DK
27661  0 30200 0 40213  1812      +2   FSB   FL1
27662  0 60100 0 12512  1813      +3   STO   COMMON        K-1
27663  0 30000 0 40214  1814      +4   FAD   FL2
27664  0 60100 0 12513  1815      +5   STO   COMMON+1      K+1
27665  0 24100 0 12512  1816      +6   FDP   COMMON
27666 -0 60000 0 12514  1817      +7   STQ   COMMON+2      K+1/K-1
27667  0 50000 0 36133  1818      +8   CLA   DK
27670  0 24100 0 12513  1819      +9   FDP   COMMON+1
27671 -0 60000 0 32766  1820      +10  STQ   C+15          K/(K+1)
27672  0 50000 0 40214  1821      +11  CLA   FL2
27673  0 24100 0 12513  1822      +12  FDP   COMMON+1
27674  0 13100 0 00000  1823      +13  XCA
27675  0 56000 0 12514  1824      +14  LDQ   COMMON+2
27676  0 07400 4 27021  1825      +15  TSX   AZE,4
27677  0 24100 0 40225  1826      +16  FDP   FL12
27700  0 26000 0 40236  1827      +17  FMP   FLG           GRAV
27701  0 24100 0 40237  1828      +18  FDP   FLR
27702  0 26000 0 36133  1829      +19  FMP   DK
27703  0 07400 4 24364  1830      +20  TSX   SQRT,4
27704  0 07400 4 42602  1831      +21  TSX   ERROR,4
27705  0 60100 0 34037  1832      +22  STO   TP+66
27706  0 56000 0 36140  1833      +23  LDQ   DDTN
27707  0 07400 4 30047  1834      +24  TSX   AYCA,4
27710  0 60100 0 47431  1835      +25  STO   PR+72         ATN FOR HB
27711  0 13100 0 00000  1836      +26  XCA
27712  0 26000 0 34037  1837      +27  FMP   TP+66
27713  0 60100 0 34037  1838      +28  STO   TP+66         KT
27714  0 56000 0 36141  1839      +29  LDQ   DDRN
27715  0 07400 4 30047  1840      +30  TSX   AYCA,4
27716  0 24100 0 34037  1841      +31  FDP   TP+66
27717  0 26000 0 40241  1842      +32  FMP   FL139
27720  0 13100 0 00000  1843      +33  XCA
27721  0 26000 0 40214  1844      +34  FMP   FL2
27722  0 60100 0 32747  1845      +35  STO   C
27723  0 50000 0 40237  1846      +36  CLA   FLR
27724  0 24100 0 40242  1847      +37  FDP   FL776
27725 -0 60000 0 32750  1848      +38  STQ   C+1           R/776
27726  0 50000 0 40275  1849      +39  CLA   PI
27727  0 24100 0 40246  1850      +40  FDP   FL108
27730  0 26000 0 40275  1851      +41  FMP   PI
27731  0 24100 0 40242  1852      +42  FDP   FL776
27732  0 26000 0 36142  1853      +43  FMP   DIPT
27733  0 24100 0 40236  1854      +44  FDP   FLG
27734 -0 60000 0 32751  1855      +45  STQ   C+2
27735  0 50000 0 40213  1856      +46  CLA   FL1
27736  0 24100 0 40243  1857      +47  FDP   FLGAL
27737  0 13100 0 00000  1858      +48  XCA
27740  0 24100 0 40245  1859      +49  FDP   FLCUF
27741 -0 60000 0 32752  1860      +50  STQ   C+3
27742  0 50000 0 40237  1861      +51  CLA   FLR
27743  0 24100 0 40244  1862      +52  FDP   FL144
27744  0 26000 0 40247  1863      +53  FMP   FL2RW
27745  0 60100 0 32753  1864      +54  STO   C+4
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27746   0 50000 0 40[illegible]  1865        +55  CLA    FLR
27747   0 24100 0 40236  1866        +56  FDP    FLG
27750   0 26000 0 40225  1867        +57  FMP    FL12
27751   0 60100 0 32754  1868        +58  STO    C+5
27752   0 56000 0 36137  1869        +59  LDQ    DDTL
27753   0 07400 4 30047  1870        +60  TSX    AYCA,4
27754   0 60100 0 32755  1871        +61  STO    C+6
27755   0 13100 0 00000  1872        +62  XCA
27756   0 26000 0 32755  1873        +63  FMP    C+6
27757   0 60100 0 32755  1874        +64  STO    C+6
2776C   0 56000 0 40225  1875        +65  LDQ    FL12
27761   0 26000 0 40242  1876        +66  FMP    FL776
27762   0 60100 0 32756  1877        +67  STO    C+7
27763   0 56000 0 36135  1878        +68  LDQ    DD2                    EQN T2A
27764   0 07400 4 30047  1879        +69  TSX    AYCA,4
27765   0 60100 0 12515  1880        +70  STO    COMMON+3
27766   0 50200 0 36134  1881        +71  CLS    DK2
27767   0 24100 0 12515  1882        +72  FDP    COMMON+3
27770   0 13100 0 00000  1883        +73  XCA
27771   0 24100 0 12515  1884        +74  FDP    COMMON+3
27772   0 13100 0 00000  1885        +75  XCA
27773   0 24100 0 40236  1886        +76  FDP    FLG
27774   0 13100 0 00000  1887        +77  XCA
27775   0 24100 0 40214  1888        +78  FDP    FL2
27776  -0 60000 0 32757  1889        +79  STO    C+8
27777   0 50000 0 36176  1890        +80  CLA    DK11
30000   0 30000 0 36177  1891        +81  FAD    DK9
30001   0 24100 0 32755  1892        +82  FDP    C+6
30002   0 26000 0 32754  1893        +83  FMP    C+5
30003   0 60100 0 34032  1894        +84  STO    TP+61
30004   0 50000 0 36167  1895        +85  CLA    DKPHM
30005   0 30200 0 40213  1896        +86  FSB    FL1
30006   0 60100 0 12516  1897        +87  STO    COMMON+4
30007   0 24100 0 40214  1898        +88  FDP    FL2
30010  -0 60000 0 32760  1899        +89  STO    C+9                    (K-1)/2
30011   0 50000 0 36167  1900        +90  CLA    DKPHM
30012   0 24100 0 12516  1901        +91  FDP    COMMON+4
30013  -0 60000 0 32764  1902        +92  STO    C+13
30014   0 56C00 0 36136  1903        +93  LDQ    DDH
30015   0 07400 4 30047  1904        +94  TSX    AYCA,4
30016   0 13100 0 00000  1905        +95  XCA
30017   0 26000 0 40272  1906        +96  FMP    FLGF
30020   0 60100 0 32761  1907        +97  STO    C+10                   G*AH
30021   0 56000 0 36154  1908        +98  LDQ    DTHET
30022   0 26C00 0 40277  1909        +99  FMP    RAD
30023   0 07400 4 42374  1910       +100  TSX    COS,4
30024   0 60100 0 32765  1911       +101  STO    C+14                   COS TETA
30025   0 56000 0 36150  1912       +102  LDQ    DDCO
30026   0 07400 4 30047  1913       +103  TSX    AYCA,4
30027   0 13100 0 00000  1914       +104  XCA
30030   0 26000 0 36151  1915       +105  FMP    DNH
30031   0 13100 0 00000  1916       +106  XCA
30032   0 26000 0 32765  1917       +107  FMP    C+14
30033   0 13100 0 00000  1918       +108  XCA
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30034   0 26C00 0 40272  1919       +109  FMP    FLGF
30035   0 60100 0 32762  1920       +110  STO    C+11                   G*ACN*COS(THETA)
30036   0 56000 0 36165  1921       +111  LDQ    DFHOT
30037   0 26000 0 40275  1922       +112  FMP    PI
30040   0 24100 0 40214  1923       +113  FDP    FL2
30041   0 26000 0 36136  1924       +114  FMP    DDH
30042   0 13100 0 00000  1925       +115  XCA
30043   0 26000 0 36146  1926       +116  FMP    DL
30044   0 60100 0 32763  1927       +117  STO    C+12                   F*PI*DH*L/2
30045   0 77400 4 00000  1928    AYCR     AXT    **0,4
30046   0 02000 4 00001  1929        +1   TRA    1,4

                         1931*REGION TO COMPUTE AREA FROM DIAMETER
30047  -0 60000 0 30054  1932    AYCA     STO    AYCA1
30050   0 26000 0 30054  1933        +1   FMP    AYCA1
30051   0 24100 0 40216  1934        +2   FDP    FL4
30052   0 26000 0 40275  1935        +3   FMP    PI
30053   0 02000 4 00001  1936        +4   TRA    1,4
                 30054   1937    AYCA1    BSS    1,F

                         1939*REGION TO COMPUTE PUMP FLOW
30055   0 63400 4 30142  1940    AYD      SXA    AYDR,4
30056   0 60000 0 32736  1941        +1   STZ    X+16
30057   0 50000 0 40305  1942        +2   CLA    BIG
30060   0 60100 0 40632  1943        +3   STO    NEWB9
30061   0 60000 0 40633  1944        +4   STZ    NEWB9+1
30062   0 56000 0 32666  1945        +5   LDQ    P+40                   N I+1
30063   0 26000 0 30154  1946        +6   FMP    AYD01
30064   0 60100 0 32700  1947        +7   STO    P+50                   Q/N GUESS = .37
30065   0 50000 0 36144  1948        +8   CLA    DHE
30066   0 07400 4 40547  1949        +9   TSX    NEWB,4
30067   0 32676 0 32700  1950       +10   PZE    P+50,,P+48
30070   0 00031 0 34027  1951       +11   PZE    TP+58,,25
30071   0 02000 0 30147  1952       +12   TRA    AYD2
30072   0 56000 0 32700  1953       +13   LDQ    P+50                       EQN PT18
30073   0 26000 0 34017  1954       +14   FMP    TP+50                  RHO1
30074   0 24100 0 32752  1955       +15   FDP    C+3
30075  -0 60000 0 32677  1956       +16   STQ    P+49                   WDOTP(I+1)
30076   0 26000 0 32673  1957       +17   FMP    P+45                   ALPHA          EQN PT17
30077   0 30000 0 32632  1958       +18   FAD    P+12                   BETA
30100   0 13100 0 00000  1959       +19   XCA
30101   0 26000 0 32677  1960       +20   FMP    P+49
30102   0 60100 0 32674  1961       +21   STO    P+46                   P2(I+1)
30103   0 07400 4 30437  1962       +22   TSX    AYI,4                  FIND T2 ISOENTROPICALLY
30104   0 60100 0 32675  1963       +23   STO    P+47                   T2(I+1)
30105   0 56000 0 32674  1964       +24   LDQ    P+46
30106   0 07400 4 25564  1965       +25   TSX    AZH,4
30107   0 02000 0 30151  1966       +26   TRA    AYD1
30110   0 50000 0 33724  1967       +27   CLA    WPR+2                  H2(I+1)
30111   0 30200 0 34070  1968       +28   FSB    TP+91                  H1(I+1)
30112   0 60100 0 34056  1969       +29   STO    T[illegible]+81
30113   0 13100 0 00000  1970       +30   XCA
30114   0 26000 0 40242  1971       +31   FMP    FL776
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30115  0 30000 0 40264   1972         +32  FAD   FL100
30116  0 60100 0 32676   1973         +33  STO   P+48                DELTA H (I+1)
30117  0 10000 0 30121   1974         +34  TZE   *+2
30120 -0 12000 0 40627   1975         +35  TMI   BDNB                P2 TOO LOW
30121  0 50000 0 32700   1976         +36  CLA   P+50                Q              EQN PT19
30122  0 24100 0 32666   1977         +37  FDP   P+40                N
30123 -0 60000 0 34000   1978         +38  STQ   TP+35               Q/N
30124  0 50000 0 32636   1979         +39  CLA   P+16                HSV
30125  0 24100 0 32666   1980         +40  FDP   P+40                N
30126  0 13100 0 00000   1981         +41  XCA
30127  0 24100 0 32666   1982         +42  FDP   P+40
30130 -0 60000 0 33773   1983         +43  STQ   TP+30               HSV/NSQ.
30131  0 07401 4 30527   1984         +44  TSX   AYK,4,1
30132  0 00000 0 34017   1985         +45  PZE   TP+50,0
30133  0 13100 0 00000   1986         +46  XCA                                EQN PT20
30134  0 26000 0 32666   1987         +47  FMP   P+40
30135  0 13100 0 00000   1988         +48  XCA
30136  0 26000 0 32666   1989         +49  FMP   P+40
30137  0 30000 0 40264   1990         +50  FAD   FL100
30140  0 60100 0 34027   1991         +51  STO   TP+58
30141  0 07400 4 40640   1992         +52  TSX   RAPB,4
30142  0 77400 4 00000   1993   AYDR       AXT   **0,4
30143  0 50000 0 32676   1994          +1  CLA   P+48
30144  0 30200 0 40264   1995          +2  FSB   FL100
30145  0 60100 0 32676   1996          +3  STO   P+4P
30146  0 02000 4 00001   1997          +4  TRA   1,4
30147 -0 62500 0 32736   1998   AYD2       STL   X+16
30150  0 02000 0 30142   1999          +1  TRA   AYDR
30151 -0 73400 4 00000   2000   AYD1       PDX   ,4
30152 -3 00001 4 40624   2001          +1  TXL   BDXB,4,1            P2 TOO HIGH
30153  0 02000 0 40627   2002          +2  TRA   BDNB                T2 TOO LOW
30154  1 77572 7 02437   2003   AYD01      DEC      .37

                         2005*REGION TO FIND INLET VALUES FOR ONE PART AT ONE TIME
30155  0 63400 4 30173   2006   AYE        SXA   AYER,4
30156  0 50000 0 32621   2007          +1  CLA   P+3
30157  0 60100 1 35612   2008          +2  STO   PT,1                INLET PRESSURE
30160  0 50000 0 32631   2009          +3  CLA   P+11
30161  0 60100 1 35624   2010          +4  STO   PT+10,1             INLET FLOW
30162  0 07400 4 27075   2011          +5  TSX   AZU,4,0
30163  0 02000 0 30177   2012          +6  TRA   AYE1
30164  0 02000 0 30175   2013          +7  TRA   AYE2
30165 -0 52000 1 36072   2014          +8  NZT   DKDPI,1
30166  0 02000 0 30173   2015          +9  TRA   AYER
30167  0 07400 4 31674   2016         +10  TSX   AYQ,4,0             ORFICE DROP    EQN HT12
30170  0 02000 0 30177   2017         +11  TRA   AYE1                ERROR RETN
30171  0 50000 0 12512   2018         +12  CLA   COMMON
30172  0 60100 1 35616   2019         +13  STO   PT+4,1
30173  0 77400 4 00000   2020   AYER       AXT   **0,4
30174  0 02000 4 00003   2021          +1  TRA   3,4
30175  0 52200 0 30173   2022   AYE2       XEC   AYER
30176  0 02000 4 00002   2023          +1  TRA   2,4
3[illegible]  0 [illegible]200 [illegible]173   202[illegible]   A[illegible]   [illegible]   ERR[illegible]XIT[illegible]   PA[illegible]

30200  0 02000 4 00001   2025          +1  TRA   1,4

                         2027*OPEN ROUTINE TO FIND OUTLET CONDITIONS FOR ONE PART AT ONE TIME POINT
30201  0 63400 4 30173   2028   AYEA       SXA   AYER,4
30202 -0 52000 1 36073   2029          +1  NZT   DKDPO,1
30203  0 02000 0 30210   2030          +2  TRA   AYEA1
30204  0 07401 4 31674   2031          +3  TSX   AYQ,4,1             ORFICE DROP    EQN HT12
30205  0 02000 0 30177   2032          +4  TRA   AYE1
30206  0 50000 0 12512   2033          +5  CLA   COMMON
30207  0 60100 1 35617   2034          +6  STO   PT+5,1
30210  0 50000 0 32621   2035   AYEA1      CLA   P+3
30211  0 60100 1 35613   2036          +1  STO   PT+1,1              OUTLET PRESSURE
30212  0 07401 4 27075   2037          +2  TSX   AZU,4,1
30213  0 02000 0 30177   2038          +3  TRA   AYE1
30214  0 02000 0 30175   2039          +4  TRA   AYE2
30215  0 50000 0 32631   2040          +5  CLA   P+11
30216  0 60100 1 35614   2041          +6  STO   PT+2,1
30217  0 02000 0 30173   2042          +7  TRA   AYER

                         2044*REGION TO COMPUTE SEVERAL QUANTITIES FOR TIME I
30220  0 63400 4 30324   2045   AYG        SXA   AYGR,4
30221  0 56000 0 32655   2046          +1  LDQ   P+31                T2             EQN 27
30222  0 26000 0 32644   2047          +2  FMP   P+22                WDOTC
30223  0 60100 0 34047   2048          +3  STO   TP+74
30224  0 56000 0 32633   2049          +4  LDQ   P+13                T6
30225  0 26000 0 32645   2050          +5  FMP   P+23                WDOT H
30226  0 30000 0 34047   2051          +6  FAD   TP+74
30227  0 60100 0 34050   2052          +7  STO   TP+75
30230  0 50000 0 32645   2053          +8  CLA   P+23                WDOTH          EQN 27A
30231  0 30000 0 32644   2054          +9  FAD   P+22                WDOTC
30232  0 60100 0 32647   2055         +10  STO   P+25                WDOTT
30233  0 24100 0 34050   2056         +11  FDP   TP+75
30234  0 26000 0 32661   2057         +12  FMP   P+35                T8
30235  0 60100 0 34036   2058         +13  STO   TP+65               K6
30236  0 50000 0 32654   2059         +14  CLA   P+30                P2             EQN PT36
30237  0 30200 0 47333   2060         +15  FSB   PR+10               PHM
30240  0 07400 4 24364   2061         +16  TSX   SQRT,4
30241  0 07400 4 42602   2062         +17  TSX   ERROR,4
30242  0 60100 0 12512   2063         +18  STO   COMMON
30243  0 50000 0 32644   2064         +19  CLA   P+22                WDOTC
30244  0 24100 0 12512   2065         +20  FDP   COMMON
30245 -0 60000 0 33740   2066         +21  STQ   TP+3                K10
30246  0 50000 0 32656   2067         +22  CLA   P+32                P6             EQN PT35
30247  0 30200 0 47333   2068         +23  FSB   PR+10
30250  0 07400 4 24364   2069         +24  TSX   SQRT,4
30251  0 07400 4 42602   2070         +25  TSX   ERROR,4
30252  0 60100 0 12512   2071         +26  STO   COMMON
30253  0 50000 0 32645   2072         +27  CLA   P+23                WDOTH
30254  0 24100 0 12512   2073         +28  FDP   COMMON
30255 -0 60000 0 33753   2074         +29  STQ   TP+14               K11
30256  0 50000 0 32647   2075         +30  CLA   P+25                WDOTT          EQN PT37
30257  0 24100 0 47447   2076         +31  FDP   PR+86               V8
30260 -0 60000 0 33754   2077         +32  STQ   TP+15               K12
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30261  0 50000 0 32645   2078        +33  CLA   P+23                WDOTN          EQN PT38
30262  0 24100 0 47446   2079        +34  FDP   PR+85               VMM
30263 -0 60000 0 33795   2080        +35  STO   TP+16               K13
30264  0 50000 0 32644   2081        +36  CLA   P+22                WDOTC          EQN PT39
30265  0 24100 0 47445   2082        +37  FDP   PR+84               VCM
30266 -0 60000 0 33762   2083        +38  STO   TP+21               K14
30267  0 50000 0 32694   2084        +39  CLA   P+30                P2             EQN PT40
30270  0 30200 0 47332   2085        +40  FSB   PR+9
30271  0 07400 4 24364   2086        +41  TSX   SQRT,4
30272  0 07400 4 42602   2087        +42  TSX   ERROR,4
30273  0 60100 0 12512   2088        +43  STO   COMMON
30274  0 50000 0 32644   2089        +44  CLA   P+22
30275  0 24100 0 12512   2090        +45  FDP   COMMON
30276 -0 60000 0 33763   2091        +46  STO   TP+22               K15
30277  0 54000 0 36131   2092        +47  LDQ   DAKV                     EQN PT33
30300  0 26000 0 34073   2093        +48  FMP   TP+94
30301  0 30200 0 36132   2094        +49  FSB   DBKV
30302  0 60100 0 34040   2095        +50  STO   TP+67               KV(I+1)
30303  0 50000 0 32753   2096        +51  CLA   C+4                 4GR/12         EQN 30A
30304  0 24100 0 34040   2097        +52  FDP   TP+67
30305  0 13100 0 00000   2098        +53  XCA
30306  0 24100 0 34040   2099        +54  FDP   TP+67
30307 -0 60000 0 34031   2100        +55  STO   TP+60               K1
30310  0 50000 0 40213   2101        +56  CLA   FL1                      EQN 30
30311  0 24100 0 34037   2102        +57  FDP   TP+66               KT
30312  0 13100 0 00000   2103        +58  XCA
30313  0 24100 0 34037   2104        +59  FDP   TP+66
30314  0 13100 0 00000   2105        +60  XCA
30315  0 30000 0 34031   2106        +61  FAD   TP+60               K1
30316  0 30000 0 34032   2107        +62  FAD   TP+61               K2
30317  0 60100 0 34033   2108        +63  STO   TP+62               K3
30320  0 50000 0 32641   2109        +64  CLA   P+35                T8             EQN 6
30321  0 60100 0 32663   2110        +65  STO   P+37                T11
30322  0 07400 4 27531   2111        +66  TSX   AYB,4               TIME I         EQN PT7-10
30323  0 07400 4 31501   2112        +67  TSX   AYL,4                     EQN PT21
30324  0 77400 4 00000   2113  AYGR  AXT   **0,4
30325  0 02000 4 00001   2114        +1   TRA   1,4

                         2116*REGION TO COMPUTE ADDITIONAL QUANTITIES AT TIME I
30326  0 50000 0 32643   2117  AYGA  CLA   P+21                WDOTP          EQN PT18
30327  0 24100 0 34060   2118        +1   FDP   TP+83               RHO1
30330  0 26000 0 32752   2119        +2   FMP   C+3
30331  0 60100 0 34061   2120        +3   STO   TP+84               QP(I)
30332  0 24100 0 32665   2121        +4   FDP   P+39
30333 -0 60000 0 34000   2122        +5   STO   TP+35               Q/N
30334  0 50000 0 32635   2123        +6   CLA   P+15
30335  0 24100 0 32665   2124        +7   FDP   P+39
30336  0 13100 0 00000   2125        +8   XCA
30337  0 24100 0 32665   2126        +9   FDP   P+39
30340 -0 60000 0 33773   2127        +10  STO   TP+30               HSV/NSQ.
30341  0 50000 0 32656   2128        +11  CLA   P+32                P6             EQN PT13
30342  0 24100 0 32643   2129        +12  FDP   P+21
30343 -0 60000 0 32632   2130        +13  STO   P+12                BETA
30344  0 50000 0 32654   2131        +14  CLA   P+30                P2             EQN PT14

30345  0 30200 0 32656   2132        +15  FSB   P+32                P6
30346  0 24100 0 32643   2133        +16  FDP   P+21
30347  0 13100 0 00000   2134        +17  XCA
30350  0 24100 0 32643   2135        +18  FDP   P+21
30351 -0 60000 0 32673   2136        +19  STO   P+45                ALPHA
30352  0 02000 4 00001   2137        +20  TRA   1,4

                         2139*REGION TO COMPUTE FILM COEFFICIENT
30353  0 63400 4 30430   2140  AYH   SXA   AYHR,4
30354  0 63400 1 30431   2141        +1   SXA   AYHR+1,1
30355  0 50000 0 32620   2142        +2   CLA   P+2                 T
30356  0 24160 4 00001   2143        +3   FDP*  1,4                 THETA
30357 -0 50000 4 00001   2144        +4   CAL   1,4
30360 -0 73700 1 00000   2145        +5   PDC   ,1
30361  0 13100 0 00000   2146        +6   XCA
30362  0 56000 1 00000   2147        +7   LDQ   0,1                 ALPHA
30363 -0 12000 0 30433   2148        +8   TMI   AYH1
30364  0 07400 4 27021   2149        +9   TSX   AZE,4
30365  0 60100 0 12524   2150        +10  STO   COMMON+10
30366  0 50000 0 33741   2151        +11  CLA   TP+4
30367  0 24100 0 33764   2152        +12  FDP   TP+23                D+DELZ
30370  0 13100 0 00000   2153        +13  XCA
30371  0 56000 1 00001   2154        +14  LDQ   1,1                 BETA
30372 -0 12000 0 30433   2155        +15  TMI   AYH1
30373  0 07400 4 27021   2156        +16  TSX   AZE,4
30374  0 60100 0 12525   2157        +17  STO   COMMON+11
30375  0 50000 0 32631   2158        +18  CLA   P+11                WDOT
30376  0 36100 0 40302   2159        +19  ACL   288
30377  0 24100 0 33760   2160        +20  FDP   TP+19                F
30400  0 13100 0 00000   2161        +21  XCA
30401  0 24100 0 33733   2162        +22  FDP   WPR+9
30402  0 13100 0 00000   2163        +23  XCA
30403  0 56000 0 40256   2164        +24  LDQ   FL.8
30404 -0 12000 0 30433   2165        +25  TMI   AYH1
30405  0 07400 4 27021   2166        +26  TSX   AZE,4
30406  0 60100 0 12526   2167        +27  STO   COMMON+12
30407  0 50000 0 33731   2168        +28  CLA   WPR+7
30410  0 24100 0 33732   2169        +29  FDP   WPR+8
30411  0 26000 0 33733   2170        +30  FMP   WPR+9
30412  0 56000 0 40226   2171        +31  LDQ   FL.4
30413 -0 12000 0 30433   2172        +32  TMI   AYH1
30414  0 07400 4 27021   2173        +33  TSX   AZE,4
30415  0 13100 0 00000   2174        +34  XCA
30416  0 26000 0 12526   2175        +35  FMP   COMMON+12
30417  0 24100 0 33741   2176        +36  FDP   TP+4                 D
30420  0 26000 0 12524   2177        +37  FMP   COMMON+10
30421  0 13100 0 00000   2178        +38  XCA
30422  0 26000 0 12525   2179        +39  FMP   COMMON+11
30423  0 13100 0 00000   2180        +40  XCA
30424  0 26000 0 33732   2181        +41  FMP   WPR+8                K
30425  0 13100 0 00000   2182        +42  XCA
30426  0 26000 1 00002   2183        +43  FMP   2,1                 GAMMA
30427  0 60100 0 32622   2184        +44  STO   P+4                 HF
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30430   0 77400 4 00000   2185    AYMR    AXT     **0,4
30431   0 77400 1 00000   2186        +1  AXT     **0,1
30432   0 02000 4 00002   2187        +2  TRA     2,4
30433  -1 30434 0 25417   2188    AYM1    STR     AZFF,,AYM2
30434   2 33025 2 34260   2189    AYM2    BCI     3,CHECK DUMP FOR NEG

                          2191*REGION TO COMPUTE TEMP CHANGE IN AN ISOENTROPIC PRESS CHANGE
30437   0 63400 4 30450   2192    AYI     SXA     AYIR,4
30440   0 60100 0 34016   2193        +1  STO     TP+49               P2
30441   0 50000 0 34065   2194        +2  CLA     TP+88               T1
30442   0 56000 0 32674   2195        +3  LDQ     P+46                P2
30443   0 07400 4 41043   2196        +4  TSX     S(TP),4
30444   0 30200 0 34062   2197        +5  FSB     TP+85               S
30445   0 24100 0 34005   2198        +6  FDP     TP+40               S-SP
30446   0 26000 0 30452   2199        +7  FMP     AYI1                DELT
30447   0 30000 0 34065   2200        +8  FAD     TP+88               T1
30450   0 77400 4 00000   2201    AYIR    AXT     **0,4
30451   0 02000 4 00001   2202        +1  TRA     1,4
30452   2 02400 0 00000   2203    AYI1    DEC       2.

                          2205*REGION TO COMPUTE CONSTANT ENTROPIES FOR AYI
30453   0 63400 4 30511   2206    AYII    SXA     AYIIR,4
30454   0 50000 0 34065   2207        +1  CLA     TP+88               T1
30455   0 56000 0 34064   2208        +2  LDQ     TP+87               P1
30456   0 07400 4 41043   2209        +3  TSX     S(TP),4
30457   0 60100 0 34062   2210        +4  STO     TP+85               S
30460   0 50000 0 34065   2211        +5  CLA     TP+88               T1((P1)
30461   0 60100 0 33742   2212        +6  STO     TP+5
30462   0 56000 0 34064   2213        +7  LDQ     TP+87               P1(I+1)
30463   0 07400 4 25564   2214        +8  TSX     AZH,4
30464  -1 25176 0 25417   2215        +9  STR     AZFF,,AZAB2
30465   0 50000 0 33730   2216       +10  CLA     WPR+6
30466   0 60100 0 34017   2217    AYII1   STO     TP+50
30467   0 50000 0 33724   2218        +1  CLA     WPR+2
30470   0 60100 0 34070   2219        +2  STO     TP+91               H1(I+1)
30471   0 50000 0 34065   2220        +3  CLA     TP+88               T1
30472   0 30000 0 30452   2221        +4  FAD     AYI1                DELT
30473   0 56000 0 34064   2222        +5  LDQ     TP+87               P1
30474   0 07400 4 41043   2223        +6  TSX     S(TP),4
30475   0 30200 0 34062   2224        +7  FSB     TP+85               S
30476   0 76000 0 00002   2225        +8  CHS
30477   0 60100 0 34005   2226        +9  STO     TP+40               S-SP
30500   0 07400 4 27142   2227       +10  TSX     AZV,4               VAPOR PRESSURE
30501   0 30200 0 34064   2228       +11  FSB     TP+87               P1
30502  -0 12000 0 30504   2229       +12  TNI     *+2
30503  -1 30513 0 25417   2230       +13  STR     AZFF,,AYII2
30504   0 76000 0 00002   2231       +14  CHS
30505   0 24100 0 34017   2232       +15  FDP     TP+50               RHO1
30506   0 13100 0 00000   2233       +16  XCA
30507   0 24100 0 40225   2234       +17  FDP     FL12
30510  -0 60000 0 32636   2235       +18  STO     P+16                HSV(I+1)
30511   0 77400 4 00000   2236    AYIIR   AXT     **0,4
30512   0 02000 4 00001   2237        +1  TRA     1,4

30513   2 72162 6 02163   2238    AYII2   BCI     3,GAS AT PUMP INLET

                          2240*REGION TO COMPUTE ETA T -- N/ROOT T IN AC
30516   0 60100 0 34023   2241    AYJ     STO     TP+54
30517   0 56000 0 30525   2242        +1  LDQ     AYJ1
30520   0 26000 0 34023   2243        +2  FMP     TP+54
30521   0 30000 0 30526   2244        +3  FAD     AYJ1+1
30522   0 13100 0 00000   2245        +4  XCA
30523   0 26000 0 34023   2246        +5  FMP     TP+54
30524   0 02000 4 00001   2247        +6  TRA     1,4
30525  -1 54523 1 45747   2248    AYJ1    DEC       -6318076E-13,11039226E-10

                          2250*REGION TO COMPUTE PUMP CHARACTERISTICS
30527   0 63400 4 30603   2251    AYK     SXA     AYKR,4
30530   0 63400 1 30604   2252        +1  SXA     AYKR+1,1
30531   0 44100 4 00000   2253        +2  LDI     0,4
30532  -0 05700 0 00002   2254        +3  RIL     2                   RESET PARABOLA FLAG
30533  -0 77400 1 31023   2255        +4  AXC     AYK1,1
30534  -0 05400 0 00001   2256        +5  LFT     1                   1 IN DECREMENT OF TSX = HEAD DESIRED
30535   0 02000 0 31076   2257        +6  TRA     AYK9                MARK 4 MOD 4 PUMP
30536   0 50000 0 33773   2258        +7  CLA     TP+30               HSV/NSQ.
30537   0 56000 0 31065   2259        +8  LDQ     AYK3                HSV/NSQ MAX
30540   0 04000 0 30542   2260        +9  TLQ     *+2
30541   0 13100 0 00000   2261       +10  XCA
30542   0 26000 0 40235   2262       +11  FMP     FL12E8
30543   0 13100 0 00000   2263       +12  XCA
30544   0 26060 4 00001   2264       +13  FMP*    1,4                 RHO
30545   0 30000 0 40214   2265       +14  FAD     FL2
30546   0 60100 0 12512   2266       +15  STO     COMMON
30547   0 50000 0 40213   2267       +16  CLA     FL1
30550   0 24100 0 12512   2268       +17  FDP     COMMON
30551  -0 60000 0 12512   2269       +18  STO     COMMON              X2
30552   0 50000 0 31066   2270       +19  CLA     AYK3+1              .36
30553   0 30200 0 34000   2271       +20  FSB     TP+35               Q/N
30554   0 60100 0 12513   2272       +21  STO     COMMON+1            X1
30555  -0 12000 0 30606   2273       +22  TNI     AYK4                IF PLUS USE -A- CURVE
30556   0 56000 1 00005   2274       +23  LDQ     5,1                 A5
30557   0 26000 0 12512   2275       +24  FMP     COMMON              X2
30560   0 30000 1 00004   2276       +25  FAD     4,1                 A4
30561   0 13100 0 00000   2277       +26  XCA
30562   0 26000 0 12513   2278       +27  FMP     COMMON+1            X1
30563   0 60100 0 12516   2279       +28  STO     COMMON+4
30564   0 56000 1 00003   2280       +29  LDQ     3,1                 A3
30565   0 26000 0 12512   2281       +30  FMP     COMMON
30566   0 30000 1 00001   2282       +31  FAD     1,1
30567   0 30000 0 12516   2283       +32  FAD     COMMON+4
30570   0 13100 0 00000   2284       +33  XCA
30571   0 26000 0 12513   2285       +34  FMP     COMMON+1            X1
30572   0 60100 0 12517   2286       +35  STO     COMMON+5
30573   0 56000 1 00002   2287       +36  LDQ     2,1
30574   0 26000 0 12512   2288       +37  FMP     COMMON              .2
30575   0 30000 1 00000   2289       +38  FAD     0,1                 A0
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30576  0 30000 0 12517  2290       +39  FAD   COMMON+5
30577 -0 05600 0 00001  2291  AYK8   LNT   1
30600  0 02000 0 30603  2292       +1   TRA   AYKR              ,,0=EFFICIENCY DESIRED
30601  0 24100 0 40234  2293       +2   FDP   FLIES
30602  0 13100 0 00000  2294       +3   XCA
30603  0 77400 4 00000  2295  AYKR   AXT   **0,4
30604  0 77400 1 00000  2296       +1   AXT   **0,1
30605  0 02000 4 00002  2297       +2   TRA   2,4
30606  0 56000 0 31070  2298  AYK4   LDQ   AYK3+3             1.31
30607  0 26000 0 12512  2299       +1   FMP   COMMON
30610  0 60100 0 12520  2300       +2   STO   COMMON+6          1.31X2
30611  0 50000 0 31067  2301       +3   CLA   AYK3+2           .9448
30612  0 30200 0 12520  2302       +4   FSB   COMMON+6
30613  0 60100 0 12521  2303       +5   STO   COMMON+7          Q/N MAX
30614  0 13100 0 00000  2304       +6   XCA
30615  0 26000 0 31071  2305       +7   FMP   AYK3+4
30616  0 60100 0 12541  2306       +8   STO   COMMON+23
30617  0 56000 0 34000  2307       +9   LDQ   TP+35              Q/N
30620  0 04000 0 30623  2308      +10   TLQ   AYK5
30621  0 75400 0 00000  2309      +11   PXA   ,0
30622  0 02000 0 30603  2310      +12   TRA   AYKR              PUMP TOO SLOW TO PUMP
30623 -0 60000 0 12523  2311  AYK5   STQ   COMMON+9           Q/N PRIME
30624  0 56000 0 12521  2312       +1   LDQ   COMMON+7
30625  0 26000 0 31072  2313       +2   FMP   AYK3+5           .95
30626  0 56000 0 34000  2314       +3   LDQ   TP+35
30627  0 04000 0 30632  2315       +4   TLQ   AYK6
30630 -0 05500 0 00002  2316       +5   SIL   2
30631  0 60100 0 12523  2317       +6   STO   COMMON+9          Q/N PRIME = .9K(Q/N)MAX
30632  0 50000 0 31073  2318  AYK6   CLA   AYK3+6           .44
30633  0 04000 0 30636  2319       +1   TLQ   AYK7
30634 -0 05500 0 00002  2320       +2   SIL   2               SET PARABOLA FLAG
30635  0 60100 0 12523  2321       +3   STO   COMMON+9          Q/N PRIME = .44
30636  0 50000 0 31066  2322  AYK7   CLA   AYK3+1           .36
30637  0 30200 0 12523  2323       +1   FSB   COMMON+9          Q/N PRIME
30640  0 60100 0 12513  2324       +2   STO   COMMON+1          X1
30641  0 30000 0 31074  2325       +3   FAD   AYK3+7           .5848
30642  0 30200 0 12520  2326       +4   FSB   COMMON+6
30643  0 60100 0 12522  2327       +5   STO   COMMON+8
30644  0 50000 0 12512  2328       +6   CLA   COMMON            X2
30645  0 24100 0 12520  2329       +7   FDP   COMMON+6
30646 -0 60000 0 12514  2330       +8   STQ   COMMON+2          X3
30647  0 50000 0 12513  2331       +9   CLA   COMMON+1          X1
30650  0 30200 0 31075  2332      +10   FSB   AYK3+8           .02
30651  0 60100 0 12524  2333      +11   STO   COMMON+10
30652  0 56000 1 00020  2334      +12   LDQ   16,1              DD
30653  0 26000 0 12512  2335      +13   FMP   COMMON
30654  0 30000 1 00017  2336      +14   FAD   15,1
30655  0 60100 0 12525  2337      +15   STO   COMMON+11
30656  0 56000 1 00014  2338      +16   LDQ   12,1              B6
30657  0 26000 0 12512  2339      +17   FMP   COMMON
30660  0 60100 0 12526  2340      +18   STO   COMMON+12
30661  0 56000 1 00016  2341      +19   LDQ   14,1              B8
30662  0 26000 0 12514  2342      +20   FMP   COMMON+2          X3
[illegible]

