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AEROJET GENERAL TIRE GENERAL

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TO
AEC-NASA SPACE NUCLEAR PROPULSION OFFICE

TRANSIENT ENGINE SIMULATION PROGRAM

ROCKET ENGINE OPERATIONS – NUCLEAR

CONTRACT SNP-1 AUGUST 1964 NERVA PROGRAM

RELEASED FOR ANNOUNCEMENT

IN NUCLEAR SCIENCE ABSTRACTS

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AEROJET-GENERAL CORPORATION

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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

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

Considering isentropic and ideal gas relationships,

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

where

$$\frac{\gamma-1}{\gamma} = \frac{R}{778\ C_p} \tag{3}$$

therefore,

$$T_{12} = \frac{P_{11}}{P_{12}}^{\frac{R}{778\ C_p}} \tag{4}$$

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

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Now, substituting pressures for temperature and rearranging algebraically.

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

b. Pump Work Done

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

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

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}:

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

where

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

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

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

*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:

$$\Delta T = \eta_T\ \Delta T_{isen} \tag{9}$$

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

solving for

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

Now, since

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

then

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

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

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

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

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

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

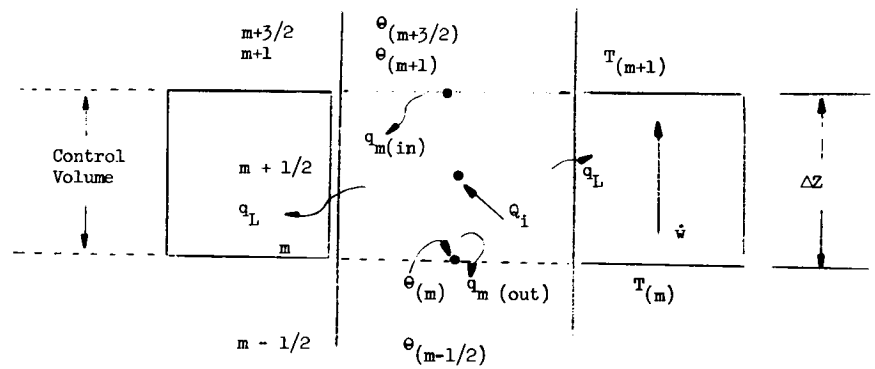
Substituting into the above, the equation for $W_{P\ act\ (1+1)}$ is obtained as

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

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

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 previous 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 $\dfrac{\dot{w}^2}{A^2\,\rho}$

$$\Delta P = \frac{\dot{w}^2}{A_F^2\,\rho\,2g}\;\frac{T_{(m+1,n)} - T_{m,n}}{T_{m,n}} + \frac{4\phi\,\Delta Z}{D} \qquad (35)$$

Rearranging,

$$P_{(m,n)} - P_{(m+1,n)} = \frac{\dot{w}^2}{A_F^2\,2g\rho}\;\frac{T_{(m+1,n)} - T_{(m,n)}}{T_{(m,n)}} + \frac{4\phi\,\Delta Z}{D} \qquad (36)$$

and

$$P_{(m+1,n)} = P_{(m,n)} - \frac{\dot{w}^2}{A_F\,\rho\,2g}\left[\frac{T_{(m+1,n)} - T_{(m,n)}}{T_{(m,n)}} + \frac{4\phi\,\Delta Z}{D}\right] \qquad (37$$

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 $\rho = f\ (\Theta_o$ 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 $_{i+1} = \Delta t$ + 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 $S = f(P_2$ 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.

Basic Subroutine AZAC
AZAB
AZAA
AYII

30. Find pump inlet saturated vapor head.

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

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. $P_{1_o} = P_{2_c} = P_{1_{(i+1)}}$, $T_{1_o} = T_{2_o} = T_{2_{(i+1)}}$, 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 $\dot{w}_{h_{(i+1)}}$ 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)

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

AZY

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.

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:

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

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

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

$$h_f = \frac{k\ \gamma}{\not{D}} \left(\frac{4\ \dot{w}}{\pi\ F_p} \right)^{0.8} \frac{T}{\theta}^{\alpha} \frac{\not{D}}{\not{D}+Z}^{\beta} \frac{C_p}{k}^{0.4} \frac{\text{Btu}}{\text{in.}^2\text{-sec}\ ^\circ\text{R}} \qquad \text{(Eq. HT8)}$$

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

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

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

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 $\dot{w}_h = 0$:

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

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.

AZPI

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:

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

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

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

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

AXB

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

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

112. Find P_{11} from the following:

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

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

AXJ

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

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 $T_{12} = T_{11} \left(\frac{P_{12}}{P_{11}}\right)^{\frac{R}{778\ C_{p\ 11}}}\ {}^{o}R$ (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

AYB

120. Find $\left(\frac{P_{12}}{P_{11}}\right)' = \frac{K_t}{2\,A_{rn}(.1396)} \sqrt{1 - \eta_T \left[1 - \left(\frac{P_{12}}{P_{11}}\right)\right]^{\left[\frac{R}{778\,C_{P\,11}}\right]}}$ (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 $W_{T\ act\ i} = \dot{w}_{T\ i}\ \eta_T\ C_{P\ 11}\ T_{11} \left[1 - \left(\frac{P_{12}}{P_{11}}\right)^{\left[\frac{R}{778\,C_{P\,11}}\right]}\right]$ 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)

AYG

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

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

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

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

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

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.

Basic Subroutine AZJ

AZG

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,

AYN

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

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,

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

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 $U = \dfrac{H\ \Delta t}{\rho_R\ C_R}$, ^oR (Eq. HT5)

Basic Subroutine AZJ

AZG

157. Find metal temperature for the next time point.

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

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

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

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

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

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 $Q_{P(i+1)}$ not closed flag.

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

180. Begin iteration to find $Q_{P\,(i+1)}$ 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.

COUNTER

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.

AYB

193. If a start assistance is being used, find

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

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

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

AYA

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

RAPB

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.

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.

AYB

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

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. $\eta_T = \eta_T' \left[\frac{\gamma\ R\ T_{12\ (i+1)}}{1 + (\gamma+1)\ C_{P\ 11}(778)\ T_{11\ (i+1)} - T_{12\ (i+1)}} \right]$, 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 $W_{P\ act\ (i+1)} = W_{P\ act\ (i)} - \frac{I_{PT}}{(778)\ 12g\ \Delta t} \left[\frac{2\pi}{60} \right]^2 N^2_{(i+1)} - N^2_{(i)}$ $+ W_{T\ act\ (i+1)} + W_{T\ act\ (i)}$, 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	$Btu/sec\text{-}^{o}R\text{-}in.^2$	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	$Btu/in.\text{-}sec\text{-}^{o}R$	Thermal Conductivity
q	Btu/sec	Heat Flow
H	$Btu/sec\text{-}in.^3$	Internal Heat Generation
υ	^{o}R	Temperature Rise Due to Internal Heat Generation
S	--	Axial Conduction Coefficient
$C_P\text{-}C_R$	$Btu/in.\text{-}^{o}R$	Specific Heat Fluid, Metal
g	$in.\text{-}lbm/lbf\text{-}sec^2$	Gravitational Constant
$\dot{w}$	lbm/sec	Flow Rate
W	Btu/sec	Work
ϕ	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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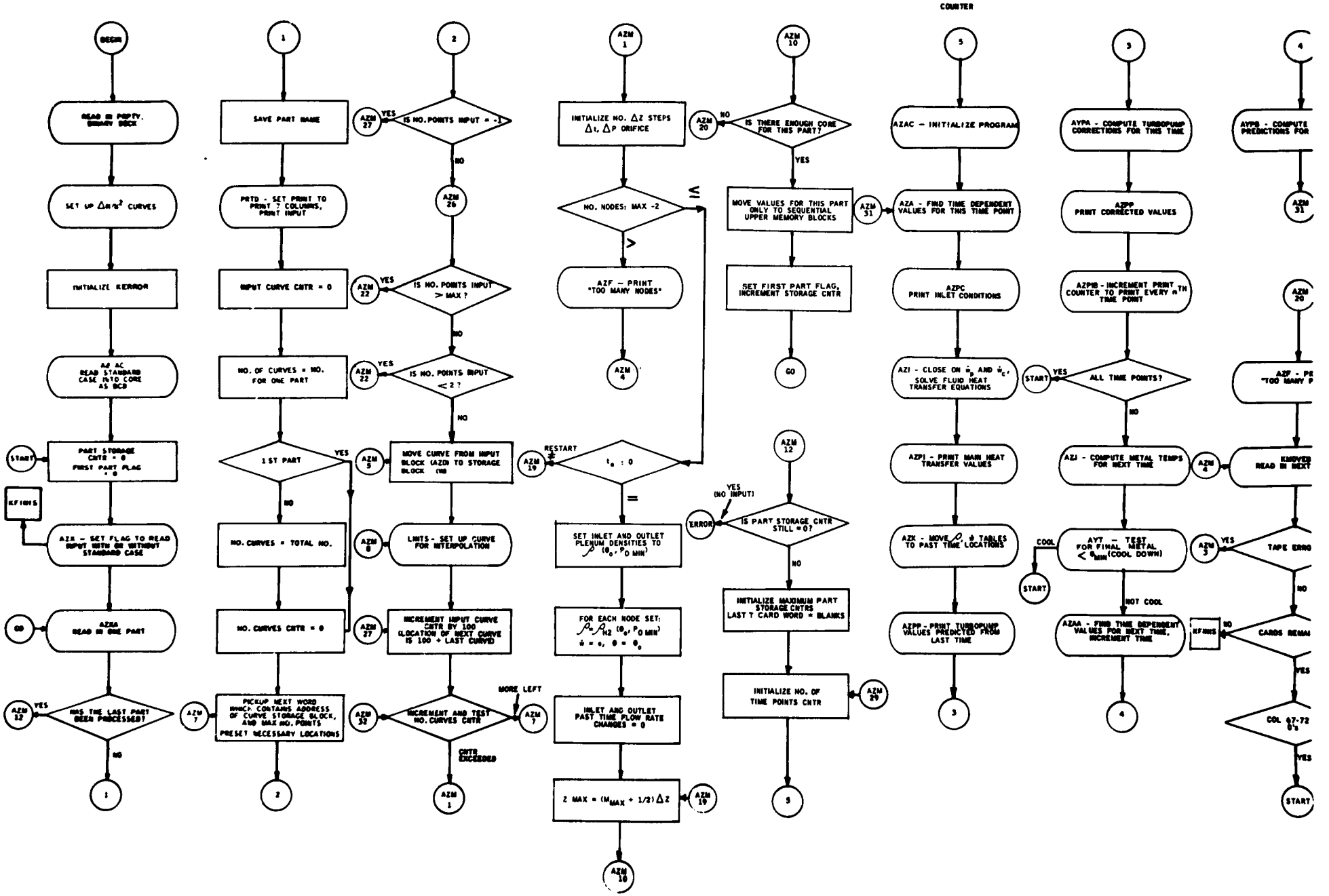