30664  0 30000 0 12526  2344      +22   FAD   COMMON+12
30665  0 30000 1 00013  2345      +23   FAD   11,1              B5
30666  0 13100 0 00000  2346      +24   XCA
30667  0 26000 0 12513  2347      +25   FMP   COMMON+1          X1
30670  0 30000 1 00007  2348      +26   FAD   7,1               B1
30671  0 60100 0 12527  2349      +27   STO   COMMON+13
30672  0 56000 1 00012  2350      +28   LDQ   10,1              B4
30673  0 26000 0 12512  2351      +29   FMP   COMMON
30674  0 60100 0 12530  2352      +30   STO   COMMON+14
30675  0 56000 1 00015  2353      +31   LDQ   13,1              B7
30676  0 26000 0 12514  2354      +32   FMP   COMMON+2
30677  0 60100 0 12534  2355      +33   STO   COMMON+18
30700  0 30000 0 12530  2356      +34   FAD   COMMON+14
30701  0 30000 0 12527  2357      +35   FAD   COMMON+13
30702  0 13100 0 00000  2358      +36   XCA
30703  0 26000 0 12513  2359      +37   FMP   COMMON+1          X1
30704  0 30000 1 00006  2360      +38   FAD   6,1               B0
30705  0 60100 0 12531  2361      +39   STO   COMMON+15
30706  0 56000 1 00010  2362      +40   LDQ   8,1               B2
30707  0 26000 0 12512  2363      +41   FMP   COMMON
30710  0 60100 0 12532  2364      +42   STO   COMMON+16
30711  0 56000 1 00011  2365      +43   LDQ   9,1
30712  0 26000 0 12514  2366      +44   FMP   COMMON+2          X3
30713  0 30000 0 12532  2367      +45   FAD   COMMON+16
30714  0 30000 0 12531  2368      +46   FAD   COMMON+15
30715  0 24100 0 12524  2369      +47   FDP   COMMON+10
30716  0 26000 0 12513  2370      +48   FMP   COMMON+1          X1
30717  0 30000 0 12525  2371      +49   FAD   COMMON+11
30720 -0 05600 0 00002  2372      +50   LNT   2
30721  0 02000 0 30577  2373      +51   TRA   AYK8              IF PARABOLA FLAG IS OFF, EXIT
30722  0 60100 0 12537  2374      +52   STO   COMMON+21
30723  0 50200 0 12514  2375      +53   CLS   COMMON+2
30724  0 24100 0 12522  2376      +54   FDP   COMMON+8
30725 -0 60000 0 12515  2377      +55   STQ   COMMON+3          X4
30726  0 26000 1 00011  2378      +56   FMP   9,1
30727  0 60100 0 12536  2379      +57   STO   COMMON+20
30730  0 56000 1 00016  2380      +58   LDQ   14,1
30731  0 26000 0 12513  2381      +59   FMP   COMMON+1
30732  0 30000 1 00015  2382      +60   FAD   13,1              B7
30733  0 13100 0 00000  2383      +61   XCA
30734  0 26000 0 12515  2384      +62   FMP   COMMON+3          X4
30735  0 60100 0 12535  2385      +63   STO   COMMON+19
30736  0 50200 1 00013  2386      +64   CLS   11,1              B5
30737  0 30200 0 12526  2387      +65   FSB   COMMON+12
30740  0 30200 0 12533  2388      +66   FSB   COMMON+17
30741  0 36100 0 40301  2389      +67   ACL   188
30742  0 30000 0 12535  2390      +68   FAD   COMMON+19
30743  0 13100 0 00000  2391      +69   XCA
30744  0 26000 0 12513  2392      +70   FMP   COMMON+1          X1
30745  0 30200 1 00007  2393      +71   FSB   7,1               B1
30746  0 30200 0 12530  2394      +72   FSB   COMMON+14
30747  0 30200 0 12534  2395      +73   FSB   COMMON+18
30750  0 30200 0 12536  2396      +74   FSB   COMMON+20
30751  0 24100 0 12524  2397      +75   FDP   COMMON+10
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30752  0 26000 0 12513  2398        +76  FMP   COMMON+1              X1
30753  0 60100 0 12540  2399        +77  STO   COMMON+22             PARTIAL Z WRT Q/N AT Q/N PRIME
30754  0 50000 0 12523  2400        +78  CLA   COMMON+9              D
30755  0 30200 0 12541  2401        +79  FSB   COMMON+23             G
30756  0 60100 0 12542  2402        +80  STO   COMMON+24
30757  0 13100 0 00000  2403        +81  XCA
30760  0 26000 0 12542  2404        +82  FMP   COMMON+24
30761  0 60100 0 12545  2405        +83  STO   COMMON+27             DENOMINATOR
30762  0 50200 0 12540  2406        +84  CLS   COMMON+22             E
30763  0 13100 0 00000  2407        +85  XCA
30764  0 26000 0 12523  2408        +86  FMP   COMMON+9              D
30765  0 30000 0 12537  2409        +87  FAD   COMMON+21             F
30766  0 60100 0 12543  2410        +88  STO   COMMON+25
30767  0 30000 0 12537  2411        +89  FAD   COMMON+21             F
30770  0 13100 0 00000  2412        +90  XCA
30771  0 26000 0 12523  2413        +91  FMP   COMMON+9              D
30772  0 60100 0 12544  2414        +92  STO   COMMON+26
30773  0 56000 0 12543  2415        +93  LDQ   COMMON+25
30774  0 26000 0 12541  2416        +94  FMP   COMMON+23
30775  0 30200 0 12544  2417        +95  FSB   COMMON+26
30776  0 24100 0 12545  2418        +96  FDP   COMMON+27
30777  0 26000 0 12541  2419        +97  FMP   COMMON+23             G
31000  0 60100 0 12550  2420        +98  STO   COMMON+30             C
31001  0 56000 0 12541  2421        +99  LDQ   COMMON+23             G
31002  0 26000 0 12541  2422       +100  FMP   COMMON+23
31003  0 13100 0 00000  2423       +101  XCA
31004  0 26000 0 12540  2424       +102  FMP   COMMON+22             E
31005  0 30000 0 12544  2425       +103  FAD   COMMON+26
31006  0 24100 0 12545  2426       +104  FDP   COMMON+27             DENOM
31007 -0 60000 0 12547  2427       +105  STO   COMMON+29             B
31010  0 56000 0 12542  2428       +106  LDQ   COMMON+24
31011  0 26000 0 12540  2429       +107  FMP   COMMON+22             E
31012  0 30200 0 12537  2430       +108  FSB   COMMON+21             F
31013  0 24100 0 12545  2431       +109  FDP   COMMON+27             DENOM
31014 -0 60000 0 12546  2432       +110  STO   COMMON+28             A
31015  0 26000 0 34000  2433       +111  FMP   TP+35                 Q/N
31016  0 30000 0 12547  2434       +112  FAD   COMMON+29             B
31017  0 13100 0 00000  2435       +113  XCA
31020  0 26000 0 34000  2436       +114  FMP   TP+35                 Q/N
31021  0 30000 0 12550  2437       +115  FAD   COMMON+30             C
31022  0 02000 0 30577  2438       +116  TRA   AYK8
31023  2 00576 1 40005  2439  AYK1      DEC      .74646,.07456,-.28222,-.74307,1.52787,-19.22319,.00335
31032  1 77523 7 00334  2440        +7  DEC      .33191,-.00636,.0011,-2.75204,-.67221,-18.35352,.16571
31041  2 01656 4 37300  2441       +14  DEC      1.68188,.74646,-.28222
31044  2 03577 6 50135  2442  AYK2      DEC      5.99732,1.64067,-.93201,-10.25526,3.80415,-62.58795
31052 -1 76413 5 30704  2443        +6  DEC      -.1307,.53358,.71196,-.01868,-2.30298,7.1731,-111.58496
31061 -1 77531 5 47502  2444       +13  DEC      -.33760,-2.20862,5.99732,-.93201
31065  1 56414 3 36750  2445  AYK3      DEC      2E-6                  MAXIMUM DELHSV/NSQ.
31066  1 77560 5 07534  2446        +1  DEC      .36                   Q/N DIVISION PT BETWEEN CURVES A, B
31067  2 00743 5 71515  2447        +2  DEC      .9448                 Q/N MAX CNST
31070  2 01517 2 70244  2448        +3  DEC      1.31                  X3 CNST
31071  2 00765 6 05075  2449        +4  DEC      .98                   Z=0 AT .98(Q/N MAX)
31072  2 00746 3 14632  2450        +5  DEC      .95                   USE PARABOLA ABOVE .95(Q/N MAX)
31073  1 77702 4 36561  2451        +6  DEC      .44                   USE PARABOLA BEYOND .44
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31074  2 00453 3 25637  2452        +7  DEC      .5848                 X3 CNST
31075  1 73507 5 34122  2453        +8  DEC      .02                   EQN 8 CNST
31076  0 56000 0 33773  2454  AYK9      LDQ   TP+30                  HSV/N**2
31077  0 26060 4 00001  2455        +1  FMP*  1,4                     RHO1
31100  0 13100 0 00000  2456        +2  XCA
31101  0 26000 0 40225  2457        +3  FMP   FL12                    NPSP/NSQ
31102  0 56000 0 31500  2458        +4  LDQ   AYK02                   MAXIMUM NPSP/NSQ
31103  0 04000 0 31105  2459        +5  TLQ   *+2
31104  0 13100 0 00000  2460        +6  XCA
31105  0 50000 0 34000  2461        +7  CLA   TP+35                   Q/N
31106  0 07400 4 40734  2462        +8  TSX   SCURV,4
31107  0 00061 0 00005  2463        +9  PZE   5,,49
31110  0 00000 0 00020  2464       +10  PZE   16
31111  0 00000 0 31113  2465       +11  PZE   AYK01
31112  0 02000 0 30603  2466       +12  TRA   AYKR
31113  1 45467 2 31151  2467  AYK01     DEC      453E-11,0.,0.,.16,0.,.18,573E-7,.21,596E-7,.22,606E-7,.24
31127  1 63402 2 74774  2468       +12  DEC      616E-7,.26,625E-7,.28,628E-7,.283,633E-7,.3,636E-7,.32
31141  1 63411 3 77556  2469       +22  DEC      633E-7,.33,627E-7,.36,0.,.4,0.,.5,0.,1.,0.
               31154  2470            BSS   16
31174  1 45635 5 41727  2471            DEC      602E-11,0.,0.,.15,0.,.18,58E-6,.21,598E-7,.22,607E-7,.24
31210  1 63402 6 23573  2472            DEC      617E-7
31211  1 77412 1 72703  2473            DEC      .26,627E-7,.28,635E-7,.29,638E-7,.31,643E-7,.33,636E-7
31223  1 77527 0 24366  2474            DEC      .335,632E-7,.342,625E-7,.38,582E-7,.4,0.,1.,0.
               31235  2475            BSS   16
31255  1 47401 5 45312  2476            DEC      15E-9,0.,0.,.13,0.,.18,594E-7,.21,609E-7,.22,617E-7,.24
31271  1 63406 4 40364  2477            DEC      626E-7,.26,634E-7,.28,641E-7,.29,643E-7,.31,645E-7,.33
31303  1 63415 2 14347  2478            DEC      642E-7,.35,639E-7,.37,631E-7,.4,617E-7,.45,0.,1.,0.
               31316  2479            BSS   16
31336  1 50402 4 35146  2480            DEC      301E-10,0.,0.,.12,0.,.18,607E-7,.21,621E-7,.22,629E-7,.24
31352  1 63413 1 32553  2481            DEC      637E-7,.26,642E-7,.28,646E-7,.29,647E-7,.31,647E-7,.33
31364  1 63416 7 47343  2482            DEC      646E-7,.35,644E-7,.37,64E-6,.39,635E-7,.45,0.,1.,0.
               31377  2483            BSS   16
31417  1 51402 4 35146  2484            DEC      602E-10,0.,0.,.1,0.,.16,616E-7,.206,634E-7,.22,639E-7,.24
31433  1 63416 0 71765  2485            DEC      644E-7,.26,647E-7,.28,649E-7,.29,65E-6,.31,651E-7,.33
31445  1 63420 5 02340  2486            DEC      65E-6,.35,647E-7,.37,644E-7,.41,633E-7,.46,0.,1.,0.
               31460  2487            BSS   16
31500  1 51402 4 35146  2488  AYK02     DEC      602E-10               MAXIMUM NPSP/NSQ

                        2490*REGION TO COMPUTE WORK REQUIRED TO DRIVE THE PUMP
31501  0 63400 4 31514  2491  AYL       SXA   AYLR,4
31502  0 50000 1 31524  2492        +1  CLA   AYLP,1
31503  0 62100 0 31505  2493        +2  STA   *+2
31504  0 07400 4 30527  2494        +3  TSX   AYK,4,0
31505  0 00000 0 00000  2495        +4  PZE   **0,0
31506  0 10000 0 31516  2496        +5  TZE   AYL2
31507  0 60100 0 12512  2497        +6  STO   COMMON
31510  0 50060 1 31526  2498        +7  CLA*  AYLW,1                  WDOTP
31511  0 24100 0 12512  2499        +8  FDP   COMMON
31512  0 26060 1 31522  2500        +9  FMP*  AYLD,1                  DELH
31513  0 60160 1 31520  2501       +10  STO*  AYLA,1
31514  0 77400 4 00000  2502  AYLR      AXT   **0,4
31515  0 02000 4 00001  2503        +1  TRA   1,4
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31517  0 02000 0 31514  2905          +1  TRA   AYLR
31520  0 00000 0 32667  2906    AYLA      PZE   P+41
31521  0 00000 0 34057  2907          +1  PZE   TP+82
31522  0 00000 0 34066  2908    AYLO      PZE   TP+89
31523  0 00000 0 34056  2909          +1  PZE   TP+81
31524  0 00000 0 34060  2910    AYLP      PZE   TP+83                 RHOL
31525  0 00000 0 34017  2911          +1  PZE   TP+50
31526  0 00000 0 32643  2912    AYLN      PZE   P+21
31527  0 00000 0 32677  2913          +1  PZE   P+49


                        2915*REGION TO COMPUTE ACTUAL WORK IN THE PUMP
31530  0 56000 0 32666  2916    AYM       LDQ   P+40                  N(I+1)          EQN PT11
31531  0 26000 0 32666  2917          +1  FMP   P+40
31532  0 60100 0 34015  2918          +2  STO   TP+48
31533  0 56000 0 32665  2919          +3  LDQ   P+39
31534  0 26000 0 32665  2920          +4  FMP   P+39
31535  0 30200 0 34015  2921          +5  FSB   TP+48                  N(I+1)**2
31536  0 24100 0 32637  2922          +6  FDP   P+17                   DELT
31537  0 26000 0 32751  2923          +7  FMP   C+2
31540  0 30200 0 32667  2924          +8  FSB   P+41                   WPACT(I)
31541  0 30000 0 32672  2925          +9  FAD   P+44                   WTACT(I+1)
31542  0 30000 0 32671  2926         +10  FAD   P+43                   WTACT(I)
31543  0 60100 0 32670  2927         +11  STO   P+42                   WPACT(I+1)
31544  0 02000 4 00001  2928         +12  TRA   1,4


                        2930*REGION TO COMPUTE HEAT RESISTANCE TERM, M, FOR ONE NODE
31545  0 56000 0 32622  2931    AYM       LDQ   P+4                   HF
31546 -0 52000 1 36071  2932          +1  NZT   DPX,1
31547  0 02000 0 31560  2933          +2  TRA   AYN1
31550  0 26000 1 36071  2934          +3  FMP   DPX,1
31551  0 30000 0 33761  2935          +4  FAD   TP+20                  K
31552  0 30000 0 33761  2936          +5  FAD   TP+20
31553  0 60100 0 33751  2937          +6  STO   TP+12
31554  0 56000 0 32622  2938          +7  LDQ   P+4                   HF
31555  0 26000 0 33761  2939          +8  FMP   TP+20
31556  0 36100 0 40301  2940          +9  ACL   188
31557  0 24100 0 33751  2941         +10  FDP   TP+12
31560 -0 60000 0 33751  2942    AYN1      STQ   TP+12
31561  0 50000 0 33731  2943          +1  CLA   WPR+7                  CP
31562  0 24100 0 33751  2944          +2  FDP   TP+12
31563  0 26000 0 32631  2945          +3  FMP   P+11                   WDOT
31564  0 24100 1 36064  2946          +4  FDP   DELZ,1
31565  0 13100 0 00000  2947          +5  XCA
31566  0 24100 0 33760  2948          +6  FDP   TP+19                  FP
31567  0 13100 0 00000  2949          +7  XCA
31570  0 60100 0 32627  2950          +8  STO   P+9                    M
31571  0 36100 0 40301  2951          +9  ACL   188
31572  0 30000 0 40213  2952         +10  FAD   FL1
31573  0 60100 0 33745  2953         +11  STO   TP+8                   2M+1
31574  0 30200 0 40214  2954         +12  FSB   FL2
31575  0 60100 0 33746  2955         +13  STO   TP+9                   2M-1
31576  0 13000 4 00001  2956         +14  TRL   1,4

31577 -0 62500 1 34560  2957         +15  STL   FX+3,1
31600  0 02000 4 00001  2958         +16  TRA   1,4


                        2960*MASTER CONTROL FOR PUMP AND TURBINE FOR TIME I (CORRECTIONS)
31601  0 63400 4 31610  2961    AYPA      SXA   AYPAR,4
31602  0 63400 1 31611  2962          +1  SXA   AYPAR+1,1
31603  0 77400 1 00000  2963          +2  AXT   0,1                    XR1= TIME I
31604  0 07400 4 30326  2964          +3  TSX   AYGA,4
31605  0 52000 0 32742  2965          +4  ZET   X+20
31606  0 02000 0 31613  2966          +5  TRA   AYPA1
31607  0 07400 4 30220  2967          +6  TSX   AYG,4
31610  0 77400 4 00000  2968    AYPAR     AXT   **0,4
31611  0 77400 1 00000  2969          +1  AXT   **0,1
31612  0 02000 4 00001  2970          +2  TRA   1,4
                        2971*P11 GIVEN
31613  0 50000 0 36201  2972    AYPA1     CLA   DP11
31614  0 60100 0 32662  2973          +1  STO   P+36
31615  0 50000 0 36202  2974          +2  CLA   DT11
31616  0 60100 0 32663  2975          +3  STO   P+37
31617  0 60100 0 34053  2976          +4  STO   TP+78
31620  0 07400 4 27531  2977          +5  TSX   AYB,4
31621  0 07400 4 31501  2978          +6  TSX   AYL,4
31622  0 60000 0 32645  2979          +7  STZ   P+23
31623  0 60000 0 32647  2980          +8  STZ   P+25
31624  0 60000 0 32660  2981          +9  STZ   P+34
31625  0 60000 0 32661  2982         +10  STZ   P+35
31626  0 02000 0 31610  2983         +11  TRA   AYPAR


                        2985*REGION TO PREDICT ENGINE AND TURBOPUMP PERFORMANCE FOR NEXT TIME POINT
31627  0 63400 4 31663  2986    AYPB      SXA   AYPBR,4
31630  0 63400 1 31664  2987          +1  SXA   AYPBR+1,1
31631 -0 77400 1 00001  2988          +2  AXC   1,1
31632  0 50000 0 32665  2989          +3  CLA   P+39
31633 -0 10000 0 31635  2990          +4  TNZ   *+2
31634  0 50000 0 31670  2991          +5  CLA   AYPB1
31635  0 60100 0 32666  2992          +6  STO   P+40                   N(I+1) GUESS
31636  0 50000 0 40305  2993          +7  CLA   BIG
31637  0 60100 0 40471  2994          +8  STO   NEWA9
31640  0 60000 0 40472  2995          +9  STZ   NEWA9+1
31641  0 50000 0 36145  2996         +10  CLA   DWPE
31642  0 07400 4 40407  2997         +11  TSX   NEWA,4
31643  0 32670 0 32666  2998         +12  PZE   P+40,,P+42
31644  0 00031 0 34057  2999         +13  PZE   TP+82,,25
31645  0 02000 0 31666  3000         +14  TRA   AYPB2                  NOT CONVERGED
31646  0 07400 4 30055  3001         +15  TSX   AYD,4                  FIND QP(I+1)
31647 -0 52000 0 32742  3002         +16  NZT   X+20                   NOT 0= P11 GIVEN
31650  0 07400 4 27402  3003         +17  TSX   AYA,4                  FIND P8
31651  0 07400 4 27531  3004         +18  TSX   AYB,4                  FIND WTACT
31652  0 07400 4 31501  3005         +19  TSX   AYL,4                  FIND WPACTPRIME
31653  0 07400 4 31530  3006         +20  TSX   AYM,4                  FIND WPACT
31654  0 07400 4 40477  3007         +21  TSX   RAPA,4
31655  0 52000 0 32736  3008         +22  ZET   X+16
31656  0 02000 0 31664  3009         +23  TRA   AYPB2
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31697   0 52000 0 32733   2610        +24  ZET   X+13
31660   0 02000 0 31666   2611        +25  TRA   AYPB2
31661   0 52000 0 32741   2612        +26  ZET   X+19
31662   0 02000 0 31666   2613        +27  TRA   AYPB2
31663   0 77400 4 00000   2614    AYPBR   AXT   **0,4
31664   0 77400 1 00000   2615        +1  AXT   **0,1
31665   0 02000 4 00001   2616        +2  TRA   1,4
31666  -1 31671 0 25440   2617    AYPB2   STR   AZPT,,AYPB3
31667   0 02000 0 31663   2618        +1  TRA   AYPBR
31670   2 19470 4 00000   2619    AYPB1   DEC      5000.              INITIAL N GUESS
31671  -0 75125 2 43123   2620    AYPB3   BCI   3,PREDICTOR FAILED

                          2622*REGION TO COMPUTE INLET AND OUTLET PRESSURE DROPS FOR ONE PART
31674   0 63400 4 31701   2623    AYQ     SXA   AYQR,4
31675   0 50000 0 32620   2624        +1  CLA   P+2                FLUID TEMP
31676   0 56000 0 32621   2625        +2  LDQ   P+3                PRESSURE
31677   0 07400 4 25564   2626        +3  TSX   AZH,4
31700   0 02000 0 31720   2627        +4  TRA   AYQ1
31701   0 77400 4 00000   2628    AYQR    AXT   **0,4
31702   0 44100 4 00000   2629        +1  LDI   0,4
31703   0 50200 1 36072   2630        +2  CLS   DKDP1,1
31704  -0 05400 0 00001   2631        +3  LFT   1
31705   0 50200 1 36073   2632        +4  CLS   DKDP0,1
31706   0 24100 0 33730   2633        +5  FDP   WPR+6                DENSITY
31707   0 26000 0 32631   2634        +6  FMP   P+11                 FLOW RATE
31710   0 24100 0 40214   2635        +7  FDP   FL2
31711   0 26000 0 32631   2636        +8  FMP   P+11
31712   0 24100 0 40236   2637        +9  FDP   FLG
31713   0 13100 0 00000   2638       +10  XCA
31714   0 60200 0 12512   2639       +11  SLW   COMMON               DELTA P
31715   0 30000 0 32621   2640       +12  FAD   P+3
31716   0 60100 0 32621   2641       +13  STO   P+3                  NEW PRESSUE
31717   0 02000 4 00002   2642       +14  TRA   2,4
31720   0 52200 0 31701   2643    AYQ1    XEC   AYQR
31721   0 02000 4 00001   2644        +1  TRA   1,4

                          2646*REGION TO COMPUTE VALUES FOR AZT
31722   0 63400 4 31775   2647    AYR     SXA   AYRR,4
31723   0 50000 0 32620   2648        +1  CLA   P+2                  T
31724   0 56000 0 32621   2649        +2  LDQ   P+3
31725   0 07400 4 25564   2650        +3  TSX   AZH,4
31726   0 02000 0 31777   2651        +4  TRA   AYR1
31727   0 50000 0 32616   2652        +5  CLA   P
31730   0 07400 4 42437   2653        +6  TSX   LINT,4
31731   0 00000 1 34625   2654        +7  PZE   WFP,1
31732   0 60100 0 33760   2655        +8  STO   TP+19
31733   0 50000 0 32616   2656        +9  CLA   P
31734   0 07400 4 42437   2657       +10  TSX   LINT,4
31735   0 00000 1 34567   2658       +11  PZE   WAF,1
31736   0 60100 0 33757   2659       +12  STO   TP+18
31737   0 24100 0 33760   2660       +13  FDP   TP+19
31740   0 26000 0 40216   2661       +14  FMP   FL4
31741   0 60100 0 33741   2662       +15  STO   TP+4                  D
31742   0 30000 1 36064   2663       +16  FAD   DELZ,1
31743   0 60100 0 33764   2664       +17  STO   TP+23
31744   0 07400 4 30353   2665       +18  TSX   AYH,4
31745   0 36156 2 35637   2666       +19  PZE   AZ01+1,2,DA
31746   0 50000 2 35637   2667       +20  CLA   AZ01+1,2
31747   0 07400 4 42437   2668       +21  TSX   LINT,4
31750   0 00000 1 35144   2669       +22  PZE   WK,1
31751   0 60100 0 33761   2670       +23  STO   TP+20
31752   0 07400 4 31545   2671       +24  TSX   AYN,4
31753   0 56000 0 40216   2672       +25  LDQ   FL4
31754   0 26000 1 36066   2673       +26  FMP   DFF,1
31755   0 24100 0 33741   2674       +27  FDP   TP+4                  D
31756   0 26000 1 36064   2675       +28  FMP   DELZ,1
31757   0 60100 0 33766   2676       +29  STO   TP+25
31760   0 50000 0 32631   2677       +30  CLA   P+11
31761   0 24100 0 33757   2678       +31  FDP   TP+18
31762  -0 60000 0 12512   2679       +32  STO   COMMON
31763   0 26000 0 12512   2680       +33  FMP   COMMON
31764   0 24100 0 40274   2681       +34  FDP   FL2GI
31765   0 26000 0 33723   2682       +35  FMP   WPR+1
31766   0 60100 0 34002   2683       +36  STO   TP+37
31767   0 50200 0 33757   2684       +37  CLS   TP+18                 AF
31770   0 24100 0 32637   2685       +38  FDP   P+17                 DELT
31771   0 26000 1 36064   2686       +39  FMP   DELZ,1
31772   0 60100 0 34074   2687       +40  STO   TP+95
31773   0 50000 0 33730   2688       +41  CLA   WPR+6
31774   0 60100 0 32623   2689       +42  STO   P+5
31775   0 77400 4 00000   2690    AYRR    AXT   **0,4
31776   0 02000 4 00002   2691        +1  TRA   2,4
31777   0 16200 0 32002   2692    AYR1    TQP   AYR2
32000   0 52200 0 31775   2693        +1  XEC   AYRR
32001   0 02000 4 00001   2694        +2  TRA   1,4
32002  -1 32003 0 25417   2695    AYR2    STR   AZFF,,AYR3
32003   2 22124 6 02643   2696    AYR3    BCI   3,BAD FLUID TMP, PRS

                          2698*REGION TO CHECK FOR MINIMUM OUTLET METAL TEMPERATURE
32006   0 50000 0 32617   2699    AYT     CLA   P+1                  M TEMP
32007   0 56000 0 36104   2700        +1  LDQ   DTMIN
32010   0 04000 4 00001   2701        +2  TLQ   1,4                  NOT COOL
32011   0 50000 0 32726   2702        +3  CLA   X+8                  PRINT INTERVAL
32012   0 40200 0 32727   2703        +4  SUB   X+9                  PRINT COUNTER
32013   0 40200 0 40200   2704        +5  SUB   FX1
32014  -0 10000 4 00001   2705        +6  TNZ   1,4                  WAIT UNTIL PRINT
32015  -1 32017 0 25421   2706        +7  STR   AZF,,AYT1
32016   0 02000 0 24430   2707        +8  TRA   START
32017   2 34646 4 32446   2708    AYT1    BCI   3,COOLDOWN REACHED

                          2710*REGION TO COMPUTE PARA HYDROGEN PROPERTIES
32022   0 63400 4 32070   2711    PRP     SXA   PRP1,4
32023   0 50000 0 33722   2712        +1  CLA   WPR                  PRESSURE
32024   0 56000 0 32111   2713        +2  LDQ   PRP4+1                1500
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32025   0 04C00 0 32072   2714          +3  TLQ   PRP7                ERROR RETURN FOR PRESS TOO BIG
32026   0 60C00 0 32100   2715          +4  STZ   PRP8
32027   0 56000 0 32107   2716          +5  LDQ   PRP6+3               14.7
32030   0 04000 0 32033   2717          +6  TLQ   PRP9
32031   0 60100 0 32100   2718          +7  STO   PRP8                 PRESS
32032  -0 60000 0 33722   2719          +8  STQ   WPR                  14.7
32033   0 50000 0 33727   2720    PRP5      CLA   WPR+5                TEMPERATURE
32034   0 30200 0 32110   2721          +1  PSB   PRP4                 36
32035  -0 12000 0 32076   2722          +2  TMI   PRP10                ERROR RETN TEMP TOO SMALL
32036   0 07400 4 13257   2723          +3  TSX   TMAL,4
32037   0 00000 0 33727   2724          +4  PZE   WPR+5                TEMP
32040   0 00000 0 33722   2725          +5  PZE   WPR                  PRESS
32041   0 50000 0 32102   2726          +6  CLA   PRP8+2               0
32042   0 00000 0 33730   2727          +7  PZE   WPR+6                DENSITY
32043   0 00000 0 32103   2728          +8  PZE   PRP8+3               0
32044   0 00000 0 33731   2729          +9  PZE   WPR+7                C P
32045   0 00000 0 33724   2730         +10  PZE   WPR+2                H
32046   0 07400 4 22027   2731         +11  TSX   VIS,4
32047   0 00000 0 33727   2732         +12  PZE   WPR+5                TEMP
32050   0 00000 0 33722   2733         +13  PZE   WPR                  PRESS
32051   0 00000 0 33730   2734         +14  PZE   WPR+6                DENS
32052   0 50000 0 32102   2735         +15  CLA   PRP8+2
32053   0 00000 0 33733   2736         +16  PZE   WPR+9                VISC
32054   0 00000 0 33732   2737         +17  PZE   WPR+8                K
32055   0 50000 0 32100   2738         +18  CLA   PRP8
32056   0 10000 0 32063   2739         +19  TZE   PRP11
32057   0 60100 0 33722   2740         +20  STO   WPR                  PRESS
32060   0 24100 0 32107   2741         +21  FDP   PRP6+3               14.7
32061   0 26000 0 33730   2742         +22  FMP   WPR+6                DENSITY
32062   0 60100 0 33730   2743         +23  STO   WPR+6
32063   0 50000 0 32106   2744    PRP11     CLA   PRP6+2               FL1
32064   0 24100 0 33730   2745          +1  FDP   WPR+6                DEN
32065   0 13100 0 00000   2746          +2  XCA
32066   0 24100 0 32112   2747          +3  FDP   PRP4+2               1728
32067  -0 60000 0 33723   2748          +4  STQ   WPR+1                SPECIFIC VOLUME
32070   0 77400 4 00000   2749    PRP1      AXT   **0,4
32071   0 02000 4 00002   2750          +1  TRA   2,4
32072   0 50000 0 32104   2751    PRP7      CLA   PRP6
32073   0 76500 0 00000   2752          +1  LRS   0
32074   0 52200 0 32070   2753          +2  XEC   PRP1
32075   0 02000 4 00001   2754          +3  TRA   1,4
32076   0 50000 0 32105   2755    PRP10     CLA   PRP6+1
32077   0 02000 0 32073   2756          +1  TRA   PRP7+1
                32100   2757    PRP8      BSS   4,F
32104   0 00001 0 00000   2758    PRP6      PZE   0,,1                 PRESSURE TOO BIG
32105   0 00002 0 00000   2759          +1  PZE   0,,2                 TEMP TOO SMALL
32106   2 C1400 0 00000   2760          +2  DEC      1.
32107   2 04726 3 14632   2761          +3  DEC      14.7
32110   2 06440 0 00000   2762    PRP4      DEC      36.
32111   2 13567 0 00000   2763          +1  DEC      1500.
32112   2 13660 0 00000   2764          +2  DEC      1728.
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2767 SEQUENCE TO PRINT INCH

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32113   0 63400 4 32222   2767    PRTD      SXA   PR99,4
32114   0 63400 2 32221   2768          +1  SXA   PR98,2
32115   0 63400 1 32220   2769          +2  SXA   PR971,1
32116  -0 62500 0 33734   2770          +3  STL   COLUM
32117   0 60000 0 32575   2771          +4  STZ   COUNT
32120   0 07400 4 00052   2772          +5  TSX   DOUT,4
32121   3 27451 0 32577   2773          +6  PTH   TCARD,,12073
32122   3 04110 0 00036   2774          +7  PTH   KDATEA,,2120
32123   3 04124 0 32573   2775          +8  PTH   PL2,,2132
32124  -1 00C01 0 00012   2776          +9  FVE   KPRINT,,1
32125   0 07400 4 00052   2777         +10  TSX   DOUT,4
32126   3 05773 0 40311   2778         +11  PTH   PR60,,3067
32127  -1 00024 0 00012   2779         +12  FVE   KPRINT,,20
32130   0 50000 0 40314   2780         +13  CLA   PR61
32131   0 62100 0 32134   2781         +14  STA   PR02
32132   0 60C00 0 40310   2782         +15  STZ   CUT
32133   0 77400 2 00000   2783         +16  AXT   0,2
32134   0 52000 2 36064   2784    PR02      ZET   D,2
32135   0 02C00 0 32150   2785          +1  TRA   PR03
32136   1 77777 2 32137   2786          +2  TXI   *+1,2,-1
32137   3 77766 2 32134   2787          +3  TXH   PR02,2,-10
32140   0 07400 4 32214   2788          +4  TSX   PR023,4
32141   0 53400 4 32134   2789    PR024     LXA   PR02,4
32142   1 00012 4 32143   2790          +1  TXI   *+1,4,10
32143   0 63400 4 32134   2791          +2  SXA   PR02,4
32144   0 52000 0 32721   2792          +3  ZET   X+3
32145   3 37357 4 32220   2793          +4  TXH   PR971,4,AZMTP          PRINT ONLY PART DATA AFTER 1ST PART
32146  -3 40177 4 32133   2794          +5  TXL   PR02-1,4,AZMTC         PRINT FROM D TO FX1
32147   0 02000 0 32220   2795          +6  TRA   PR971
32150   0 50000 0 32134   2796    PR03      CLA   PR02
32151   0 62100 0 32207   2797          +1  STA   PR04
32152   0 53400 4 32207   2798          +2  LXA   PR04,4
32153   0 63400 4 32172   2799          +3  SXA   PR10,4
32154   1 41550 4 32155   2800          +4  TXI   *+1,4,-AZD
32155   3 77633 4 32175   2801          +5  TXH   PR12,4,D-AZD-1
32156   0 75400 4 00000   2802          +6  PXA   ,4
32157   0 13100 0 00000   2803          +7  XCA
32160   0 75400 0 00000   2804          +8  PXA   ,0
32161   0 22100 0 32224   2805          +9  DVP   PR11                   FX150
32162  -0 10000 0 32206   2806         +10  TNZ   PR04-1
32163   0 13100 0 00000   2807         +11  XCA
32164   0 76700 0 00002   2808         +12  ALS   2
32165   0 73400 4 00000   2809         +13  PAX   ,4
32166  -0 63600 4 00061   2810         +14  SCD   KINDX4,4
32167   0 07400 4 00052   2811         +15  TSX   DOUT,4
32170   3 07675 4 32225   2812         +16  PTH   PR13,4,4029
32171   3 02060 0 32275   2813         +17  PTH   PR14,,1072
32172  -3 00101 0 00000   2814    PR10      SVN   **0,,65
32173  -1 00024 0 00012   2815          +1  FVE   10,,20
32174   0 02000 0 32206   2816          +2  TRA   PR04-1
32175   0 53500 4 40310   2817    PR12      LAC   CUT,4
32176  -3 00000 4 32201   2818          +1  TXL   *+3,4,0
32177   0 52000 0 32721   2819          +2  ZET   X+3
32200  -3 77766 4 32212   2820          +3  TXL   PR01,4,D-AZMTE         PRINT ONLY PART
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32201 -0 63400 4 00061   2821       +4  SXD    KINDX4,4
32202  0 07400 4 00052   2822       +5  TSX    DOUT,4
32203  3 01763 4 32276   2823       +6  PTH    PR15,4,1011
32204  0 21465 0 00001   2824       +7  PZE    1,,9013
32205 -1 00024 0 00012   2825       +8  FVE    10,,20
32206  0 07400 4 00052   2826       +9  TSX    DOUT,4
32207 -2 13574 0 00000   2827   PR04    SIX    0,,6012
32210  0 21465 0 00001   2828       +1  PZE    1,,9013
32211 -1 00012 0 00012   2829       +2  FVE    KPRINT,,10
32212  0 07400 4 32214   2830   PR01    TSX    PR023,4
32213  0 02000 0 32141   2831       +1  TRA    PR024
32214  0 50000 0 40310   2832   PR023   CLA    CUT
32215  0 40000 0 40211   2833       +1  ADD    FX10
32216  0 60100 0 40310   2834       +2  STO    CUT
32217  0 02000 4 00001   2835       +3  TRA    1,4
32220  0 77400 1 00000   2836   PR971   AXT    0,1
32221  0 77400 2 00000   2837   PR98    AXT    ,2
32222  0 77400 4 00000   2838   PR99    AXT    ,4
32223  0 02000 4 00001   2839       +1  TRA    1,4
32224  0 00000 0 00144   2840   PR11    PZE    100
32225  2 64346 6 66021   2841   PR13    BCI    4,FLOW AREA VS DISTANCE
32231 -2 62563 6 32524   2842       +4  BCI    4,WETTED PERIMETER VS Z
32235  2 65121 2 36360   2843       +8  BCI    4,FRACT HEAT GEN VS DIST
32241  3 14563 6 03025   2844      +12  BCI    4,INT HEAT GEN VS TIME
32245 -2 33025 5 14421   2845      +16  BCI    4,THERMAL CONDUCTIVITY
32251  2 36062 6 42260   2846      +20  BCI    4,C SUB R VS TEMPERATURE
32255  3 14543 2 56360   2847      +24  BCI    4,INLET TEMP VS TIME
32261  3 14543 2 56360   2848      +28  BCI    4,INLET PRESSURE VS TIME
32265 -0 66463 4 32563   2849      +32  BCI    4,OUTLET PRESSURE VS TIME
32271  2 72163 2 56047   2850      +36  BCI    4,GATE POSITION VS TIME
32275 -0 74631 4 56362   2851   PR14    BCI    1,POINTS
32276  2 42543 6 07160   2852   PR15
32277 -3 16047 6 36260   2853       +1
32300  2 65131 2 36360   2854       +2
32301 -2 54631 2 46026   2855       +3
32302 -1 13046 6 05160   2856       +4
32303 -2 62143 4 36067   2857       +5
32304  2 54563 7 06042   2858       +6
32305  2 56731 6 36042   2859       +7
32306  3 14543 6 36065   2860       +8  BCI    2,INLT VOTLT V
32310 -0 75131 4 56360   2861      +10
32311 -2 33144 2 56000   2862      +11
32312  2 42543 6 06360   2863      +12
32313 -2 36047 6 36260   2864      +13
32314  2 46360 4 43145   2865      +14
32315 -0 46343 6 06300   2866      +15
32316 -0 44560 6 34447   2867      +16
32317 -0 46760 6 34447   2868      +17
32320  2 43143 6 44563   2869      +18  BCI    2,DILUNTP1
32322 -2 30160 6 06060   2870      +20  BCI    1,T1
32323 -0 74660 4 43145   2871      +21
32324 -0 70260 2 34362   2872      +22
32325 -0 71060 2 34362   2873      +23
3[illegible] -[illegible]446[illegible]604[illegible] 28[illegible] [illegible]24