COUNTER
BEGIN
READ IN PRPTY. BINARY DECK
SET UP $\Delta n/n^2$ CURVES
INITIALIZE KERROR
AZ AC READ STANDARD CASE INTO CORE AS BCD
START
PART STORAGE CNTR = 0 FIRST PART FLAG = 0
KFINIS
AZX - SET FLAG TO READ INPUT WITH OR WITHOUT STANDARD CASE
GO
AZXA READ IN ONE PART
AZM 12
YES
HAS THE LAST PART BEEN 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
LINTS - SET UP CURVE FOR INTERPOLATION
AZM 27
INCREMENT INPUT CURVE CNTR BY 100 (LOCATION OF NEXT CURVE IS 100 + LAST CURVE)
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
$\leq$
$>$
AZF - PRINT "TOO MANY NODES"
AZM 4
AZM 19
RESTART
$\neq$
$t_0 : 0$
$=$
SET INLET AND OUTLET PLENUM DENSITIES TO $\rho(\theta_0, P_{0\,MIN})$
FOR EACH NODE SET: $\rho = \rho_{H2}(\theta_0, P_{0\,MIN})$ $\dot{w} = 0$, $\theta = \theta_0$
INLET AND OUTLET PAST TIME FLOW RATE CHANGES = 0
Z MAX = $(M_{MAX} + 1/2)\Delta Z$
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
SET FIRST PART FLAG, INCREMENT STORAGE CNTR
GO
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
AZM 31
AZA - FIND TIME DEPENDENT VALUES FOR THIS TIME POINT
AZPC PRINT INLET CONDITIONS
AZI - CLOSE ON $\dot{w}_p$ AND $\dot{w}_c$, SOLVE FLUID HEAT TRANSFER EQUATIONS
AZPI - PRINT MAIN HEAT TRANSFER VALUES
AZX - MOVE ρ, $\dot{w}$ 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
AZPIB - INCREMENT PRINT COUNTER TO PRINT EVERY n^{TH} TIME POINT
START
YES
ALL TIME POINTS?
NO
AZJ - COMPUTE METAL TEMPS FOR NEXT TIME
COOL
START
AYT - TEST FOR FINAL METAL $< \theta_{MIN}$ (COOL DOWN)
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
AZM 4
KMOVED READ IN NEXT
AZM 3
YES
TAPE ERRO
NO
KFINIS
NO
CARDS REMA
YES
COL 67-72 0's
YES
START