32327 -2 62446 6 36023   2875      +25
32330 -2 62446 6 36030   2876      +26
32331 -2 62360 2 34362   2877      +27
32332 -2 65160 2 34362   2878      +28
32333  2 16006 6 06060   2879      +29
32334  2 16062 6 32151   2880      +30  BCI     ,A STARNTB FFPARTS WALL TQ1 INTSWT   GATE PA(KV) B(KV) K(KT)
32346 -0 26002 6 06060   2881      +40  BCI    3,K 2   D 2   D H
32351  2 46063 4 36060   2882      +43
32352  2 46063 4 56060   2883      +44
32353  2 46051 4 56060   2884      +45
32354  3 16047 6 36060   2885      +46
32355 -2 24725 2 52460   2886      +47
32356  3 06023 4 36260   2887      +48  BCI    2,H CLS WP CLS
32360  3 02260 4 36330   2888      +50
32361 -0 50060 6 06760   2889      +51
32362  2 46023 4 66060   2890      +52
32363 -0 50060 3 04362   2891      +53
32364 -2 06360 6 06060   2892      +54  BCI     , T     R     THETA       A COLOB COLDC COLDA HOT B HOT C HOT
32376  2 65123 6 36023   2893      +64  BCI     ,FRCT CFRCT H      K(PHM)K(PCM)K(DLP)KC CMPKC INCR COLDR HOT
32410 -0 26001 0 16060   2894      +74
32411 -0 26011 6 06060   2895      +75
32412 -0 26025 6 06060   2896      +76
32413 -0 76001 0 16060   2897      +77  BCI    3,P 11  T 11  0=NO B
32416 -2 22523 6 00160   2898      +80  BCI     ,SEC 1 K 1   SEC 2 K 2   SEC 3 K 3   SEC 4 K 4   SEC 5 K 5
32430 -2 22523 6 00660   2899      +90  BCI     ,SEC 6 K 6   SEC 7 K 7   SEC 8 K 8   SEC 9 K 9   SEC 10K 10
                         2900*PRINT REGION
32442  0 63400 4 32522   2901   PRINT   SXA    PP97,4
32443  0 63400 2 32523   2902       +1  SXA    PP98,2
32444  0 63400 1 32524   2903       +2  SXA    PP99,1
32445  0 52000 0 33734   2904       +3  ZET    COLUM
32446  0 02000 0 32526   2905       +4  TRA    PZ
32447  0 53400 4 40315   2906       +5  LXA    PP40,4
32450  0 63400 4 32470   2907       +6  SXA    PP06,4
32451 -0 53400 4 40315   2908       +7  LXD    PP40,4
32452  0 63400 4 32504   2909       +8  SXA    PP075,4
32453 -0 53400 2 40316   2910       +9  LXD    PP41,2
32454  3 00000 2 32461   2911      +10  TXH    PP04,2,0
32455  0 07400 4 00052   2912   PP01    TSX    DOUT,4
32456  3 27451 0 32577   2913       +1  PTH    TCARD,,12073
32457  3 04110 0 00036   2914       +2  PTH    KDATEA,,2120
32460 -1 00001 0 00012   2915       +3  FVE    KPRINT,,1
32461  1 77777 2 32462   2916   PP04    TXI    *+1,2,-1
32462  3 77767 2 32465   2917       +1  TXH    *+3,2,-9
32463  0 60000 0 40316   2918       +2  STZ    PP41
32464  0 02000 0 32453   2919       +3  TRA    PP01-2
32465 -0 63400 2 40316   2920       +4  SXD    PP41,2
32466  0 77400 2 00010   2921       +5  AXT    X/8-P/8,2             OK SINCE P IS A MULTIPLE OF 8
32467  0 77400 1 00000   2922   PP05    AXT    0,1
32470  0 52000 1 32616   2923   PP06    ZET    P,1
32471  0 02000 0 32501   2924       +1  TRA    PP07
32472  1 77777 1 32473   2925       +2  TXI    *+1,1,-1
32473  3 77770 1 32470   2926       +3  TXH    PP06,1,-8
32474 -0 53400 4 40316   2927       +4  LXD    PP41,4
32475  3 77776 4 32513   2928       +5  TXH    PP09,4,-2
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32476  1 00001 4 32477   2929          +6  TXI   **1,4,1
32477 -0 63400 4 40316   2930          +7  SXD   PP41,4
32500  0 02000 0 32513   2931          +8  TRA   PP09
32501  0 53400 4 32470   2932     PP07     LXA   PP06,4
32502  0 63400 4 32510   2933          +1  SXA   PP08,4
32503  0 07400 4 00052   2934          +2  TSX   DOUT,4
32504  3 01757 0 40317   2935     PP079    PTH   HEDER,,1007
32505  0 15547 0 00001   2936          +1  PZE   1,,7015
32506 -1 00024 0 00012   2937          +2  FVE   KPRINT,,20
32507  0 07400 4 00052   2938          +3  TSX   DOUT,4
32510 -2 17515 0 32616   2939     PP08     SIX   P,,8013
32511  0 15547 0 00001   2940          +1  PZE   1,,7015
32512 -1 00012 0 00012   2941          +2  FVE   KPRINT,,10
32513  0 53400 4 32504   2942     PP09     LXA   PP079,4
32514  1 00010 4 32515   2943          +1  TXI   **1,4,8
32515  0 63400 4 32504   2944          +2  SXA   PP079,4
32516  0 53400 4 32470   2945          +3  LXA   PP06,4
32517  1 00010 4 32520   2946          +4  TXI   **1,4,8
32520  0 63400 4 32470   2947          +5  SXA   PP06,4
32521  2 00001 2 32467   2948          +6  TIX   PP05,2,1
32522  0 77400 4 00000   2949     PP97     AXT   ,4
32523  0 77400 2 00000   2950     PP98     AXT   ,2
32524  0 77400 1 00000   2951     *P99     AXT   ,1
32525  0 02000 4 00001   2952          +1  TRA   1,4
32526  0 07401 4 32541   2953     PZ       TSX   PL,4,1
32527 -0 53400 4 32575   2954          +1  LXD   COUNT,4
32530  3 00001 4 32533   2955          +2  TXH   PA,4,1
32531  0 07400 4 32563   2956          +3  TSX   PC,4                    PRINT COLUMN HEADS
32532 -1 00024 0 00012   2957          +4  FVE   KPRINT,,20
32533  0 07400 4 00052   2958     PA       TSX   DOUT,4
32534 -2 13621 0 32616   2959          +1  SIX   P,,6033
32535  0 11625 0 00001   2960          +2  PZE   1,,5013
32536 -2 13737 0 32631   2961          +3  SIX   P+11,,6111
32537 -1 00012 0 00012   2962          +4  FVE   10,,10
32540  0 02000 0 32522   2963          +5  TRA   PP97
                         2964*SUBROUTINE TO TEST LINE COUNT AND PRINT PAGE HEAD
32541  0 63400 4 32561   2965     PL       SXA   PLR,4
32542  0 44100 4 00000   2966          +1  LDI   0,4
32543 -0 05700 7 77700   2967          +2  RIL   777700
32544 -0 04600 0 00000   2968          +3  PIA
32545  0 62200 0 32556   2969          +4  STD   PF
32546 -0 53400 4 32575   2970          +5  LXD   COUNT,4
32547  3 00000 4 32556   2971          +6  TXH   PF,4,0
32550  0 07400 4 00052   2972     PL1      TSX   DOUT,4
32551  3 27451 0 32577   2973          +1  PTH   TCARD,,12073
32552  3 04110 0 00036   2974          +2  PTH   KDATEA,,2120
32553  3 04124 0 32573   2975          +3  PTH   PL2,,2132
32554 -1 00001 0 00012   2976          +4  FVE   KPRINT,,1
32555  0 77400 4 00000   2977          +5  AXT   0,4
32556  1 00000 4 32557   2978     PF       TXI   **+1,4,**0
32557  3 00067 4 32550   2979          +1  TXH   PL1,4,NLMAX
32560 -0 63400 4 32575   2980     PG       SXD   COUNT,4
32561  0 77400 4 00000   2981     PLR      AXT   **0,4
32562  0 02000 0 00001   2982          +1  TRA   1,4
                         2983*SUBROUTINE TO PRINT COLUMN HEADS
32563 -0 63400 4 00061   2984     PC       SXD   KINDX4,4
32564  0 07400 4 00052   2985          +1  TSX   DOUT,4
32565  3 02011 C 40317   2986          +2  PTH   HEDER,,1033
32566  0 11625 0 00001   2987          +3  PZE   1,,5013
32567  3 02127 C 40332   2988          +4  PTH   HEDER+11,,1111
32570  1 C0000 4 00001   2989          +5  PON   1,4
32571 -0 53400 4 00061   2990          +6  LXD   KINDX4,4
32572  0 C2000 4 00002   2991          +7  TRA   2,4
32573 -2 06633 6 04633   2992     PL2      BCI   2, W. O.= 0718           CONFIDENTIAL R D WORK ORDER NO.


32575  0 00000 0 00000   2994     COUNT    PZE   0,,0
32576  0 02000 0 42566   2995     ENDO     TRA   END


                         32577   2997     TCARD    BSS   15,0
                         32616   2998     P        BSS   64,F          PERMENANT STORAGE
                         32716   2999     X        BSS   25,0          FIXED POINT AND OCTAL STORAGE
                         32747   3000     C        BSS   20,F          SOME PROG CNSTS (FLOATING PT)
                         32773   3001     WTI      BSS   147,F         INLET TEMP
                         33216   3002     WPI      BSS   147,F         INLET PRESS
                         33441   3003     WPO      BSS   147,F         OUTLET PRESS
                         33664   3004     WGP      BSS   30,F          GATE POSITION
                         33722   3005     WPR      BSS   10,F          PROPERTIES OF PARA HYDROGEN
                         33734   3006     COLUM    BSS   1,F
                         33735   3007     TP       BSS   100,F         TEMPORARY STORAGE
                         34101   3008     AZMTB    EQU   **+1          BEGINNING OF PART STORAGE
                                 3009*BEGINNING OF PART STORAGE
                         34101   3010     AZ02     BSS   NZMAX,F       TEMPORARY FLOW RATE, LB/SEC
                         34163   3011     AZ03     BSS   NZMAX,F       FLUID TEMPS, DEGR
                         34245   3012     AZ04     BSS   NZMAX,F       PRESSURE, PSIA
                         34327   3013     AZ05     BSS   NZMAX,F       FILM COEFF, BTU/IN2-SEC-DEGR
                         34411   3014     AZ07     BSS   NZMAX,F       NEW FLUID DENSITIES, LB/IN3
                         34473   3015     AZ09     BSS   NZMAX,F       CSUBP
                         34555   3016     FX       BSS   10,0
                         34567   3017     WAF      BSS   30,F          FLOW AREA
                         34625   3018     WFP      BSS   30,F          WETTED PERIMETER
                         34663   3019     WH       BSS   30,F          FRACT HEAT GEN VS DISTANCE
                         34721   3020     WHT      BSS   147,F         INT HEAT GEN VS TIME
                         35144   3021     WK       BSS   147,F         THERMAL CONDUCTIVITY
                         35367   3022     WCR      BSS   147,F         HEAT CAPACITY OF METAL
                                 3023*THE FOLLOWING CELLS ARE RELATIVE TO D
                         35612   3024     PT       BSS   20,F          FLOATING POINT STORAGE, EACH PART
                         35636   3025     AZ01     BSS   NZMAX,F       OLD METAL TEMPS, DEGR
                         35720   3026     AZ06     BSS   NZMAX,F       OLD DENSITIES, LB/IN3
                         36002   3027     AZ08     BSS   NZMAX,F       PERMENANT FLOW RATE, LB/SEC
                         36064   3028     D        EQU   **1           INPUT STORAGES
                         36064   3029     DELZ     BSS   1,F          POSITION INCREMENT, IN
                         36065   3030     DNMAX    BSS   1,F          *NC. POSITION PTS, 3= IGNORE THIS PT
                         36066   3031     DFF      BSS   1,F          FRICTION FACTOR
                         36067   3032     DVF      BSS   1,F          VOID FRACTION
                         36070   3033     DRHOR    BSS   1,F          METAL DENSITY, LB/CU IN
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36071   3034   DPX      BSS   1,F                  *WALL THICK, IN, NOT O= PIPE OPTION
36072   3035   DKDPI    BSS   1,F                  K FOR INLET PRESS DROP, 1/IN4
36073   3036   DKDPO    BSS   1,F                  K FOR OUTLET PRESS DROP, 1/IN4
36074   3037   DVI      BSS   1,F                  INLET PLENUM, IN3
36075   3038   DVO      BSS   1,F                  OUTLET PLENUM, IN3
36076   3039   AZMTE    EQU   *+1                  END OF PART STORAGE
        3040*PART STORAGE ENDS HERE
36076   3041            ORG   D+10                 WHOLE ENGINE SYSTEM INPUT
36076   3042   DPRI     BSS   1,F                  PRINT INTERVAL
36077   3043   DTMI     BSS   1,F                  *INIT TIME, NOT O= RESTART PROGRAM
36100   3044   DELT     BSS   1,F                  TIME INCREMENT, SEC
36101   3045   DNDT     BSS   1,F                  NO. TIME INCREMENTS
36102   3046   DMDT     BSS   1,F                  MINIMUM TIME INTERVAL, SEC
36103   3047   DTMO     BSS   1,F                  INITIAL METAL TEMP, DEGR
36104   3048   DTMIN    BSS   1,F                  MIN OUTLET METAL TEMP, DEGR
36105   3049   DTMAX    BSS   1,F                  MAX ALLOWABLE FLUID TEMP, DEGR
36106   3050   DDIL     BSS   1,F                  STATION FOR REMOVAL OF DILUENT
36107   3051   DPI      BSS   1,F                  *TANK PRESSURE, PSIA, O= USE CURVE
36110   3052   DTI      BSS   1,F                  TANK TEMPERATURE, DEGR
36111   3053   DPO      BSS   1,F                  *MIN OUTLET PRESS, O= USE CURVE
36112   3054   DP8E     BSS   1,F                  P8 CLOSURE
36113   3055   DP12E    BSS   1,F                  P12 CLOSURE
36114   3056   DWP      BSS   1,F                  INITIAL PUMP FLOW GUESS, LB/SEC
36115   3057   DWC      BSS   1,F                  INITIAL DILUENT FLOW GUESS, LB/SEC
36116   3058   DWH      BSS   1,F                  INITIAL HOT BLEED FLOW GUESS, LB/SEC
36117   3059   DWCE     BSS   1,F                  WDOT C CLOSURE
36120   3060   DWRE     BSS   1,F                  WDOT R CLOSURE
36121   3061   DA6      BSS   1,F                  AREA OF CORE OUTLET, IN2
36122   3062   DASTR    BSS   1,F                  NOZZLE THROAT AREA, IN
36123   3063   DNZFF    BSS   1,F                  *NOZ TUBE FRICT FACTOR, O= NO TUBES
36124   3064   DNP      BSS   1,F                  NO. NOZ TUBE SEGMENTS
36125   3065   DWT      BSS   1,F                  NOZ TUBE WALL THICKNESS, IN
36126   3066   DQINT    BSS   1,F                  INIT P1 FOR NOZ TUBES
36127   3067   DSWT     BSS   1,F                  *7= PRINT NOZZLE TUBE ITERATIONS
36130   3068   DGP      BSS   1,F                  *GATE POSITION, PERCENT, O=USE CURVE
36131   3069   DAKV     BSS   1,F                  CNST FOR KV COMP
36132   3070   DBKV     BSS   1,F                  CNST FOR KV COMP
36133   3071   DK       BSS   1,F                  K FOR KT COMPUTATION
36134   3072   DK2      BSS   1,F                  K FOR NOZ TUBE INLET LINE
36135   3073   DD2      BSS   1,F                  DIAM OF NOZ TUBE INLET LINE, IN
36136   3074   DDH      BSS   1,F                  DIAM OF HOT BLEED PORT, IN
36137   3075   DDTL     BSS   1,F                  DIAM OF TURBINE LINE, SQIN
36140   3076   DDTN     BSS   1,F                  DIAM OF TURBINE NOZZLE, IN
36141   3077   DDRN     BSS   1,F                  DIAM OF ROLL CONTROL NOZZLE,IN
36142   3078   DIPT     BSS   1,F                  MOMENT OF PUMP AND TURBINE, LB-SQIN
36143   3079   DNI      BSS   1,F                  INITIAL TURBINE SPEED, RPM
36144   3080   DHE      BSS   1,F                  PUMP HEAD CLOSURE
36145   3081   DWPE     BSS   1,F                  PUMP WORK CLOSURE
36146   3082   DL       BSS   1,F                  LENGTH OF HOT BLEED PORT, IN
36147   3083   DNX      BSS   1,F                  NO. POSITION STEPS IN HBP
36150   3084   DDCD     BSS   1,F                  DIAM OF COLD FLOW HOLES, IN
36151   3085   DNH      BSS   1,F                  NO. COLD FLOW HOLES
36152   3086   DT       BSS   1,F                  THICKNESS OF COLD FLOW ANNULUS, IN
 615    308    D                                   THI  F H  B  CL  HO  N
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               36154   3088   DTHET    BSS   1,F            DILUENT IMPINGENT ANGLE, DEG
               36155   3089   TK       EQU   *+1            THE NEXT 20 VALUES ARE FOR HBP
               36155   3090            BSS   1              NOT USED
               36156   3091   DA       BSS   1,F            COLD FILM COEFF CNST
               36157   3092   DB       BSS   1,F            COLD FILM COEFF CNST
               36160   3093   DC       BSS   1,F            COLD FILM COEFF CNST
               36161   3094   DAHOT    BSS   1,F            HOT FILM COEFF CNST
               36162   3095   DBHOT    BSS   1,F            HOT FILM COEFF CNST
               36163   3096   DCHOT    BSS   1,F            HOT FILM COEFF CNST
               36164   3097   DFCLD    BSS   1,F            HBP COLD FRICTION FACTOR
               36165   3098   DFHOT    BSS   1,F            HBP HOT FRICTION FACTOR
               36166   3099            BSS   1              NOT USED
               36167   3100   DKPHM    BSS   1,F            K FOR PHM,PO8,CHM,CC
               36170   3101   DKPCM    BSS   1,F            K FOR PCM,CC
               36171   3102   DKIN     BSS   1,F            K FOR DELTA P
               36172   3103   DKCC     BSS   1,F            COMPRESSIBLE
               36173   3104   DKCI     BSS   1,F            INCOMPRESSIBLE
               36174   3105   DRC      BSS   1,F            COLD GAS CNST
               36175   3106   DRH      BSS   1,F            HOT GAS CNST
               36176   3107   DK11     BSS   1,F            K11 FOR PO8
               36177   3108   DK9      BSS   1,F            K9 FOR PO8
               36200   3109   DKE      BSS   1,F            KE FOR PO8
               36201   3110   DP11     BSS   1,F            *TURBINE INLET PRESS, PSIA, O=NO BOT
               36202   3111   DT11     BSS   1,F            TURBINE INLET TEMP, DEGR
               36203   3112   DKFLG    BSS   1,F            *NOT O=BELLOWS SECTIONS INPUT
               36204   3113            ORG   D+80           BELLOWS SECTION INPUT
               36204   3114   BELLO    BSS   20,F           BELLOW SECTION CNSTS,(SEC, K)
               36230   3115            ORG   D+100          CURVE INPUT STORAGES
               36230   3116   AZD      BSS   100*NCURV,F    D AND AZD MULTIPLES OF 10
               40177   3117   AZMTC    EQU   *              END OF ALL CURVES

40200  0 00000 0 00001   3119   FX1      PZE   1
40201  0 00000 0 00002   3120   FX2      PZE   2
40202  0 00000 0 00003   3121   FX3      PZE   3
40203  0 00000 0 00004   3122   FX4      PZE   4
40204  0 00000 0 00005   3123   FX5      PZE   5
40205  0 00000 0 00006   3124   FX6      PZE   6
40206  0 00000 0 00007   3125   FX7      PZE   7
40207  0 00000 0 00010   3126   FX8      PZE   8
40210  0 00000 0 00011   3127   FX9      PZE   9
40211  0 00000 0 00012   3128   FX10     PZE   10
40212  0 00000 0 01750   3129   FX1E3    PZE   1000
40213  2 01400 0 00000   3130   FL1
40214  2 02400 0 00000   3131   FL2
40215  2 02600 0 00000   3132   FL3
40216  2 03400 0 00000   3133   FL4
40217  2 03500 0 00000   3134   FL5
40220  2 03600 0 00000   3135   FL6
40221  2 03700 0 00000   3136   FL7
40222  2 04400 0 00000   3137   FL8
40223  2 04440 0 00000   3138   FL9
40224  2 04500 0 00000   3139   FL10
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40226  1 77631 4 63146    3141    FL.4     DEC        .4
40227  2 00714 6 31463    3142    FL.9     DEC        .9
40230  2 01431 4 63146    3143    FL1.1    DEC        1.1
40231  2 01463 1 46315    3144    FL1.2    DEC        1.2
40232  2 01600 0 00000    3145    FL1.5    DEC        1.5
40233  2 00746 3 14632    3146    FL.95    DEC        .95
40234  2 21606 5 00000    3147    FL1E5    DEC        1E5
40235  2 37436 0 64300    3148    FL12E8   DEC        12E8
40236  2 11601 5 77627    3149    FLG      DEC        385.7496          GRAVITY, IN-LB/LBF-SEC
40237  2 12602 2 00000    3150    FLR      DEC        772.5             GAS CNST, FT-LBF/LB-DEGR
40240  2 00774 3 15101    3151    FLRB     DEC        .99297            GAS CNST, BTU/LB-DEGR
40241  1 76435 7 15153    3152    FL139    DEC        .1396             LB-DEGR**.5/SEC-LBF
40242  2 12604 7 70244    3153    FL776    DEC        777.97            FT-LBF/BTU
40243  1 70444 0 16431    3154    FLGAL    DEC        .002228           FT**3-MIN/GAL-SEC
40244  2 10440 0 00000    3155    FL144    DEC        144.              SQIN/SQFT
40245  2 13660 0 00000    3156    FLCUF    DEC        1728.             CUIN/CUFT
40246  2 16521 4 00000    3157    FL108    DEC        10800.
40247  2 07763 1 46315    3158    FL2RW    DEC        124.8             2*DENSITY OF WATER, LB/FT3
40250  1 75631 4 63146    3159    FL.1     DEC        .1
40251  1 76631 4 63146    3160    FL.2     DEC        .2
40252  1 76700 4 06112    3161    FL.219   DEC        .219
40253  1 77400 0 00000    3162    FL.25    DEC        .25
40254  2 00400 0 00000    3163    FL.5     DEC        .5
40255  2 00463 1 46315    3164    FL.6     DEC        .6
40256  2 00631 4 63146    3165    FL.8     DEC        .8
40257  2 02671 4 63146    3166    FL3.45   DEC        3.45
4026C  2 06602 1 72703    3167    FL48.2   DEC        48.28
40261  2 06720 C 00000    3168    FL58     DEC        58.0
40262  2 02731 4 63146    3169    FL3.7    DEC        3.7
40263  2 07410 0 00000    3170    FL66     DEC        66.
40264  2 07620 0 00000    3171    FL100    DEC        100.
40265  2 10401 4 63146    3172    FL128.   DEC        128.8
40266  2 10550 0 00000    3173    FL180    DEC        180.
40267  2 11440 0 00000    3174    FL288    DEC        288.
40270  2 12764 C 00000    3175    1000.    DEC        1000.
40271  2 02622 0 77327    3176    FLPI     DEC        3.1415927
40272  2 06401 3 10721    3177    FLGF     DEC        32.17405          GRAVITY, FT-LB/LBF-SEC2
40273  2 07401 3 10721    3178    FL2G     DEC        64.3481
40274  2 12601 5 77627    3179    FL2GI    DEC        771.4992          2*GRAVITY, IN-LB/LBF-SEC2
40275  2 02622 0 77324    3180    PI
40276  2 03622 0 77325    3181    2PI
40277  1 73435 7 50646    3182    RAD
40300  2 06712 2 73406    3183    DEG
                          3184*OCTAL CONSTANTS
40301  0 01000 0 00000    3185    1B8      DEC        1B8
40302  0 02000 0 00000    3186    2B8      DEC        2B8
40303  0 00000 0 00000    3187    ZERO     PZE      0,,0
40304 -2 06060 6 06060    3188    BLANK
40305  3 77777 7 77777    3189    BIG      OCT      377777777777
40306  2 33000 0 00000    3190    FIX      OCT      233000000000

40307  2 [illegible]0 6 [illegible]060  3192  BCDD  BCI  1,[illegible]
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40310  0 00000 0 00000    3193    CUT      PZE    0
40311 -0 75146 2 75121    3194    PR60
40312 -0 46031 4 54764    3195        +1
40313 -2 36060 6 06060    3196        +2
40314  0 40307 0 36064    3197    PR61     PZE    D,,BCDD
40315  0 40317 0 32616    3198    PP40     PZE    P,,HEDER
40316  0 00000 0 00000    3199    PP41     PZE    0,,0
40317 -3 16024 3 16263    3200    HEDER
40320 -0 42563 4 36063    3201        +1
40321  2 64364 2 46063    3202        +2
40322 -0 75125 6 26260    3203        +3
40323  2 63143 4 46023    3204        +4
40324 -2 05130 4 66060    3205        +5   BCI    1, RHO
40325 -2 06045 6 06060    3206        +6
40326 -2 06261 0 26060    3207        +7
40327  3 06360 2 72545    3208        +8
40330 -2 06044 6 06060    3209        +9   BCI    1,   M
40331 -2 33144 2 56060    3210        +10
40332 -2 62446 6 36051    3211        +11
40333 -2 02225 6 32160    3212        +12
40334 -2 06360 0 66060    3213        +13
40335 -1 16360 6 30660    3214        +14
40336  3 06265 6 03160    3215        +15  BCI    2,HSV I HSVI+1
40340  2 42543 6 06360    3216        +17
40341 -0 74660 4 43145    3217        +18
40342 -1 00131 4 53163    3218        +19
40343 -2 06060 6 06060    3219        +20
40344 -2 62446 6 36047    3220        +21
40345 -2 62446 6 36023    3221        +22
40346 -2 62446 6 36030    3222        +23
40347 -2 62446 6 36045    3223        +24  BCI    8,WDOT NWDOT T      NT CHK P 1   T 1   P 2   T 2
40357 -2 04760 0 66060    3224        +32  BCI    8, P 6   G P   P 8   T 8   P 11  T 11  P 12  N(I)
40367 -0 57431 2 00134    3225        +40
40370 -2 64721 2 36360    3226        +41
40371 -2 64721 3 12001    3227        +42
40372 -2 66321 2 36360    3228        +43
40373 -2 66321 3 12001    3229        +44
40374  2 14347 3 02160    3230        +45
40375 -0 70260 3 12001    3231        +46
40376 -2 30260 3 12001    3232        +47
40377  2 43060 3 12001    3233        +48
40400 -2 64760 3 12001    3234        +49
40401 -1 04760 3 12001    3235        +50
40402 -2 06060 6 06060    3236        +51
40403 -2 04760 0 36060    3237        +52
40404 -2 06360 0 36060    3238        +53
40405 -2 04760 2 36060    3239        +54
40406 -2 06360 2 36060    3240        +55


                          3242*NEWTONS ITERATION ROUTINE FOR ONE VARIABLE
                          3243*CLOSURE IN AC, MAX AND MIN SET
                          3244*        TSX      NEWA,4
                          3245*        PZE      [illegible]
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                                3246*      PZE     LI(YPRIME),,MAX NO. ITERATIONS
                                3247*                              NON-CONVERGENCE EXIT
                                3248*                              EVALUATE
                                3249*      TSX     RAPA,4
                                3250*                              CONVERGED
40407   0 60100 0 40473   3251    NEWA    STO     NEWA1           CLOSURE IN AC
40410   0 60000 0 40475   3252        +1  STZ     NEWA1+2
40411  -0 50000 4 00001   3253        +2  CAL     1,4             X
40412   0 62100 0 40524   3254        +3  STA     RAPA5
40413   0 62100 0 40533   3255        +4  STA     RAPA6
40414   0 62100 0 40537   3256        +5  STA     RAPA1
40415   0 62100 0 40542   3257        +6  STA     RAPA7
40416   0 62100 0 40433   3258        +7  STA     NEWA8
40417   0 77100 0 00022   3259        +8  ARS     18              Y1
40420   0 62100 0 40477   3260        +9  STA     RAPA
40421   0 62100 0 40506   3261       +10  STA     RAPA8
40422  -0 50000 4 00002   3262       +11  CAL     2,4             Y2
40423   0 62100 0 40504   3263       +12  STA     RAPA+5
40424   0 77100 0 00022   3264       +13  ARS     18              MAX NO. ITERATIONS
40425   0 62100 0 40427   3265       +14  STA     NEWA2+1
40426   0 63400 4 40432   3266    NEWA2   SXA     NEWAR,4
40427   0 77400 4 00000   3267        +1  AXT     **0,4
40430  -2 00001 4 40461   3268        +2  TNX     NEWA7,4,1
40431   0 63400 4 40427   3269        +3  SXA     *-2,4
40432   0 77400 4 00000   3270    NEWAR   AXT     **0,4
40433   0 50000 0 00000   3271    NEWA8   CLA     **0             GUESS
40434   0 56000 0 40471   3272        +1  LDQ     NEWA9           MAX
40435   0 04000 0 40450   3273        +2  TLQ     NEWA6
40436   0 56000 0 40472   3274        +3  LDQ     NEWA9+1         MIN
40437   0 04000 4 00004   3275        +4  TLQ     4,4
40440   0 50000 0 40251   3276        +5  CLA     FL.2
40441  -0 52000 0 40475   3277    NEWA3   NZT     NEWA1+2
40442   0 02000 0 40452   3278        +1  TRA     NEWA5
40443   0 13100 0 00000   3279        +2  XCA
40444   0 30000 0 40474   3280        +3  FAD     NEWA1+1
40445   0 24100 0 40214   3281        +4  FDP     FL2
40446  -0 60060 0 40433   3282        +5  STQ*    NEWA8
40447   0 02000 0 40427   3283        +6  TRA     NEWA2+1
40450   0 50200 0 40253   3284    NEWA6   CLS     FL.25
40451   0 02000 0 40441   3285        +1  TRA     NEWA3
40452   0 60100 0 12512   3286    NEWA5   STO     COMMON
40453   0 50060 0 40433   3287        +1  CLA*    NEWA8
40454  -0 13000 0 00000   3288        +2  XCL
40455   0 26000 0 12512   3289        +3  FMP     COMMON
40456   0 30060 0 40433   3290        +4  FAD*    NEWA8
40457   0 60160 0 40433   3291        +5  STD*    NEWA8
40460   0 02000 0 40427   3292        +6  TRA     NEWA2+1
40461   0 52200 0 40432   3293    NEWA7   XEC     NEWAR
40462   0 02000 4 00003   3294        +1  TRA     3,4             NON-CONVERGENCE
40463   0 56060 0 40433   3295    BDXA    LDQ*    NEWA8
40464  -0 60000 0 40471   3296        +1  STQ     NEWA9
40465   0 02000 0 40450   3297        +2  TRA     NEWA6
40466   0 56060 0 40433   3298    BDNA    LDQ*    NEWA8
40467  -0 60000 0 40472   3299        +1  STQ     NEWA9+1

40470   0 02000 0 40440   3300        +2  TRA     NEWA3-1
                  40471   3301    NEWA9   BSS     2,F             MAX,MIN
                  40473   3302    NEWA1   BSS     3,F
40476   2 00746 3 14632   3303        -1  DEC       .95
40477   0 50000 0 00000   3304    RAPA    CLA     **0             Y1
40500  -0 34000 0 40473   3305        +1  LAS     NEWA1
40501   0 02000 0 40504   3306        +2  TRA     *+3
40502   0 02000 0 40504   3307        +3  TRA     *+2
40503   0 02000 0 40544   3308        +4  TRA     RAPA9
40504   0 30200 0 00000   3309        +5  FSB     **0             Y2
40505   0 60100 0 12514   3310        +6  STO     COMMON+2        NEW E
40506   0 24100 0 00000   3311    RAPA8   FDP     **0             Y1
40507   0 13100 0 00000   3312        +1  XCA
40510  -0 34000 0 40473   3313        +2  LAS     NEWA1           CLOSURE
40511   0 02000 0 40514   3314        +3  TRA     *+3
40512   0 02000 4 00001   3315        +4  TRA     1,4
40513   0 02000 4 00001   3316        +5  TRA     1,4
40514   0 50000 0 40475   3317        +6  CLA     NEWA1+2         OLD E
40515   0 10000 0 40537   3318        +7  TZE     RAPA1           FIRST PASS
40516   0 30200 0 12514   3319        +8  FSB     COMMON+2
40517   0 10000 0 40537   3320        +9  TZE     RAPA1           E OLD= E NEW
40520   0 60100 0 12512   3321       +10  STO     COMMON
40521   0 56000 0 12514   3322       +11  LDQ     COMMON+2        NEW E
40522   0 26000 0 40474   3323       +12  FMP     NEWA1+1         OLD X
40523   0 60100 0 12513   3324       +13  STO     COMMON+1
40524   0 56000 0 00000   3325    RAPA5   LDQ     **0             NEWX
40525  -0 60000 0 40474   3326        +1  STQ     NEWA1+1
40526   0 26000 0 40475   3327        +2  FMP     NEWA1+2         OLD E
40527   0 30200 0 12513   3328        +3  FSB     COMMON+1
40530   0 24100 0 12512   3329        +4  FDP     COMMON
40531   0 76000 0 00012   3330        +5  DCT
40532   0 02000 0 40537   3331        +6  TRA     RAPA1
40533  -0 60000 0 00000   3332    RAPA6   STQ     **0             NEW GUESS
40534   0 50000 0 12514   3333    RAPA2   CLA     COMMON+2
40535   0 60100 0 40475   3334        +1  STO     NEWA1+2         NEW E
40536   0 02000 0 40427   3335        +2  TRA     NEWA2+1
40537   0 56000 0 00000   3336    RAPA1   LDQ     **0             X
40540  -0 60000 0 40474   3337        +1  STQ     NEWA1+1         OLD X
40541   0 26000 0 40476   3338        +2  FMP     NEWA1+3         BUMPER
40542   0 60100 0 00000   3339    RAPA7   STO     **0             NEW GUESS
40543   0 02000 0 40534   3340        +1  TRA     RAPA2
40544   0 30260 0 40504   3341    RAPA9   FSB*    RAPA8-2
40545   0 60100 0 12514   3342        +1  STO     COMMON+2
40546   0 02000 0 40510   3343        +2  TRA     RAPA8+2
40547   0 60100 0 40634   3344    NEWB    STO     NEWB1
40550   0 60000 0 40636   3345        +1  STZ     NEWB1+2
40551  -0 50000 4 00001   3346        +2  CAL     1,4
40552   0 62100 0 40665   3347        +3  STA     RAPB5
40553   0 62100 0 40674   3348        +4  STA     RAPB6
40554   0 62100 0 40700   3349        +5  STA     RAPB1
40555   0 62100 0 40703   3350        +6  STA     RAPB7
40556   0 62100 0 40574   3351        +7  STA     NEWB8
40557   0 77100 0 00022   3352        +8  ARS     18
40560   0 62100 0 40640   3353        +9  STA     RAPB
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40561   0 62100 0 40647   3394        +10  STA    RAPB8
40562  -0 50000 4 00002   3395        +11  CAL    2,4
40563   0 62100 0 40645   3396        +12  STA    RAPB3
40564   0 62100 0 40705   3397        +13  STA    RAPB9
40565   0 77100 0 00022   3398        +14  ARS    18
40566   0 62100 0 40570   3399        +15  STA    NEWB2+1
40567   0 63400 4 40573   3400    NEWB2   SXA    NEWBR,4
40570   0 77400 4 00000   3401        +1   AXT    **0,4
40571  -2 00001 4 40622   3402        +2   TNX    NEWB7,4,1
40572   0 63400 4 40570   3403        +3   SXA    *-2,4
40573   0 77400 4 00000   3404    NEWBR   AXT    **0,4
40574   0 50000 0 00000   3405    NEWB8   CLA    **0                 GUESS
40575   0 56000 0 40632   3406        +1   LDQ    NEWB9               MAX
40576   0 04000 0 40611   3407        +2   TLQ    NEWB6
40577   0 56000 0 40633   3408        +3   LDQ    NEWB9+1             MIN
40600   0 04000 4 00004   3409        +4   TLQ    4,4
40601   0 50000 0 40251   3410        +5   CLA    FL.2
40602  -0 52000 0 40636   3411    NEWB3   NZT    NEWB1+2
40603   0 02000 0 40613   3412        +1   TRA    NEWB5
40604   0 13100 0 00000   3413        +2   XCA
40605   0 30000 0 40635   3414        +3   FAD    NEWB1+1
40606   0 24100 0 40214   3415        +4   FDP    FL2
40607  -0 60060 0 40574   3416        +5   STQ*   NEWB8
40610   0 02000 0 40570   3417        +6   TRA    NEWB2+1
40611   0 50200 0 40253   3418    NEWB6   CLS    FL.25
40612   0 02000 0 40602   3419        +1   TRA    NEWB3
40613   0 60100 0 12512   3420    NEWB5   STO    COMMON
40614   0 50060 0 40574   3421        +1   CLA*   NEWB8
40615  -0 13000 0 00000   3422        +2   XCL
40616   0 26000 0 12512   3423        +3   FMP    COMMON
40617   0 30060 0 40574   3424        +4   FAD*   NEWB8
40620   0 60160 0 40574   3425        +5   STO*   NEWB8
40621   0 02000 0 40570   3426        +6   TRA    NEWB2+1
40622   0 52200 0 40573   3427    NEWB7   XEC    NEWBR
40623   0 02000 4 00003   3428        +1   TRA    3,4                 NON-CONVERGENCE
40624   0 56060 0 40574   3429    BDXB    LDQ*   NEWB8
40625  -0 60000 0 40632   3430        +1   STQ    NEWB9
40626   0 02000 0 40611   3431        +2   TRA    NEWB6
40627   0 56060 0 40574   3432    BDNB    LDQ*   NEWB8
40630  -0 60000 0 40633   3433        +1   STQ    NEWB9+1
40631   0 02000 0 40601   3434        +2   TRA    NEWB3-1
                40632     3435    NEWB9   BSS    2,F                 MAX,MIN
                40634     3436    NEWB1   BSS    3,F
40637   2 00746 3 14632   3437        -1   DEC       .95
40640   0 50000 0 00000   3438    RAPB    CLA    **0
40641  -0 34000 0 40634   3439        +1   LAS    NEWB1
40642   0 02000 0 40645   3440        +2   TRA    *+3
40643   0 02000 0 40645   3441        +3   TRA    *+2
40644   0 02000 0 40705   3442        +4   TRA    RAPB9
40645   0 30200 0 00000   3443    RAPB3   FSB    **0
40646   0 60100 0 12514   3444        +1   STO    COMMON+2
40647   0 24100 0 00000   3445    RAPB8   FDP    **0
40650   0 13100 0 00000   3446        +1   XCA
40651  -0 34000 0 40634   3447        +2   LAS    NEWB1
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40652   0 02000 0 40655   3448        +3   TRA    *+3
40653   0 02000 4 00001   3449        +4   TRA    1,4
40654   0 02000 4 00001   3450        +5   TRA    1,4
40655   0 50000 0 40636   3451        +6   CLA    NEWB1+2
40656   0 10000 0 40700   3452        +7   TZE    RAPB1
40657   0 30200 0 12514   3453        +8   FSB    COMMON+2
40660   0 10000 0 40700   3454        +9   TZE    RAPB1
40661   0 60100 0 12512   3455       +10   STO    COMMON
40662   0 56000 0 12514   3456       +11   LDQ    COMMON+2
40663   0 26000 0 40635   3457       +12   FMP    NEWB1+1
40664   0 60100 0 12513   3458       +13   STO    COMMON+1
40665   0 56000 0 00000   3459    RAPB5   LDQ    **0
40666  -0 60000 0 40635   3460        +1   STQ    NEWB1+1
40667   0 26000 0 40636   3461        +2   FMP    NEWB1+2
40670   0 30200 0 12513   3462        +3   FSB    COMMON+1
40671   0 24100 0 12512   3463        +4   FDP    COMMON
40672   0 76000 0 00012   3464        +5   DCT
40673   0 02000 0 40700   3465        +6   TRA    RAPB1
40674  -0 60000 0 00000   3466    RAPB6   STQ    **0
40675   0 50000 0 12514   3467    RAPB2   CLA    COMMON+2
40676   0 60100 0 40636   3468        +1   STO    NEWB1+2
40677   0 02000 0 40570   3469    RAPB4   TRA    NEWB2+1
40700   0 56000 0 00000   3470    RAPB1   LDQ    **0
40701  -0 60000 0 40635   3471        +1   STQ    NEWB1+1
40702   0 26000 0 40637   3472        +2   FMP    NEWB1+3
40703   0 60100 0 00000   3473    RAPB7   STO    **0
40704   0 02000 0 40675   3474        +1   TRA    RAPB2
40705   0 30200 0 00000   3475    RAPB9   FSB    **0
40706   0 60100 0 12514   3476        +1   STO    COMMON+2
40707   0 02000 0 40651   3477        +2   TRA    RAPB8+2
40710   0 63400 1 40777   3478    ICURV   SXA    CURVR,1
40711   0 63400 2 41000   3479        +1   SXA    CURVR+1,2
40712   0 63400 4 41001   3480        +2   SXA    CURVR+2,4
40713   0 50000 4 00001   3481        +3   CLA    1,4
40714   0 10000 4 00004   3482        +4   TZE    4,4
40715  -0 73400 2 00000   3483        +5   PDX    ,2
40716  -0 63600 2 40731   3484        +6   SCD    CURV1+1,2
40717   0 73400 2 00000   3485        +7   PAX    0,2
40720   0 50000 4 00002   3486        +8   CLA    2,4
40721   0 73400 1 00000   3487        +9   PAX    0,1
40722  -0 63400 1 40730   3488       +10   SXD    CURV1,1
40723   0 50000 4 00003   3489       +11   CLA    3,4
40724   0 40000 0 41004   3490       +12   ADD    CURVC+1
40725   0 62100 0 40730   3491       +13   STA    CURV1
40726   0 77400 1 00000   3492       +14   AXT    0,1
40727   0 07400 4 42511   3493       +15   TSX    LINTS,4
40730   0 00000 1 00000   3494    CURV1   PZE    **0,1,**0
40731   1 77552 1 40732   3495        +1   TXI    *+1,1,-150          Z2 TABLE MUST BE 150 GREATER
40732   2 00001 2 40727   3496        +2   TIX    *-3,2,1
40733   0 02000 0 40777   3497        +3   TRA    CURVR
40734   0 63400 1 40777   3498    SCURV   SXA    CURVR,1
40735   0 63400 2 41000   3499        +1   SXA    CURVR+1,2
40736   0 63400 4 41001   3500        +2   SXA    CURVR+2,4
40737   0 60100 0 41005   3501        +3   STO    CURVC+2             X
```

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TO INITIALIZE
      TSX ICURV,4
      PZE NO. Z CURVES (ADDRESS),,DELTA
      PZE NO. X,Y PAIRS (ADDRESS)
      PZE TABLE (Z1,X1,Y1,X2,Y2,...)


TO INTERPOLATE  X IN AC
      Z IN MQ
      TSX  SCURV,4
      PZE  SAME
      PZE  SAME
      PZE  SAME
      Y IN ACC.
```

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40740 -0 60000 0 41006  3462        +4  STQ   CURVC+3              Z
40741  0 50000 4 00001  3463        +5  CLA   1,4
40742  0 10000 4 00004  3464        +6  TZE   4,4
40743 -0 73400 2 00000  3465        +7  PDX   ,2
40744 -0 63600 2 40767  3466        +8  SCD   CURV7-1,2
40745  0 73400 2 00000  3467        +9  PAX   0,2
40746  0 63400 2 40754  3468       +10  SXA   CURV4,2
40747 -0 63400 2 40773  3469       +11  SXD   CURV8,2
40750  0 50000 4 00003  3470       +12  CLA   3,4
40751  0 62100 0 40760  3471       +13  STA   CURV5
40752  0 40000 0 41004  3472       +14  ADD   CURVC+1
40753  0 62100 0 40764  3473       +15  STA   CURV6
40754  0 77400 4 00000  3474  CURV4  AXT   **0,4                  **=NO Z CURVES
40755  0 77400 1 00000  3475       +1  AXT   0,1
40756  0 77400 2 00000  3476       +2  AXT   0,2
40757  0 63400 4 40770  3477       +3  SXA   CURV7,4
40760  0 50000 1 00000  3478  CURV5  CLA   **0,1
40761  0 60100 2 41007  3479       +1  STO   CURVC+4,2
40762  0 50000 0 41005  3480       +2  CLA   CURVC+2
40763  0 07400 4 42437  3481       +3  TSX   LINT,4
40764  0 00000 1 00000  3482  CURV6  PZE   **0,1
40765  0 60100 2 41010  3483       +1  STO   CURVC+5,2
40766  1 77776 2 40767  3484       +2  TXI   *+1,2,-2
40767  1 77552 1 40770  3485       +3  TXI   *+1,1,-150             DELTA Z(CURVES)
40770  0 77400 4 00000  3486  CURV7  AXT   **0,4
40771  2 00001 4 40757  3487       +1  TIX   CURV5-1,4,1
40772  0 07400 4 42511  3488       +2  TSX   LINTS,4
40773  0 00000 0 41007  3489  CURV8  PZE   CURVC+4,,**0            ,,NO. OF Z CURVES
40774  0 50000 0 41006  3490       +1  CLA   CURVC+3
40775  0 07400 4 42437  3491       +2  TSX   LINT,4
40776  0 00000 0 41007  3492       +3  PZE   CURVC+4
40777  0 77400 1 00000  3493  CURVR  AXT   **0,1
41000  0 77400 2 00000  3494       +1  AXT   **0,2
41001  0 77400 4 00000  3495       +2  AXT   **0,4
41002  0 02000 4 00004  3496       +3  TRA   4,4
41003  2 33000 0 00000  3497  CURVC  OCT   233000000000
41004  0 00000 0 00001  3498       +1  PZE   1
              41005      3499           BSS   30


                        3502*ENTROPY ROUTINE, TEMP IN AC, PRESS IN MQ
                        3503*      TSX     S(TP),4
                        3504*ENTROPY IN AC
41043  0 63400 4 41153  3505    S(TP)  SXA     STPEX,4
                        3506           UNLIST
                        3892           LIST


                        3894*AS58 HAS BEEN MODIFIED (SEE AZX)
41664  0 50200 4 00001  3895    AS58   CLS     1,4
                        3896           UNLIST


                        4148           LIST
42374  0 30000 0 42435  4149    COS    FAD     SIN+32               ADD PI/2 FOR COS
                        4150           UNLIST
                        4181           LIST
42437  0 60100 0 12512  4182    LINT   STO     COMMON               STORE ARGUMENT
                        4183           UNLIST
                        4270           LIST


                        4272           UNLESS  1
42566 -0 62500 0 04171          END    STL     2169
                        4273           CORE    AZN,LAST
42572 -0 62500 0 04171             +4  STL     2169
                        4274           CORE    HBI,KSUBM
42576 -0 62500 0 04171             +8  STL     2169
42602  0 02000 0 42603  4275    ERROR  TRA     *+1
                        4276           UNLESS  1
42603 -0 62500 0 04171             +1  STL     2169
                        4277           CORE    BEGIN,PRTD
42607 -0 62500 0 04171             +5  STL     2169
                        4278           CORE    NEHA,RAP89
42613 -0 62500 0 04171             +9  STL     2169
42617 -0 63400 4 00061  4279       +13  SXD    KINDX4,4
                        4280           CORE    -10,10,S,4,4
42620 -0 62500 0 04171            +14  STL     2169
42624  0 07400 4 00055  4281       +18  TSX     KDEBUG,4
42625 -1 01163 0 32716  4282       +19  FVE     X,,AZMTB-X
42626 -1 07764 0 51162  4283       +20  FVE     AZMT,,4*AZMTS
42627 -1 00165 0 44277  4284       +21  FVE     TY,,LQI-TY
42630 -1 23421 0 44514  4285       +22  FVE     LAST,,10001
42631 -1 00226 0 47321  4286       +23  FVE     PR,,150
42632  0 60000 0 33734  4287       +24  STZ     COLUM
42633  0 07400 4 32442  4288       +25  TSX     PRINT,4
42634  0 07400 4 47024  4289       +26  TSX     HBP,4
42635  0 02000 0 24430  4290       +27  TRA     START


                        4292*NOZZLE TUBE PROGRAM ** HUDSON
42636  0 63400 4 43552  4293    AZN    SXA     AZNR,4
42637  0 63400 1 43553  4294       +1  SXA     AZNR+1,1
42640  0 63400 2 43554  4295       +2  SXA     AZNR+2,2
42641  0 76000 0 00012  4296       +3  DCT
42642  0 02000 0 42643  4297       +4  TRA     *+1
42643  0 50000 0 44475  4298       +5  CLA     AZN5
42644  0 60100 0 44105  4299       +6  STO     SWT                  ITER PRINT FLAG
42645  0 77400 4 00012  4300       +7  AXT     10,4
42646 -0 63400 4 43745  4301       +8  SXD     ITER5,4              NO. ITERATIONS
42647  0 77400 4 43556  4302       +9  AXT     BUG,4
42650  0 63400 4 44020  4303      +10  SXA     ITER9,4              ERROR RETURN
42651  0 50000 0 32631  4304      +11  CLA     P+11                 CURRENT FLOW RATE
42652  0 60100 0 34063  4305      +12  STO     WR
42653  0 76000 0 00012  4306      +13  DCT
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42654  0 02000 0 426[illegible]  4307       +14  TRA    *+1
                                 4308*NOZZLE FLOW COMPUTED IGNORING CAPACITANCE
42655  0 50000 0 32643  4309       +15  CLA    P+21
42656  0 30200 0 32644  4310       +16  FSB    P+22
42657  0 30200 0 34045  4311       +17  FSB    TP+72
42660  0 60100 0 32646  4312       +18  STO    P+24
42661  0 60000 0 32724  4313       +19  STZ    X+6
42662  0 60000 0 32731  4314       +20  STZ    X+11                LOWER Q1 GUESS FLAG
42663  0 50000 0 44224  4315       +21  CLA    NTOTL                     TOTAL LENGTH
42664  0 24100 0 36124  4316       +22  FDP    NUMBR
42665  0 76000 0 00012  4317       +23  DCT
42666  0 07400 4 44235  4318       +24  TSX    DIVCK,4
42667 -0 60000 0 44461  4319       +25  STQ    DELTAZ                    LENGTH OF DELTA Z
42670 -0 63400 0 43262  4320       +26  SXD    CNT6,0
42671 -0 63400 0 43377  4321       +27  SXD    CNT7,0
42672 -0 63400 0 43460  4322       +28  SXD    CNT8,0
42673 -0 63400 0 43536  4323       +29  SXD    CNT9,0
42674  0 50000 0 32633  4324       +30  CLA    T6
42675  0 30200 0 32620  4325       +31  FSB    T3
42676  0 13100 0 00000  4326       +32  XCA
42677  0 26000 0 44467  4327       +33  FMP    KON11               MAX ERROR OF CLOSURE BETWEEN T6
42700  0 60100 0 44513  4328       +34  STO    MAXER               INPUT AND COMPUTED T6
42701  0 56000 0 32633  4329       +35  LDQ    T6
42702  0 26000 0 44154  4330       +36  FMP    LVSRN+1
42703  0 13100 0 00000  4331       +37  XCA
42704  0 26000 0 44232  4332       +38  FMP    KON55               .98
42705  0 60100 0 44373  4333       +39  STO    THINT
42706  0 60100 0 44440  4334       +40  STO    TSUBH                     INITIAL GUESS OF EXIT TEMP
42707  0 50000 0 32620  4335       +41  CLA    T3
42710  0 56000 0 32621  4336       +42  LDQ    P3
42711  0 07400 4 25564  4337       +43  TSX    AZH,4
42712  0 02000 0 43576  4338       +44  TRA    AZN1
42713  0 50200 0 33723  4339       +45  CLS    WPR+1
42714  0 24100 0 40245  4340       +46  FDP    FLCUF
42715  0 26000 0 34063  4341       +47  FMP    WR
42716  0 13100 0 00000  4342       +48  XCA
42717  0 26000 0 34063  4343       +49  FMP    WR
42720  0 13100 0 00000  4344       +50  XCA
42721  0 26000 0 44223  4345       +51  FMP    KON39               .025
42722  0 30000 0 32621  4346       +52  FAD    P3
42723  0 60100 0 44462  4347       +53  STO    PIN
42724  0 77400 4 00060  4348  AZN4      AXT    48,4                RETURN HERE AFTER Q1 LOWERED
42725  0 60000 4 44357  4349       +1   STZ    TY+48,4
42726  2 00001 4 42725  4350       +2   TIX    *-1,4,1
42727  0 50000 0 44462  4351  NUTHI     CLA    PIN
42730  0 60100 0 44442  4352       +1   STO    PSUBC
42731  0 50000 0 32620  4353       +2   CLA    T3
42732  0 60100 0 44444  4354       +3   STO    TSUBC
42733  0 60100 0 44453  4355       +4   STO    TCW                       INITIAL GUESS OF COLD WALL TEMP
42734  0 50000 0 44373  4356       +5   CLA    THINT
42735  0 60100 0 44454  4357       +6   STO    THW                       INITIAL GUESS OF HOT WALL TEMP
42736  0 50000 0 32641  4358       +7   CLA    Q1INT                     RESET Q1 WITH INITIAL GUESS
42737  0 60100 0 44476  4359       +8   STO    Q1
42740  0 50000 0 44144  4360       +9   CLA    LVSDH+1

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42741  0 60100 0 44434  4361       +10  STO    DSUBH                     DIAMETER AT POINT N
42742  0 50000 0 44154  4362       +11  CLA    LVSRN+1
42743  0 60100 0 44436  4363       +12  STO    RSUBN                     RECOVERY FACTOR AT POINT N
42744  0 50000 0 36124  4364       +13  CLA    NUMBR                     NUMBER OF DELTA Z
42745  0 60100 0 44367  4365       +14  STO    NLEFT
42746  0 50000 0 44461  4366       +15  CLA    DELTAZ
42747  0 60100 0 44460  4367       +16  STO    NUM
42750  0 50000 0 44460  4368  DHRN      CLA    NUM                       TOTAL LENGTH USE TO POINT N+M
42751  0 07400 4 44515  4369       +1   TSX    TIN1,4                    FIND DIAMETER AT POINT N+M M=1,2...
42752  0 00000 0 44143  4370       +2   HTR    LVSDH,0,0
42753  0 00004 0 00001  4371       +3   HTR    1,0,4
42754  0 60100 0 44435  4372       +4   STO    DSUBH+1
42755  0 30000 0 44434  4373       +5   FAD    DSUBH
42756  0 13100 0 00000  4374       +6   XCA
42757  0 26000 0 44472  4375       +7   FMP    KON8
42760  0 60100 0 44413  4376       +8   STO    DSUBHI                    AVERAGE
42761  0 50000 0 44460  4377       +9   CLA    NUM
42762  0 07400 4 44515  4378       +10  TSX    TIN1,4                    FIND RECOVERY FACTOR AT POINT N+M
42763  0 00000 0 44153  4379       +11  HTR    LVSRN,0,0
42764  0 00004 0 00001  4380       +12  HTR    1,0,4
42765  0 60100 0 44437  4381       +13  STO    RSUBN+1
42766  0 50000 0 44460  4382       +14  CLA    NUM
42767  0 07400 4 44515  4383       +15  TSX    TIN1,4                    FIND CIRCUM. HOT
42770  0 00000 0 44163  4384       +16  HTR    LVSCH,0,0
42771  0 00007 0 00001  4385       +17  HTR    1,0,7
42772  0 60100 0 44412  4386       +18  STO    CH
42773  0 50000 0 44440  4387  FINQ1     CLA    TSUBH
42774  0 56000 0 32656  4388       +1   LDQ    P+32                P6
42775  0 07400 4 25564  4389       +2   TSX    AZH,4                     FIND C SUB P HOT
42776  0 02000 0 43576  4390       +3   TRA    AZN1
42777  0 56000 0 33731  4391       +4   LDQ    WPR+7
43000  0 26000 0 32646  4392       +5   FMP    P+24                NOZZLE FLOW (HOT SIDE)
43001  0 60100 0 12512  4393       +6   STO    COMMON                    C SUB P (WR)
43002  0 50000 0 44476  4394       +7   CLA    Q1                        FIND TEMP AT NEXT SEGMENT OF
43003  0 24100 0 12512  4395       +8   FDP    COMMON                    HOT SIDE
43004  0 76000 0 00012  4396       +9   DCT
43005  0 07400 4 44235  4397       +10  TSX    DIVCK,4
43006 -0 60000 0 12512  4398       +11  STQ    COMMON
43007  0 50000 0 44440  4399       +12  CLA    TSUBH
43010  0 24100 0 44436  4400       +13  FDP    RSUBN
43011  0 76000 0 00012  4401       +14  DCT
43012  0 07400 4 44235  4402       +15  TSX    DIVCK,4
43013  0 13100 0 00000  4403       +16  XCA
43014  0 30000 0 12512  4404       +17  FAD    COMMON
43015  0 13100 0 00000  4405       +18  XCA
43016  0 26000 0 44437  4406       +19  FMP    RSUBN+1
43017  0 60100 0 44441  4407       +20  STO    TSUBH+1                   TEMP AT BEGIN OF NEXT SEGMENT
43020  0 30000 0 44440  4408       +21  FAD    TSUBH
43021  0 13100 0 00000  4409       +22  XCA
43022  0 26000 0 44472  4410       +23  FMP    KON8
43023  0 60100 0 44446  4411       +24  STO    TSUBHI                    MEAN HOT TEMP OF THE SEGMENT
43024  0 50000 0 44444  4412       +25  CLA    TSUBC
43025  0 56000 0 44442  4413       +26  LDQ    PSUBC
43026  0 07400 4 25564  4414       +27  TSX    AZH,4                     C SUB P COLD
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43027  0 02C00 0 43576  4415      +28  TRA   AZN1
43030  0 50000 0 33731  4416      +29  CLA   WPR+7                C P
43031  0 13100 0 00000  4417      +30  XCA                        C SUB P  COLD
43032  0 26000 0 34063  4418      +31  FMP   WR
43033  0 60100 0 12512  4419      +32  STO   COMMON
43034  0 50000 0 44476  4420      +33  CLA   Q1                   FIND TEMP OF NEXT SEGMENT OF
43035  0 24100 0 12512  4421      +34  FDP   COMMON               COLD SIDE
43036  0 76C00 0 00012  4422      +35  DCT
43037  0 07400 4 44235  4423      +36  TSX   DIVCK,4
43040  0 13100 0 00000  4424      +37  XCA
43041  0 30000 0 44444  4425      +38  FAD   TSUBC
43042  0 60100 0 44445  4426      +39  STO   TSUBC+1                TEMP BEGIN OF NEXT SEGMENT
43043  0 30000 0 44444  4427      +40  FAD   TSUBC
43044  0 13100 0 00000  4428      +41  XCA
43045  0 26000 0 44472  4429      +42  FMP   KON8
43046  0 60100 0 44447  4430      +43  STO   TSUBCI                 MEAN COLD TEMP OF THE SEGMENT
43047  0 50000 0 44460  4431      +44  CLA   NUM
43050  0 30200 0 44461  4432      +45  FSB   DELTAZ
43051  0 60100 0 44500  4433      +46  STO   TEMP
43052  0 07400 4 44515  4434      +47  TSX   TIN1,4                FIND WETTED PERIMETER NEEDED
43053  0 00000 0 44125  4435      +48  HTR   LVSCC,0,0
43054  0 00007 0 00001  4436      +49  HTR   1,0,7
43055  0 60100 0 44451  4437      +50  STO   CCI
43056  0 50000 0 44500  4438      +51  CLA   TEMP
43057  0 07400 4 44515  4439      +52  TSX   TIN1,4                FIND COLD FLOW HEAT TRANSFER AREA
43060  0 00000 0 44107  4440      +53  HTR   LVSAC,0,0
43061  0 00007 0 00001  4441      +54  HTR   1,0,7
43062  0 60100 0 44450  4442      +55  STO   ACI                  COLD FLOW HEAT TRANSFER AREA
43063  0 24100 0 44451  4443      +56  FDP   CCI                  WETTED PERIMETER OF COLD FLOW
43064  0 76000 0 00012  4444      +57  DCT
43065  0 07400 4 44235  4445      +58  TSX   DIVCK,4
43066  0 26000 0 40216  4446      +59  FMP   KON40                4
43067  0 60100 0 44452  4447      +60  STO   DSUBC                COLD FLOW HYDRAULIC DIAMETER
43070  0 13100 0 00000  4448      +61  XCA
43071  0 26000 0 44473  4449      +62  FMP   KON5                 64.4 = 2 G
43072  0 13100 0 00000  4450      +63  XCA
43073  0 26000 0 44450  4451      +64  FMP   ACI
43074  0 13100 0 00000  4452      +65  XCA
43075  0 26000 0 44450  4453      +66  FMP   ACI
43076  0 60100 0 44502  4454      +67  STO   TEMP+2
43077  0 50000 0 44447  4455      +68  CLA   TSUBCI
43100  0 56000 0 44442  4456      +69  LDQ   PSUBC
43101  0 07400 4 25564  4457      +70  TSX   AZH,4
43102  0 02000 0 43576  4458      +71  TRA   AZN1
43103  0 50000 0 33723  4459      +72  CLA   WPR+1                1/RHO
43104  0 24100 0 40245  4460      +73  FDP   FLCUF
43105  0 26000 0 44465  4461      +74  FMP   KON1                 144
43106  0 13100 0 00000  4462      +75  XCA
43107  0 26000 0 34063  4463      +76  FMP   WR                   COLD FLOW
43110  0 13100 0 00000  4464      +77  XCA
43111  0 26000 0 34063  4465      +78  FMP   WR                   COLD FLOW
43112  0 24100 0 44502  4466      +79  FDP   TEMP+2
43113  0 76000 0 00012  4467      +80  DCT
43114  0 07400 4 44235  4468      +81  TSX   DIVCK,4

43115  0 26000 0 44461  4469      +82  FMP   DELTAZ                LENGTH OF SEGMENT
43116  0 13100 0 00000  4470      +83  XCA
43117  0 26000 0 40216  4471      +84  FMP   KON40                4
43120  0 13100 0 00000  4472      +85  XCA
43121  0 26000 0 36123  4473      +86  FMP   FRICT                FRICTION FACTOR
43122  0 76C00 0 00002  4474      +87  CHS
43123  0 30C00 0 44442  4475      +88  FAD   PSUBC
43124  0 60100 0 44443  4476      +89  STO   PSUBC+1              PRESS AT NEXT SEGMENT
43125  0 56C00 0 44450  4477      +90  LDQ   ACI
43126  0 26C00 0 40216  4478      +91  FMP   KON40                4
43127  0 60100 0 44500  4479      +92  STO   TEMP                 4(ACI)
43130  0 50000 0 44447  4480      +93  CLA   TSUBCI               AVERAGE COLD TEMP
43131  0 56000 0 44442  4481      +94  LDQ   PSUBC
43132  0 07400 4 25564  4482      +95  TSX   AZH,4
43133  0 02000 0 43576  4483      +96  TRA   AZN1
43134  0 07400 4 26223  4484      +97  TSX   AZL,4                L
43135  0 13100 0 00000  4485      +98  XCA                        L SUB CI
43136  0 26000 0 43605  4486      +99  FMP   GAMMAC               FIND HEAT TRANSFER COEFFICIENT COLD
43137  0 24100 0 44500  4487     +100  FDP   TEMP                 FOR COLD SIDE
43140  0 76000 0 00012  4488     +101  DCT
43141  0 07400 4 44235  4489     +102  TSX   DIVCK,4
43142 -0 60000 0 44502  4490     +103  STQ   TEMP+2
43143  0 50000 0 40275  4491     +104  CLA   KON44                PI
43144  0 07400 4 24307  4492     +105  TSX   LN,4
43145  0 07400 4 44243  4493     +106  TSX   ERLN,4
43146  0 13100 0 00000  4494     +107  XCA
43147  0 26000 0 40256  4495     +108  FMP   KON41                .8
43150  0 07400 4 24240  4496     +109  TSX   EXP,4
43151  0 07400 4 44254  4497     +110  TSX   EREXP,4
43152  0 13100 0 00000  4498     +111  XCA
43153  0 26000 0 44502  4499     +112  FMP   TEMP+2
43154  0 60100 0 44502  4500     +113  STO   TEMP+2
43155  0 50000 0 34063  4501     +114  CLA   WR                   COLD FLOW
43156  0 07400 4 24307  4502     +115  TSX   LN,4
43157  0 07400 4 44243  4503     +116  TSX   ERLN,4
43160  0 13100 0 00000  4504     +117  XCA
43161  0 26000 0 40256  4505     +118  FMP   KON41                .8
43162  0 07400 4 24240  4506     +119  TSX   EXP,4
43163  0 07400 4 44254  4507     +120  TSX   EREXP,4
43164  0 13100 0 00000  4508     +121  XCA
43165  0 26000 0 44502  4509     +122  FMP   TEMP+2
43166  0 60100 0 44502  4510     +123  STO   TEMP+2
43167  0 50000 0 44451  4511     +124  CLA   CCI
43170  0 07400 4 24307  4512     +125  TSX   LN,4
43171  0 07400 4 44243  4513     +126  TSX   ERLN,4
43172  0 13100 0 00000  4514     +127  XCA
43173  0 26000 0 40251  4515     +128  FMP   KON42                .2
43174  0 07400 4 24240  4516     +129  TSX   EXP,4
43175  0 07400 4 44254  4517     +130  TSX   EREXP,4
43176  0 13100 0 00000  4518     +131  XCA
43177  0 26000 0 44502  4519     +132  FMP   TEMP+2
43200  0 60100 0 44502  4520     +133  STO   TEMP+2
43201  0 50000 0 44452  4521     +134  CLA   DSUBC
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43203  0 60100 0 12512  4523      +136  STO   COMMON
43204  0 50000 0 44452  4524      +137  CLA   DSUBC
43205  0 24100 0 12512  4525      +138  FDP   COMMON
43206  0 76000 0 00012  4526      +139  DCT
43207  0 07400 4 44235  4527      +140  TSX   DIVCK,4
43210  0 13100 0 00000  4528      +141  XCA
43211  0 07400 4 24307  4529      +142  TSX   LN,4
43212  0 07400 4 44243  4530      +143  TSX   ERLN,4
43213  0 13100 0 00000  4531      +144  XCA
43214  0 26000 0 43604  4532      +145  FMP   BETAC
43215  0 07400 4 24240  4533      +146  TSX   EXP,4
43216  0 07400 4 44254  4534      +147  TSX   EREXP,4
43217  0 13100 0 00000  4535      +148  XCA
43220  0 26000 0 44502  4536      +149  FMP   TEMP+2
43221  0 60100 0 44502  4537      +150  STO   TEMP+2
43222  0 50000 0 44447  4538    NUTCW   CLA   TSUBCI          AVERAGE COLD TEMP
43223  0 24100 0 44453  4539        +1  FDP   TCW             COLD WALL TEMP
43224  0 76000 0 00012  4540        +2  DCT
43225  0 07400 4 44235  4541        +3  TSX   DIVCK,4
43226  0 13100 0 00000  4542        +4  XCA
43227  0 07400 4 24307  4543        +5  TSX   LN,4
43230  0 07400 4 44243  4544        +6  TSX   ERLN,4
43231  0 13100 0 00000  4545        +7  XCA
43232  0 26000 0 43603  4546        +8  FMP   ALPHAC
43233  0 07400 4 24240  4547        +9  TSX   EXP,4
43234  0 07400 4 44254  4548       +10  TSX   EREXP,4
43235  0 13100 0 00000  4549       +11  XCA
43236  0 26000 0 44502  4550       +12  FMP   TEMP+2
43237  0 60100 0 44455  4551       +13  STO   HCI             HEAT TRANSFER COEFFICIENT COLD SIDE
43240  0 13100 0 00000  4552       +14  XCA
43241  0 26000 0 44461  4553       +15  FMP   DELTAZ          LENGTH OF SEGMENT
43242  0 13100 0 00000  4554       +16  XCA
43243  0 26000 0 44412  4555       +17  FMP   CH              HOT CIRCUM. AREA
43244  0 60100 0 12512  4556       +18  STO   COMMON
43245  0 50000 0 44476  4557       +19  CLA   Q1              HEAT TRANSFER RATE
43246  0 24100 0 12512  4558       +20  FDP   COMMON
43247  0 76000 0 00012  4559       +21  DCT
43250  0 07400 4 44235  4560       +22  TSX   DIVCK,4
43251  0 13100 0 00000  4561       +23  XCA
43252  0 30000 0 44447  4562       +24  FAD   TSUBCI
43253  0 13100 0 00000  4563       +25  XCA             TEMP COLD WALL PRIME
43254  0 50000 0 44453  4564       +26  CLA   TCW       TEMP COLD WALL
43255  0 07401 2 43624  4565       +27  TSX   ITER,2,1
43256 -0 44466 0 44324  4566       +28  NZE   TY+21,,KON17
43257  0 44467 0 44325  4567       +29  PZE   TY+22,,KON11
43260  0 44474 0 44326  4568       +30  PZE   TY+23,,KON10
43261  3 44453 0 44266  4569       +31  PTH   LTCW,,TCW
43262  3 00000 0 44266  4570    CNT6    PTH   LTCW
43263  0 44470 0 44471  4571        +1  PZE   KON13,,KON12
43264  0 02000 0 43267  4572        +2  TRA   TCWOK           CLOSED
43265  0 60100 0 44453  4573        +3  STO   TCW             NEW GUESS COLD WALL TEMP
43266  0 02000 0 43222  4574        +4  TRA   NUTCW
43267  0 50000 0 44413  4575    TCWOK   CLA   DSUBHI      AVERAGE DIAMETER
43270  0 07400 4 24307  4576        +1  TSX   LN,4