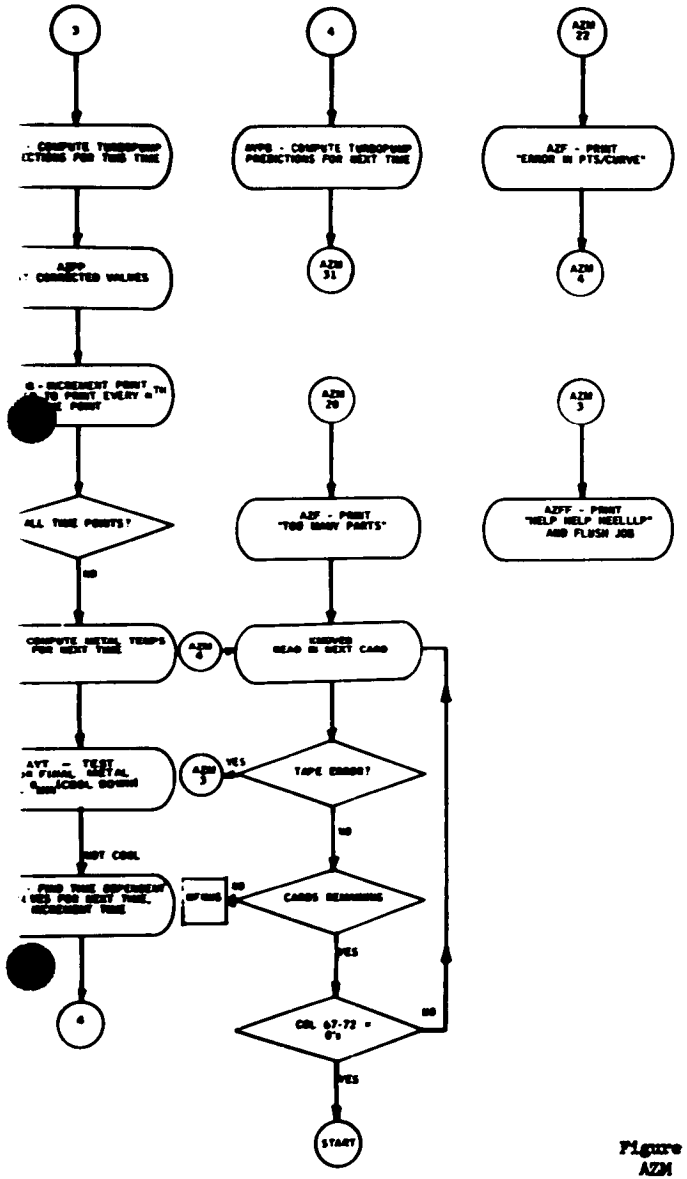

Figure 1
AZM
12013 Master Control Region and Input Initialization

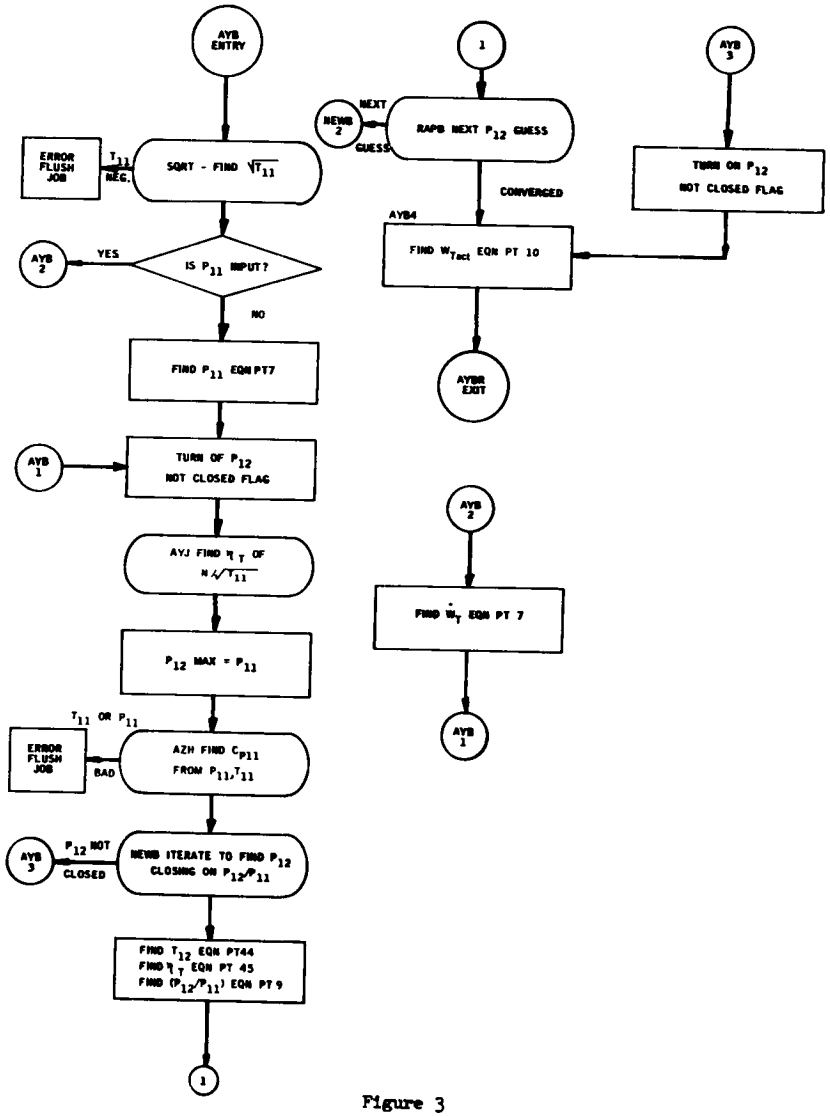

Figure 3
AYB
Find Actual Turbine Work

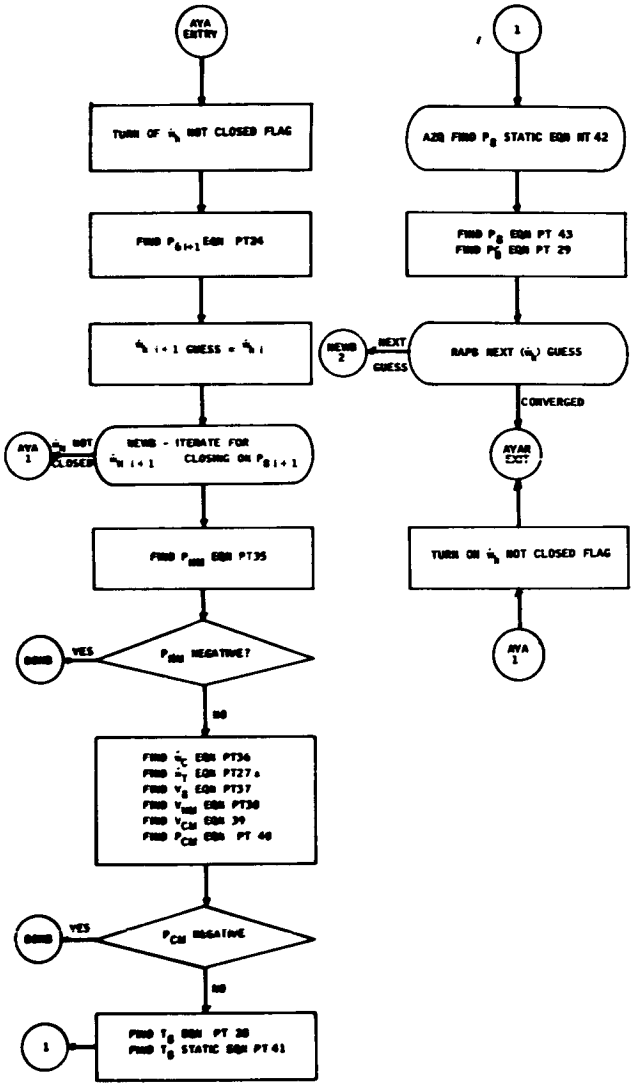

Figure 2
AYA
Iterate to Find $\dot{w}_h$ Closing on P_8

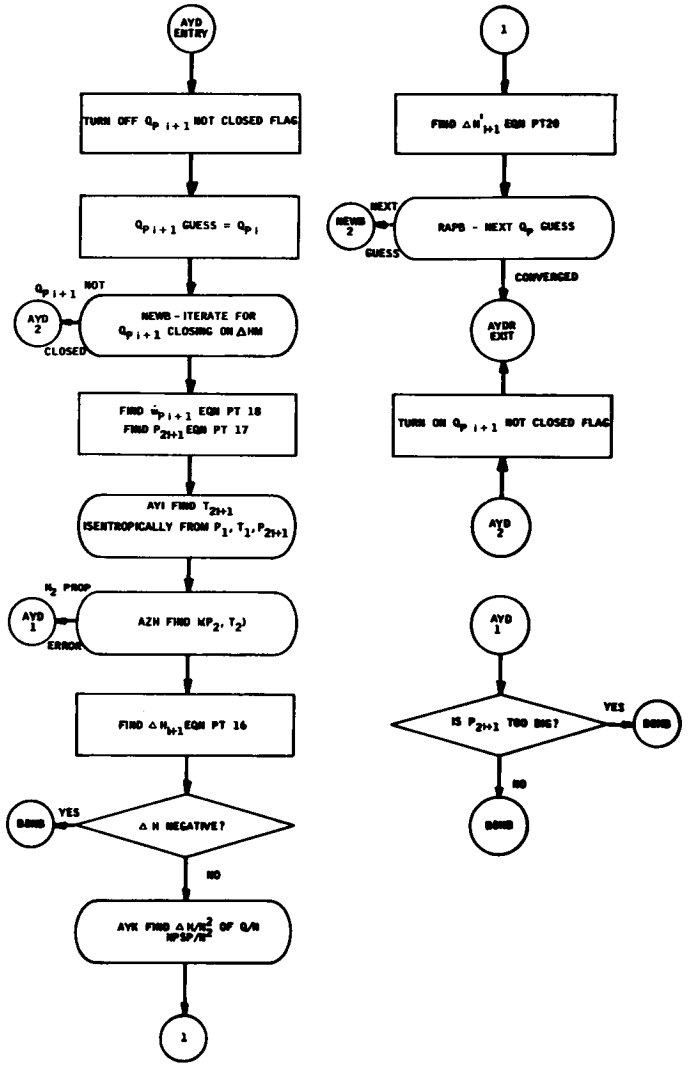

Figure 4
AYD
Find Pump Flow Rate

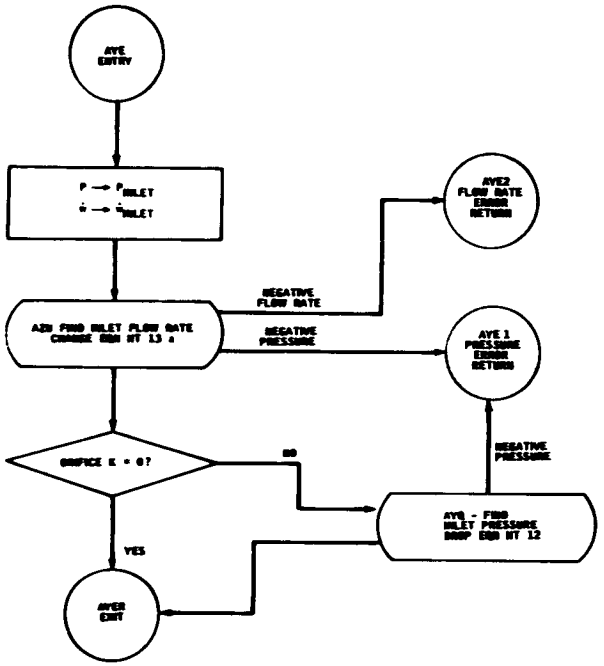

Figure 5
AYE
Find Inlet Pressure and Flow Rate Changes for One Part

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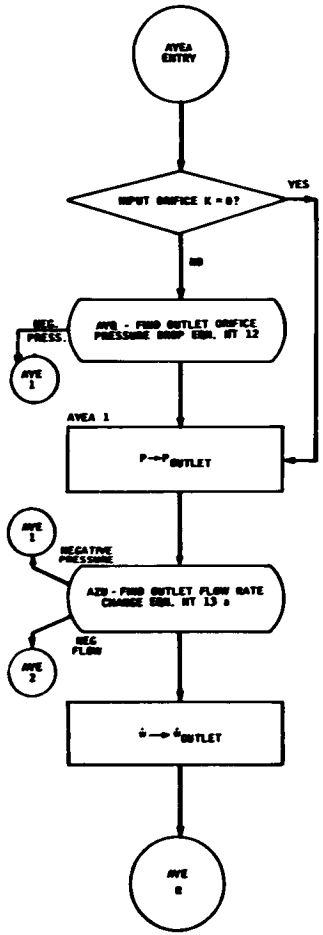

Figure 6
AYEA
Find Outlet Pressure and Flow Rate for One Part

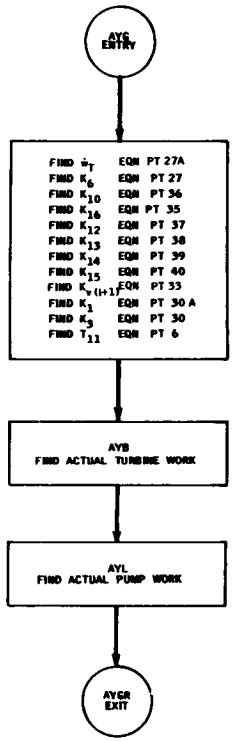

Figure 7
AYG
Region to Compute Part of Corrector Equations

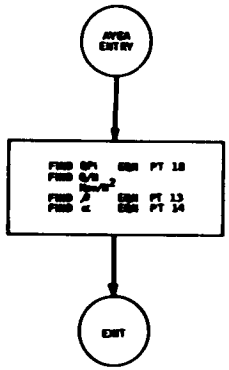

Figure 8
AYGA
Compute Some Corrector Equations

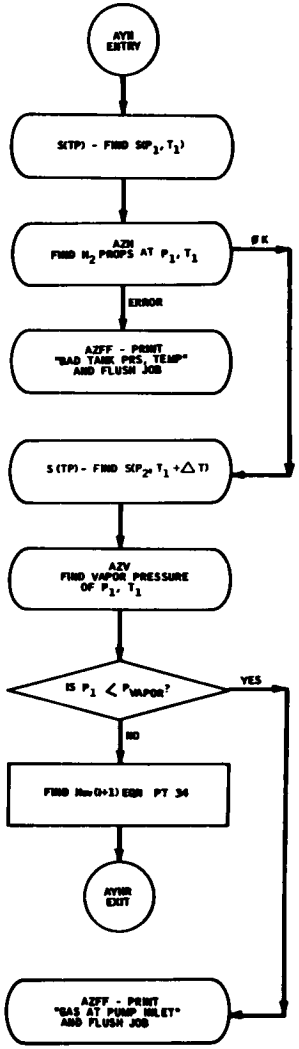

Figure 9
AYII
Look-Up Isentropic Values

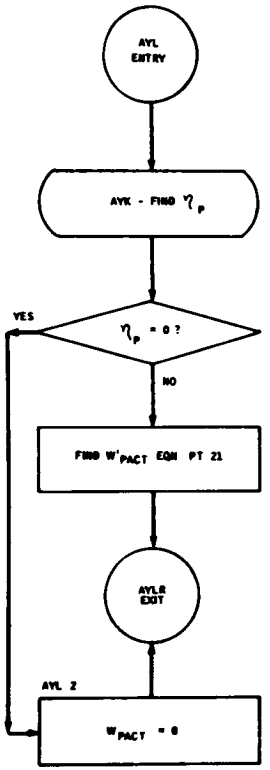

Figure 10
AYL
Compute Work Required by the Pump

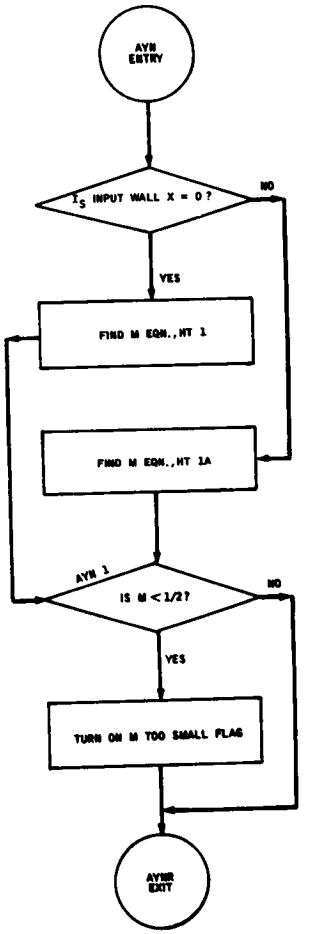

Figure 11
AYN
Compute Heat Resistance Term, M, for One Mode

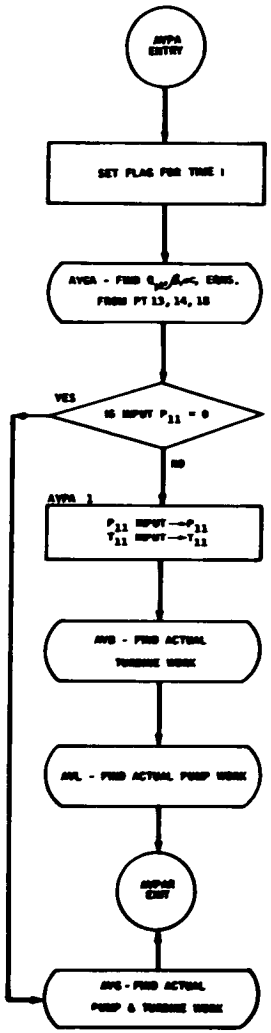

Figure 12
AYPA
Pump and Turbine Master Control (Corrector)

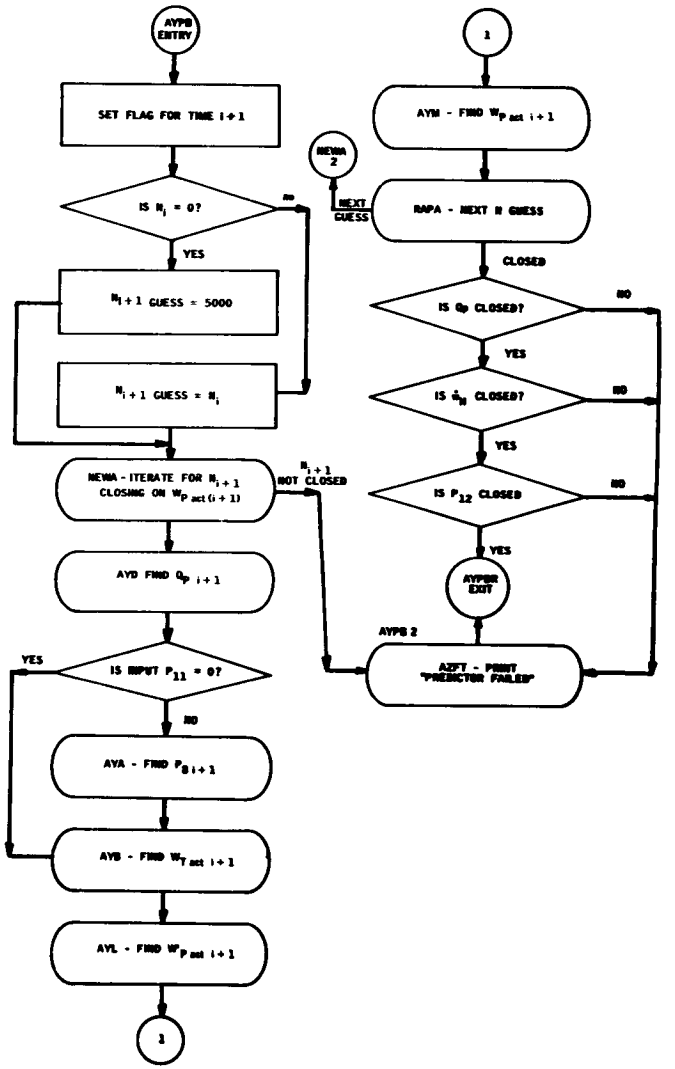

Figure 13
AYPB
Turbopump Master Control Time, i+1 (Prediction)