43271  0 07400 4 44243  4577        +2  TSX   ERLN,4
43272  0 13100 0 00000  4578        +3  XCA
43273  0 26000 0 44230  4579        +4  FMP   KON53         1.8
43274  0 07400 4 24240  4580        +5  TSX   EXP,4
43275  0 07400 4 44254  4581        +6  TSX   EREXP,4
43276  0 60100 0 44500  4582        +7  STO   TEMP
43277  0 50000 0 44446  4583        +8  CLA   TSUBHI        AVERAGE HOT TEMP
43300  0 56000 0 32656  4584        +9  LDQ   P+32          P6
43301  0 07400 4 25564  4585       +10  TSX   AZH,4
43302  0 02000 0 43556  4586       +11  TRA   BUG
43303  0 07400 4 26223  4587       +12  TSX   AZL,4
43304  0 13100 0 00000  4588       +13  XCA
43305  0 26000 0 44231  4589       +14  FMP   KON54         L SUB HI
43306  0 60100 0 44511  4590       +15  STO   TEMP+9       .026
43307  0 50000 0 34063  4591       +16  CLA   WR            HOT FLOW
43310  0 07400 4 24307  4592       +17  TSX   LN,4
43311  0 07400 4 44243  4593       +18  TSX   ERLN,4
43312  0 13100 0 00000  4594       +19  XCA
43313  0 26000 0 40256  4595       +20  FMP   KON41         .8
43314  0 07400 4 24240  4596       +21  TSX   EXP,4
43315  0 07400 4 44254  4597       +22  TSX   EREXP,4
43316  0 13100 0 00000  4598       +23  XCA
43317  0 26000 0 44511  4599       +24  FMP   TEMP+9
43320  0 24100 0 44500  4600       +25  FDP   TEMP
43321  0 76000 0 00012  4601       +26  DCT
43322  0 07400 4 44235  4602       +27  TSX   DIVCK,4
43323 -0 60000 0 44511  4603       +28  STQ   TEMP+9
43324  0 50000 0 44460  4604       +29  CLA   NUM
43325  0 30200 0 44461  4605       +30  FSB   DELTAZ          LENGTH OF SEGMENT
43326  0 07400 4 44515  4606       +31  TSX   TIN1,4
43327  0 00000 0 44201  4607       +32  HTR   LVSIG,0,0
43330  0 00011 0 00001  4608       +33  HTR   1,0,9
43331  0 60100 0 44512  4609       +34  STO   SIGMA
43332  0 50000 0 44446  4610    NUTHW   CLA   TSUBHI        AVERAGE HOT TEMP
43333  0 30000 0 44454  4611        +1  FAD   THW           HOT WALL TEMP
43334  0 60100 0 12512  4612        +2  STO   COMMON
43335  0 56000 0 44512  4613        +3  LDQ   SIGMA
43336  0 26000 0 44446  4614        +4  FMP   TSUBHI
43337  0 24100 0 12512  4615        +5  FDP   COMMON
43340  0 76000 0 00012  4616        +6  DCT
43341  0 07400 4 44235  4617        +7  TSX   DIVCK,4
43342  0 13100 0 00000  4618        +8  XCA
43343  0 07400 4 24307  4619        +9  TSX   LN,4
43344  0 07400 4 44243  4620       +10  TSX   ERLN,4
43345  0 13100 0 00000  4621       +11  XCA
43346  0 26000 0 40256  4622       +12  FMP   KON41
43347  0 07400 4 24240  4623       +13  TSX   EXP,4
43350  0 07400 4 44254  4624       +14  TSX   EREXP,4
43351  0 13100 0 00000  4625       +15  XCA
43352  0 26000 0 44511  4626       +16  FMP   TEMP+9
43353  0 60100 0 44456  4627       +17  STO   HHI
43354  0 13100 0 00000  4628       +18  XCA             HEAT TRANSFER COEFFICIENT HOT
43355  0 26000 0 44412  4629       +19  FMP   CH
43356  0 13100 0 00000  4630       +20  XCA
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43357  0 26000 0 44461  4631      +21  FMP   DELTAZ          LENGTH OF SEGMENT
43360  0 60100 0 12512  4632      +22  STO   COMMON
43361  0 50000 0 44476  4633      +23  CLA   Q1              HEAT TRANSFER RATE
43362  0 24100 0 12512  4634      +24  FDP   COMMON
43363  0 76000 0 00012  4635      +25  DCT
43364  0 07400 4 44235  4636      +26  TSX   DIVCK,4
43365  0 13100 0 00000  4637      +27  XCA
43366  0 76000 0 00002  4638      +28  CHS
43367  0 30000 0 44446  4639      +29  FAD   TSUBHI           AVERAGE HOT TEMP
43370  0 13100 0 00000  4640      +30  XCA                   HOT WALL TEMP PRIME
43371  0 50000 0 44454  4641      +31  CLA   THW             HOT WALL TEMP
43372  0 07402 2 43624  4642      +32  TSX   ITER,2,2
43373  0 44466 0 44327  4643      +33  PZE   TY+24,,KON17
43374  0 44467 0 44330  4644      +34  PZE   TY+25,,KON11
43375  0 44474 0 44331  4645      +35  PZE   TY+26,,KON10
43376  3 44454 0 44265  4646      +36  PTH   LTHW,,THW
43377  3 00000 0 44265  4647  CNT7    PTH   LTHW
43400  0 44470 0 44471  4648       +1  PZE   KON13,,KON12
43401  0 02000 0 43404  4649       +2  TRA   THWOK           CLOSED
43402  0 60100 0 44454  4650       +3  STO   THW             NEW GUESS HOT WALL TEMP
43403  0 02000 0 43332  4651       +4  TRA   NUTHW
43404  0 50000 0 44454  4652  THWOK   CLA   THW
43405  0 30000 0 44453  4653       +1  FAD   TCW
43406  0 13100 0 00000  4654       +2  XCA
43407  0 26000 0 44472  4655       +3  FMP   KON8            .5
43410  0 13100 0 00000  4656       +4  XCA
43411  0 26000 0 44226  4657       +5  FMP   KON51
43412  0 30000 0 44225  4658       +6  FAD   KON50
43413  0 13100 0 00000  4659       +7  XCA
43414  0 26000 0 44227  4660       +8  FMP   KON52
43415  0 60100 0 44457  4661       +9  STO   KM              THERMAL CONDUCTIVITY
43416  0 50000 0 36125  4662      +10  CLA   XTHIK           METAL THICKNESS
43417  0 24100 0 44457  4663      +11  FDP   KM
43420  0 76000 0 00012  4664      +12  DCT
43421  0 07400 4 44235  4665      +13  TSX   DIVCK,4
43422 -0 60000 0 12512  4666      +14  STO   COMMON
43423  0 50000 0 44474  4667      +15  CLA   KON10           1
43424  0 24100 0 44456  4668      +16  FDP   HHI             HOT SIDE HEAT TRANSFER COEFFICIENT
43425  0 76000 0 00012  4669      +17  DCT
43426  0 07400 4 44235  4670      +18  TSX   DIVCK,4
43427  0 13100 0 00000  4671      +19  XCA
43430  0 30000 0 12512  4672      +20  FAD   COMMON
43431  0 60100 0 12512  4673      +21  STO   COMMON
43432  0 50000 0 44474  4674      +22  CLA   KON10           1
43433  0 24100 0 44455  4675      +23  FDP   HCI             COLD SIDE HEAT TRANSFER COEFFICIENT
43434  0 76000 0 00012  4676      +24  DCT
43435  0 07400 4 44235  4677      +25  TSX   DIVCK,4
43436  0 13100 0 00000  4678      +26  XCA
43437  0 30000 0 12512  4679      +27  FAD   COMMON
43440  0 60100 0 12512  4680      +28  STO   COMMON
43441  0 50000 0 44446  4681      +29  CLA   TSUBHI          TEMP HOT SIDE
43442  0 30200 0 44447  4682      +30  FSB   TSUBCI          TEMP COLD SIDE
43443  0 13100 0 00000  4683      +31  XCA
43444  0 26000 0 44612  4684      +32  FMP   CH              HOT CIRCUM. AREA

43445  0 13100 0 00000  4685      +33  XCA
43446  0 26000 0 44461  4686      +34  FMP   DELTAZ          LENGTH OF SEGMENT
43447  0 24100 0 12512  4687      +35  FDP   COMMON          OBTAIN Q1 PRIME
43450  0 76000 0 00012  4688      +36  DCT
43451  0 07400 4 44235  4689      +37  TSX   DIVCK,4
43452  0 50000 0 44476  4690      +38  CLA   Q1              HEAT TRANSFER RATE
43453  0 07403 2 43624  4691      +39  TSX   ITER,2,3
43454  0 44466 0 44332  4692      +40  PZE   TY+27,,KON17
43455  0 44467 0 44333  4693      +41  PZE   TY+28,,KON11
43456  0 44474 0 44334  4694      +42  PZE   TY+29,,KON10
43457  3 44476 0 44464  4695      +43  PTH   LQ1,,Q1
43460  3 00000 0 44464  4696  CNT8    PTH   LQ1
43461  0 44470 0 44471  4697       +1  PZE   KON13,,KON12
43462  0 02000 0 43465  4698       +2  TRA   Q1OK            CLOSED
43463  0 60100 0 44476  4699       +3  STO   Q1              NEW Q1 GUESS
43464  0 02000 0 42773  4700       +4  TRA   FINQ1
43465  0 50000 0 44367  4701  Q1OK    CLA   NLEFT           CNTR FOR NO. SEGMENTS
43466  0 30200 0 44474  4702       +1  FSB   KON10
43467  0 10000 0 43544  4703       +2  TZE   CLOSD           SKIP T6 ITERATION
43470  0 60100 0 44367  4704       +3  STO   NLEFT
43471  0 50000 0 44460  4705       +4  CLA   NUM
43472  0 60100 0 44463  4706       +5  STO   AZN2            LAST DISTANCE
43473  0 30000 0 44461  4707       +6  FAD   DELTAZ
43474  0 60100 0 44460  4708       +7  STO   NUM
43475  0 50000 0 44233  4709       +8  CLA   AZN3            DISTANCE TO THROAT
43476  0 34000 0 44463  4710       +9  CAS   AZN2
43477  0 02000 0 43500  4711      +10  TRA   *+1
43500  0 34000 0 44460  4712      +11  CAS   NUM
43501  0 02000 0 43504  4713      +12  TRA   *+3
43502  0 02000 0 43504  4714      +13  TRA   *+2
43503  0 07400 4 26266  4715      +14  TSX   AZNN,4          FIND CRITICAL FLOW IN THROAT
43504  0 63400 0 43606  4716      +15  SXA   QINU,0
43505  0 50000 0 44435  4717  ROTAT   CLA   DSUBH+1          ROTATE DATA
43506  0 60100 0 44434  4718       +1  STO   DSUBH
43507  0 50000 0 44437  4719       +2  CLA   RSUBN+1
43510  0 60100 0 44436  4720       +3  STO   RSUBN
43511  0 50000 0 44441  4721       +4  CLA   TSUBH+1
43512  0 60100 0 44440  4722       +5  STO   TSUBH
43513  0 50000 0 44443  4723       +6  CLA   PSUBC+1
43514  0 60100 0 44442  4724       +7  STO   PSUBC
43515  0 50000 0 44445  4725       +8  CLA   TSUBC+1
43516  0 60100 0 44444  4726       +9  STO   TSUBC
43517  0 02000 0 42750  4727      +10  TRA   DHRN
43520  0 50000 0 32633  4728  TEST    CLA   T6              TEST FOR CLOSURE OF T6 INPUT TO
43521  0 30200 0 44441  4729       +1  FSB   TSUBH+1         T6 COMPUTED
43522  0 76000 0 00003  4730       +2  SSP
43523  0 34000 0 44513  4731       +3  CAS   MAXER
43524  0 02000 0 43527  4732       +4  TRA   *+3             TAKE NEW GUESS
43525  0 02000 0 43544  4733       +5  TRA   CLOSD
43526  0 02000 0 43544  4734       +6  TRA   CLOSD
43527  0 50000 0 32633  4735       +7  CLA   T6
43530  0 56000 0 44441  4736       +8  LDQ   TSUBH+1
43531  0 07404 2 43624  4737       +9  TSX   ITER,2,4
43532  0 44466 0 44335  4738      +10  PZE   TY+30,,KON17
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43533   0 44467 0 44336   4739        +11  PZE   TY+31,,KON11
43534   0 44474 0 44337   4740        +12  PZE   TY+32,,KON10
43535   3 44373 0 43623   4741        +13  PTH   LT6,,THINT
43536   3 00000 0 43622   4742   CNT9     PTH   LTH
43537   0 44470 0 44471   4743         +1  PZE   KON13,,KON12
43540   0 02000 0 43544   4744         +2  TRA   CLOSD                    CLOSED
43541   0 60100 0 44373   4745         +3  STO   THINT                    NEW EXIT TEMP. GUESS
43542   0 60100 0 44440   4746         +4  STO   TSUBH                    NEW GUESS
43543   0 02000 0 42727   4747         +5  TRA   NUTHI
43544   0 50000 0 44445   4748   CLOSD    CLA   TSUBC+1
43545   0 56000 0 44443   4749         +1  LDQ   PSUBC+1
43546   0 60100 0 32620   4750         +2  STO   T3
43547  -0 60000 0 32621   4751         +3  STQ   P3
43550   0 50000 0 44476   4752         +4  CLA   Q1
43551   0 60100 0 32641   4753         +5  STO   Q1INT
43552   0 77400 4 00000   4754   AZNR     AXT   **0,4
43553   0 77400 1 00000   4755         +1  AXT   **0,1
43554   0 77400 2 00000   4756         +2  AXT   **0,2
43555   0 02000 4 00003   4757         +3  TRA   3,4                      NORMAL RETN
43556   0 52000 0 32731   4758   BUG      ZET   X+11
43557   0 02000 0 43567   4759         +1  TRA   BUG2                     HOPELESS ERROR
43560   0 50000 0 32641   4760         +2  CLA   Q1INT
43561   0 24100 0 40224   4761         +3  FDP   FL10
43562  -0 60000 0 32641   4762         +4  STQ   Q1INT                    RECOVER FROM ERROR
43563  -0 62500 0 32731   4763         +5  STL   X+11
43564   0 50000 0 32703   4764         +6  CLA   P+53
43565   0 60100 0 32620   4765         +7  STO   T3
43566   0 02000 0 42724   4766         +8  TRA   AZN4
43567  -0 62500 0 32724   4767   BUG2     STL   X+6                      ERROR FLAG
43570  -0 63400 4 00061   4768         +1  SXD   KINDX4,4
43571   0 52200 0 43552   4769         +2  XEC   AZNR
43572   1 00002 4 43553   4770         +3  TXI   AZNR+1,4,2               1,4 ERROR RETURN
43573  -0 54671 7 14325   4771   BUG1     BCI   3,NOZZLE TUBE ERROR
43576   0 16200 0 43556   4772   AZN1     TQP   BUG
43577  -0 62500 0 32724   4773         +1  STL   X+6
43600  -0 63400 4 00061   4774         +2  SXD   KINDX4,4
43601   0 52200 0 43552   4775         +3  XEC   AZNR
43602   1 00001 4 43553   4776         +4  TXI   AZNR+1,4,1               2,4            NEG PRESSURE RETN
                  40216   4777   KON40    EQU   FL4
                  40256   4778   KON41    EQU   FL.8
                  40251   4779   KON42    EQU   FL.2
                  40275   4780   KON44    EQU   PI
43603   1 77534 1 21727   4781   ALPHAC   DEC      .34
43604   0 00000 0 00000   4782   BETAC    DEC      0
43605   1 73543 4 20626   4783   GAMMAC   DEC      .0217
43606   0 77400 1 00000   4784   Q1NU     AXT   0,1
43607   3 00000 1 44243   4785         +1  TXH   ERLN,1,0
43610   1 00001 1 43611   4786         +2  TXI   **1,1,1
43611   0 63400 1 43606   4787         +3  SXA   *-3,1
43612   0 50000 0 32641   4788         +4  CLA   Q1INT
43613   0 60100 0 44476   4789         +5  STO   Q1
43614   0 50000 0 44373   4790         +6  CLA   THINT
43615   0 60100 0 44454   4791         +7  STO   THN
43616   0 40000 0 44327   4792         +8  STZ   TY+24
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43617   0 00000 0 44330   4793         +9  STZ   TY+25
43620   0 60000 0 44331   4794        +10  STZ   TY+26
43621   0 02000 0 42773   4795        +11  TRA   FINQ1
43622  -2 36025 6 73163   4796   LTH      BCI   1,T EXIT
43623  -2 30660 6 06060   4797   LT6      BCI   1,T6
                           4798* G E N E R A L  N E W T O N  T Y P E  I T E R A T I O N  S C H E M E
43624   0 63400 4 44010   4799   ITER     SXA   ITERX,4                   IR4
43625   0 63400 1 44011   4800         +1  SXA   ITERX+1,1                 IR1
43626   0 60000 0 32735   4801         +2  STZ   X+15                     ERROR FLAG
43627   0 60100 0 44073   4802         +3  STO   Q
43630  -0 60000 0 44074   4803         +4  STQ   Q+1
43631   0 30200 0 44074   4804         +5  FSB   Q+1
43632   0 60100 0 44076   4805         +6  STO   Q+3
43633   0 24100 0 44074   4806         +7  FDP   Q+1
43634  -0 60000 0 44077   4807         +8  STQ   Q+4
43635   0 50000 2 00004   4808         +9  CLA   4,2
43636  -0 73700 4 00000   4809        +10  PDC   0,4
43637   0 50000 4 00000   4810        +11  CLA   0,4
43640   0 60100 0 44075   4811        +12  STO   Q+2
43641   0 50000 2 00001   4812        +13  CLA   1,2
43642  -0 73700 4 00000   4813        +14  PDC   0,4
43643   0 50000 4 00000   4814        +15  CLA   0,4
43644   0 76500 0 00000   4815        +16  LRS   0
43645   0 04000 0 43765   4816        +17  TLQ   ITER7                    CLOSED
43646   0 50000 2 00001   4817        +18  CLA   1,2
43647  -0 12000 0 43723   4818        +19  TMI   ITER4                    NO X2 CALCULATED
43650  -0 32000 0 44046   4819        +20  ANA   ANA
43651  -0 10000 0 43662   4820        +21  TNZ   ITER2                    TYPE 2 TRANSFER
43652   0 50000 2 00002   4821   ITER1    CLA   2,2
43653  -0 73700 4 00000   4822         +1  PDC   0,4
43654   0 56000 4 00000   4823         +2  LDQ   0,4
43655   0 26000 0 44075   4824         +3  FMP   Q+2
43656   0 24100 0 44074   4825         +4  FDP   Q+1
43657   0 26000 0 44073   4826         +5  FMP   Q
43660   0 60100 0 44102   4827         +6  STO   Q+7
43661   0 02000 0 43720   4828         +7  TRA   ITER3
43662  -0 52060 2 00001   4829   ITER2    NZT*  1,2
43663   0 02000 0 43652   4830         +1  TRA   ITER1
43664   0 50000 2 00004   4831         +2  CLA   4,2
43665  -0 73700 4 00000   4832         +3  PDC   0,4
43666   0 50000 2 00006   4833         +4  CLA   6,2
43667  -0 73700 1 00000   4834         +5  PDC   0,1
43670   0 50000 4 00000   4835         +6  CLA   0,4
43671   0 60100 0 44075   4836         +7  STO   Q+2
43672   0 30260 2 00003   4837         +8  FSB*  3,2
43673   0 60100 0 44100   4838         +9  STO   Q+5
43674   0 50060 2 00001   4839        +10  CLA*  1,2
43675   0 30260 2 00002   4840        +11  FSB*  2,2
43676   0 30200 0 44076   4841        +12  FSB   Q+3
43677   0 60100 0 44101   4842        +13  STO   Q+6
43700   0 50000 2 00003   4843        +14  CLA   3,2
43701  -0 73700 4 00000   4844        +15  PDC   0,4
43702   0 56000 4 00000   4845        +16  LDQ   0,4
43703   0 26000 0 44100   4846        +17  FMP   Q+5
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43704   0 24100 0 44101   4847        +18  FDP    Q+6
43705   0 26000 0 44076   4848        +19  FMP    Q+3
43706   0 60100 0 44102   4849        +20  STO    Q+7
43707   0 56060 2 00006   4850        +21  LDQ*   6,2                    FX BUMPER
43710   0 76500 0 00000   4851        +22  LRS    0
43711  -0 60000 0 44103   4852        +23  STQ    Q+8
43712   0 56000 1 00000   4853        +24  LDQ    0,1                    TEST E LESS THAN DELTA X3
43713   0 76300 0 00000   4854        +25  LLS    0
43714   0 04000 0 43720   4855        +26  TLQ    ITER3
43715   0 50000 0 44075   4856        +27  CLA    Q+2
43716   0 30000 0 44103   4857        +28  FAD    Q+8
43717   0 02000 0 43722   4858        +29  TRA    ITER3+2
43720   0 50000 0 44075   4859    ITER3   CLA    Q+2
43721   0 30000 0 44102   4860          +1  FAD    Q+7
43722   0 60100 0 44104   4861          +2  STO    Q+9
43723   0 50000 2 00005   4862    ITER4   CLA    5,2
43724  -0 73400 4 00000   4863          +1  PDX    0,4
43725   1 00001 4 43726   4864          +2  TXI    *+1,4,1
43726  -0 75400 4 00000   4865          +3  PXD    0,4
43727   0 60000 0 44100   4866          +4  STZ    Q+5
43730   0 63400 4 44100   4867          +5  SXA    Q+5,4
43731   0 62200 2 00005   4868          +6  STD    5,2
43732   0 50000 2 00000   4869          +7  CLA    0,2
43733   0 77100 0 00022   4870          +8  ARS    18
43734  -0 32000 0 40206   4871          +9  ANA    FX7
43735   0 60100 0 44076   4872         +10  STO    Q+3                    LOOP NO.
43736   0 50000 0 44105   4873         +11  CLA    SWT
43737   0 32200 0 40206   4874         +12  ERA    FX7
43740   0 10000 0 43743   4875         +13  TZE    *+3
43741   0 50000 0 44076   4876         +14  CLA    Q+3
43742   0 40200 0 44105   4877         +15  SUB    SWT
43743   3 00050 4 43745   4878         +16  TXH    ITER5,4,40
43744  -0 10000 0 43750   4879         +17  TNZ    ITER6
                          4880*MAX NO. ITERATIONS IN DECREMENT
43745   3 00012 4 44071   4881    ITER5   TXH    ITERR+3,4,10
43746   0 77400 1 00000   4882          +1  AXT    0,1
43747   0 07400 4 44021   4883          +2  TSX    ITERP,4                PRINT ITERATION
43750   0 50000 0 44073   4884    ITER6   CLA    Q
43751   0 60160 2 00001   4885          +1  STO*   1,2
43752   0 50000 0 44074   4886          +2  CLA    Q+1
43753   0 60160 2 00002   4887          +3  STO*   2,2
43754   0 50000 0 44075   4888          +4  CLA    Q+2
43755   0 60160 2 00003   4889          +5  STO*   3,2
43756   0 60000 0 44075   4890          +6  STZ    Q+2
43757   0 50000 2 00001   4891          +7  CLA    1,2
43760   0 12000 0 43763   4892          +8  TPL    *+3
43761   0 50000 0 44074   4893          +9  CLA    Q+1
43762   1 77777 2 44010   4894         +10  TXI    ITERX,2,-1
43763   0 50000 0 44104   4895         +11  CLA    Q+9
43764   1 77777 2 44010   4896         +12  TXI    ITERX,2,-1
43765   0 50000 0 44105   4897    ITER7   CLA    SWT
43766   0 10000 0 44003   4898          +1  TZE    ITER8                  NO PRINT
43767   0 50000 2 00000   4899          +2  CLA    0,2
43770   0 77100 0 00022   4900          +3  ARS    18
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43771  -0 32000 0 40206   4901          +4  ANA    FX7
43772   0 60100 0 44076   4902          +5  STO    Q+3                    LOOP NO
43773   0 50000 0 44105   4903          +6  CLA    SWT
43774   0 40200 0 40206   4904          +7  SUB    FX7
43775   0 10000 0 44001   4905          +8  TZE    ITER7A                 PRINT ALL LOOP
43776   0 50000 0 44076   4906          +9  CLA    Q+3
43777   0 40200 0 44105   4907         +10  SUB    SWT
44000  -0 10000 0 44003   4908         +11  TNZ    ITER8
44001   0 77400 1 00001   4909    ITER7A  AXT    1,1
44002   0 07400 4 44021   4910          +1  TSX    ITERP,4
44003   0 60060 2 00001   4911    ITER8   STZ*   1,2
44004   0 60060 2 00002   4912          +1  STZ*   2,2
44005   0 60060 2 00003   4913          +2  STZ*   3,2
44006  -0 75400 0 00000   4914          +3  PXD
44007   0 62200 2 00005   4915          +4  STD    5,2
44010   0 77400 4 00000   4916    ITERX   AXT    **0,4                  IR4
44011   0 77400 1 00000   4917          +1  AXT    **0,1                  IR1
44012   0 76000 0 00012   4918          +2  DCT
44013   0 02000 0 44014   4919          +3  TRA    *+1
44014  -0 76000 0 00144   4920          +4  SLT    4
44015   0 02000 2 00007   4921          +5  TRA    7,2                    OFF NORMAL RETURN
44016  -0 50060 2 00005   4922          +6  CAL*   5,2                 NAME OF LOOP
44017   0 60200 0 32735   4923          +7  SLW    X+15
44020   0 02000 0 00000   4924    ITER9   TRA    **0                    PRESET ERROR RETURN
44021   0 63400 4 44042   4925    ITERP   SXA    ITERPX,4
44022   0 07400 4 00052   4926          +1  TSX    DOUT,4
44023   3 01757 0 44047   4927          +2  PTH    ANA+1,,1007
44024   3 01770 0 44050   4928          +3  PTH    ANA+2,,1016
44025   3 02105 0 44051   4929          +4  PTH    ANA+3,,1093
44026   1 02004 2 00005   4930          +5  PON    5,2,1028
44027   1 02031 2 00004   4931          +6  PON    4,2,1049
44030   1 02057 2 00004   4932          +7  PON    4,2,1071
44031   3 02065 0 44052   4933          +8  PTH    ANA+4,,1077            *
44032  -0 00007 0 44076   4934          +9  FOR    Q+3,,7
44033  -0 00023 0 44100   4935         +10  FOR    Q+5,,19
44034  -3 11660 0 44075   4936         +11  SVN    Q+2,,5040
44035  -3 11706 0 44073   4937         +12  SVN    Q,,5062
44036  -3 11734 0 44074   4938         +13  SVN    Q+1,,5084
44037  -3 17647 0 44077   4939         +14  SVN    Q+4,,8103
44040   1 02133 1 44045   4940         +15  PON    ITBCD+1,1,1115
44041   1 00012 0 44106   4941         +16  PON    MODE,,10
44042   0 77400 4 00000   4942    ITERPX  AXT    **0,4
44043   0 02000 4 00001   4943          +1  TRA    1,4
44044   3 02133 0 44053   4944    ITBCD   PTH    ANA+5,,1115
44045   3 02133 0 40304   4945          +1  PTH    BLANK,,1115
44046   0 00000 0 77777   4946    ANA     PZE    0-1
44047  -0 34646 4 76060   4947          +1  BCI    5,LOOP  ITERS.ERROR *     CLOSED
44054  -2 33031 6 26022   4948    ITEXP   BCI      ,THIS BALANCE FAILED TO CONVERGE ** IT MUST BE BUM INPUT **
44066   0 07400 4 00052   4949    ITERR   TSX    DOUT,4
44067   3 23610 0 44054   4950          +1  PTH    ITEXP,,10120
44070   1 00012 0 44106   4951          +2  PON    MODE,,10
44071   0 76000 0 00144   4952          +3  SLN    4
44072   0 02000 0 43765   4953          +4  TRA    ITER7
                  44073   4954    Q       BSS    10,0
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                  441        4955     SWT     BSS     1,X
44106 -1 00012 0 0001        4956     MODE    FVE     KPRINT,,10
                             4957* DISTANCE VS COLD FLOW HEAT TRANSFER AREA
                  44107      4958     LVSAC   BSS     14,F
                             4959* DISTANCE VS COLD FLOW WETTED PERIMETER
                  44125      4960     LVSCC   BSS     14,F
                             4961* DISTANCE VS DIAMETER TABLE
                  44143      4962     LVSDH   BSS     8,F
                             4963* DISTANCE VS RECOVERY FACTOR TABLE
                  44153      4964     LVSRN   BSS     8,F
                             4965*  DISTANCE VS CIRCUMFERENCE TABLE OF HOT FLOW AREA
                  44163      4966     LVSCH   BSS     14,F
                             4967* DISTANCE VS SIGMA
                  44201      4968     LVSIG   BSS     18,F
                  44223      4969     KON39   BSS     1,F
                  44224      4970     NTOTL   BSS     1,F
                  44225      4971     KON50   BSS     1,F
                  44226      4972     KON51   BSS     1,F
                  44227      4973     KON52   BSS     1,F
                  44230      4974     KON53   BSS     1,F
                  44231      4975     KON54   BSS     1,F
                  44232      4976     KON55   BSS     1,F
                  44233      4977     AZN3    BSS     2,F                  Z AT THROAT, THROAT AREA
44235  0 63600 4 44514       4978     DIVCK   SCA     LAST,4
44236  0 02000 0 43556       4979         +1  TRA     BUG
44237  2 43165 3 12431       4980         +2  BCI     4,DIVIDING BY 0 AT LOC
44243  0 63600 4 44514       4981     ERLN    SCA     LAST,4
44244  0 02000 0 43556       4982         +1  TRA     BUG
44245  2 55151 4 65160       4983         +2  BCI     7,ERROR WHEN TAKING LN OF A NUMBER   LOC
44254  0 63600 4 44514       4984     EREXP   SCA     LAST,4
44255  0 02000 0 43556       4985         +1  TRA     BUG
44256  2 55151 4 65160       4986         +2  BCI     7,ERROR WHEN GETTING EXP. OF A NUMBER   LOC
44265 -2 33066 6 06060       4987     LTHW    BCI     1,THW
44266 -2 32366 6 06060       4988     LTCW    BCI     1,TCW
44267 -2 33033 3 14563       4989         +1  BCI     1,TH.INT
44270  2 14347 3 02160       4990         +2  BCI     1,ALPHA
44271  2 72144 4 42160       4991         +3  BCI     1,GAMMA
44272  2 22563 2 16060       4992         +4  BCI     1,BETA
44273 -2 62143 4 36063       4993         +5  BCI     2,WALL THICK.
44275  2 65131 2 33360       4994         +7  BCI     2,FRIC. FACTOR
                  44277      4995     TY      BSS     48,H                      STORAGE USE WITH ITERATION ROUTINE
                  44357      4996     INDAT   BSS     8,H
                  44367      4997     NLEFT   BSS     1,D
                  44370      4998             BSS     3
                  44373      4999     THINT   BSS     1,H                       INITIAL GUESS OF EXIT TEMP
                  44374      5000             BSS     14
                  36123      5001     FRICT   EQU     DNZFF              NOZZLE TUBE FRICTION FACTOR
                  32641      5002     Q1INT   EQU     P+19               INITIAL Q1 GUESS
                  44412      5003     CH      BSS     1,D
                  36124      5004     NUMBR   EQU     DNP                NO. PARTS
                  44413      5005     DSUBHI  BSS     1,D                     AVERAGE OF DIAMETERS N AND N+1
                  44414      5006             BSS     6
                  44422      5007             BSS     10
                  36125      5008     XTHIK   EQU     DWT                WALL THICKNESS
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                  44434      5009     DSUBH   BSS     2,H
                  44436      5010     RSUBN   BSS     2,H
                  44440      5011     TSUBH   BSS     2,H
                  44442      5012     PSUBC   BSS     2,H
                  44444      5013     TSUBC   BSS     2,H
                  44446      5014     TSUBHI  BSS     1,H
                  44447      5015     TSUBCI  BSS     1,H
                  44450      5016     ACI     BSS     1,H
                  44451      5017     CCI     BSS     1,H                       COLD FLOW HEAT TRANSFER AREA
                  44452      5018     DSUBC   BSS     1,H                       WETTED PERIMETER COLD FLOW
                  44453      5019     TCW     BSS     1,H                       HYDRAULIC DIAMETER OF COLD FLOW
                  44454      5020     THW     BSS     1,H                       TEMP COLD WALL
                  44455      5021     HCI     BSS     1,H                       TEMP HOT WALL
                  44456      5022     HHI     BSS     1,H                       HEAT TRANSFER COEFFICIENT COLD SIDE
                  44457      5023     KM      BSS     1,H                       HEAT TRANSFER COEFFICIENT HOT SIDE
                  44460      5024     NUM     BSS     1,H                       THERMAL CONDUCTIVITY
                  44461      5025     DELTAZ  BSS     1,H
                  44462      5026     PIN     BSS     1,F
                  44463      5027     AZN2    BSS     1,F                 INLET PRESSURE
                             5028* TEMPORARY STORAGE AND CONSTANTS FOR CHECKOUT
44464 -1 00160 6 06060       5029     LQ1     BCI     1,Q1
44465  2 10440 0 00000       5030     KON1    DEC        144.
44466  1 67406 1 11565       5031     KON17   DEC        .001
44467  1 72507 5 34122       5032     KON11   DEC        .01
44470  1 60517 4 26542       5033     KON12   DEC        .00001
44471  1 37667 6 33766       5034     KON13   DEC        .0000000001
44472  2 00400 0 00000       5035     KON8    DEC        .5
44473  2 07401 4 63146       5036     KON5    DEC        64.4
44474  2 01400 0 00000       5037     KON10   DEC        1.
                  44475      5038     AZN5    BSS     1,X
                  32621      5039     P3      EQU     P+3
                  32620      5040     T3      EQU     P+2
                  34063      5041     WR      EQU     TP+86
                  44476      5042     Q1      BSS     1,X
                  32633      5043     T6      EQU     P+13
                  44477      5044     RHO4    BSS     1,X
                  44500      5045     TEMP    BSS     10,X
                  44512      5046     SIGMA   BSS     1,D
                  44513      5047     MAXER   BSS     1,D
                  44514      5048     LAST    BSS     1,X
44515  0 60100 0 44657       5049     TIN1    STO     TIN1+98
44516 -0 63400 1 44644       5050         +1  SXD     TIN1+87,1
44517 -0 63400 2 44645       5051         +2  SXD     TIN1+88,2
44520 -0 63400 4 44646       5052         +3  SXD     TIN1+89,4
44521  0 50000 4 00002       5053         +4  CLA     2,4
44522  0 60100 0 44653       5054         +5  STO     TIN1+94
44523  0 40000 0 44650       5055         +6  ADD     TIN1+91
44524  0 73400 1 00000       5056         +7  PAX     0,1
44525 -0 63400 1 44552       5057         +8  SXD     TIN1+29,1
44526  0 76700 0 00001       5058         +9  ALS     1
44527  0 62100 0 44654       5059        +10  STA     TIN1+95
44530  0 50000 0 44653       5060        +11  CLA     TIN1+94
44531  0 77100 0 00021       5061        +12  ARS     17
44532  0 40200 0 44654       5062        +13  SUB     TIN1+95
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44533   0 73400 1 00000   5063      +14  PAX    0,1
44534  -0 63400 1 44554   5064      +15  SXD    TIN1+31,1
44535   0 40000 0 44494   5065      +16  ADD    TIN1+95
44536   0 73400 1 00000   5066      +17  PAX    0,1
44537   0 40000 4 00001   5067      +18  ADD    1,4
44540   0 62100 0 44544   5068      +19  STA    TIN1+23
44541   0 62100 0 44566   5069      +20  STA    TIN1+41
44542   0 62100 0 44570   5070      +21  STA    TIN1+43
44543   0 50000 0 44657   5071      +22  CLA    TIN1+98                BEGIN SEARCH FOR
44544   0 34000 1 00000   5072      +23  CAS    0,1                    K+1 BEST POINTS
44545   2 00002 1 44544   5073      +24  TIX    TIN1+23,1,2
44546   0 02000 0 44547   5074      +25  TRA    TIN1+26
44547   0 50000 0 44653   5075      +26  CLA    TIN1+94                TEST EVEN/ODD K
44550   0 76000 0 00001   5076      +27  LBT
44551   0 02000 0 44566   5077      +28  TRA    TIN1+41                K EVEN
44552   2 00000 1 44554   5078      +29  TIX    TIN1+31,1,0            K ODD
44553  -0 53400 1 44647   5079      +30  LXD    TIN1+90,1
44554  -3 00000 1 44556   5080      +31  TXL    TIN1+33,1,0
44555  -0 53400 1 44554   5081      +32  LXD    TIN1+31,1
44556  -0 75400 1 00000   5082      +33  PXD    0,1
44557   0 77100 0 00022   5083      +34  ARS    18
44560   0 76000 0 00002   5084      +35  CHS
44561   0 40000 0 44544   5085      +36  ADD    TIN1+23
44562   0 62100 0 44603   5086      +37  STA    TIN1+54
44563   0 40000 0 44650   5087      +38  ADD    TIN1+91
44564   0 62100 0 44601   5088      +39  STA    TIN1+52
44565   0 02000 0 44577   5089      +40  TRA    TIN1+50
44566   0 50000 1 00000   5090      +41  CLA    0,1
44567   1 00002 1 44570   5091      +42  TXI    TIN1+43,1,2
44570   0 30000 1 00000   5092      +43  FAD    0,1
44571   0 76500 0 00043   5093      +44  LRS    35
44572   0 26000 0 44651   5094      +45  FMP    TIN1+92
44573   0 34000 0 44657   5095      +46  CAS    TIN1+98
44574   1 77777 1 44552   5096      +47  TXI    TIN1+29,1,-1
44575   1 77777 1 44552   5097      +48  TXI    TIN1+29,1,-1
44576   1 77775 1 44552   5098      +49  TXI    TIN1+29,1,-3
44577  -0 53400 2 44647   5099      +50  LXD    TIN1+90,2              BEGIN AITKENS INTERPOLATION
44600   0 53400 1 44654   5100      +51  LXA    TIN1+95,1
44601   0 50000 1 00000   5101      +52  CLA    0,1
44602   0 60100 2 12513   5102      +53  STO    COMMON+1,2
44603   0 50000 1 00000   5103      +54  CLA    0,1
44604   0 30200 0 44657   5104      +55  FSB    TIN1+98
44605   0 60100 2 12512   5105      +56  STO    COMMON,2
44606   1 77776 2 44607   5106      +57  TXI    TIN1+58,2,-2
44607   2 00002 1 44601   5107      +58  TXI    TIN1+52,1,2
44610   0 50000 0 12512   5108      +59  CLA    COMMON
44611   0 60100 2 12512   5109      +60  STO    COMMON,2
44612   0 53400 4 44653   5110      +61  LXA    TIN1+94,4
44613  -0 53400 2 44652   5111      +62  LXD    TIN1+93,2
44614   1 77776 2 44615   5112      +63  TXI    TIN1+64,2,-2
44615  -0 75400 2 00000   5113      +64  PXD    0,2
44616  -0 73400 1 00000   5114      +65  PDX    0,1
44617   0 50000 1 12514   5115      +66  CLA    COMMON+2,1
44620   0 30200 2 12512   5116      +67  FSB    COMMON,2
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44621   0 10000 0 44634   5117      +68  TZE    TIN1+79
44622   0 60100 0 44656   5118      +69  STO    TIN1+97
44623   0 56000 2 12512   5119      +70  LDQ    COMMON,2
44624   0 26000 1 12515   5120      +71  FMP    COMMON+3,1
44625   0 60100 0 44655   5121      +72  STO    TIN1+96
44626   0 56000 1 12514   5122      +73  LDQ    COMMON+2,1
44627   0 26000 2 12513   5123      +74  FMP    COMMON+1,2
44630   0 30200 0 44655   5124      +75  FSB    TIN1+96
44631   0 24100 0 44656   5125      +76  FDP    TIN1+97
44632  -0 60000 1 12515   5126      +77  STQ    COMMON+3,1
44633   1 77776 1 44617   5127      +78  TXI    TIN1+66,1,-2
44634   0 50000 2 12514   5128      +79  CLA    COMMON+2,2
44635   0 60100 1 12514   5129      +80  STO    COMMON+2,1
44636   2 00001 4 44614   5130      +81  TIX    TIN1+63,4,1
44637   0 50000 1 12513   5131      +82  CLA    COMMON+1,1
44640  -0 53400 1 44644   5132      +83  LXD    TIN1+87,1
44641  -0 53400 2 44645   5133      +84  LXD    TIN1+88,2
44642  -0 53400 4 44646   5134      +85  LXD    TIN1+89,4
44643   0 02000 4 00003   5135      +86  TRA    3,4                    ESCAPE
44644   0 00000 0 00000   5136      +87  DEC       0,,,,1,,5
44652   0 00002 0 00000   5137      +93  PZE    0,0,2
44653   0 00000 0 00000   5138      +94  DEC       0,,,,0
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                          5140*HOT BLEED PORT ROUTINES
                          5141*REGION TO INITIALIZE HOT BLEED PORT FOR EACH TIME POINT
44660   0 50000 0 32704   5142      HBI    CLA    P+54                   PC
44661  -0 10000 0 44663   5143             TNZ    *+2                    *CHECKOUT ONLY
44662   0 50000 0 32702   5144             CLA    P+52                   *CHECKOUT ONLY
44663   0 60100 0 47321   5145             STO    PR
44664   0 60100 0 47325   5146             STO    PR+4
44665   0 60000 0 47322   5147             STZ    PR+1                   PH
44666   0 50000 0 32656   5148             CLA    P+32                   P6
44667   0 60100 0 47323   5149             STO    PR+2
44670   0 60000 0 47324   5150             STZ    PR+3                   P8
44671   0 60000 0 47334   5151             STZ    PR+11                  P08
44672   0 50000 0 32705   5152             CLA    P+55                   TC
44673  -0 10000 0 44675   5153             TNZ    *+2                    *CHECKOUT ONLY
44674   0 50000 0 32703   5154             CLA    P+53                   *CHECKOUT ONLY
44675   0 60100 0 47352   5155             STO    PR+25
44676   0 60100 0 47356   5156             STO    PR+29
44677   0 60000 0 47353   5157             STZ    PR+26                  TH
44700   0 50000 0 32633   5158             CLA    P+13                   T6
44701   0 60100 0 47354   5159             STO    PR+27
44702   0 60000 0 47355   5160             STZ    PR+28                  T8
44703   0 60000 0 47365   5161             STZ    PR+36                  T08
44704   0 50000 0 32644   5162             CLA    P+22
44705   0 60100 0 47403   5163             STO    PR+50                  WDOTC
44706   0 50000 0 34045   5164             CLA    TP+72                  WDOTH
44707   0 60100 0 47404   5165             STO    PR+51
44710   0 50000 0 32657   5166             CLA    P+33
44711   0 60100 0 47350   5167             STO    PR+23                  G.P.
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                                    5169*REGION TO OUTPUT MB QUANTITIES
 44713  0 50000 0 47334  5170     MBO      CLA    PR+11
 44714  0 60100 0 32660  5171          +1  STO    P+34                    POB
 44715  0 50000 0 47365  5172          +2  CLA    PR+36
 44716  0 60100 0 32661  5173          +3  STO    P+35                    TOB
 44717  0 50000 0 47406  5174          +4  CLA    PR+51
 44720  0 60100 0 32645  5175          +5  STO    P+23                    WDOTH
 44721  0 50000 0 47407  5176          +6  CLA    PR+54
 44722  0 60100 0 34007  5177          +7  STO    TP+42                   WDOTNCHOKE
 44723  0 02000 4 00001  5178          +8  TRA    1,4
                                    5179*REGION TO INITIALIZE INPUT FOR HOT BLEED PORT
 44724  0 50000 0 36152  5180     MBZ      CLA    DT
 44725  0 60100 0 47341  5181          +1  STO    P'+16
 44726  0 50000 0 36136  5182          +2  CLA    DLH
 44727  0 60100 0 47340  5183          +3  STO    PR+15
 44730  0 50000 0 36153  5184          +4  CLA    DR
 44731  0 60100 0 47342  5185          +5  STO    PR+17
 44732  0 50000 0 36150  5186          +6  CLA    DDCO
 44733  0 60100 0 47343  5187          +7  STO    PR+18
 44734  0 50000 0 36151  5188          +8  CLA    DNH
 44735  0 60100 0 47344  5189          +9  STO    PR+19
 44736  0 50000 0 36154  5190         +10  CLA    DTHET
 44737  0 60100 0 47345  5191         +11  STO    PR+20
 44740  0 50000 0 36147  5192         +12  CLA    DNX
 44741  0 60100 0 47370  5193         +13  STO    PR+39
 44742  0 50000 0 36146  5194         +14  CLA    DL
 44743  0 60100 0 47372  5195         +15  STO    PR+41
 44744  0 50000 0 36121  5196         +16  CLA    DA6
 44745  0 60100 0 47422  5197         +17  STO    PR+65
 44746  0 50000 0 36122  5198         +18  CLA    DASTR
 44747  0 60100 0 47430  5199         +19  STO    PR+71
 44750  0 50000 0 36203  5200         +20  CLA    DKFLG
 44751  0 60100 0 47455  5201         +21  STO    PR+92
 44752  0 50000 0 36131  5202         +22  CLA    DAKV
 44753  0 60100 0 47456  5203         +23  STO    PR+93
 44754  0 50000 0 36132  5204         +24  CLA    DBKV
 44755  0 60100 0 47457  5205         +25  STO    PR+94
 44756  0 02000 4 00001  5206         +26  TRA    1,4
                                    5207*HOT BLEED PORT PROGRAM -- KEN NAGASAWA
 44757  0 63400 4 47051  5208     MB       SXA    MBR,4
 44760  0 63400 2 47052  5209          +1  SXA    MBR+1,2
 44761  0 63400 3 47053  5210          +2  SXA    MBR+2,3
 44762  0 63400 1 47054  5211          +3  SXA    MBR+3,1
 44763  0 63400 5 47055  5212          +4  SXA    MBR+4,5
 44764  0 63400 6 47056  5213          +5  SXA    MBR+5,6
 44765  0 63400 7 47057  5214          +6  SXA    MBR+6,7
 44766  0 77400 1 00000  5215          +7  AXT    0,1
 44767  0 77400 2 00000  5216          +8  AXT    0,2
 44770  0 77400 3 00000  5217          +9  AXT    0,3
 44771  0 77400 5 00000  5218         +10  AXT    0,5
 44772  0 77400 6 00000  5219         +11  AXT    0,6
 44773  0 77400 7 00000  5220         +12  AXT    0,7
 44774  0 76000 0 00012  5221         +13  DCT
 44775  0 02000 0 44776  5222         +14  TRA    *+1
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 44776  0 50000 0 47714  5223         +15  CLA    HB6
 44777  0 60100 0 44105  5224         +16  STO    SWT                     ITER PRINT FLAG
 45000  0 77400 4 00050  5225         +17  AXT    40,4
 45001 -0 63400 4 43745  5226         +18  SXD    ITER5,4                 NO. ITERATIONS
 45002  0 77400 4 47065  5227         +19  AXT    HB4,4
 45003  0 63400 4 44020  5228         +20  SXA    ITER9,4
 45004  0 07400 4 44660  5229         +21  TSX    HBI,4                   ERROR RETURN
 45005  0 50000 0 47354  5230         +22  CLA    PR+27                   INPUT
 45006  0 56000 0 47323  5231         +23  LDQ    PR+2                    T6
 45007  0 07400 4 25564  5232         +24  TSX    AZH,4                   P6
 45010  0 07400 4 42602  5233         +25  TSX    ERROR,4
 45011  0 50000 0 33724  5234         +26  CLA    WPR+2
 45012  0 60100 0 47524  5235         +27  STO    Z+31                    H06
 45013  0 50000 0 47356  5236         +28  CLA    PR+29                   T2C
 45014  0 56000 0 47325  5237         +29  LDQ    PR+4                    P2C
 45015  0 07400 4 25564  5238         +30  TSX    AZH,4
 45016  0 07400 4 42602  5239         +31  TSX    ERROR,4
 45017  0 50000 0 33724  5240         +32  CLA    WPR+2
 45020  0 60100 0 47525  5241         +33  STO    Z+32                    H02C
 45021  0 56000 0 47404  5242         +34  LDQ    PR+51                         WH
 45022  0 26000 0 40262  5243         +35  FMP    FL3,7
 45023  0 60100 0 47453  5244         +36  STO    PR+90
 45024  0 50000 0 47372  5245         +37  CLA    PR+41                   Q INITIAL GUESS
 45025  0 24100 0 47370  5246         +38  FDP    PR+39                   LENGTH
 45026 -0 60000 0 47371  5247         +39  STQ    PR+40                   NO OF DELTAS
 45027  0 50000 0 47370  5248         +40  CLA    PR+39                   DELTA X
 45030  0 60100 0 47546  5249         +41  STO    Z+49
 45031  0 77400 7 00002  5250         +42  AXT    2,7
 45032  0 50000 0 47323  5251   20.00      CLA    PR+2                    P6
 45033  0 56000 0 47354  5252          +1  LDQ    PR+27                   T6= THIC
 45034 -3 00000 6 45037  5253          +2  TXL    *+3,6,0                 MR HOT NOT INPUT
 45035  0 07400 4 47733  5254          +3  TSX    RHOMR,4                 CALC. DENSITY = (P*144)/(RH*T)
 45036  0 02000 0 45045  5255          +4  TRA    *+7
 45037  0 13100 0 00000  5256          +5  XCA
 45040  0 07400 4 25564  5257          +6  TSX    AZH,4
 45041  0 07400 4 42602  5258          +7  TSX    ERROR,4
 45042  0 56000 0 33730  5259          +8  LDQ    WPR+6
 45043  0 26000 0 40245  5260          +9  FMP    FLCUF
 45044  0 60100 0 47522  5261         +10  STO    Z+29
 45045  0 76000 0 00142  5262         +11  SLN    2
 45046  0 50000 0 36167  5263         +12  CLA    TK+10                   COMPUTE WN  ,K=1.4
 45047  0 30200 0 40213  5264         +13  FSB    FL1
 45050  0 60100 0 47465  5265         +14  STO    Z                       K-1
 45051  0 30000 0 40214  5266         +15  FAD    FL2
 45052  0 60100 0 47466  5267         +16  STO    Z+1                     K+1
 45053  0 24100 0 47465  5268         +17  FDP    Z
 45054 -0 60000 0 47467  5269         +18  STQ    Z+2
 45055  0 50000 0 40214  5270         +19  CLA    FL2
 45056  0 24100 0 47466  5271         +20  FDP    Z+1
 45057  0 13100 0 00000  5272         +21  XCA
 45060  0 56000 0 47467  5273         +22  LDQ    Z+2
 45061  0 07400 1 47752  5274         +23  TSX    POWER,1
 45062  0 13100 0 00000  5275         +24  XCA
 45063  0 24000 0 36147  5276         +25  FMP
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45064   0 24100 0 36175   5277        +26  FDP   TK+16
45065   0 26000 0 40272   5278        +27  FMP   FLGF
45066   0 60100 0 47930   5279        +28  STO   Z+35
45067   0 24100 0 47354   5280        +29  FDP   PR+27          T6
45070   0 13100 0 00000   5281        +30  XCA
45071   0 07400 4 24364   5282        +31  TSX   SQRT,4
45072   0 07400 4 42602   5283        +32  TSX   ERROR,4
45073   0 13100 0 00000   5284        +33  XCA
45074   0 26000 0 47323   5285        +34  FMP   PR+2           P6
45075   0 13100 0 00000   5286        +35  XCA
45076   0 26000 0 47430   5287        +36  FMP   PR+71          AN
45077   0 60100 0 47407   5288        +37  STO   PR+54          WN
45100   0 30000 0 47404   5289        +38  FAD   PR+51          WH
45101   0 60100 0 47406   5290     20.01   STO   PR+53          WR
45102   0 50000 0 47406   5291        +1   CLA   PR+53          WR
45103   0 24100 0 47522   5292        +2   FDP   Z+29
45104   0 26000 0 40244   5293        +3   FMP   FL144
45105   0 24100 0 47422   5294        +4   FDP   PR+65          A6
45106  -0 60000 0 47450   5295        +5   STO   PR+87          V6
45107   0 50000 0 40254   5296     20.50   CLA   FL.5
45110  -0 52000 0 47401   5297        +1   NZT   PR+48          MACH HOT MIX
45111   0 60100 0 47401   5298        +2   STO   PR+48
45112   0 50000 0 47354   5299        +3   CLA   PR+27
45113   0 60100 0 47367   5300        +4   STO   PR+38          THIC=T6
45114   0 50C00 0 36167   5301        +5   CLA   TK+10
45115   0 30200 0 40213   5302        +6   FSB   FL1
45116   0 24100 0 40214   5303        +7   FDP   FL2
45117  -0 60000 0 47472   5304        +8   STO   Z+5           K-1/2
45120   0 26C00 0 47401   5305        +9   FMP   PR+48
45121   0 13100 0 00000   5306       +10   XCA
45122   0 26000 0 47401   5307       +11   FMP   PR+48
45123   0 30C00 0 40213   5308       +12   FAD   FL1
45124   0 60100 0 47473   5309       +13   STO   Z+6
45125   0 50C00 0 47367   5310       +14   CLA   PR+38
45126   0 24100 0 47473   5311       +15   FDP   Z+6
45127  -0 60C00 0 47364   5312       +16   STO   PR+35          THM
45130   0 26000 0 40272   5313     20.55   FMP   FLGF
45131   0 13100 0 00000   5314        +1   XCA
45132   0 26000 0 36167   5315        +2   FMP   TK+10
45133   0 13100 0 00000   5316        +3   XCA
45134   0 26000 0 36175   5317        +4   FMP   TK+16          R HOT
45135   0 07400 4 24364   5318        +5   TSX   SQRT,4
45136   0 07400 4 42602   5319        +6   TSX   ERROR,4
45137   0 60100 0 47521   5320        +7   STO   Z+28          C HOT
45140   0 13100 0 00000   5321        +8   XCA
45141   0 26000 0 47401   5322        +9   FMP   PR+48
45142   0 60100 0 47446   5323       +10   STO   PR+85          VHM
45143   0 56000 0 47340   5324     20.56   LDQ   PR+15          DH
45144   0 26000 0 47340   5325        +1   FMP   PR+15
45145   0 24100 0 40216   5326        +2   FDP   FL4
45146   0 26000 0 40271   5327        +3   FMP   FLPI
45147   0 60100 0 47424   5328        +4   STO   PR+67          AH
45150   0 52000 0 47454   5329        +5   ZET   PR+91          HEAT TRANSFER FLAG
45151   0 02000 0 45507   5330        +6   TRA   21.99          NON ZERO
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45152   0 50000 0 47404   5331     20.58   CLA   PR+51          WH
45153   0 76000 0 00003   5332        +1   SSP                  MAKE ABSOLUTE
45154   0 24100 0 47446   5333        +2   FDP   PR+85
45155   0 26000 0 40244   5334        +3   FMP   FL144
45156   0 24100 0 47424   5335        +4   FDP   PR+67          AH
45157  -0 60000 0 47523   5336        +5   STO   Z+30
45160   0 56000 0 47446   5337        +6   LDQ   PR+85          VHM
45161   0 26000 0 47446   5338     20.60   FMP   PR+85
45162   0 60100 0 47466   5339        +1   STO   Z+1
45163   0 56000 0 47450   5340        +2   LDQ   PR+87          V6
45164   0 26000 0 47450   5341        +3   FMP   PR+87
45165   0 30000 0 47466   5342        +4   FAD   Z+1
45166   0 60100 0 47465   5343        +5   STO   Z
45167   0 07400 4 24364   5344        +6   TSX   SQRT,4
45170   0 07400 4 42602   5345        +7   TSX   ERROR,4
45171   0 60100 0 47451   5346        +8   STO   PR+88          VIN
45172   0 50000 0 47522   5347     20.65   CLA   Z+29
45173   0 30000 0 47523   5348        +1   FAD   Z+30
45174   0 24100 0 40214   5349        +2   FDP   FL2
45175  -0 60000 0 47474   5350        +3   STO   Z+7           RHO IN
45176   0 56000 0 36171   5351     20.70   LDQ   TK+12          KIN = .5
45177   0 26000 0 47465   5352        +1   FMP   Z             VIN 2
45200   0 60100 0 47465   5353        +2   STO   Z
45201   0 50000 0 47451   5354        +3   CLA   PR+88          VIN
45202   0 30200 0 47446   5355        +4   FSB   PR+85          VAM
45203   0 60100 0 47466   5356        +5   STO   Z+1
45204   0 13100 0 00000   5357        +6   XCA
45205   0 26000 0 47466   5358        +7   FMP   Z+1
45206   0 30000 0 47465   5359        +8   FAD   Z
45207   0 24100 0 40273   5360        +9   FDP   FL2G
45210   0 26000 0 47474   5361       +10   FMP   Z+7           RHO IN
45211   0 24100 0 40244   5362       +11   FDP   FL144
45212  -0 60000 0 47335   5363       +12   STO   PR+12          DELTA P
45213   0 50000 0 47323   5364     20.75   CLA   PR+2           P6
45214   0 30200 0 47335   5365        +1   FSB   PR+12
45215   0 60100 0 47336   5366        +2   STO   PR+13          PHM 0
45216   0 50C00 0 36167   5367     20.76   CLA   TK+10          K
45217   0 30200 0 40213   5368        +1   FSB   FL1
45220   0 60100 0 47465   5369        +2   STO   Z
45221   0 50000 0 36167   5370        +3   CLA   TK+10
45222   0 24100 0 47465   5371        +4   FDP   Z
45223  -0 60C00 0 47513   5372        +5   STO   Z+22          K/K-1
45224   0 50C00 0 47473   5373        +6   CLA   Z+6
45225   0 07400 1 47752   5374        +7   TSX   POWER,1
45226   0 60100 0 47465   5375        +8   STO   Z
45227   0 50000 0 47336   5376        +9   CLA   PR+13          PHM 0
45230   0 24100 0 47465   5377       +10   FDP   Z
45231  -0 60C00 0 47333   5378       +11   STO   PR+10          PHM
45232   0 50000 0 36167   5379     20.77   CLA   TK+10          1.4
45233   0 30000 0 40213   5380        +1   FAD   FL1
45234   0 60100 0 47466   5381        +2   STO   Z+1
45235   0 50000 0 40214   5382        +3   CLA   FL2
45236   0 24100 0 47466   5383        +4   FDP   Z+1
45237  -0 60000 0 47465   5384        +5   STO   Z             2/K+1
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45240  0 50000  0 36167   5385          +6  CLA    TK+10
45241  0 30200  0 40213   5386          +7  FSB    FL1
45242  0 60100  0 47467   5387          +8  STO    Z+2
45243  0 50000  0 47466   5388          +9  CLA    Z+1
45244  0 24100  0 47467   5389         +10  FDP    Z+2                    K+1/K-1
45245  0 50000  0 47465   5390         +11  CLA    Z
45246  0 07400  1 47752   5391         +12  TSX    POWER,1
45247  0 24100  0 36175   5392         +13  FDP    TK+16                  772.
45250  0 26000  0 40272   5393         +14  FMP    FLGF
45251  0 13100  0 00000   5394         +15  XCA
45252  0 26000  0 36167   5395         +16  FMP    TK+10
45253  0 24100  0 47367   5396         +17  FDP    PR+38
45254  0 13100  0 00000   5397         +18  XCA
45255  0 07400  4 24364   5398         +19  TSX    SQRT,4
45256  0 07400  4 42602   5399         +20  TSX    ERROR,4
45257  0 13100  0 00000   5400         +21  XCA
4526C  0 26000  0 47336   5401         +22  FMP    PR+13
45261  0 13100  0 00000   5402         +23  XCA
45262  0 26000  0 47424   5403         +24  FMP    PR+67
45263  0 34000  0 47404   5404         +25  CAS    PR+51                  WH
45264  0 02000  0 45271   5405         +26  TRA    20.80
45265  0 02000  0 45352   5406         +27  TRA    20.90
45266  0 60100  0 47404   5407         +28  STO    PR+51                  WHMAX = WH
45267  0 50000  0 40213   5408         +29  CLA    FL1
45270  0 02000  0 45111   5409         +30  TRA    20.50+2
45271  0 56000  0 47472   5410   20.80      LDQ    Z+5
45272  0 26000  0 47404   5411         +1  FMP    PR+51
45273  0 13100  0 00000   5412         +2  XCA
45274  0 26000  0 47404   5413         +3  FMP    PR+51
45275  0 60100  0 47466   5414         +4  STO    Z+1
45276  0 50000  0 47333   5415   20.85      CLA    PR+10                  PHM
45277  0 56000  0 47364   5416         +1  LDQ    PR+35                  THM
45300 -3 00000  6 45303   5417         +2  TXL    *+3,6,0                MR HOT NOT INPUT
45301  0 07400  4 47733   5418         +3  TSX    RHOMR,4                CALC. DENSITY = (P*144)/(RH*T)
45302  0 02000  0 45311   5419         +4  TRA    *+7
45303  0 13100  0 00000   5420         +5  XCA
45304  0 07400  4 25564   5421         +6  TSX    AZH,4
45305  0 07400  4 42602   5422         +7  TSX    ERROR,4
45306  0 56000  0 33730   5423         +8  LDQ    WPR+6
45307  0 26000  0 40245   5424         +9  FMP    FLCUF
45310  0 60100  0 47465   5425        +10  STO    Z                      RHO PRIME HM
45311  0 24100  0 40244   5426        +11  FDP    FL144
45312  0 26000  0 47465   5427        +12  FMP    Z
45313  0 24100  0 40244   5428        +13  FDP    FL144
45314  0 26000  0 47424   5429        +14  FMP    PR+67                  AH
45315  0 13100  0 00000   5430        +15  XCA
45316  0 26000  0 47424   5431        +16  FMP    PR+67
45317  0 13100  0 00000   5432        +17  XCA
45320  0 26000  0 47367   5433        +18  FMP    PR+38                  THM 0
45321  0 13100  0 00000   5434        +19  XCA
45322  0 26000  0 36175   5435        +20  FMP    TK+16
45323  0 13100  0 00000   5436        +21  XCA
45324  0 26000  0 36167   5437        +22  FMP    TK+10
45325  0 13100  0 00000   5438        +23  XCA
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45326  0 26000  0 40272   5439        +24  FMP    FLGF
45327  0 30200  0 47466   5440        +25  FSB    Z+1
45330  0 07400  4 24364   5441        +26  TSX    SQRT,4
45331  0 07400  4 42602   5442        +27  TSX    ERROR,4
45332  0 60100  0 47465   5443        +28  STO    Z
45333  0 50000  0 47404   5444        +29  CLA    PR+51                  WH
45334  0 76000  0 00003   5445        +30  SSP                           MAKE ABSOLUTE
45335  0 24100  0 47465   5446        +31  FDP    Z
45336  0 50000  0 47401   5447        +32  CLA    PR+48
                          5448*NHM ITERATION
45337  0 07402  2 43624   5449        +33  TSX    ITER,2,2
45340 -0 47755  0 47573   5450        +34  NZE    IT+20,,CLS2
45341  0 47754  0 47574   5451        +35  PZE    IT+21,,CLS1
45342  0 40213  0 47575   5452        +36  PZE    IT+22,,FL1
45343  3 47401  0 47307   5453        +37  PTH    YHD,,PR+48
45344  3 00000  0 47275   5454        +38  PTH    XHD
45345  0 47757  0 47757   5455        +39  PZE    CLS4,,CLS4
45346  0 02000  0 45352   5456        +40  TRA    20.90
45347  0 12000  0 45351   5457        +41  TPL    *+2
45350  0 50000  0 40256   5458        +42  CLA    FL.8
45351  0 02000  0 45111   5459        +43  TRA    20.50+2
45352 -3 00000  6 45367   5460   20.90      TXL    21.00,6,0              MR HOT NOT INPUT
45353  0 77400  7 00001   5461         +1  AXT    1,7                          INITIALIZE FOR MR MIX
45354  0 50000  0 47461   5462         +2  CLA    PR+96                        COMPUTE MR MIX   MR HOT
45355  0 30000  0 40213   5463         +3  FAD    FL1
45356  0 13100  0 00000   5464         +4  XCA
45357  0 26000  0 47403   5465         +5  FMP    PR+50                  W C
45360  0 30000  0 47404   5466         +6  FAD    PR+51                  WH
45361  0 60100  0 12512   5467         +7  STO    KON
45362  0 50000  0 47461   5468         +8  CLA    PR+96                  MR H INPUT
45363  0 24100  0 12512   5469         +9  FDP    KON
45364  0 26000  0 47404   5470        +10  FMP    PR+51                  WH
45365  0 60100  0 47462   5471        +11  STO    PR+97                  MR MIX
45366  0 07400  4 47715   5472        +12  TSX    NEWRCP,4               COMPUTE NEW R AND C SUB P FOR MIX
45367  0 56000  0 47404   5473   21.00      LDQ    PR+51                  WH
45370  0 26000  0 47524   5474         +1  FMP    Z+31
45371  0 60100  0 47465   5475         +2  STO    Z
45372  0 50000  0 47403   5476         +3  CLA    PR+50                  WC
45373  0 30000  0 47404   5477         +4  FAD    PR+51                  WH
45374  0 60100  0 47405   5478         +5  STO    PR+52                  WT
45375  0 56000  0 47403   5479         +6  LDQ    PR+50                  WC
45376  0 26000  0 47525   5480         +7  FMP    Z+32                   HO2
45377  0 30000  0 47465   5481         +8  FAD    Z                      WH(HO6)
45400  0 24100  0 47405   5482         +9  FDP    PR+52                  WT
45401  0 76000  0 00012   5483        +10  DCT
45402  0 07400  4 42602   5484        +11  TSX    ERROR,4
45403 -0 60000  0 47526   5485        +12  STQ    Z+33
45404  0 13100  0 00000   5486        +13  XCA                           HO8
45405 -3 00000  6 45412   5487        +14  TXL    *+5,6,0                MR HOT NOT INPUT
45406  0 24160  7 47752   5488        +15  FDP*   NEWCP+2,7               HO8 IN AC    IR7=1 C SUB P MIX
45407  0 13100  0 00000   5489        +16  XCA
45410  0 30000  0 40263   5490        +17  FAD    FL66
45411  0 02000  0 45415   5491        +18  TRA    *+4                    TO8 IN AC
                          5492*CAVEMAN INTERPOLATION
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45412  0 07400 4 44515     +19  TSX   TINI,4                  H08 VS. T08
45413  0 00000 0 47760     +20  HTR   THOT,0,0
45414  0 00022 0 00001     +21  HTR   1,0,18
45415  0 60100 0 47365     +22  STO   PR+36                   T08
45416  0 60100 0 47353     +23  STO   PR+26                   TH
                      *COMPUTE PO 8 ON EACH PASS
45417  0 50000 0 47530     +24  CLA   Z+35                    CALCULATE  PO 8
45420 -3 00000 6 45423     +25  TXL   *+3,6,0                 MR HOT NOT INPUT
45421  0 24160 7 47750     +26  FDP*  NEWR+2,7                IR =2 RHOT,IR=1 R MIX       IR7=1
45422  0 26060 7 47747     +27  FMP*  NEWR+1,7                IR =2 RHOT,IR=1 R MIX       IR7=1
45423  0 07400 4 24364     +28  TSX   SQRT,4
45424  0 07400 4 42602     +29  TSX   ERROR,4
45425  0 13100 0 00000     +30  XCA
45426  0 26000 0 47431     +31  FMP   PR+72                   ATN
45427  0 60100 0 47531     +32  STO   Z+36                    KT
45430  0 13100 0 00000     +33  XCA
45431  0 26000 0 47531     +34  FMP   Z+36
45432  0 60100 0 47532     +35  STO   Z+37                    KT2
45433  0 56000 0 47350     +36  LDQ   PR+23                   GATE POS
45434  0 26000 0 47456     +37  FMP   PR+93                   A
45435  0 30200 0 47457     +38  FSB   PR+94                   B
45436  0 60100 0 47460     +39  STO   PR+95                   KV
45437  0 13100 0 00000     +40  XCA
45440  0 26000 0 47460     +41  FMP   PR+95
45441  0 60100 0 47533     +42  STO   Z+38                    KV SQUARE
45442  0 50000 0 40265     +43  CLA   FL128.
45443  0 24100 0 47533     +44  FDP   Z+38                    KV2
45444  0 26060 7 47750     +45  FMP*  NEWR+2,7                R HOT IR=2, R MIX IR=1
45445  0 24100 0 40244     +46  FDP   FL144
45446  0 26000 0 47532     +47  FMP   Z+37                    KT2
45447  0 60100 0 47534     +48  STO   Z+39                    F
45450  0 50000 0 36176     +49  CLA   TK+17                   K11
45451  0 30000 0 36177     +50  FAD   TK+18                   K9
45452  0 60100 0 47466     +51  STO   Z+1
45453  0 56000 0 47340     +52  LDQ   PR+15                   DTL EQU. DH
45454  0 26000 0 47340     +53  FMP   PR+15                   DTL EQU. DH
45455  0 24100 0 40216     +54  FDP   FL4
45456  0 26000 0 40271     +55  FMP   FLPI
45457  0 60100 0 47535     +56  STO   Z+40                    ATL
45460  0 13100 0 00000     +57  XCA
45461  0 26000 0 47535     +58  FMP   Z+40                    ATL
45462  0 60100 0 47535     +59  STO   Z+40                    ATL SQUARE
45463  0 50060 7 47750     +60  CLA*  NEWR+2,7                R HOT IR=2, R MIX IR=1
45464  0 24100 0 47535     +61  FDP   Z+40                    ATL SQUARE
45465  0 26000 0 47532     +62  FMP   Z+37                    KT2
45466  0 24100 0 40272     +63  FDP   FLGF
45467 -0 60000 0 47536     +64  STQ   Z+41                    L
45470  0 26000 0 47466     +65  FMP   Z+1                     K11+K9
45471  0 30000 0 47534     +66  FAD   Z+39                    F
45472  0 30000 0 40213     +67  FAD   FL1
45473  0 07400 4 24364     +68  TSX   SQRT,4
45474  0 07400 4 42602     +69  TSX   ERROR,4
45475  0 60100 0 47537     +70  STO   Z+42
45476  0 50000 0 47365     +71  CLA   PR+36                   T08