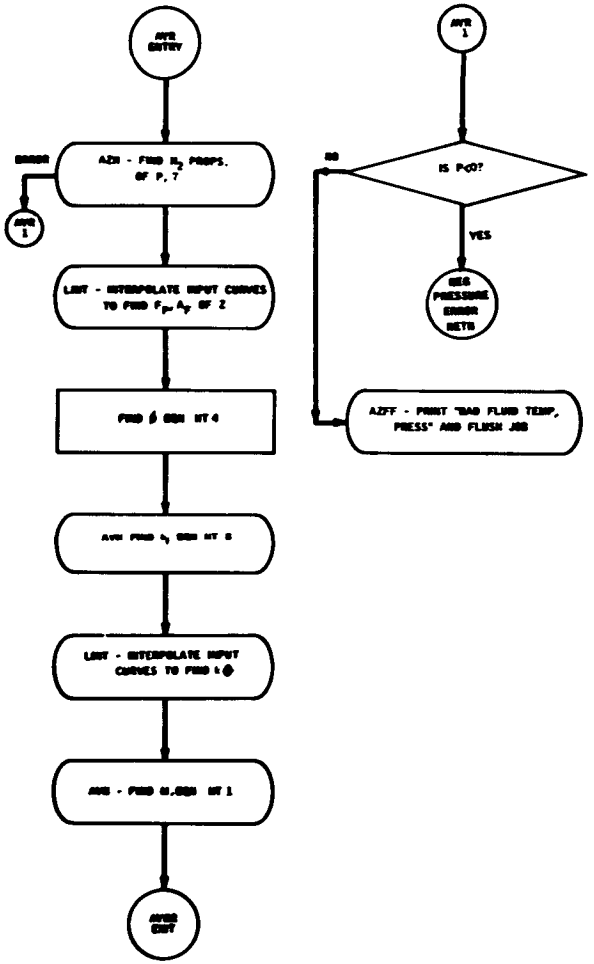

Figure 14
AYR
Find Values for One Node

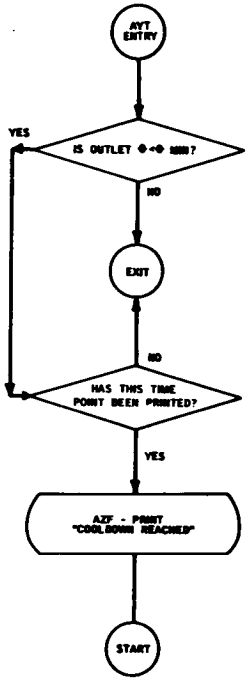

Figure 15
AYT
Check for Cool-Down Reached

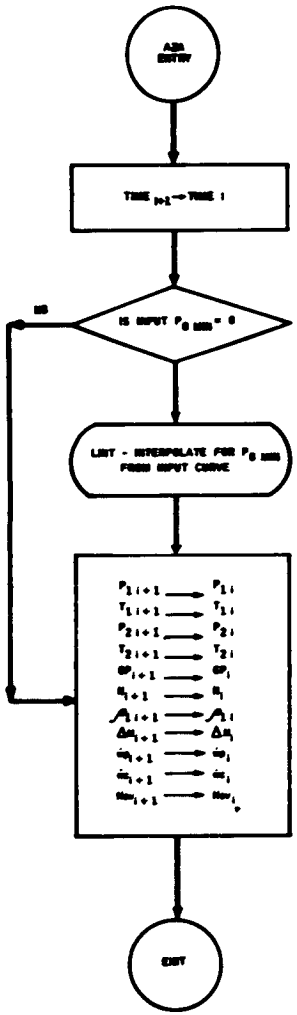

Figure 16
AZA
Set Values for One Time Step

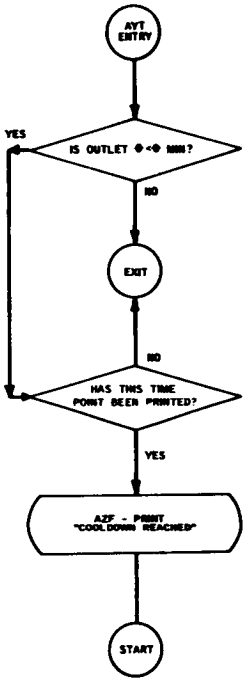

Figure 15
AYT
Check for Cool-Down Reached

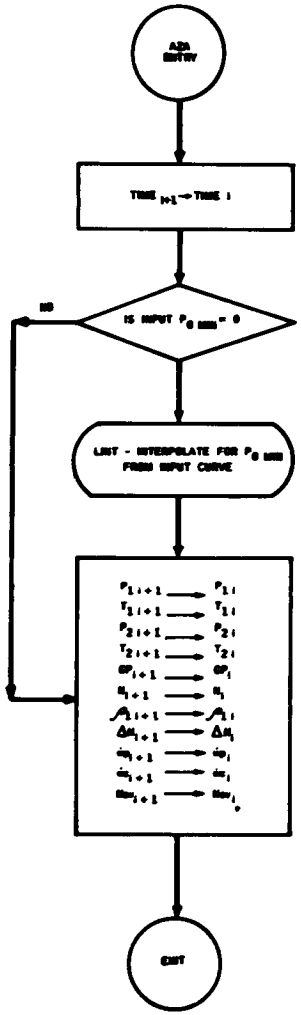

Figure 16
AZA
Set Values for One Time Step

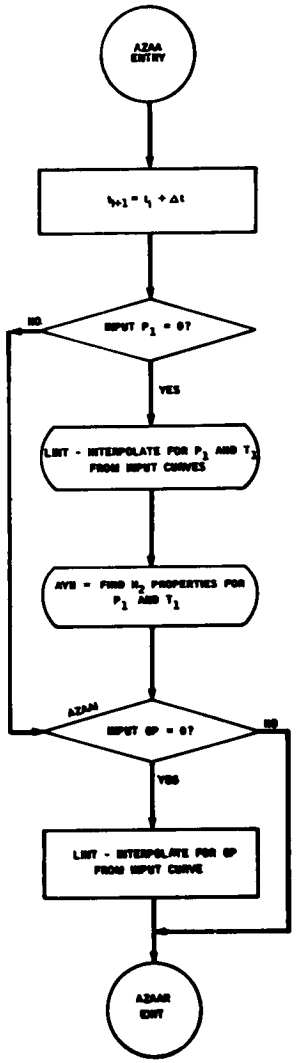

Figure 17
AZAA
Obtain Values for Next Time Point

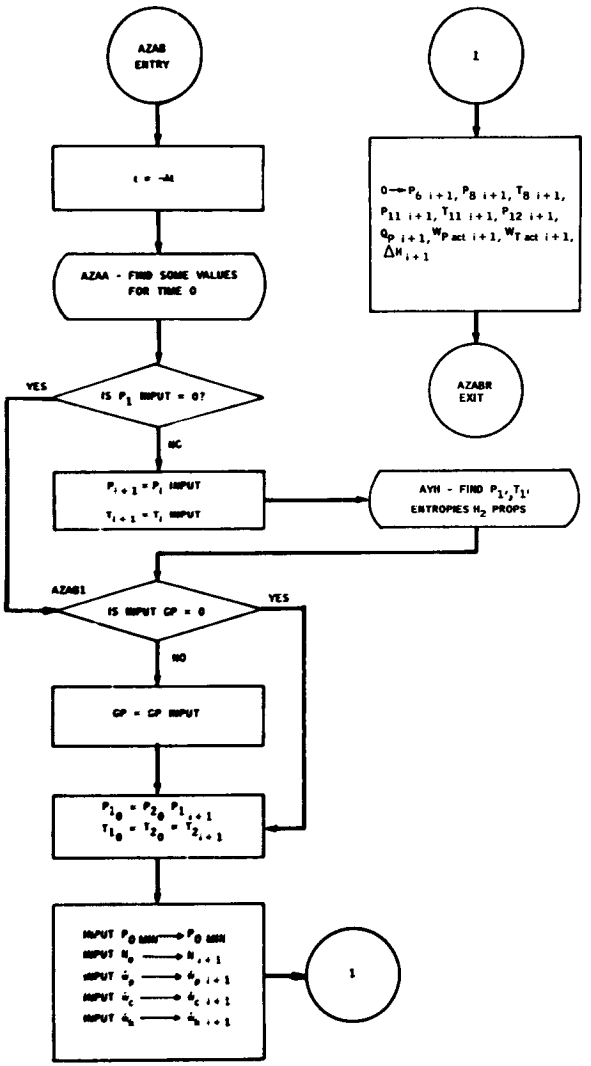

Figure 18
AZAB
Find Values at Zero Time

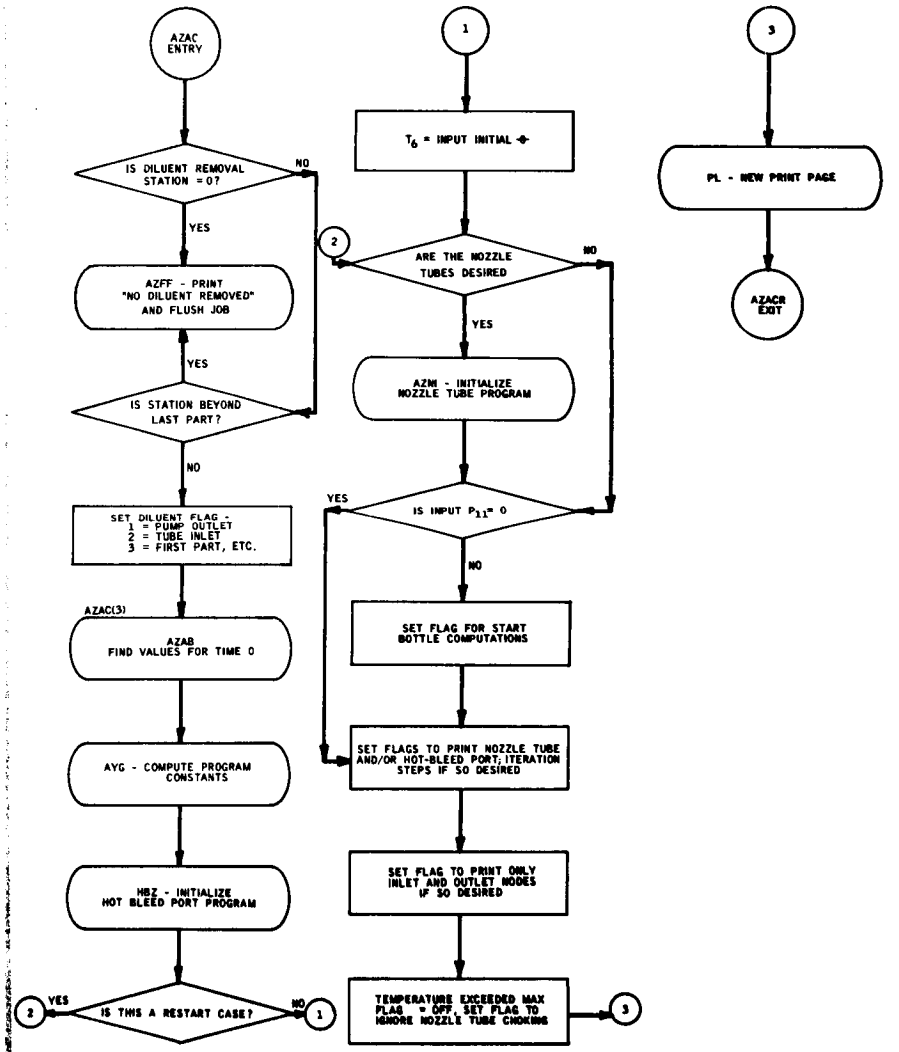

Figure 19
AZAC
Initialize Program

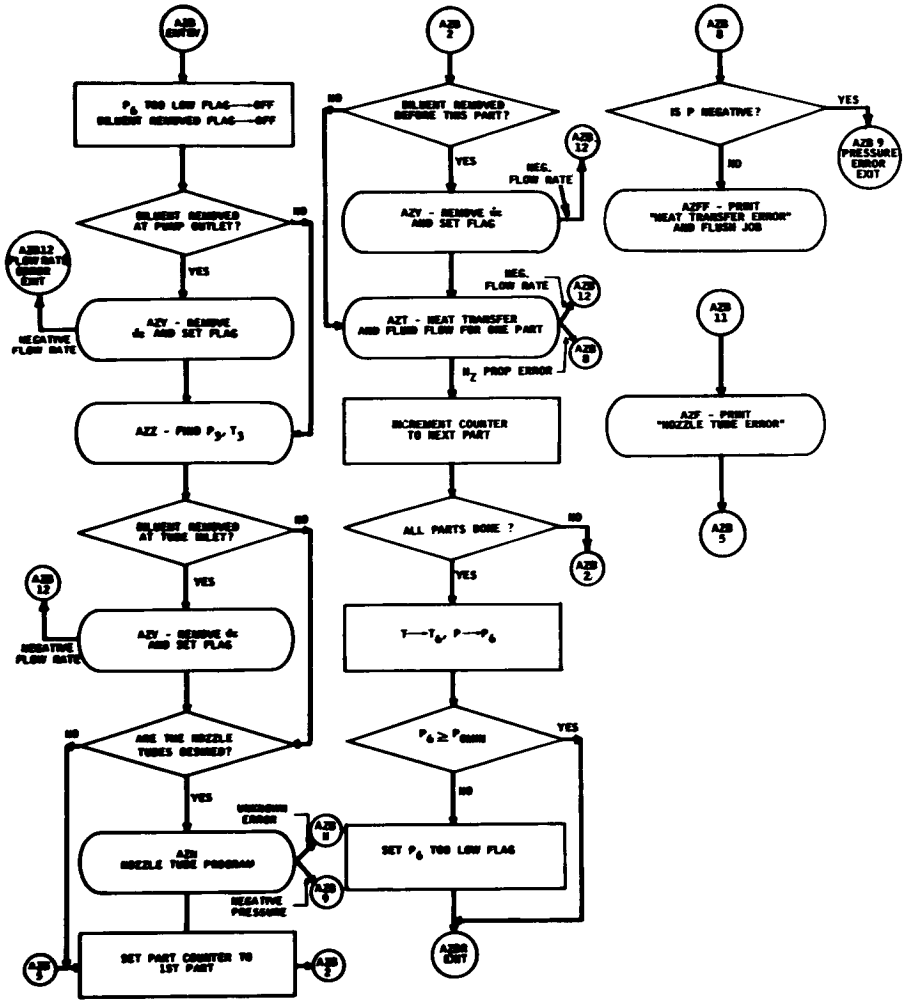

Figure 20
AZB
Main Engine Heat Transfer and Fluid Flow

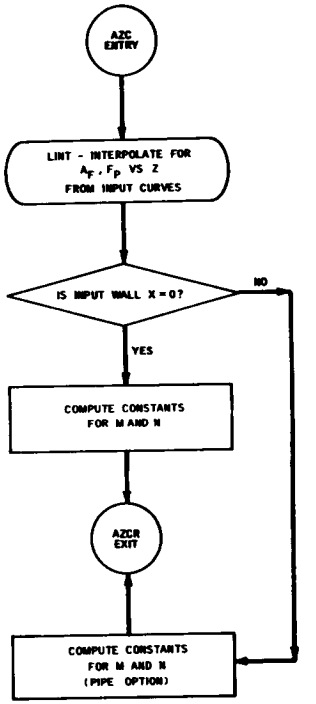

Figure 21
AZC
Compute Some Values for One-Node Metal Temp

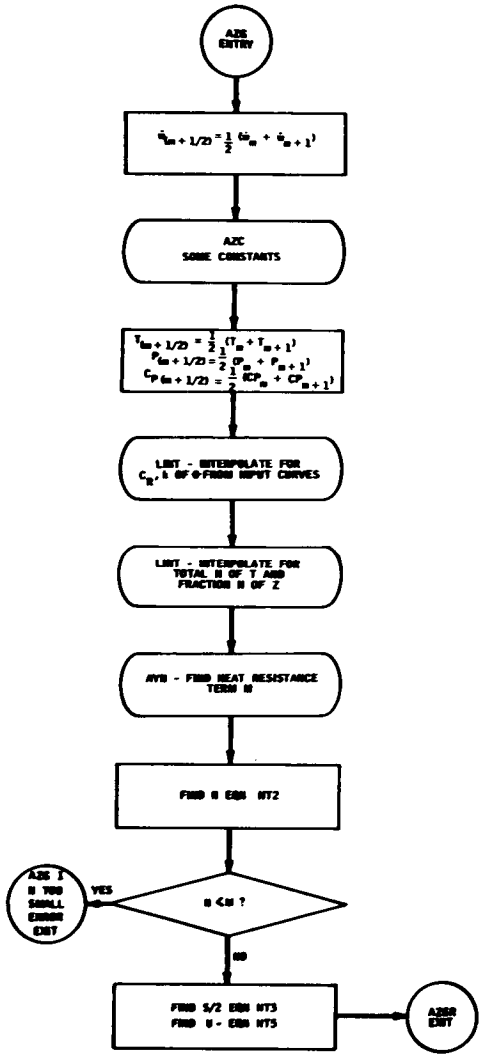

Figure 22
AZG
Compute Some Values for One-Node Metal Temps

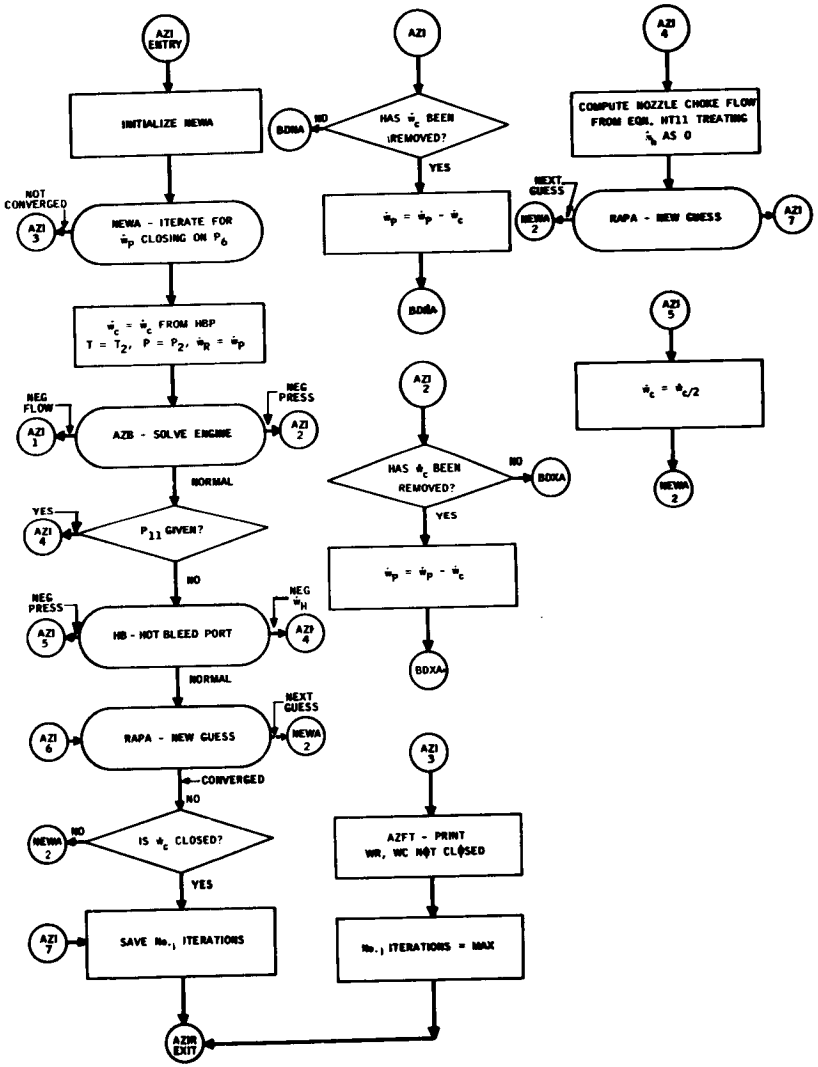

Figure 23
AZI
Heat-Transfer Iteration Master Control

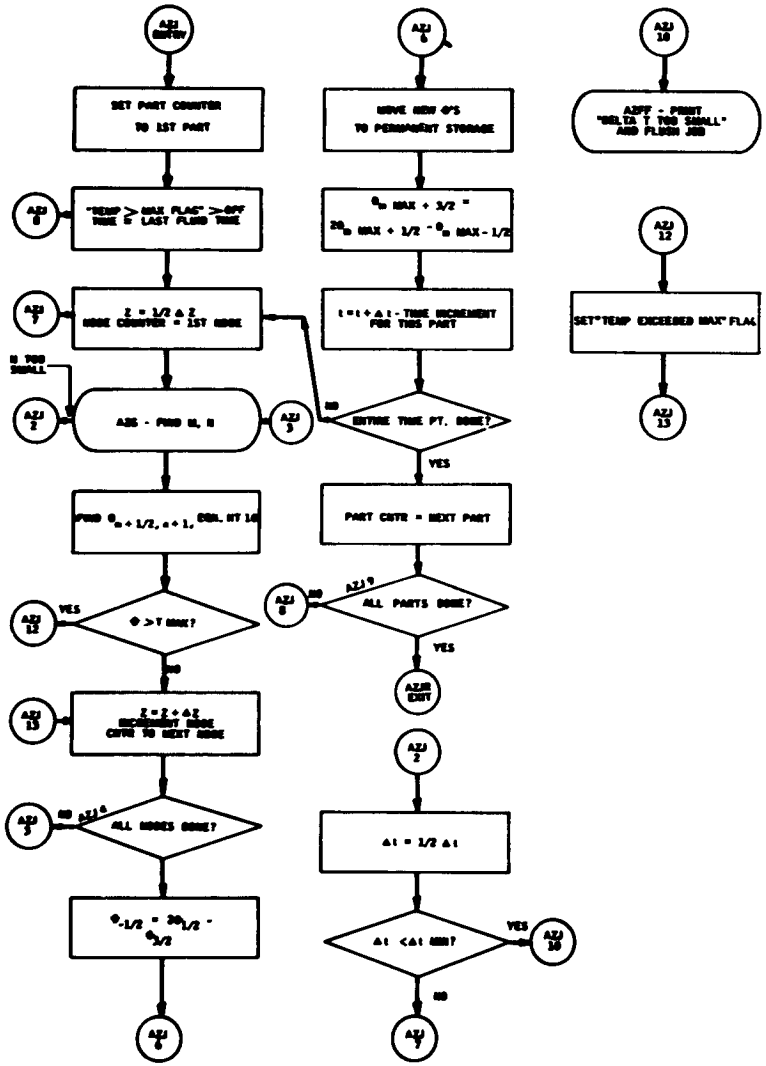

Figure 24
AZJ
Compute Metal Temps for One Time Point

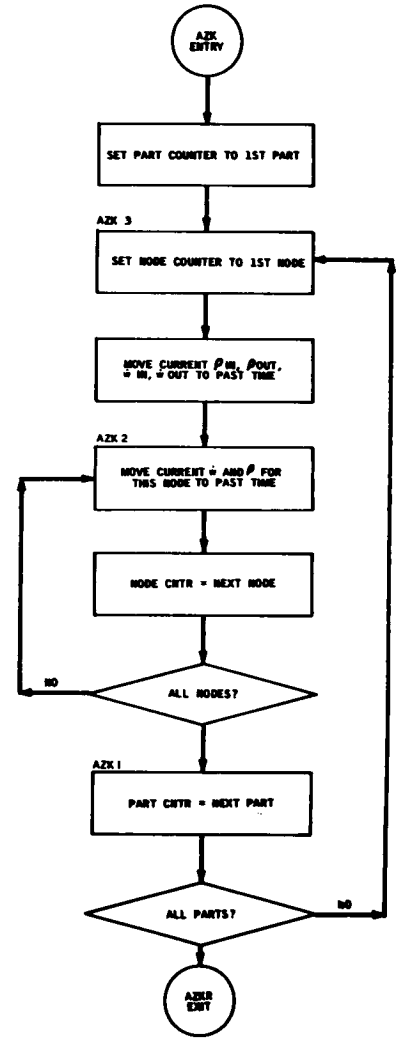

Figure 25
AZK
Move Current Values to Past Time Values for Each Part

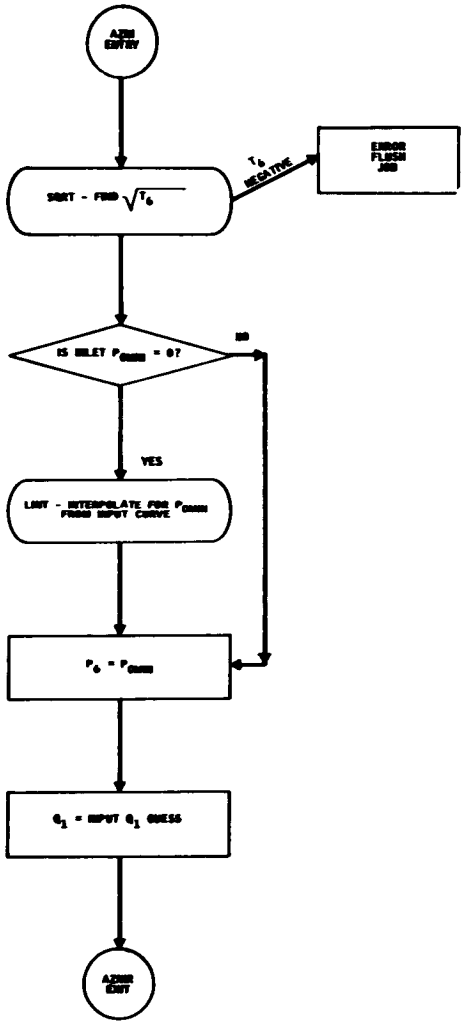

Figure 26
AZNI
Initialize Nozzle Tube Program

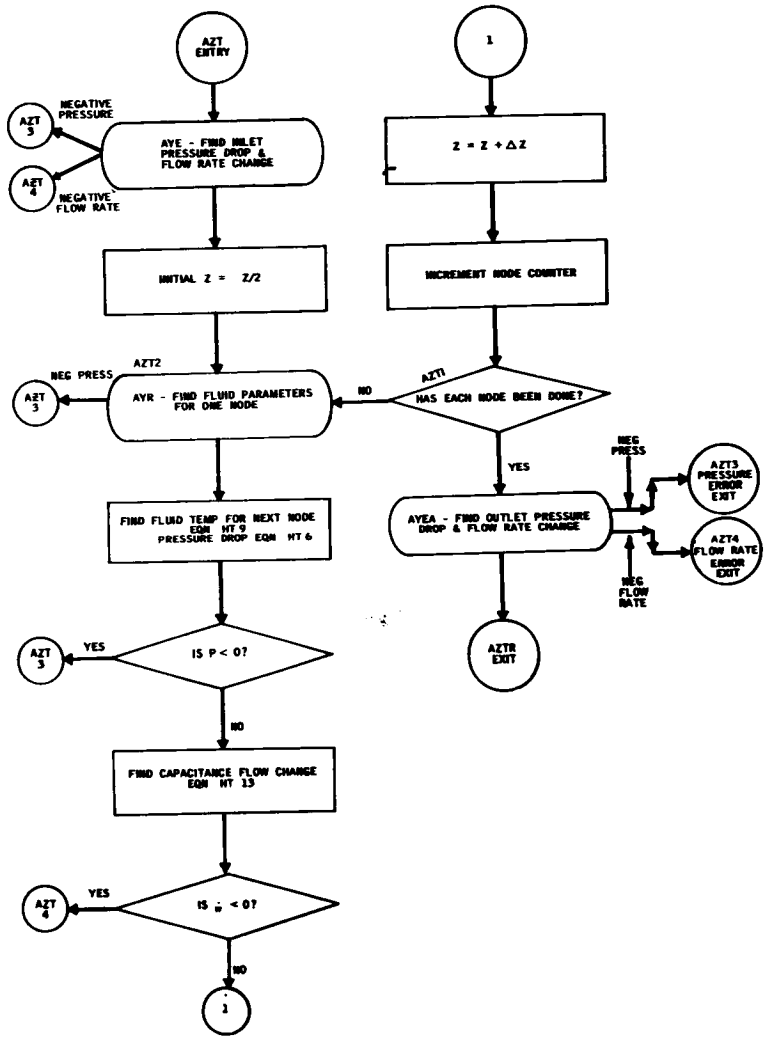

Figure 27
AZT
Fluid Node Corrections

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 MUST 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	1/IN4	$PRESSURE DROP K FOR INLET ORFICE.
	KPRESS OUT	1/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.

115	THETA 0	DEGR	S*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	SMINIMUM ALLOWABLE FLUID OUTLET TEMP.
	T MAX	DEGR	SMAXIMUM ALLOWABLE TEMPERATURE.
	DIL STA	NONE	S*POSITION OF INLET TO DILUENT LINE. 1=AT PUMP DISCHARGE. 2=AT NOZZLE TUBE INLET. 3=AT FIRST PART INLET. ETC.
	P1	PSIA	S*TANK PRESSURE. IF THIS VALUE IS ZERO. THE PROGRAM WILL USE THE INLET PRESSURE AND TEMPERATURE CURVES.
120	T1	DEGR	STANK TEMP.
	P OUT MIN	PSIA	S*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	SHOT BLEED PORT OUTLET PRESSURE CLOSURE TOLERANCE.
	EPS P12	NONE	STURBINE OUTLET PRESSURE CLOSURE TOLERANCE.
	WDOTP GUESS	LB/SEC	SINITIAL 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	SDILUENT FLOW RATE CLOSURE TOLERANCE.
	EPS WDOTR	NONE	SCORE OUTLET FLOW RATE CLOSURE TOLERANCE.
	A6	IN2	SAREA OF CORE OUTLET.
130	A STAR	IN2	SMINIMUM NOZZLE THROAT AREA.
	PHI(NT)	NONE	S*NOZZLE TUBE FRICTION FACTOR. IF THIS VALUE IS 0 THE NOZZLE TUBES WILL BE IGNORED.
	NO. PARTS	NONE	SNO. OF SEGMENTS IN NOZZLE TUBES (DISTANCE NODES).