45477  0 07400 4 24364     +72  TSX   SQRT,4
45500  0 07400 4 42602     +73  TSX   ERROR,4
45501  0 24100 0 47531     +74  FDP   Z+36                    KT
45502  0 26000 0 47405     +75  FMP   PR+52                   WT
45503  0 13100 0 00000     +76  XCA
45504  0 26000 0 47537     +77  FMP   Z+42
45505  0 60100 0 47322     +78  STO   PR+1                    NEW PH
45506  0 60100 0 47334   21.05  STO   PR+11                   PO8
45507  0 60000 0 47545   21.99  STZ   Z+48                    INITIALIZE FOR BELLOW SECTIONS
45510  0 77400 1 00000      +1  AXT   0,1
45511  0 63400 1 46220      +2  SXA   23.93,1
                      * HEAT TRANSFER PROGRAM  8/23/63
45512 -3 00000 6 45515   22.00  TXL   *+3,6,0                 MR HCT NOT INPUT
45513  0 50060 7 47752      +1  CLA*  NEWCP+2,7               C SUB P MIX
45514  0 02000 0 45522      +2  TRA   *+6
45515  0 50000 0 47353      +3  CLA   PR+26                   TH I
45516  0 56000 0 47322      +4  LDQ   PR+1                    PH I
45517  0 07400 4 25564      +5  TSX   AZH,4
45520  0 07400 4 42602      +6  TSX   ERROR,4
45521  0 50000 0 33731      +7  CLA   WPR+7
45522  0 60100 0 47465      +8  STO   Z                       CSUBP HOT
45523  0 50000 0 47453      +9  CLA   PR+90                   QI
45524  0 24100 0 47465     +10  FDP   Z
45525  0 13100 0 00000     +11  XCA
45526  0 24100 0 47405     +12  FDP   PR+52                    (
45527  0 13100 0 00000     +13  XCA
45530  0 30000 0 47353     +14  FAD   PR+26                   THI
45531  0 60100 0 47362     +15  STO   PR+33                   TH I+1
45532  0 30000 0 47353   22.10  FAD   PR+26
45533  0 24100 0 40214      +1  FDP   FL2
45534 -0 60000 0 47413      +2  STQ   PR+58                   TH I+1/2
45535  0 50000 0 47352   22.20  CLA   PR+25                   TC I
45536  0 56000 0 47321      +1  LDQ   PR                      PC I
45537  0 16200 0 45541      +2  TQP   *+2
45540  0 02000 0 47063      +3  TRA   HB8                  NEGATIVE PC (I)
45541  0 07400 4 25564      +4  TSX   AZH,4
45542  0 07400 4 42602      +5  TSX   ERROR,4
45543  0 50000 0 33731      +6  CLA   WPR+7
45544  0 60100 0 47465      +7  STO   Z                       CSUBP COLD
45545  0 50000 0 47453      +8  CLA   PR+90                   Q I
45546  0 24100 0 47465      +9  FDP   Z
45547  0 13100 0 00000     +10  XCA
45550  0 24100 0 47403     +11  FDP   PR+50                   WC
45551  0 13100 0 00000     +12  XCA
45552  0 30000 0 47352     +13  FAD   PR+25                   TCI
45553  0 60100 0 47361     +14  STO   PR+32                   TCI+1
45554  0 30000 0 47352   22.30  FAD   PR+25
45555  0 24100 0 40214      +1  FDP   FL2
45556 -0 60000 0 47412      +2  STQ   PR+57                   TC I+1/2
45557  0 56000 0 47340   22.40  LDQ   PR+15                   DH
4556C  0 26000 0 40271      +1  FMP   FLPI
45561  0 60100 0 47465      +2  STO   Z                       F PH
45562  0 560C0 0 47424      +3  LDQ   PR+67                   AH
45563  0 26000 0 40216      +4  FMP   FL4
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45644   0 24100 0 47347   5601          +5  FDP   Z
45645  -0 60000 0 47347   5602          +6  STQ   PR+22                 D SLA H
45646   0 50000 0 47362   5603          +7  CLA   PR+33                 TH I+1
45647   0 30200 0 47353   5604          +8  FSB   PR+26                 TH I
45570   0 24100 0 47413   5605          +9  FDP   PR+58                 TH I+1/2
45571  -0 60000 0 47466   5606         +10  STQ   Z+1
45572   0 56000 0 40216   5607         +11  LDQ   FL4
45573   0 26000 0 36165   5608         +12  FMP   TK+8                  FRICTION MOT
45574   0 24100 0 47347   5609         +13  FDP   PR+22                 D SLA H
45575   0 26000 0 47371   5610         +14  FMP   PR+40
45576   0 30000 0 47466   5611         +15  FAD   Z+1
45577   0 60100 0 47466   5612         +16  STO   Z+1
45600   0 50000 0 47322   5613         +17  CLA   PR+1                  PH I
45601   0 56000 0 47353   5614         +18  LDQ   PR+26                 TH I
45602  -3 00000 6 45605   5615         +19  TXL   *+3,6,0               MR MOT NOT INPUT
45603   0 07400 4 47733   5616         +20  TSX   RHOMR,4               CALC. DENSITY = (P*144)/(RH*T)
45604   0 02000 0 45613   5617         +21  TRA   *+7
45605   0 13100 0 00000   5618         +22  XCA
45606   0 07400 4 25564   5619         +23  TSX   AZM,4
45607   0 07400 4 42602   5620         +24  TSX   ERROR,4
45610   0 56000 0 33730   5621         +25  LDQ   WPR+6
45611   0 26000 0 40245   5622         +26  FMP   FLCUF
45612   0 60100 0 47465   5623         +27  STO   Z
45613   0 50000 0 40244   5624         +28  CLA   FL144
45614   0 24100 0 47465   5625         +29  FDP   Z                     RHO MI
45615   0 26000 0 47405   5626         +30  FMP   PR+52                 WT
45616   0 24100 0 47424   5627         +31  FDP   PR+67                 AH
45617   0 26000 0 47405   5628         +32  FMP   PR+52
45620   0 24100 0 47424   5629         +33  FDP   PR+67
45621   0 26000 0 47466   5630         +34  FMP   Z+1
45622   0 24100 0 40273   5631         +35  FDP   FL2G
45623   0 13100 0 00000   5632         +36  XCA
45624   0 30000 0 47322   5633         +37  FAD   PR+1                  PH I
45625   0 60100 0 47331   5634         +38  STO   PR+8                  PH I+1
45626   0 30000 0 47322   5635      22.50   FAD   PR+1
45627   0 24100 0 40214   5636         +1   FDP   FL2
45630  -0 60000 0 47476   5637         +2   STQ   Z+9                   PH I+1/2
45631   0 50000 0 47413   5638      22.60   CLA   PR+58                 TH I+1/2
45632   0 07400 4 25564   5639         +1   TSX   AZM,4
45633   0 07400 4 42602   5640         +2   TSX   ERROR,4
45634   0 07400 4 26223   5641         +3   TSX   AZL,4
45635   0 60100 0 47376   5642      22.70   STO   PR+45                 LH I+1/2
45636   0 50000 0 47371   5643         +1   CLA   PR+40                 DELTA X
45637   0 30000 0 47340   5644         +2   FAD   PR+15                 DH
45640   0 60100 0 47465   5645         +3   STO   Z
45641   0 50000 0 47340   5646         +4   CLA   PR+15
45642   0 24100 0 47465   5647         +5   FDP   Z                     DH+DELTAX
45643   0 13100 0 00000   5648         +6   XCA
45644   0 56000 0 36162   5649         +7   LDQ   TK+5                  B MOT
45645   0 07400 1 47752   5650         +8   TSX   POWER,1
45646   0 24100 0 47424   5651         +9   FDP   PR+67                 AH
45647   0 26000 0 36163   5652        +10   FMP   TK+6                  C MOT
45650   0 60100 0 47465   5653        +11   STO   Z
45651   0 50000 0 40270   5654        +12   CLA   1000.

45652  -0 52000 0 47416   5655        +13   NZT   PR+61
45653   0 60100 0 47416   5656        +14   STO   PR+61                 THW I+1/2
45654   0 50000 0 47413   5657        +15   CLA   PR+58
45655   0 24100 0 47416   5658        +16   FDP   PR+61                 TH I+1/2
45656   0 13100 0 00000   5659        +17   XCA
45657   0 56000 0 36161   5660        +18   LDQ   TK+4
4566C   0 07400 1 47752   5661        +19   TSX   POWER,1               A MOT
45661   0 24100 0 40216   5662        +20   FDP   FL4
45662   0 26000 0 47465   5663        +21   FMP   Z
45663   0 60100 0 47465   5664        +22   STO   Z
45664   0 56000 0 47340   5665        +23   LDQ   PR+15
45665   0 26000 0 40271   5666        +24   FMP   FLPI                  DH
45666   0 60100 0 47500   5667        +25   STO   Z+11
45667   0 56000 0 40251   5668        +26   LDQ   FL.2
45670   0 07400 1 47752   5669        +27   TSX   POWER,1
45671   0 60100 0 47466   5670        +28   STO   Z+1
45672   0 56000 0 47405   5671        +29   LDQ   PR+52
45673   0 26000 0 40271   5672        +30   FMP   FLPI                  WT
45674   0 56000 0 40256   5673        +31   LDQ   FL.8
45675   0 07400 1 47752   5674        +32   TSX   POWER,1
45676   0 13100 0 00000   5675        +33   XCA
45677   0 26000 0 47466   5676        +34   FMP   Z+1
45700   0 13100 0 00000   5677        +35   XCA
45701   0 26000 0 47465   5678        +36   FMP   Z
49702   0 13100 0 00000   5679        +37   XCA
45703   0 26000 0 47376   5680        +38   FMP   PR+45                 LH I+1/2
45704   0 60100 0 47374   5681        +39   STO   PR+43                 H H I+1/2
45705   0 50000 0 47453   5682      22.80   CLA   PR+90                 Q I
45706   0 24100 0 47374   5683         +1   FDP   PR+43
45707   0 13100 0 00000   5684         +2   XCA
4571C   0 24100 0 47371   5685         +3   FDP   PR+40                 DELTAX
45711   0 13100 0 00000   5686         +4   XCA
45712   0 24100 0 47500   5687         +5   FDP   Z+11                  FPH
45713   0 13100 0 00000   5688         +6   XCA
45714   0 76000 0 00002   5689         +7   CHS
45715   0 30000 0 47413   5690         +8   FAD   PR+58                 TH I+1/2
45716   0 60100 0 47416   5691         +9   STO   PR+61                 THW I+1/2
45717   0 12000 0 45722   5692        +10   TPL   22.90
45720   0 60000 0 47416   5693        +11   STZ   PR+61                 THW I+1/2 IS MINUS
45721   0 02000 0 45754   5694        +12   TRA   22.99                 GO TO LOWER Q GUESS
45722   0 50000 0 47414   5695      22.90   CLA   PR+59                 TH I+1/2
45723  -0 10000 0 45730   5696         +1   TNZ   22.95
45724   0 50000 0 47415   5697         +2   CLA   PR+60
45725   0 30000 0 47416   5698         +3   FAD   PR+61
45726   0 24100 0 40214   5699         +4   FDP   FL2
45727   0 13100 0 00000   5700         +5   XCA
                          5701*CAVEMAN INTERPOLATION
45730   0 07400 4 44515   5702      22.95   TSX   TIN1,4
45731   0 00000 0 50024   5703         +1   HTR   KSUBM,0,0
45732   0 00003 0 00001   5704         +2   HTR   1,0,3
45733   0 60100 0 47377   5705         +3   STO   PR+46                 KM
45734   0 50000 0 47360   5706         +4   CLA   PR+15                 DH
45735   0 30000 0 47341   5707         +5   FAD   PR+16                 THICK.
45736   0 24100 0 47341   5708         +6   FDP   PR+16
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45737  0 26000 0 47377  5709        +7  FMP   PR+46
45740  0 60100 0 47465  5710        +8  STQ   Z
45741  0 50000 0 47453  5711        +9  CLA   PR+90          Q I
45742  0 24100 0 47465  5712       +10  FDP   Z
45743  0 13100 0 00000  5713       +11  XCA
45744  0 24100 0 47371  5714       +12  FDP   PR+40          DELTA X
45745  0 13100 0 00000  5715       +13  XCA
45746  0 24100 0 40271  5716       +14  FDP   FLPI
45747  0 13100 0 00000  5717       +15  XCA
45750  0 76000 0 00002  5718       +16  CHS
45751  0 30000 0 47416  5719       +17  FAD   PR+61          TMW I+1/2
45752  0 60100 0 47415  5720       +18  STQ   PR+60          TCW I+1/2
45753  0 12000 0 45760  5721       +19  TPL   23.00
45754  0 50000 0 47453  5722    22.99   CLA   PR+90          Q
45755  0 24100 0 40214  5723        +1  FDP   FL2
45756 -0 60000 0 47453  5724        +2  STQ   PR+90          NEW Q GUESS
45757  0 02000 0 45512  5725        +3  TRA   22.00
45760  0 50000 0 47341  5726    23.00   CLA   PR+16          THICK.
45761  0 30000 0 47341  5727        +1  FAD   PR+16
45762  0 30000 0 47342  5728        +2  FAD   PR+17          RAD.
45763  0 30000 0 47340  5729        +3  FAD   PR+15          DH
45764  0 60100 0 47501  5730        +4  STQ   Z+12           DH+R+2T
45765  0 13100 0 00000  5731        +5  XCA
45766  0 26000 0 47342  5732        +6  FMP   PR+17
45767  0 13100 0 00000  5733        +7  XCA
45770  0 26000 0 40271  5734        +8  FMP   FLPI
45771  0 60100 0 47423  5735        +9  STQ   PR+66          AREA COLD
45772  0 56000 0 47501  5736    23.10   LDQ   Z+12
45773  0 26000 0 40271  5737        +1  FMP   FLPI
45774  0 24100 0 40254  5738        +2  FDP   FL.5
45775 -0 60000 0 47502  5739        +3  STQ   Z+13          FPC
45776  0 50000 0 47352  5740    23.20   CLA   PR+25          TCI
45777  0 56000 0 47321  5741        +1  LDQ   PR            PC I
46000  0 07400 4 25564  5742        +2  TSX   AZH,4
46001  0 07400 4 42602  5743        +3  TSX   ERROR,4
46002  0 56000 0 33730  5744        +4  LDQ   WPR+6
46003  0 26000 0 40245  5745        +5  FMP   FLCUF
46004  0 60100 0 47465  5746        +6  STQ   Z
46005  0 50000 0 47361  5747        +7  CLA   PR+32          TC I+1
46006  0 30200 0 47352  5748        +8  FSB   PR+25          TC I
46007  0 24100 0 47412  5749        +9  FDP   PR+57          TC I+1/2
46010 -0 60000 0 47466  5750       +10  STQ   Z+1           FRICTION COLD
46011  0 50000 0 36164  5751       +11  CLA   TK+7           R
46012  0 24100 0 47342  5752       +12  FDP   PR+17
46013  0 13100 0 00000  5753       +13  XCA
46014  0 26000 0 40214  5754       +14  FMP   FL2
46015  0 26000 0 47371  5755       +15  FMP   PR+40          DELTA X
46016  0 30000 0 47466  5756       +16  FAD   Z+1
46017  0 24100 0 47465  5757       +17  FDP   Z
46020  0 26000 0 47403  5758       +18  FMP   PR+50          WC
46021  0 24100 0 47423  5759       +19  FDP   PR+66          AC
46022  0 26000 0 47403  5760       +20  FMP   PR+50          WC
46023  0 24100 0 47423  5761       +21  FDP   PR+66
46024  0 26000 0 40244  5762       +22  FMP   FL144
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46025  0 24100 0 40273  5763       +23  FDP   FL2G
46026  0 13100 0 00000  5764       +24  XCA
46027  0 76000 0 00002  5765       +25  CHS
46030  0 30000 0 47321  5766       +26  FAD   PR            PC I
46031  0 60100 0 47330  5767       +27  STQ   PR+7          PC I+1
46032  0 12000 0 46034  5768       +28  TPL   23.30
46033  0 02000 0 47063  5769       +29  TRA   HBB           NEGATIVE PC (I+1)
46034  0 30000 0 47321  5770    23.30   FAD   PR
46035  0 24100 0 40214  5771        +1  FDP   FL2
46036 -0 60000 0 47477  5772        +2  STQ   Z+10          PC I+1/2
46037  0 50000 0 47342  5773    23.40   CLA   PR+17          RAD.
46040  0 30000 0 47342  5774        +1  FAD   PR+17
46041  0 60100 0 47346  5775        +2  STQ   PR+21          D SLA C
46042  0 30000 0 47371  5776        +3  FAD   PR+40
46043  0 60100 0 47465  5777        +4  STQ   Z
46044  0 50000 0 47346  5778        +5  CLA   PR+21
46045  0 24100 0 47465  5779        +6  FDP   Z
46046  0 13100 0 00000  5780        +7  XCA
46047  0 56000 0 36157  5781        +8  LDQ   TK+2           B COLD
46050  0 07400 1 47752  5782        +9  TSX   POWER,1
46051  0 24100 0 47423  5783       +10  FDP   PR+66
46052  0 26000 0 36160  5784       +11  FMP   TK+3           C COLD
46053  0 60100 0 47465  5785       +12  STQ   Z
46054  0 50000 0 47412  5786    23.50   CLA   PR+57
46055  0 56000 0 47477  5787        +1  LDQ   Z+10          PC I+1/2
46056  0 07400 4 25564  5788        +2  TSX   AZH,4
46057  0 07400 4 42602  5789        +3  TSX   ERROR,4
46060  0 07400 4 26223  5790        +4  TSX   AZL,4
46061  0 60100 0 47375  5791    23.65   STQ   PR+44          LC I+1/2
46062  0 50000 0 47412  5792        +1  CLA   PR+57          TC I+1/2
46063  0 24100 0 47415  5793        +2  FDP   PR+60          TWC I+1/2
46064  0 13100 0 00000  5794        +3  XCA
46065  0 56000 0 36156  5795        +4  LDQ   TK+1           A COLD
46066  0 07400 1 47752  5796        +5  TSX   POWER,1
46067  0 60100 0 47466  5797        +6  STQ   Z+1
46070  0 56000 0 47403  5798        +7  LDQ   PR+50          WC
46071  0 26000 0 40271  5799        +8  FMP   FLPI
46072  0 56000 0 40256  5800        +9  LDQ   FL.8
46073  0 07400 1 47752  5801       +10  TSX   POWER,1
46074  0 13100 0 00000  5802       +11  XCA
46075  0 26000 0 47466  5803       +12  FMP   Z+1
46076  0 60100 0 47466  5804       +13  STQ   Z+1
46077  0 50000 0 47502  5805       +14  CLA   Z+13          FPC
46100  0 56000 0 40251  5806       +15  LDQ   FL.2
46101  0 07400 1 47752  5807       +16  TSX   POWER,1
46102  0 24100 0 40216  5808       +17  FDP   FL4
46103  0 26000 0 47466  5809       +18  FMP   Z+1
46104  0 13100 0 00000  5810       +19  XCA
46105  0 26000 0 47375  5811       +20  FMP   PR+44          LC I+1/2
46106  0 13100 0 00000  5812       +21  XCA
46107  0 26000 0 47465  5813       +22  FMP   Z
46110  0 60100 0 47373  5814       +23  STQ   PR+42          H CI
46111  0 50000 0 47501  5815    23.70   CLA   Z+12
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46113   0 60100 0 47903   5817          +2  STO   Z+14                    DH+2T
46114   0 50000 0 47493   5818          +3  CLA   PR+90                    Q I
46115   0 24100 0 47503   5819          +4  FDP   Z+14
46116   0 13100 0 00000   5820          +5  XCA
46117   0 24100 0 47373   5821          +6  FDP   PR+42                    H CI
46120   0 13100 0 00000   5822          +7  XCA
46121   0 24100 0 40271   5823          +8  FDP   FLPI
46122   0 13100 0 00000   5824          +9  XCA
46123   0 24100 0 47371   5825         +10  FDP   PR+40                    DELTA X
46124   0 13100 0 00000   5826         +11  XCA
46125   0 30C00 0 47412   5827         +12  FAD   PR+57                    TC I+1/2
46126   0 60100 0 47415   5828         +13  STO   PR+60                    TCW I+1/2
46127   0 30C00 0 47416   5829      23.80   FAD   PR+61                    THW I+1/2
46130   0 24100 0 40214   5830          +1  FDP   FL2
46131  -0 60C00 0 47414   5831          +2  STO   PR+59                    TH I+1/2
46132   0 13100 0 00000   5832          +3  XCA
                          5833*CAVEMAN INTERPOLATION
46133   0 07400 4 44515   5834          +4  TSX   TIN1,4
46134   0 00000 0 50024   5835          +5  HTR   KSUBN,0,0
46135   0 00003 0 00001   5836          +6  HTR   1,0,3
46136   0 60100 0 47377   5837          +7  STO   PR+46                    KM
46137   0 50000 0 40213   5838      23.90   CLA   FL1
46140   0 24100 0 47371   5839          +1  FDP   PR+40                    DELTA X
46141   0 13100 0 00000   5840          +2  XCA
46142   0 24100 0 40271   5841          +3  FDP   FLPI
46143  -0 60000 0 47466   5842          +4  STO   Z+1
46144   0 13100 0 00000   5843          +5  XCA
46145   0 24100 0 47503   5844          +6  FDP   Z+14                    DH+2T
46146   0 13100 0 00000   5845          +7  XCA
46147   0 24100 0 47373   5846          +8  FDP   PR+42                    HCI
46150  -C 60000 0 47465   5847          +9  STO   Z
46151   0 50000 0 47466   5848         +10  CLA   Z+1
46152   0 24100 0 47340   5849         +11  FDP   PR+15                    DH
46153   0 13100 0 00000   5850         +12  XCA
46154   0 24100 0 47374   5851         +13  FDP   PR+43                    H HI
46155   0 13100 0 00000   5852         +14  XCA
46156   0 30000 0 47465   5853         +15  FAD   Z
46157   0 60100 0 47465   5854         +16  STO   Z
46160   0 50000 0 47341   5855         +17  CLA   PR+16                    THICK.
46161   0 30000 0 47340   5856         +18  FAD   PR+15                    DH
46162   0 60100 0 47467   5857         +19  STO   Z+2
46163   0 50000 0 47466   5858         +20  CLA   Z+1
46164   0 24100 0 47467   5859         +21  FDP   Z+2
46165   0 26000 0 47341   5860         +22  FMP   PR+16
46166   0 24100 0 47377   5861         +23  FDP   PR+46
46167   0 13100 0 00000   5862         +24  XCA
46170   0 30000 0 47465   5863         +25  FAD   Z
46171   0 60100 0 47465   5864         +26  STO   Z
46172   0 50000 0 47413   5865         +27  CLA   PR+58                    TH I+1/2
46173   0 30200 0 47412   5866         +28  FSB   PR+57                    TC I+1/2
46174   0 24100 0 47465   5867         +29  FDP   Z
46175  -0 60000 0 47465   5868         +30  STO   Z                       Q CALCULATED
46176   0 50000 0 47755   5869         +31  CLA   CLS2
46177   0 24100 0 47465   5870         +32  FDP   Z
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46200   0 13100 0 00000   5871         +33  XCA
46201   0 60200 0 12512   5872         +34  SLW   COMMON
46202   0 56000 0 47465   5873         +35  LDQ   Z                       RESTORE MQ
46203   0 50000 0 47453   5874         +36  CLA   PR+90
                          5875*Q ITERATION
46204   0 07402 2 43624   5876         +37  TSX   ITER,2,2
46205   0 12512 0 47547   5877         +38  PZE   IT,,COMMON               NEWTON, ABSOLUTE CLOSURE
46206   0 47754 0 47550   5878         +39  PZE   IT+1,,CLS1
46207   0 40213 0 47551   5879         +40  PZE   IT+2,,FL1
46210   3 47453 0 47310   5880         +41  PTH   YHD+1,,PR+90
46211   3 00000 0 47276   5881         +42  PTH   XHD+1
46212   0 47757 0 47757   5882         +43  PZE   CLS4,,CLS4
46213   0 02000 0 46216   5883         +44  TRA   23.92
46214   0 60100 0 47453   5884      23.91   STO   PR+90                    Q GUESS
46215   0 02000 0 45512   5885          +1  TRA   22.00
46216  -0 52000 0 47455   5886      23.92   NZT   PR+92                    K VALUE FLAG
46217   0 02000 0 46262   5887          +1  TRA   24.00
46220   0 77400 1 00000   5888      23.93   AXT   0,1
46221   0 50000 0 47371   5889          +1  CLA   PR+40                    DELTA FLAG
46222   0 30C00 0 47545   5890          +2  FAD   Z+48                     SUM DELTA X
46223   0 60100 0 47545   5891          +3  STO   Z+48                     SUM DELTA X
46224   0 13100 0 00000   5892          +4  XCA
46225   0 50000 1 36204   5893          +5  CLA   BELLO,1
46226   0 04000 0 46256   5894          +6  TLQ   23.94
46227   0 50C00 0 47361   5895          +7  CLA   PR+32                    TC I+1
46230   0 56000 0 47330   5896          +8  LDQ   PR+7                     PC I+1
46231   0 07400 4 25564   5897          +9  TSX   AZH,4
46232   0 07400 4 42602   5898         +10  TSX   ERROR,4
46233   0 56000 0 33730   5899         +11  LDQ   WPR+6
46234   0 26C00 0 40245   5900         +12  FMP   FLCUF
46235   0 60100 0 47465   5901         +13  STO   Z
46236   0 50000 0 47403   5902         +14  CLA   PR+50                    WC
46237   0 24100 0 47465   5903         +15  FDP   Z
46240   0 26000 0 47403   5904         +16  FMP   PR+50                    WC
46241   0 24100 0 40273   5905         +17  FDP   FL2G
46242   0 26000 0 40244   5906         +18  FMP   FL144
46243   0 24100 0 47423   5907         +19  FDP   PR+66                    AC I
46244   0 26000 1 36205   5908         +20  FMP   BELLO+1,1
46245   0 24100 0 47423   5909         +21  FDP   PR+66                    AC I
46246   0 13100 0 00000   5910         +22  XCA
46247   0 76000 0 00002   5911         +23  CHS
46250   0 30000 0 47330   5912         +24  FAD   PR+7
46251   0 60100 0 47330   5913         +25  STO   PR+7                     NEW PC I+1 DUE TO BELLOWS SECTION
46252   1 77776 1 46253   5914         +26  TXI   *+1,1,-2
46253   3 77752 1 46255   5915         +27  TXH   *+2,1,-22                10 PASSES MAXIMUM
46254   0 07400 4 42602   5916         +28  TSX   ERROR,4
46255   0 63400 1 46220   5917         +29  SXA   23.93,1
46256   0 50000 0 47330   5918      23.94   CLA   PR+7                     PC I+1
46257   0 60100 0 47326   5919          +1  STO   PR+5                     PC1C
46260   0 50000 0 47361   5920          +2  CLA   PR+32                    TC
46261   0 60100 0 47357   5921          +3  STO   PR+30                    TC1C
46262   0 50000 0 47546   5922      24.00   CLA   Z+49
46263   0 30200 0 40213   5923          +1  FSB   FL1
46264   0 10000 0 46[illegible] 5924      +2  TZE   [illegible]
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46265  0 60100 0 475    5925          +3  STO   Z+49          DELTA X
46266  0 77400 1 00002  5926          +4  AXT   2,1
4626   0 50000 1 47332  5927          +5  CLA   PR+9,1
46270  0 60100 1 47323  5928          +6  STO   PR+2,1
46271  0 50000 1 47363  5929          +7  CLA   PR+34,1
46272  0 60100 1 47354  5930          +8  STO   PR+27,1
46273  2 00001 1 46267  5931          +9  TIX   *-4,1,1
46274  0 02000 0 45512  5932         +10  TRA   22.00
46275  0 50000 0 47370  5933    25.00     CLA   PR+39
46276  0 60100 0 47546  5934          +1  STO   Z+49               RESTORING DELTA FOR HEAT TRANSFER
46277  0 50000 0 32704  5935          +2  CLA   P+54          PC, THIS ASSUMES PH, TH TO BE ZERO
4630C  0 60100 0 47321  5936          +3  STO   PR
46301  0 60000 0 47322  5937          +4  STZ   PR+1          PH
46302  0 50000 0 32705  5938          +5  CLA   P+55
46303  0 60100 0 47352  5939          +6  STO   PR+25         TC
46304  0 60000 0 47353  5940          +7  STZ   PR+26         TH
46305  0 50000 0 47361  5941          +8  CLA   PR+32              TC I+1
46306  0 56000 0 47330  5942          +9  LDQ   PR+7               PC I+1
46307  0 07400 4 25564  5943         +10  TSX   AZH,4
46310  0 07400 4 42602  5944         +11  TSX   ERROR,4
46311  0 56000 0 33730  5945         +12  LDQ   WPR+6
46312  0 26000 0 40245  5946         +13  FMP   FLCUF
4631   0 60100 0 47504  5947         +14  STO   Z+15
4631   0 56000 0 47343  5948    25.10     LDQ   PR+18              DCO
4631   0 26000 0 47343  5949          +1  FMP   PR+18
46316  0 24100 0 40216  5950          +2  FDP   FL4
46317  0 26000 0 47344  5951          +3  FMP   PR+19              NO.
4632   0 13100 0 00000  5952          +4  XCA
46321  0 26000 0 40271  5953          +5  FMP   FLPI
46322  0 60100 0 47427  5954          +6  STO   PR+70              ACN
46323  0 56C00 0 47504  5955    25.20     LDQ   Z+15
46324  0 50000 0 40215  5956          +1  CLA   FL3
46325  0 04000 0 46412  5957          +2  TLQ   26.00              COMPRESSIBLE
                        5958* INCOMPRESSIBLE EQUATIONS
46326  0 50000 0 47361  5959    25.30     CLA   PR+32              TC I+1
46327  0 60100 0 47363  5960          +1  STO   PR+34              TCM
46330  0 34000 0 40261  5961          +2  CAS   FL58
46331  0 02000 0 46342  5962          +3  TRA   25.40
46332  0 02000 0 46342  5963          +4  TRA   25.40
46333  0 60100 0 33742  5964          +5  STO   TP+5
46334  0 07400 4 27142  5965          +6  TSX   AZV,4
46335  0 13100 0 00000  5966          +7  XCA
46336  0 50000 0 47333  5967          +8  CLA   PR+10              PHM
46337  0 04000 0 46342  5968          +9  TLQ   25.40              PCMV LESS THAN PHM
46340  0 60000 0 47332  5969         +10  STQ   PR+9               PCM=PCMV
46341  0 02000 0 46344  5970         +11  TRA   25.50
46342  0 50000 0 47333  5971    25.40     CLA   PR+10
46343  0 60100 0 47332  5972          +1  STO   PR+9               PCM=PHM
46344  0 50000 0 47363  5973    25.50     CLA   PR+34              TCM
46345  0 56000 0 47332  5974          +1  LDQ   PR+9               PCM
46346  0 07400 4 25564  5975          +2  TSX   AZH,4
46347  0 07400 4 42602  5976          +3  TSX   ERROR,4
46350  0 56000 0 33730  5977          +4  LDQ   WPR+6
46351  0 26000 0 40245  5978          +5  FMP   FLCUF
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46352  0 60100 0 47505  5979          +6  STO   Z+16
46353  0 50000 0 36173  5980          +7  CLA   TK+14              KC IN = .5
46354  0 30000 0 40213  5981          +8  FAD   FL1
46355  0 60100 0 47465  5982          +9  STO   Z
46356  0 50000 0 47330  5983         +10  CLA   PR+7               PCI 0
46357  0 30200 0 47332  5984         +11  FSB   PR+9               PCM
46360  0 24100 0 47465  5985         +12  FDP   Z
46361  0 26000 0 40272  5986         +13  FMP   FLGF
46362  0 24100 0 47505  5987         +14  FDP   Z+16               RHO CM
46363  0 26000 0 40267  5988         +15  FMP   FL288
46364  0 07400 4 24364  5989         +16  TSX   SQRT,4
46365  0 07400 4 42602  5990         +17  TSX   ERROR,4
46366  0 60100 0 47445  5991         +18  STO   PR+84              VCM
46367  0 24100 0 40244  5992    25.60     FDP   FL144
46370  0 26000 0 47427  5993          +1  FMP   PR+70              ACN
46371  0 13100 0 00000  5994          +2  XCA
46372  0 26000 0 40255  5995          +3  FMP   FL.6          VENA CAVA EFFECT
46373  0 13100 0 00000  5996          +4  XCA
46374  0 26000 0 47505  5997          +5  FMP   Z+16               RHO CM
46375  0 13100 0 00000  5998          +6  XCA
46376  0 50000 0 47403  5999          +7  CLA   PR+50
                        6000*WC ITERATION
46377  0 07402 2 43624  6001          +8  TSX   ITER,2,2
46400 -0 47755 0 47576  6002          +9  MZE   IT+23,,CLS2
46401  0 47754 0 47577  6003         +10  PZE   IT+24,,CLS1
46402  0 40213 0 47600  6004         +11  PZE   IT+25,,FL1
46403  3 47403 0 47314  6005         +12  PTH   YHD+5,,PR+50
46404  3 00000 0 47302  6006         +13  PTH   XHD+5
46405  0 47757 0 47757  6007         +14  PZE   CLS4,,CLS4
46406  0 02000 0 46601  6008         +15  TRA   27.00
46407  0 60100 0 47403  6009         +16  STO   PR+50
46410 -3 00000 6 45367  6010         +17  TXL   21.00,6,0     MR HOT INPUT
46411  0 02000 0 45352  6011         +18  TRA   20.90
                        6012* COMPRESSIBLE EQUATIONS
46412  0 50000 0 47333  6013    26.00     CLA   PR+10
46413  0 60100 0 47332  6014          +1  STO   PR+9               PCM = PHM
46414  0 34000 0 47330  6015          +2  CAS   PR+7          PCI 0
46415  0 02000 0 46420  6016          +3  TRA   26.01
46416  0 02000 0 46423  6017          +4  TRA   26.02
46417  0 02000 0 46423  6018          +5  TRA   26.02
46420  0 56C00 0 47403  6019    26.01     LDQ   PR+50
46421  0 26C00 0 40254  6020          +1  FMP   FL.5          LOWER WC
46422  0 02000 0 46576  6021          +2  TRA   HB3
46423  0 50000 0 47402  6022    26.02     CLA   PR+49
46424  0 30200 0 40213  6023          +1  FSB   FL1
46425 -0 10C00 0 46427  6024          +2  TNZ   26.10
46426  0 60000 0 47402  6025          +3  STZ   PR+49
46427  0 50C00 0 40254  6026    26.10     CLA   FL.5
46430 -0 52000 0 47402  6027          +1  NZT   PR+49              MACH CM
46431  0 60100 0 47402  6028          +2  STO   PR+49
46432  0 56000 0 47402  6029    26.20     LDQ   PR+49
46433  0 26000 0 47402  6030          +1  FMP   PR+49
46434  0 60100 0 47466  6031          +2  STO   Z+1
46435  0 13100 0 00000  6032          +3  XCA
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46436  0 26000 0 47474   6033        +4  FMP   Z+5
46437  0 30000 0 40213   6034        +5  FAD   FL1
46440  0 60100 0 47506   6035        +6  STO   Z+17
46441  0 56000 0 47513   6036        +7  LDQ   Z+22                    K/K-1
46442  0 07400 1 47752   6037        +8  TSX   POWER,1
46443  0 60100 0 47465   6038        +9  STO   Z
46444  0 56000 0 47466   6039       +10  LDQ   Z+1
46445  0 26000 0 36167   6040       +11  FMP   TK+10
46446  0 24100 0 40214   6041       +12  FDP   FL2
46447  0 26000 0 36172   6042       +13  FMP   TK+13                    KC IN = .5
46450  0 30000 0 40213   6043       +14  FAD   FL1
46451  0 13100 0 00000   6044       +15  XCA
46452  0 26000 0 47465   6045       +16  FMP   Z
46453  0 60100 0 47465   6046       +17  STO   Z
46454  0 50000 0 47330   6047       +18  CLA   PR+7                     PC I+1
46455  0 24100 0 47465   6048       +19  FDP   Z
46456 -0 60000 0 47465   6049       +20  STO   Z
46457  0 50000 0 47402   6050       +21  CLA   PR+49                    M CM
46460  0 30200 0 40213   6051       +22  FSB   FL1
46461 -0 10000 0 46465   6052       +23  TNZ   *+4
46462  0 50000 0 47465   6053       +24  CLA   Z
46463  0 60100 0 47332   6054       +25  STO   PR+9
46464  0 02000 0 46506   6055       +26  TRA   26.30
46465  0 56000 0 47465   6056       +27  LDQ   Z
46466  0 50000 0 47332   6057       +28  CLA   PR+9
                         6058*MCM,PCM ITERATION
46467  0 07402 2 43624   6059       +29  TSX   ITER,2,2
46470  0 47756 0 47553   6060       +30  PZE   IT+4,,CLS3
46471  0 47754 0 47554   6061       +31  PZE   IT+5,,CLS1
46472  0 40213 0 47555   6062       +32  PZE   IT+6,,FL1
46473  3 47402 0 47315   6063       +33  PTH   YHD+6,,PR+49
46474  3 00000 0 47303   6064       +34  PTH   XHD+6
46475  0 47757 0 47757   6065       +35  PZE   CLS4,,CLS4
46476  0 02000 0 46506   6066       +36  TRA   26.30
46477  0 12000 0 46502   6067       +37  TPL   *+3
46500  0 50000 0 47402   6068       +38  CLA   PR+49
46501  0 30000 0 40250   6069       +39  FAD   FL.1
46502  0 34000 0 40213   6070       +40  CAS   FL1
46503  0 50000 0 40213   6071       +41  CLA   FL1
46504  0 50000 0 40213   6072       +42  CLA   FL1
46505  0 02000 0 46431   6073       +43  TRA   26.20-1
46506  0 50000 0 47361   6074  26.30  CLA   PR+32                    TC I+1
46507  0 60100 0 47357   6075        +1  STO   PR+30                    TCM 0
46510  0 24100 0 47506   6076        +2  FDP   Z+17
46511 -0 60000 0 47363   6077        +3  STO   PR+34                    TCM
46512  0 26000 0 40272   6078  26.40  FMP   FLGF
46513  0 13100 0 00000   6079        +1  XCA
46514  0 26000 0 36167   6080        +2  FMP   TK+10                    K = 1.4
46515  0 13100 0 00000   6081        +3  XCA
46516  0 26000 0 36174   6082        +4  FMP   TK+15                    R = 772.
46517  0 07400 4 24364   6083        +5  TSX   SQRT,4
46520  0 07400 4 42602   6084        +6  TSX   ERROR,4
46521  0 60100 0 47507   6085        +7  STO   Z+18                    CCM
46522  0 13100 0 00000   6086  26.50  XCA

46523  0 26000 0 47402   6087        +1  FMP   PR+49
46524  0 60100 0 47445   6088        +2  STO   PR+84                    VCM
46525  0 50000 0 36167   6089        +3  CLA   TK+10                    K=1.4  COMPUTE  ACN (PRIME)
46526  0 30200 0 40213   6090        +4  FSB   FL1
46527  0 60100 0 47465   6091        +5  STO   Z
46530  0 50000 0 40213   6092        +6  CLA   FL1
46531  0 24100 0 47465   6093        +7  FDP   Z
46532  0 50000 0 47506   6094        +8  CLA   Z+17
46533  0 07400 1 47752   6095        +9  TSX   POWER,1
46534  0 60100 0 47465   6096       +10  STO   Z
46535  0 50000 0 40214   6097       +11  CLA   FL2
46536  0 24100 0 47465   6098       +12  FDP   Z
46537  0 13100 0 00000   6099       +13  XCA
46540  0 30000 0 40271   6100       +14  FAD   FLPI
46541  0 60100 0 47465   6101       +15  STO   Z
46542  0 50000 0 40271   6102       +16  CLA   FLPI
46543  0 24100 0 47465   6103       +17  FDP   Z
46544 -0 60000 0 47465   6104       +18  STO   Z
46545  0 26000 0 47465   6105       +19  FMP   Z
46546  0 13100 0 00000   6106       +20  XCA
46547  0 26000 0 47427   6107       +21  FMP   PR+70                    ACM
46550  0 60100 0 47527   6108       +22  STO   Z+34                    ACM PRIME
46551  0 50000 0 47363   6109  26.60  CLA   PR+34                    TCM
46552  0 56000 0 47332   6110        +1  LDQ   PR+9                     PCM
46553  0 07400 4 25564   6111        +2  TSX   AZH,4
46554  0 07400 4 42602   6112        +3  TSX   ERROR,4
46555  0 56000 0 33730   6113        +4  LDQ   MPR+6
46556  0 26000 0 40245   6114        +5  FMP   FLCUF
46557  0 60100 0 47505   6115        +6  STO   Z+16
46560  0 13100 0 00000   6116        +7  XCA
46561  0 26000 0 47445   6117        +8  FMP   PR+84                    VCM
46562  0 13100 0 00000   6118        +9  XCA
46563  0 26000 0 47527   6119       +10  FMP   Z+34                    ACN PRIME
46564  0 24100 0 40244   6120       +11  FDP   FL144
46565  0 50000 0 47403   6121       +12  CLA   PR+50
46566  0 07402 2 43624   6122       +13  TSX   ITER,2,2
46567 -0 47755 0 47556   6123       +14  NZE   IT+7,,CLS2
46570  0 47754 0 47557   6124       +15  PZE   IT+8,,CLS1
46571  0 40213 0 47560   6125       +16  PZE   IT+9,,FL1
46572  3 47403 0 47314   6126       +17  PTH   YHD+5,,PR+50
46573  3 00000 0 47302   6127       +18  PTH   XHD+5
46574  0 47757 0 47757   6128       +19  PZE   CLS4,,CLS4
46575  0 02000 0 46601   6129       +20  TRA   27.00
46576  0 60100 0 47403   6130  MH3       STO   PR+50
46577 -3 00000 6 45367   6131        +1  TXL   21.00,6,0                MR HOT INPUT
46600  0 02000 0 45352   6132        +2  TRA   20.90                        CALCULATE NEW MR MIX
46601  0 50000 0 47400   6133  27.00  CLA   PR+47                    MH8
46602  0 10000 0 46606   6134        +1  TZE   27.01
46603  0 30200 0 40213   6135        +2  FSB   FL1
46604 -0 10000 0 46606   6136        +3  TNZ   27.01
46605  0 60000 0 47400   6137        +4  STZ   PR+47
46606  0 50000 0 40254   6138  27.01  CLA   FL.5
46607 -0 52000 0 47400   6139        +1  NZT   PR+47                    MH8
46610  0 60100 0 47400   6140        +2  STO   PR+47
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46611  0 56000 0 47400   6141   27.10   LDQ    PR+47
46612  0 26000 0 47400   6142      +1   FMP    PR+47
46613  0 13100 0 00000   6143      +2   XCA
46614  0 26000 0 47472   6144      +3   FMP    Z+5                    K-1/2
46615  0 30000 0 40213   6145      +4   FAD    FL1
46616  0 60100 0 47510   6146      +5   STQ    Z+19
46617  0 50000 0 36167   6147      +6   CLA    TK+10
46620  0 30000 0 40213   6148      +7   FAD    FL1
46621  0 24100 0 47472   6149      +8   FDP    Z+5
46622  0 26000 0 40253   6150      +9   FMP    FL.25
46623  0 13100 0 00000   6151     +10   XCA
46624  0 50000 0 47510   6152     +11   CLA    Z+19
46625  0 07400 1 47752   6153     +12   TSX    POWER,1
46626  0 60100 0 47465   6154     +13   STQ    Z
46627  0 50000 0 36167   6155   27.20   CLA    TK+10
46630  0 24100 0 47365   6156      +1   FDP    PR+36                  T8 0
46631  0 26000 0 40272   6157      +2   FMP    FLGF
46632  0 24160 7 47750   6158      +3   FDP*   NEWR+2,7               R HOT IR=2, R MIX IR=1
46633  0 13100 0 00000   6159      +4   XCA
46634  0 07400 4 24364   6160      +5   TSX    SQRT,4
46635  0 07400 4 42602   6161      +6   TSX    ERROR,4
46636  0 13100 0 00000   6162      +7   XCA
46637  0 26000 0 47400   6163      +8   FMP    PR+47                  MH8
46640  0 24100 0 47465   6164      +9   FDP    Z
46641  0 26000 0 47424   6165     +10   FMP    PR+67                  AH
46642  0 13100 0 00000   6166     +11   XCA
46643  0 26000 0 47334   6167     +12   FMP    PR+11                  P8 0
46644  0 60100 0 47465   6168     +13   STQ    Z
46645  0 50000 0 47400   6169     +14   CLA    PR+47
46646  0 30200 0 40213   6170     +15   FSB    FL1
46647  0 10000 0 46671   6171     +16   TZE    27.30                  MH8=1
46650  0 56000 0 47465   6172     +17   LDQ    Z
46651  0 50000 0 47405   6173     +18   CLA    PR+52                  WT
46652  0 07402 2 43624   6174     +19   TSX    ITER,2,2
46653  0 47756 0 47561   6175     +20   PZE    IT+10,,CLS3
46654  0 47754 0 47562   6176     +21   PZE    IT+11,,CLS1
46655  0 40213 0 47563   6177     +22   PZE    IT+12,,FL1
46656  3 47400 0 47316   6178     +23   PTH    YHD+7,,PR+47
46657  3 00000 0 47304   6179     +24   PTH    XHD+7
46660  0 47757 0 47757   6180     +25   PZE    CLS4,,CLS4
46661  0 02000 0 46671   6181     +26   TRA    27.30
46662  0 12000 0 46665   6182     +27   TPL    *+3
46663  0 56000 0 47400   6183     +28   LDQ    PR+47
46664  0 26000 0 40250   6184     +29   FMP    FL.1
46665  0 34000 0 40213   6185     +30   CAS    FL1
46666  0 50000 0 40213   6186     +31   CLA    FL1
46667  0 50000 0 40213   6187     +32   CLA    FL1
46670  0 02000 0 46610   6188     +33   TRA    27.10-1
46671  0 50000 0 47365   6189   27.30   CLA    PR+36                  T8 0
46672  0 24100 0 47510   6190      +1   FDP    Z+19
46673 -0 60000 0 47355   6191      +2   STQ    PR+28                  T8
46674  0 26000 0 40272   6192   27.40   FMP    FLGF
46675  0 13100 0 00000   6193      +1   XCA
46676  0 [illegible]      6194      +2   FMP    TK+10