	NT WALL X	IN	SNOZZLE TUBE WALL THICKNESS.
	QI INIT	BTU/SEC-IN2	SINITIAL HEAT TRANSFER GUESS FOR NOZZLE TUBES.

135	ITER FLAG	NONE	S*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	S*TURBINE LINE VALVE GATE POSITION. IF THIS VALUE IS ZERO. THE PROGRAM WILL USE THE GATE POSITION CURVE.
	A(KV)	NONE	SCONSTANT FOR K SUB V.
	B(KV)	NONE	SCONSTANT FOR K SUB V.
	GAMMA	NONE	SRATIO OF SPECIFIC HEATS.
140	K2	NONE	SK FOR NOZZLE TUBE INLET LINE PRESSURE DROP.
	D2	IN	SDIAMETER OF NOZZLE TUBE INLET LINE.
	DH	IN	SDIAMETER OF HOT BLEED PORT.
	DTL	IN	SDIAMETER OF TURBINE LINE
	DTN	IN	SDIAMETER OF TURBINE NOZZLE.
145	DRN	IN	SDIAMETER OF ROLL CONTROL NOZZLE.
	IPT	LB-IN2	SMOMENT OF PUMP AND TURBINE ROTOR.
	N INIT	RPM	SINITIAL TURBINE SPEED.
	EPS H	NONE	SPUMP HEAD RISE CLOSURE TOLERANCE.
	EPS WP ACT	NONE	SPUMP ACTUAL WORK CLOSURE TOLERANCE.
150	L	IN	SLENGTH OF HOT BLEED PORT.
	N	NONE	SNUMBER OF POSITION STEPS IN HOT BLEED PORT.
	DCO	IN	SDIAMETER OF HOT BLEED PORT COLD FLOW HOLES.
	NCO	NONE	SNUMBER OF HOT BLEED PORT COLD FLOW HOLES.
	T	IN	STHICKNESS OF HOT BLEED PORT COLD FLOW ANNULUS.
155	R	IN	STHICKNESS OF METAL BETWEEN HOT AND COLD FLOWS IN HOT BLEED PORT.
	THETA	DEG	SDILUENT IMPINGENT ANGLE.
	158 A COLD	NONE	SHOT BLEED PORT COLD FLOW FILM COEFF PARAMETER.
	B COLD	NONE	SHOT BLEED PORT COLD FLOW FILM COEFF PARAMETER.