46677  0 13100 0 00000   6195      +3   XCA
46700  0 26060 7 47750   6196      +4   FMP*   NEWR+2,7               R HOT IR=2, R MIX IR=1
46701  0 07400 4 24364   6197      +5   TSX    SQRT,4
46702  0 07400 4 42602   6198      +6   TSX    ERROR,4
46703  0 60100 0 47511   6199      +7   STQ    Z+20
46704  0 13100 0 00000   6200   27.50   XCA                           CH 8
46705  0 26000 0 47400   6201      +1   FMP    PR+47                  MH8
46706  0 60100 0 47447   6202      +2   STO    PR+86                  V8
46707 -0 50000 7 47750   6203   28.00   CAL    NEWR+2,7
46710  0 62100 0 46712   6204      +1   STA    *+2
46711  0 07400 4 27034   6205      +2   TSX    AZQ,4                  COMPUTE P8
46712  0 00000 0 00000   6206      +3   PZE    **0
46713  0 50000 0 47510   6207   28.20   CLA    Z+19
46714  0 56000 0 47513   6208      +1   LDQ    Z+22                   K/K-1
46715  0 07400 1 47752   6209      +2   TSX    POWER,1
46716  0 13100 0 00000   6210      +3   XCA
46717  0 26000 0 47324   6211      +4   FMP    PR+3                   P8
46720  0 60100 0 47514   6212      +5   STO    Z+23                   P8 0 PRIME
46721  0 50000 0 47400   6213   28.30   CLA    PR+47                  MACH H8
46722  0 30200 0 40213   6214      +1   FSB    FL1
46723 -0 10000 0 46771   6215      +2   TNZ    28.50
46724  0 50000 0 36167   6216   28.40   CLA    TK+10
46725  0 30200 0 40213   6217      +1   FSB    FL1
46726  0 60100 0 47465   6218      +2   STO    Z                      K-1
46727  0 30000 0 40214   6219      +3   FAD    FL2
46730  0 60100 0 47466   6220      +4   STO    Z+1                    K+1
46731  0 24100 0 47465   6221      +5   FDP    Z
46732 -0 60000 0 47465   6222      +6   STQ    Z                      K+1/K-1
46733  0 50000 0 40214   6223      +7   CLA    FL2
46734  0 24100 0 47466   6224      +8   FDP    Z+1                    K+1
46735  0 13100 0 00000   6225      +9   XCA
46736  0 56000 0 47465   6226     +10   LDQ    Z                      K+1/K-1
46737  0 07400 1 47752   6227     +11   TSX    POWER,1
46740  0 13100 0 00000   6228     +12   XCA
46741  0 26000 0 36167   6229     +13   FMP    TK+10                  K
46742  0 24160 7 47750   6230     +14   FDP*   NEWR+2,7               R HOT IR=2, R MIX IR=1
46743  0 26000 0 40272   6231     +15   FMP    FLGF
46744  0 24100 0 47365   6232     +16   FDP    PR+36                  T8 0
46745  0 13100 0 00000   6233     +17   XCA
46746  0 07400 4 24364   6234     +18   TSX    SQRT,4
46747  0 07400 4 42602   6235     +19   TSX    ERROR,4
46750  0 13100 0 00000   6236     +20   XCA
46751  0 26000 0 47334   6237     +21   FMP    PR+11                  P8 0
46752  0 13100 0 00000   6238     +22   XCA
46753  0 26000 0 47424   6239     +23   FMP    PR+67                  AH
46754  0 13100 0 00000   6240     +24   XCA
46755  0 50000 0 47405   6241     +25   CLA    PR+52                  WT
46756  0 07402 2 43624   6242     +26   TSX    ITER,2,2
46757 -0 47755 0 47564   6243     +27   NZE    IT+13,,CLS2
46760  0 47754 0 47565   6244     +28   PZE    IT+14,,CLS1
46761  0 40213 0 47566   6245     +29   PZE    IT+15,,FL1
46762  3 47405 0 47317   6246     +30   PTH    YHD+8,,PR+52
46763  3 00000 0 47305   6247     +31   PTH    XHD+8
46764  0 47757 0 47757   6248     +32   PZE    CLS4,,CLS4
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46765  0 02000 0 47017   6249        +33  TRA   HB1
46766  0 30200 0 47403   6250        +34  FSB   PR+90
46767  0 60100 0 47404   6251        +35  STO   PR+91
46770  0 02000 0 47014   6252        +36  TRA   HB2+1
46771  0 50000 0 47334   6253   28.50  CLA   PR+11
46772  0 56000 0 47514   6254        +1   LDQ   Z+23
46773  0 07402 2 43624   6255        +2   TSX   ITER,2,2
46774  0 47756 0 47567   6256        +3   PZE   IT+16,,CLS2
46775  0 47754 0 47570   6257        +4   PZE   IT+17,,CLS1
46776  0 40213 0 47571   6258        +5   PZE   IT+18,,PL1
46777  3 47404 0 47320   6259        +6   PTH   YHD+9,,PR+91
47000  3 00000 0 47306   6260        +7   PTH   XHD+9
47001  0 47757 0 47757   6261        +8   PZE   CL54,,CL54
47002  0 02000 0 47017   6262        +9   TRA   HB1
47003  0 12000 0 47013   6263   28.60  TPL   HB2
47004  0 77400 1 00003   6264        +1   AXT   3,1                        INITIALIZE FOR NEW GUESS
47005  0 60000 1 47572   6265        +2   STZ   IT+19,1
47006  2 00001 1 47005   6266        +3   TIX   *-1,1,1
47007 -0 76000 0 00142   6267        +4   SLT   Z
47010  0 02000 0 47061   6268        +5   TRA   HB7                        WDOTH NEG 2ND TIME
47011  0 56000 0 47404   6269        +6   LDQ   PR+91                      LOWER WDOTH GUESS
47012  0 26000 0 40256   6270        +7   FMP   FL.8
47013  0 60100 0 47404   6271   HB2  STO   PR+91
47014  0 30000 0 47407   6272        +1   FAD   PR+94                      WN
47015  0 77400 7 00002   6273        +2   AXT   2,7
47016  0 02000 0 45101   6274        +3   TRA   20.01                      NEW WR
47017  0 50000 0 47365   6275   HB1  CLA   PR+36                      TOB
47020  0 60100 0 47353   6276        +1   STO   PR+26                      TH
47021  0 52000 0 44105   6277        +2   ZET   $WT
47022  0 07400 4 47024   6278        +3   TSX   HBP,4                      PRINT
47023  0 02000 0 47044   6279        +4   TRA   HBR-5
                         6280*PRINT REGION
47024  0 63400 4 47041   6281   HBP  SXA   HBPR,4
47025  0 63400 1 47042   6282        +1   SXA   HBPR+1,1
47026  0 50000 0 47334   6283        +2   CLA   PR+11
47027  0 10000 0 47031   6284        +3   TZE   *+2
47030  0 60100 0 47322   6285        +4   STO   PR+1                       PH
47031  0 77400 1 00031   6286        +5   AXT   25,1
47032  0 07400 4 00052   6287   PRIN1  TSX   DOUT,4
47033  3 02001 1 47136   6288        +1   PTH   HD1+25,1,1025
47034  0 05722 0 00036   6289        +2   PZE   30,,3026
47035 -3 11665 1 47352   6290        +3   SVN   PR+25,1,5037
47036  0 05722 0 00031   6291        +4   PZE   25,,3026
47037  1 00000 0 44106   6292        +5   PON   MODE
47040  2 00001 1 47032   6293        +6   TIX   PRIN1,1,1
47041  0 77400 4 00000   6294   HBPR AXT   **0,4
47042  0 77400 1 00000   6295        +1   AXT   **0,1
47043  0 02000 4 00001   6296        +2   TRA   1,4
47044  0 76000 0 00140   6297        +3   SLF
47045  0 77400 1 00144   6298        +4   AXT   100,1
47046  0 60000 1 47713   6299        +5   STZ   IT+100,1
47047  2 00001 1 47046   6300        +6   TIX   *-1,1,1
47050  0 07400 4 44713   6301        +7   TSX   HB0,4                      OUTPUT
47051  0 77400 4 00000   6302   HBR  AXT   **0,4

47052  0 77400 2 00000   6303        +1   AXT   **0,2
47053  0 77400 3 00000   6304        +2   AXT   **0,3
47054  0 77400 1 00000   6305        +3   AXT   **0,1
47055  0 77400 5 00000   6306        +4   AXT   **0,5
47056  0 77400 6 00000   6307        +5   AXT   **0,6
47057  0 77400 7 00000   6308        +6   AXT   **0,7
47060  0 02000 4 00003   6309        +7   TRA   3,4
47061  0 52200 0 47051   6310   HB7  XEC   HBR                          ERROR
47062  1 00002 4 47052   6311        +1   TXI   HBR+1,4,2                      RETURN FOR WDOTH NEG
47063  0 52200 0 47051   6312   HB0  XEC   HBR
47064  1 00001 4 47052   6313        +1   TXI   HBR+1,4,1                  ERROR RETN FOR PC NEGATIVE
                         6314*ERROR RECOVERY FROM ITER
47065  0 60200 0 47070   6315   HB4  SLW   HB5                          NAME OF LOOP IN AC
47066 -1 47070 0 25421   6316        +1   AZF,,HB5
47067  0 02000 2 00007   6317        +2   TRA   7,2                        NORMAL ITER RETURN
47070 -2 06060 6 06060   6318   HB5  BCI   3,     NOT CLOSED
47073 -0 52551 6 54664   6319   HDHD BCI    ,NERVOUS BALANCE    HOT BLEED PORT PROGRAM
47105 -0 72360 6 06060   6320   HD1  BCI    ,PC    PH    P6    P8    P2C   PC1C  P11   PC I+1PH I+1PCH
47117 -0 73044 6 06060   6321       +10  BCI    ,PHH   PO 8  DELTAPPH1C        OH    T     R     DCO   NO.
47131 -2 33025 6 32160   6322       +20  BCI    ,THETA DSLA CDSLA HG POS
47143 -2 32360 6 06060   6323       +30  BCI    ,TC    TH    T6    T8    T2C   TC1C        TC I+1TH I+1TCH
47155 -2 33044 6 06060   6324       +40  BCI    ,THH   TO 8        TH1C  DELTASDELTAXLENGTHHC**F HH**F LCI
47167 -0 33031 6 06060   6325       +50  BCI    ,LHI   KH    H H8   H HH  H CH
47201 -2 62360 6 06060   6326   HD3  BCI    ,HC    WH    WT    HR    WN                  TCI   THI   THI
47213 -2 32366 3 16060   6327       +10  BCI    ,TCHI  THHI                     A6    ACI   AH    WPCI  WPHI
47225  2 12345 6 06060   6328       +20  BCI    ,ACN   AN    ATN   A-COLDB-COLD
47237  2 34023 4 64324   6329   HD4  BCI    ,C-COLDA -HOTB -HOTC -HOTFRIC-CFRIC-HKIN   KCIN-CKCIN-IVCH
47251 -2 53044 6 06060   6330       +10  BCI    ,VHH   V8    V6    VIN2        QSUBI HT FLGK FLAGA     B
47263 -0 26560 6 06060   6331       +20  BCI    ,KV    HR HOTHR MIXHR FLG
47275 -0 43044 6 06060   6332   XHD  BCI    ,HHH   Q     THW   TCW   THI   WC    MCH   HH8   WT    WH
47307 -0 43044 6 06060   6333   YHD  BCI    ,HHH   Q     THW   TCW   THI   WC    PCH   WT    WT    P8 O
                  47321  6334   PR   BSS   100,F
                  47465  6335   Z    BSS   50,F
                  47567  6336   IT   BSS   100,F
                  47713  6337   Y    BSS   1,0
                  47714  6338   HB6  BSS   1,X
                         6339*    SUBROUTINES TO CALCULATE NEW R HOT,R MIX NEW HOB,NEW CSUB P(H,MIX)
47715  0 50000 7 47463   6340   NEWRCP CLA   PR+98,7                      HR HOT IR=2, HR MIX IR=1
47716  0 30000 0 40213   6341        +1   FAD   FL1
47717  0 60100 0 12512   6342        +2   STO   KOH
47720  0 56000 0 40260   6343        +3   LDQ   FL48.2
47721  0 26000 7 47463   6344        +4   FMP   PR+98,7                    HR HOT IR=2, HR MIX IR=1
47722  0 30000 0 40242   6345        +5   FAD   FL776
47723  0 24100 0 12512   6346        +6   FDP   KOH
47724 -0 60060 7 47750   6347        +7   STQ*  NEWR+2,7                   NEW RHOT AND R MIX
47725  0 56000 0 40252   6348        +8   LDQ   FL.219
47726  0 26000 7 47463   6349        +9   FMP   PR+98,7                    HR HOT IR=2, HR MIX IR=1
47727  0 30000 0 40257   6350       +10   FAD   FL3.45
47730  0 24100 0 12512   6351       +11   FDP   KOH
47731 -0 60060 7 47752   6352       +12   STQ*  NEWCP+2,7                  NEW C SUBP HOT AND MIX
47732  0 02000 4 00001   6353       +13   TRA   1,4
47733  0 60100 0 12512   6354   RHOMR  STO   KOH                          P
47734 -0 60000 0 12513   6355        +1   STQ   KOH+1                      T  COMPUTE DENSITY
47735  0 24160 7 47750   6356        +2   FDP*  NEWR+2,7                   R HOT IR=2, R MIX IR=1
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47736  0 26C00 0 40244   6357          +3   FMP    FL144
47737  0 24100 0 12513   6358          +4   FDP    KOM+1                    T
4774C  0 13100 J 00000   6359          +5   XCA
47741  0 02000 4 00001   6360          +6   TRA    1,4
47742  0 30200 0 40263   6361     NEWM      FSB    FL66                     TEMP. IN AC
47743  0 13100 0 00000   6362          +1   XCA
47744  0 26060 7 47752   6363          +2   FMP*   NEWCP+2,7                C SUB P MIX
47745  0 02000 4 00001   6364          +3   TRA    1,4
47746  0 00000 0 36175   6365     NEWR      HTR    TK+16                    R HOT
47747  0 00000 0 47540   6366          +1   HTR    Z+43                     R MIX
47750  0 00000 0 47541   6367     NEWCP     HTR    Z+44                     CP HOT
47751  0 00000 0 47542   6368          +1   HTR    Z+45                     CP MIX
                 12512   6369     KOM       EQU    COMMON
                         6370* POWER SUBROUTINE
47752  0 07400 4 27021   6371     POWER     TSX    AZE,4
47753  0 02000 1 00001   6372          +1   TRA    1,1
47754  1 72507 5 34122   6373     CLS1      DEC       .01
47755  1 67406 1 11565   6374     CLS2      DEC       .001
47756  1 63643 3 34273   6375     CLS3      DEC       .0001
47757  1 60517 4 26542   6376     CLS4      DEC       .00001
                         6377*CAVEMAN ENTHALPY VS. TEMP TABLE FOR HOT TEMPS
47760  2 13651 C 00000   6378     THOT      DEC       1700.,510.,2000.,595.,2300.,680.,2700.,795.,3200.,940.
47772  2 14764 0 00000   6379          +10  DEC       4000.,1155.,5500.,1600.,7500.,2150.,9000.,2550.,11000.
50003  2 14575 2 00000   6380          +19  DEC       3050.,13000.,3555.,15000.,4050.,17000.,4500.,19100.,5000.
50014  2 17470 4 00000   6381          +28  DEC       20000.,5200.,21000.,5400.,22000.,5600.,24000.,6000.
                         6382*CAVEMAN TEMP VS. SOME SORT OF THERMAL CONDUCTIVITY
50024  0 00000 0 00000   6383     KSUBM     DEC       0.,0.,200.,115E-6,2000.,355E-6


                 50032   6385     AZXI      BSS    12*CARDS,H                 STORAGE FOR STANDARD CASE, BCD
51162  0 00000 0 00000   6386     AZMT      PZE                               TEMP STORAGE FOR EACH PHASE PART
                 15061   6387     AZMTG     EQU    AZMT-AZMTB                 GAP BETWEEN PART AND CURRENT STORAGE
                 37357   6388     AZMTP     EQU    AZD+100*NCTMP-1            END OF PART CURVES
                 01775   6389     AZMTS     EQU    AZMTE-AZMTB                SIZE OF STORAGE FOR EACH PART
                 00062   6390     CARDS     EQU    50                         MAX NO. CARDS IN STD CASE
                 00012   6391     NCURV     EQU    10                         TOTAL NO. CURVES
                 00006   6392     NCTMP     EQU    6                          NO. CURVES FOR ONE PART
                 00024   6393     NHIT      EQU    20                         MAX NO. HEAT TRANSFER ITERATIONS
                 00067   6394     NLMAX     EQU    55                         MAX NO LINES/PAGE
                 00062   6395     NZMAX     EQU    50                         MAX NO. NODES/PART
                 24416   6396               END    BEGIN
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 58CENT *0065          *KPRINT  0001          22.70 *0090          2PI   *0058          AYE1   0036
 58YYAS  0065          *KPUNCH *0001          22.80 *0091          58BCD  0065          AYE2   0036
 ALPHAC  0074           KRBUFF *0001          22.90  0091          58EOF  0065          AYEA   0037
 AS58C1  0065          *KRTAPE *0001          22.95  0091          58IR1  0065          AYEA1  0037
 AS58C2  0065           KSERCH *0001          22.99  0092          58IR2  0065          AYER   0036
 AS58C3  0065           KSHORT *0001          23.00  0092          58IR4  0065          AYG    0037
 AS58D1  0065           KSQZRD *0001          23.10 *0092          58MIL  0065          AYGA   0038
 AS58F1  0065           KSTART *0001          23.20 *0092          58ONE  0065          AYGR   0038
 AS58F2  0065           KSTIME *0001          23.30  0093          58TEN *0065          AYH    0039
 AS58Y1  0065           KSTUFF *0001          23.40 *0093          ACI    0079          AYH1   0040
*COMMON  0001           KTAKEB  0001          23.50 *0093          ANA    0077          AYH2   0040
 DELTAZ  0079           KTIMEX *0001          23.65 *0093          AS58   0064          AYHR   0040
 DSUBHI  0078           KTUNIT *0001          23.70 *0093          AS58A  0065          AYI    0040
 FL128.  0058           KUNFLO *0001          23.80 *0094          AS58B  0065          AYI1   0040
 FL12E8  0058           KWBUFF *0001          23.90 *0094          AS58C  0065          AYII   0040
 FL3.45  0058           KWITAP *0001          23.91 *0095          AS58D  0065          AYII1 *0040
 FL48.2  0058          *KWTAPE *0001          23.92  0095          AS58E  0065          AYII2  0041
 FL.219  0058           NEWRCP  0103          23.93  0095          AS58F  0065          AYIIR  0040
 GAMMAC  0074           ST1763  0064          23.94  0095          AS58G  0065          AYIR   0040
 ITERTA  0077           ST59.4  0064          24.00  0095          AS58H  0065          AYJ    0041
 ITERPX  0077           ST59.7  0064          25.00  0096          AS58J  0065          AYJ1   0041
 KBINLD  0001           TSUBCI  0079          25.10 *0096          AS58K  0065          AYK    0041
 KCLOCK *0001           TSUBHI  0079          25.20 *0096          AS58P  0065          AYK01  0045
 KDATEA  0001            1000.  0058          25.30 *0096          AS58Q  0065          AYK02  0045
 KDATEN *0001            188    0058          25.40  0096          AS58V  0065          AYK1   0044
 KDEBUG  0001           20.00 *0083          25.50  0096          AS58W  0065          AYK2  *0044
*KDELAY *0001           20.01  0084          25.60 *0097          AS58X  0065          AYK3   0044
 KENTRY *0001           20.50  0084          26.00  0097          AS58Y  0065          AYK4   0042
*KERROR  0001           20.55 *0084          26.01  0097          AS58Z  0065          AYK5   0042
*KFINIS  0001           20.56 *0084          26.02  0097          AYA    0029          AYK6   0042
 KINDX1 *0001           20.58 *0085          26.10  0097          AYA1   0031          AYK7   0042
 KINDX2 *0001           20.60 *0085          26.20  0097          AYAR   0031          AYK8   0042
*KINDX4  0001           20.65 *0085          26.30  0098          AYB    0031          AYK9   0045
 KISBSF *0001           20.70 *0085          26.40 *0098          AYB1   0031          AYKR   0042
*KISBSR *0001           20.75 *0085          26.50 *0098          AYB2   0032          AYL    0045
 KISETT *0001           20.76 *0085          26.60 *0099          AYB3   0032          AYL2   0045
*KISCRG *0001           20.77 *0085          27.00  0099          AYB4   0032          AYLA   0046
*KISOUT  0001           20.80  0086          27.01  0099          AYBR   0032          AYLO   0046
 KISREW *0001           20.85 *0086          27.10  0100          AYBT   0032          AYLP   0046
 KISRTT *0001           20.90  0087          27.20 *0100          AYBW   0032          AYLR   0045
 KISTAT *0001           21.00  0087          27.30  0100          AYC    0032          AYLW   0046
 KISWEF *0001           21.05 *0089          27.40 *0100          AYCA   0035          AYM    0046
*KJOBNO *0001           21.99  0089          27.50 *0101          AYCA1  0035          AYN    0046
 KLCSTR  0001           22.00  0C89          28.00 *0101          AYCR   0035          AYN1   0046
 KLCCAT *0001           22.10 *0C89          28.20 *0101          AYD    0035          AYPA   0047
 KLROUT *0001           22.20 *0089          28.30 *0101          AYD01  0036          AYPA1  0047
*KMOVEB  0001           22.30 *0089          28.40 *0101          AYD1   0036          AYPAR  0047
 KONLIN  0001           22.40 *0089          28.50  0102          AYD2   0036          AYPB   0047
*KOPINP *0001           22.50 *0090          28.60 *0102          AYDR   0036          AYPB1  0048
*KOVFLO  0001           22.60 *0090          288    0058          AYE    0036          AYPB2  0048
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AVPB3	0048	AZC	0011	AZK	0017	AZNI1	0019	AZQ	0025
AVPBR	0048	AZC1	0011	AZK1	0018	AZNIR	0019	AZQR	0025
AVQ	0048	AZC2	0011	AZK2	0018	AZNR	0074	AZT	0005
AVQ1	0048	AZCR	0011	AZK3	0018	AZNW	0019	AZT1	0006
AVQR	0048	AZD	0057	AZK4	0018	AZNW1	0019	AZT2	0006
AVR	0048	AZE	0025	AZKR	0018	AZNW2	0019	AZT3	0007
AVR1	0049	AZE1	0025	AZL	0018	AZNWR	0019	AZT4	0007
AVR2	0049	AZER	0025	AZLR	0018	AZP3	0021	AZTR	0006
AVR3	0049	AZF	0011	AZM01	0005	AZPC	0019	AZU	0026
AVRR	0049	AZF1	0012	AZM1	*0003	AZPC1	0020	AZU1	0026
AVT	0049	AZF2	0012	AZM10	0004	AZPC2	0020	AZU2	0026
AVT1	0049	AZF3	0011	AZM11	0005	AZPC3	0020	AZU3	0026
AZ01	0055	AZFF	0011	AZM12	0004	AZPCR	0020	AZU4	0026
AZ02	0055	AZFR	0012	AZM17	0003	AZPD	0020	AZU5	0026
AZ03	0055	AZFT	0012	AZM19	0004	AZPD1	0020	AZU6	0026
AZ04	0055	AZFT1	0012	AZM2	*0004	AZPD2	0021	AZUR	0026
AZ05	0055	AZG	0012	AZM20	0005	AZPD3	0021	AZV	0026
AZ06	0055	AZG1	0013	AZM21	0005	AZPD4	0021	AZV1	0026
AZ07	0055	AZGR	0013	AZM22	0005	AZPD5	0021	AZV2	0026
AZ08	0055	AZH	0013	AZM23	0005	AZPD6	0021	AZVR	0026
AZ09	0055	AZH1	0014	AZM24	0002	AZPD7	0021	AZX	0027
AZA	0007	AZH2	0013	AZM25	0002	AZPD8	0021	AZX1	0027
AZA1	0007	AZH3	0013	AZM26	0002	AZPD9	0021	AZX2	0027
AZAA	0007	AZH4	0014	AZM27	0003	AZPDR	0020	AZX3	0027
AZAA1	0008	AZHR	0014	AZM28	0003	AZPI	0021	AZX4	0027
AZAAR	0008	AZI	0014	AZM29	*0004	AZPI1	0022	AZX5	0027
AZAB	0008	AZI01	0015	AZM3	0005	AZPI2	0021	AZX6	0027
AZAB1	0008	AZI1	0015	AZM30	0005	AZPI3	0021	AZX7	0027
AZAB2	0009	AZI2	0015	AZM31	0004	AZPI4	0022	AZX8	0027
AZABR	0009	AZI3	0015	AZM32	0003	AZPI5	0022	AZX9	0027
AZAC	0009	AZI4	0015	AZM4	0005	AZPI6	0022	AZXA	0027
AZAC1	0009	AZI5	0016	AZM5	0002	AZPI7	0022	AZXA1	0027
AZAC2	0009	AZI6	*0015	AZM6	0003	AZPI8	0022	AZXA2	0028
AZAC3	0009	AZI7	0015	AZM7	0002	AZPI9	0022	AZXA3	0028
AZAC4	0010	AZIR	0015	AZM8	0002	AZPIB	0023	AZXA4	0028
AZAC5	0009	AZJ	0016	AZM9	0003	AZPIR	0022	AZXA5	*0028
AZAC6	0009	AZJ1	0017	AZMT	0104	AZPN	0023	AZXAR	0027
AZAC7	0009	AZJ10	0017	AZMT8	0055	AZPN1	0023	AZXB	0028
AZACR	0009	AZJ11	0017	AZMTC	0057	AZPNZ	0023	AZXB1	0028
AZB	0010	AZJ12	0017	AZMTE	0056	AZPNR	0023	AZXB2	0028
AZB10	0010	AZJ13	0016	AZMTG	0104	AZPP	0023	AZXB3	0028
AZB11	0010	AZJ2	0017	AZMTP	0104	AZPP1	0024	AZXBR	0028
AZB12	0010	AZJ3	0016	AZMTS	0104	AZPP2	0024	AZXC	0028
AZB2	0010	AZJ4	0017	AZN	0065	AZPP4	0024	AZXC1	0028
AZB3	0010	AZJ5	0017	AZN1	0074	AZPP5	0024	AZXC2	0028
AZB5	0010	AZJ6	0017	AZN2	0079	AZPP6	0024	AZXC3	0029
AZB7	0010	AZJ7	0016	AZN3	0078	AZPP7	0024	AZXC4	0028
AZB8	0010	AZJ8	0016	AZN4	0066	AZPPR	0024	AZXCR	0029
AZB9	0010	AZJ9	0017	AZN5	0079	AZPS1	0021	AZXI	0104
AZBR	0010	AZJR	0017	AZNI	0018	AZPS3	0021	AZXR	0027

AZV	0029	DA6	0056	DNX	0056	EQT3	0064	FL.8	0058
AZZ	0029	DAHOT	*0057	DNZFF	0056	EQT3R	0064	FL.9	*0058
BA	0065	DAKV	0056	* DOUT	0001	EREXP	0078	FL.95	*0058
BCOD	0058	DASTR	0056	DP11	0057	ERLN	0078	FR	0065
BDNA	0060	DB	*0057	DP12E	0056	ERROR	0065	FRICT	0078
BDNB	0062	DBHOT	*0057	DP8E	0056	EXP	0001	FX	0055
BDXA	0060	DBKV	0056	DPD	*0001	EXP[3	*0001	FX1	0057
BDXB	0062	DC	*0057	DPD1	*0001	FINQ1	0067	FX10	0057
BEGIN	0002	DCHOT	*0057	DPDT	*0001	FIX	0058	FX1E3	0057
BELLO	0057	DD2	0056	DPI	0056	FL1	0057	FX2	*0057
BETAC	0074	DDCO	0056	DPO	0056	FL10	0057	FX3	*C057
BIG	0058	DDH	0056	DPRI	0056	FL100	0058	FX4	*0057
BLANK	0058	DDIL	0056	DPX	0056	FL108	0058	FX5	*0057
BUG	0074	DDRN	0056	DQINT	0056	FL12	0057	FX6	*0057
BUG1	0074	DDTL	0056	DR	0056	FL139	0058	FX7	0057
BUG2	0074	DDTN	0056	DRC	*0057	FL144	0058	FX8	*0057
C	0055	DEG	*0058	DRH	0057	FL180	*0058	FX9	*0057
CARDS	0104	DELT	0056	DRHOR	0055	FL1E5	0058	F.A	0064
CCI	0079	DELZ	0055	DSA	*0001	FL1.1	*0058	F.B	0064
CD	0065	DEN	*0001	DSAT	*0001	FL1.2	*0058	F.C	0064
CH	0078	DEN1	*0001	DST	*0001	FL1.5	*0058	F.D	0064
CLOSD	0074	DENT	*0001	DSTT	*0001	FL2	0057	F.E	0064
CLS1	0104	DFCLD	*0057	DSUBC	0079	FL288	0058	F.F	0064
CLS2	0104	DFF	0055	DSUBH	0079	FL2G	0058	F.G	0064
CLS3	0104	DFHOT	0057	DSWT	0056	FL2GI	0058	F.H	0064
CLS4	0104	DGP	0056	DT	0056	FL2RW	0058	F.I	0064
CNT6	0070	DHE	0056	DTI1	0057	FL3	0057	F.J	0064
CNT7	0072	DHRN	0067	DTHO	0056	FL3.7	0058	F.K	0064
CNT8	0073	DIPT	0056	DTHET	0057	FL4	0057	F.L	0064
CNT9	0074	DIVCK	0078	DTI	0056	FL5	*0057	GO	0002
COLUN	0055	DK	0056	DTMAX	0056	FL58	0058	HB	0082
COS	0065	DK11	0057	DTMI	0056	FL6	*0057	HB1	0102
COUNT	0055	DK2	0056	DTMIN	0056	FL66	0058	HB2	0102
CP3	*0001	DK9	0057	DVF	0055	FL7	*0057	HB3	0099
CP31	*0001	DKCC	*0057	DVI	0056	FL776	0058	HB4	0103
CP3T	*0001	DKCI	*0057	DVO	0056	FL8	*0057	HB5	0103
CPH	*0001	DKDPI	0056	DWC	0056	FL9	*0057	HB6	0103
CPH1	*0001	DKDPO	0056	DWCE	0056	FLCUF	0058	HB7	0103
CPHT	*0001	DKE	*0057	DWH	0056	FLG	0058	HB8	0103
CURV1	0063	DKFLG	0057	DWP	0056	FLGAL	0058	HBI	0081
CURV4	0064	DKIN	*0057	DWPE	0056	FLGF	0058	HBO	0082
CURV5	0064	DKPCN	*0057	DWRE	0056	FLPI	0058	HBP	0102
CURV6	0064	DKPHN	0057	DWT	0056	FLR	0058	HBPR	0102
CURV7	0064	DL	0056	END	0065	FLRB	0058	HBR	0102
CURV8	0064	DMDT	0056	ENDO	0055	FL.1	0058	HBZ	0082
CURVC	0064	DMMAX	0055	ENT	*0001	FL.2	0058	HCI	0079
CURVR	0064	DNDT	0056	ENT1	*0001	FL.25	0058	HD1	0103
CUT	0059	DNH	0056	ENTT	*0001	FL.4	0058	HD3	*0103
D	0055	DNI	0056	EQT1	0064	FL.5	0058	HD4	*0103
DA	0057	DNP	0056	EQT2	0064	FL.6	0058	HDHD	*0103

MEDER	0039	LN	0001	NUTHI	0066	PR98	0052	RHO4	*0079
MHI	0079	LO	0065	NUTHW	0071	PR99	0052	RHOMR	0103
ICURV	0063	LQ1	0079	NZMAX	0104	PRESS	0064	ROTAT	*0073
IN	0065	LT6	0078	P	0055	PRINI	0102	RSUBN	0079
INDAT	*0078	LTCW	0078	P3	0079	PRINT	0053	SCURV	0063
INT	*0001	LTH	0078	PA	0054	PRP	0049	SET	0065
IR1	0065	LTHW	0078	PC	0055	PRP1	0050	SIGMA	0079
IR2	0065	LVSAC	0078	PEXP	*0001	PRP10	0050	SIN	0065
IR4	0065	LVSCC	0078	PF	0054	PRP11	0050	SPACE	0064
IT	0103	LVSCH	0078	PG	*0054	PRP4	0050	SQRT	0001
ITOCD	0077	LVSDH	0078	PI	0058	PRP6	0050	ST102	0064
ITER	0075	LVSIG	0078	PIN	0079	PRP7	0050	ST188	0064
ITER1	0075	LVSRN	0078	PL	0054	PRP8	0050	ST220	0064
ITER2	0075	MAXER	0079	PL1	0054	PRP9	0050	ST293	0064
ITER3	0076	MODE	0078	PL2	0055	PRPT1	*0001	ST440	0064
ITER4	0076	NCTRP	0104	PLOG	*0001	PRPTY	*0001	ST881	0064
ITER5	0076	NCURV	0104	PLR	0054	PRTD	0051	START	0002
ITER6	0076	NE	0065	PNB	*0001	PSQRT	*0001	STP72	0064
ITER7	0076	NEWA	0060	PNB1	*0001	PST	*0001	STP1	0064
ITER8	0077	NEWA1	0061	PNBT	*0001	PSTT	*0001	STP1C	0064
ITER9	0077	NEWA2	0060	POWER	0104	PSUBC	0079	STP2	0064
ITERP	0077	NEWA3	0060	PP01	0053	PT	0055	STP2C	0064
ITERR	0077	NEWA5	0060	PP04	0053	PVT	*0001	STP3	0064
ITERX	0077	NEWA6	0060	PP05	0053	PVT1	*0001	STP3C	0064
ITEXP	0077	NEWA7	0060	PP06	0053	PVTT	*0001	STP4	0064
KA	0079	NEWA8	0060	PP07	0054	PZ	0054	STP4C	0064
KCM	0104	NEWA9	0061	PP075	0054	Q	0077	STP5	0064
KONL	0079	NEWAR	0060	PP08	0054	Q1	0079	STP5C	0064
KONL0	0079	NEWB	0061	PP09	0054	Q1INT	0078	STP6	0064
KONL1	0079	NEWB1	0062	PP40	0059	Q1NU	0074	STP6C	0064
KONL2	0079	NEWB2	0062	PP41	0059	Q1OK	0073	STP7	0064
KONL3	0079	NEWB3	0062	PP97	0054	RAD	0058	STP7C	0064
KONL7	0079	NEWB5	0062	PP98	0054	RAPA	0061	STP8	0064
KON39	0078	NEWB6	0062	PP99	0054	RAPA1	0061	STP8C	0064
KON40	0074	NEWB7	0062	PR	0103	RAPA2	0061	STP9	0064
KON41	0074	NEWB8	0062	PR01	0052	RAPA5	0061	STP9C	0064
KON42	0074	NEWB9	0062	PR02	0051	RAPA6	0061	STPEX	0064
KON44	0074	NEWBR	0062	PR023	0052	RAPA7	0061	STPG	0064
KONS	0079	NEWCP	0104	PR024	0051	RAPA8	0061	STPG1	0064
KONS0	0078	NEWH	*0104	PR03	0051	RAPA9	0061	STPG2	0064
KONS1	0078	NEWR	0104	PR04	0052	RAPB	0062	STPG3	0064
KONS2	0078	NHIT	0104	PR10	0051	RAPB1	0063	STPG4	0064
KONS3	0078	NLEFT	0078	PR11	0052	RAPB2	0063	STPG5	0064
KONS4	0078	NLMAX	0104	PR12	0051	RAPB3	0062	STPZO	0064
KONS5	0078	NRA	*0001	PR13	0052	RAPB4	*0063	SWT	0078
KONB	0079	NRAT	*0001	PR14	0052	RAPB5	0063	S(TP)	0064
KSUBR	0104	NTOTL	0078	PR15	0052	RAPB6	0063	T3	0079
LAST	0079	NUM	0079	PR60	0059	RAPB7	0063	T6	0079
LINT	0065	NUMBR	0078	PR61	0059	RAPB8	0062	TCARD	0055
LINTS	0065	NUTCW	0070	PR971	0052	RAPB9	0063	TCW	0079

TCWOK	0070	THINT	0078	TSUBH	0079	WH	0055	XHD	0103
TEMP	0079	THOT	0104	TY	0078	WHT	0055	XLC	*0001
TEMPR	0064	THW	0079	VIS	0001	WK	0055	XLC1	*0001
TES	0065	THWOK	0072	VIS1	*0001	WPI	0055	XLCT	*0001
TEST	*0073	TIN1	0079	VIST	*0001	WPO	0055	XTHIK	0078
THAL	0001	TK	0057	WAF	0055	WPR	0055	Y	*0103
THAL1	*0001	TLO	0065	WCR	0055	WR	0079	YHD	0103
THALT	*0001	TP	0055	WFP	0055	WTI	0055	Z	0103
THI	0065	TSUBC	0079	WGP	0055	X	0055	ZERO	*0058