160	C COLD	NONE	SHOT BLEED PORT COLD FLOW FILM COEFF PARAMETER.
	A HOT	NONE	SHOT BLEED PORT HOT FLOW FILM COEFF PARAMETER.
	B HOT	NONE	SHOT BLEED PORT HOT FLOW FILM COEFF PARAMETER.
	C HOT	NONE	SHOT BLEED PORT HOT FLOW FILM COEFF PARAMETER.
	F COLD	NONE	SHOT BLEED PORT COLD FLOW FRICTION FACTOR.
165	F HOT	NONE	SHOT BLEED PORT HOT FLOW FRICTION FACTOR.
167	K PHN	NONE	SK FOR PHN.POS.CHM.CC.
	K PCN	NONE	SK FOR PCN. CC.
	K IN	NONE	SK FOR HOT BLEED PORT INLET PRESSURE DROP.
170	K CC	NONE	SCOMPRESSIBLE FLOW K.
	K CI	NONE	SINCOMPRESSIBLE FLOW K.
	R COLD	FT-LBF/LB-DEGR	SCOLD GAS CONSTANT.
	R HOT	FT-LBF/LB-DEGR	SHOT GAS CONSTANT.
	K 11	NONE	SK FOR POS.
175	K 9	NONE	SK FOR POS.
	K E	NONE	SK FOR POS.
	P 11	PSIA	SPPRESSURE IN TURBINE INLET START BOTTLE. IF THIS VALUE IS ZERO. THE PROGRAM WILL ASSUME THAT THERE IS NO START BOTTLE.
	T 11	DEGR	STURBINE START BOTTLE TEMPERATURE.
	BELLOWS FLAG	NONE	SOPP THIS VALUE IS ZERO. THE BELLOWS SECTIONS WILL BE IGNORED.
8[illegible]	BELLOWS K	NONE	STABLE OF BELLOWS SECTION PRESSURE DROP K VALUES VS DISTANCE (IN) INPUT AS +I+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

1100	A SUB F	IN2	SFLOW AREA VS DISTANCE (IN) 10
1200	F SUB P	IN	SWETTED PERIMETER VS DISTANCE (IN) 10
1300	FRACT H	NONE	SFRACTION (PERCENT/100) OF INTERNAL HEAT GENERATION VS DISTANCE (IN) 10
1400	H	BTU/IN3-SEC	INTERNAL HEAT GENERATION COEFF VS TIME (SEC) 49
1500	K SUB R	BTU/SEC-IN-DEGR	SMETAL THERMAL CONDUCTIVITY VS TEMP (DEGR) 49
1600	C SUB R	BTU/LB-DEGR	SMETAL HEAT CAPACITY VS TEMP (DEGR) 49

c. For Entire System

1700	T1	DEGR	STANK TEMP VS TIME (SEC) 49
1800	P1	PSIA	STANK PRESSURE VS TIME (SEC) 49
1900	P OUT MIN	PSIA	SMINIMUM OUTLET PRESSURE VS TIME (SEC) 49
11000	GP	PERCENT	SGATE 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.

1C	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
[illegible]	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
L-150	THETA	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. PROGRAM MESSAGES

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
COOLDOWN 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.
PG TOO LOW	PG LESS THAN PGMIN
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
VR. VC 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 HOT BLEED PORT ITERATION DIDNT CLOSE

APPENDIX B

SAMPLE CASE - NERVA ENGINE TRANSIENT PROGRAM

PROGRAM INPUT

DEL Z	Z PTS	FRICT	VOID F	RHO R	WALL X	ENTY R	EXIT R	INLT V	OTLT V
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
PRINM	TIME 0	DEL T	T PTS	DT MIN	MTL TO	MM TMP	MX TMP	DILUNT	PI
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
TI	PO MIN	P2 CLS	P0 CLS	WDOT P	WDOT C	WDOT H	WC CLS	WR CLS	A 6
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
A STAR	HTB FF	PARTS	WALL T	QI INT	SWT	GATE P	AIRV1	DIRV1	KINT1
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
K 2	D 2	D H	D TL	D TN	D RN	I PT	SPEED	H CLS	WP CL.
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
HB LTH	HO X	D CD	HO HLS	T	R	THETA		A COLD	B COLD
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	000000	1 100000	1 100000
C COLD	A HOT	B HOT	C HOT	FRCT C	FRCT H		KIPHRH	KIPCRH	KIOLPI
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	000000	1 100000	1 100000	1 100000
KC CMP	KC INC	A COLD	A HOT	K 11	K 9	K E	P 11	T 11	O-HRD O
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
SEC 1	K 1	SEC 2	K 2	SEC 3	K 3	SEC 4	K 4	SEC 5	K 5
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
SEC 6	K 6	SEC 7	K 7	SEC 8	K 8	SEC 9	K 9	SEC 10	K 10
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
FLOW AREA VS DISTANCE					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
WETTED PERIMETER VS Z					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
FRACT HEAT GEN VS DIST					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
INT HEAT GEN VS TIME					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
THERMAL CONDUCTIVITY					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
C SUB R VS TEMPERATURE					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
INLET TEMP VS TIME					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
INLET PRESSURE VS TIME					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
OUTLET PRESSURE VS TIME					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
GATE POSITION VS TIME					1 POINTS				
[illegible]	000000	000000	000000	000000	000000	000000	000000	000000	000000

PROGRAM INPUT

DEL Z	Z PTS	FRICT	VOID F	RHO R	WALL X	ENTY R	EXIT R	INLT V	OTLT V
1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000	1 100000
FLOW AREA VS DISTANCE					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
WETTED PERIMETER VS Z					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
FRACT HEAT GEN VS DIST					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
INT HEAT GEN VS TIME					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
THERMAL CONDUCTIVITY					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000
C SUB R VS TEMPERATURE					1 POINTS				
1 100000	000000	000000	000000	000000	000000	000000	000000	000000	000000

APPENDIX C

TYPICAL PROGRAM PRINTOUT

```
NOZZLE TURB 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        FLUID 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
```

```
                 1            LBR   KISMET                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
2424C  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  TMI    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
[illegible]  0 [illegible]00 [illegible]000  21[illegible]  AZM[illegible]  [illegible]  [illegible]2
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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  STQ    PT+6                INLET
24556 -0 60000 2 35720   261    AZM9    STQ    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    AZO1,2
24567  0 50000 2 35636    270        +9  CLA    AZO1,2
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 56000 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]        [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    AZMO1   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 34556    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    AZT1,4
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    AZO3,2
24733  0 50000 0 32631    369       +14  CLA    P+11                    WDOT
24734  0 60100 2 34101    370       +15  STO    AZO2,2
24735  0 50000 0 32621    371       +16  CLA    P+3                     INLET PRESS
24736  0 60100 2 34245    372       +17  STO    AZO4,2
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 50000 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 02000 0 25032   423       +2  TRA   AZT3                  ERROR
25022  0 02000 0 25030   424       +3  TRA   AZT4                  ERROR
25023  0 50000 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 34065    484        +13  STO    TP+88                    T1
25113  0 07400 4 30453    485        +14  TSX    AYII,4
25114  0 52000 0 36130    486    AZAA1    ZET    DGP
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 33664    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    DGP
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    DPO
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
[redacted]
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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 34557    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    DSWT
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  STO    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  STO    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
25266  0 63400 4 25331    594    AZB     SXA    AZBR,4
25267  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                  NDOTR -
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
2[illegible] -0[illegible]60 [illegible]64[illegible] 64[illegible] AZ[illegible] [illegible] *-4 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 0 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 02000 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 0 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  0 24100 0 40214    715        +3  FDP    FL2
25451 -0 60000 0 32631    716        +4  STQ    P+11
25452  0 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  0 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  0 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  0 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
25500  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
25505  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]

25511  0 26000 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  0 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 26000 0 33771    755       +43  FMP    TP+28
25521  0 60100 0 32624    756       +44  STO    P+6
25522  0 34000 0 32627    757       +45  CAS    P+9                    M
25523  0 02000 0 25526    758       +46  TRA    *+3
25524  0 02000 0 25526    759       +47  TRA    *+2
25525  0 02000 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 60000 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
[redacted]
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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,WR, 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 26000 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
25750 -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
25770  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
26020  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
26030  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 EXTRAF
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
26070  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  0 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 34596   1015        +1   CLA    PX+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 50C00 0 33731   1041        +1   CLA    WPR+7                 C P
26225  0 24100 0 33732   1042        +2   FDP    WPR+8                 K
26226  0 26C00 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
26251  0 [illegible] 4364 1067        +2   T[illegible]   [illegible],4

26252  0 07400 4 42602   1066        +3   TSX    ERROR,4               BAD THETA 0
26253  0 60100 0 32634   1067        +4   STO    P+14
26254  C 50000 0 36111   1068        +5   CLA    DPO
26255 -C 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  C 50000 0 36126   1074        +1   CLA    DQINT
26263  0 60100 0 32641   1075        +2   STO    Q1INT
26264  0 77400 4 00000   1076    AZNIR    AXT    **0,4
26265  0 02000 4 00001   1077        +1   TRA    1,4

                         1079*REGION TO CCMPUTE CRITICAL FLOW IN NOZZLE TUBES
26266  0 63400 4 26321   1080    AZNW     SXA    AZNWR,4
26267  C 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 26C00 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  C 60000 0 32737   1096       +16   STZ    X+17
26307  0 04000 0 26311   1097       +17   TLG    AZNW2                 H2 GAS
2631C -0 62500 0 32737   1098       +18   STL    X+17                  FLAG TO IGNORE NOZZLE TUBE CHOKE
26311  0 07400 4 26364   1099    AZNW2    TSX    SQRT,4
26312  0 07400 4 42602   1100        +1   TSX    ERROR,4
26313  C 60100 0 33756   1101        +2   STO    TP+17
26314  0 56000 0 44234   1102        +3   LDQ    AZN3+1                AREA CF 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*REGICN TO PRINT INLET CONDITIONS
26324  0 52C00 0 32727   1113    AZPC     ZET    X+9
26325  0 02000 4 00001   1114        +1   TRA    1,4
26326  0 63400 4 26355   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  PTM    AZPC1,,3066
26336  3 02064 0 26455   1123       +10  PTM    AZPS1+2,,1078
26337 -2 13672 0 32630   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  PTM    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 14943 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*REGION 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  PTM    FX,1,1018                PART NAME
26401  3 02001 4 26430   1151        +6  PTM    AZPD1+2,4,1025           IN OR OUT
26402  3 05744 0 26430   1152        +7  PTM    AZPD2,,3044
26403  3 05773 0 26435   1153        +8  PTM    AZPD4,,3067
26404  3 02071 0 26435   1154        +9  PTM    AZPD4,,1081
26405  3 04056 0 26456   1155       +10  PTM    AZPS3,,2094
26406  3 04104 0 26444   1156       +11  PTM    AZPD7,,2116
26407  3 02154 0 26446   1157       +12  PTM    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 02000 0 26424   1166       +21  TRA    AZPDR
26421  0 07402 4 32541   1167       +22  TSX    PL,4,2
26422  0 07400 4 32543   1168       +23  TSX    PC,4
26423 -1 00012 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
[redacted]-2 [redacted] 5 [redacted]563[redacted] 1172 [redacted] AZ[redacted] [redacted] [redacted]NLE[redacted]UTLET[redacted]
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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    AZNTB-AZNT,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
26510  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  0 60100 0 32622   1218       +11  STO    P+4                      HF
26516  0 50000 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  0 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  0 52000 0 32725   1226       +19  ZET    X+7
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26526  1 77777 2 26577   1227        +20  TXI    AZPI8,2,-1
26527  C 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
2655[illegible] 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
[illegible]557  3 04007 C 26460   1252        +12  PTH    AZP3,,2055
[illegible]60  3 06017 0 26605   1253        +13  PTH    AZPI5,,3087
[illegible]51  3 06055 0 26453   1254        +14  PTH    AZPS1,,3117
[illegible]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
26701  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  FVE    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  FVE    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  FVE    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 -2 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 47447   1409        +3  FMP    PR+86                  V8
27040  0 24100 0 47355   1410        +4  FDP    PR+28                  T8
27041  0 26000 0 47447   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 47445   1422       +16  LDQ    PR+84                  VCM
27055  0 26000 0 32765   1423       +17  FMP    C+14
27056  0 30200 0 47447   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 47446   1428       +22  CLA    PR+85                  VHM
27063  0 30200 0 47447   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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                                1440*REGION TO COMPUTE INLET AND OUTLET CAPACITANCE FLOW RATE CHANGE
27075  0 63400 4 27123   1441     AZU      SXA     AZUR,4
27076  0 63400 2 27124   1442         +1   SXA     AZUR+1,2
27077  0 54000 0 32621   1443         +2   LDQ     P+3
27100  0 16200 0 27102   1444         +3   TQP     *+2
27101  0 02000 4 00001   1445         +4   TRA     1,4                     NEGATIVE PRESSURE
27102  0 44100 4 00000   1446         +5   LDI     0,4
27103 -0 05700 7 77776   1447         +6   RIL     777776
27104 -0 04600 0 00000   1448         +7   PIA
27105 -0 73700 2 00000   1449         +8   PDC     ,2
27106  0 50000 0 32620   1450         +9   CLA     P+2                     T
27107  0 07400 4 25564   1451        +10   TSX     AZN,4
27110  0 07400 4 42602   1452        +11   TSX     ERROR,4
27111  0 50200 0 33730   1453        +12   CLS     WPR+6                   NEW RHO        EQN MT13
27112  0 60260 2 27130   1454        +13   SLW*    AZU1,2
27113  0 30060 2 27132   1455        +14   FAD*    AZU2,2                  OLD RHO
27114  0 24100 0 32637   1456        +15   FDP     P+17                    DELT
27115  0 26060 2 27134   1457        +16   FMP*    AZU3,2                  PLENUM VOLUME
27116  0 30060 2 27136   1458        +17   FAD*    AZU5,2                  OLD DELWDOT
27117  0 60160 2 27140   1459        +18   STO*    AZU6,2                  -CURRENT DELWDOT
27120  0 30000 0 32631   1460        +19   FAD     P+11
27121  0 60100 0 32631   1461        +20   STO     P+11
27122 -0 12000 0 27126   1462        +21   TNI     AZU4                    NEGATIVE FLOW RATE
27123  0 77400 4 00000   1463     AZUR     AXT     **0,4
27124  0 77400 2 00000   1464         +1   AXT     **0,2
27125  0 02000 4 00003   1465         +2   TRA     3,4
27126  0 52200 0 27123   1466     AZU4     XEC     AZUR
27127  1 00001 4 27124   1467         +1   TXI     AZUR+1,4,1              ERROR RETURN
27130  0 00000 1 35621   1468     AZU1     PZE     PT+7,1
27131  0 00000 1 35623   1469         +1   PZE     PT+9,1
27132  0 00000 1 35620   1470     AZU2     PZE     PT+6,1
27133  0 00000 1 35622   1471         +1   PZE     PT+8,1
27134  0 00000 1 36074   1472     AZU3     PZE     DVI,1
27135  0 00000 1 36075   1473         +1   PZE     DVO,1
27136  0 00000 1 35624   1474     AZU5     PZE     PT+12,1                 PAST TIME DELWDOT
27137  0 00000 1 35627   1475         +1   PZE     PT+13,1
27140  0 00000 1 35630   1476     AZU6     PZE     PT+14,1                 -CURRENT DELWDOT
27141  0 00000 1 35631   1477         +1   PZE     PT+15,1

                                1479*REGION TO COMPUTE VAPOR PRESSURE VS TEMP
27142  0 63400 4 27152   1480     AZV      SXA     AZVR,4
27143  0 77400 4 00005   1481         +1   AXT     5,4
27144  0 75400 0 00000   1482         +2   PXA     ,0
27145  0 30000 4 27161   1483     AZV2     FAD     AZV1+5,4
27146 -2 00001 4 27152   1484         +1   TNX     AZVR,4,1
27147  0 13100 0 00000   1485         +2   XCA
27150  0 26000 0 33742   1486         +3   FMP     TP+5
27151  0 02000 0 27145   1487         +4   TRA     AZV2
27152  0 77400 4 00000   1488     AZVR     AXT     **0,4
27153  0 02000 4 00001   1489         +1   TRA     1,4
27154  1 62526 4 30773   1490     AZV1     DEC        40835E-9,-.0037617,.238625,-7.92,96.38

                                1492*INPUT SUBROUTINES
                                1493*TEST NEXT CASE FOR STANDARD INPUT DESIRED
27161  0 63400 4 27177   1494     AZX      SXA     AZXR,4
27162  0 63400 0 27304   1495         +1   SXA     AZXB2,0                 INITIALIZE XR FOR NEW CASE
27163  0 07476 4 00102   1496         +2   TSX     KTAKEB,4,62
27164 -1 00001 0 27215   1497         +3   FVE     AZX1,,1
27165  0 12000 0 27170   1498         +4   TPL     *+3
27166 -1 27217 0 25421   1499     AZX6     STR     AZF,,AZX3
27167  0 07400 4 00076   1500         +1   TSX     KFINIS,4
27170  0 16200 0 27201   1501         +2   TQP     AZX4
27171 -0 50000 0 27215   1502         +3   CAL     AZX1
27172  0 32200 0 27216   1503         +4   ERA     AZX2
27173  0 60200 0 27215   1504         +5   SLW     AZX1
27174 -0 10000 0 27177   1505         +6   TNZ     AZXR                    N CARD SAYS IGNORE STD INPUT
27175  0 07476 4 00101   1506         +7   TSX     KMOVEB,4,62             PASS N CARD
27176 -1 00016 0 00000   1507         +8   FVE     0,,14
27177  0 77400 4 00000   1508     AZXR     AXT     **0,4
27200  0 02000 4 00001   1509         +1   TRA     1,4
27201 -1 27222 0 25421   1510     AZX4     STR     AZF,,AZX5
27202  0 07400 4 00052   1511         +1   TSX     DOUT,4
27203  3 21544 0 27225   1512         +2   PTH     AZX7,,9060
27204 -1 00024 0 00000   1513         +3   FVE     KONLIN,,20
27205  0 07400 4 00076   1514         +4   TSX     KFINIS,4
27206  0 07400 4 00055   1515     AZX8     TSX     KDEBUG,4
27207  0 16200 0 27201   1516         +1   TQP     AZX4
27210 -1 27212 0 25421   1517         +2   STR     AZF,,AZX9
27211  0 02000 0 24654   1518         +3   TRA     AZM4
27212  3 14343 2 52721   1519     AZX9     BCI     3,ILLEGAL CHARACTER
                 27215   1520     AZX1     BSS     1,0                     NOT 0= STD CASE
27216 -0 56060 6 06060   1521     AZX2     BCI     1,N
27217  2 54524 6 04626   1522     AZX3     BCI     3,END OF INPUT
27222  2 22124 6 06321   1523     AZX5     BCI     3,BAD TAPE- FLUSH
27225 -2 32147 2 56023   1524     AZX7     BCI     9,TAPE CHECK ON KISMET INPUT TAPE, PLEASE SAVE TAPE

                                1526*READ IN ONE PART
27236  0 63400 4 27257   1527     AZXA     SXA     AZXAR,4
27237 -0 52000 0 27215   1528         +1   NZT     AZX1
27240  0 02000 0 27250   1529         +2   TRA     AZXA1                   IGNORE STD CASE
27241 -0 62500 0 27322   1530         +3   STL     AZXB1                   INPUT FROM CORE
27242  0 07400 4 41664   1531         +4   TSX     AS58,4
27243  0 32577 0 36064   1532         +5   PZE     D,,TCARD
27244  0 07400 4 00056   1533         +6   TSX     KERROR,4
27245  0 07400 4 00056   1534         +7   TSX     KERROR,4
27246 -0 52000 0 32612   1535         +8   NZT     TCARD+11
27247  0 02000 0 27261   1536         +9   TRA     AZXA2
27250  0 60000 0 27322   1537     AZXA1    STZ     AZXB1                   INPUT FROM TAPE
27251  0 07400 4 41664   1538         +1   TSX     AS58,4
27252  0 32577 0 36064   1539         +2   PZE     D,,TCARD
27253  0 02000 0 27206   1540         +3   TRA     AZX8
27254  0 02000 0 27166   1541         +4   TRA     AZX6                    EOF
27255 -0 52000 0 36065   1542         +5   NZT     DMMAX                   0= IGNORE THIS PART
27256  0 02000 0 27237   1543         +6   TRA     AZXA+1
27257  0 77400 4 00000   1544     AZXAR    AXT     **0,4
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27261  0 60000 0 27322   1546    AZXA2   STZ    AZXB1
27262  0 07400 4 41664   1547        +1  TSX    AS58,4                    READ TUBE INPUT, IF ANY
27263  0 32577 0 44107   1548        +2  PZE    LVSAC,,TCARD
27264  0 02000 0 27206   1549        +3  TRA    AZX8
27265  0 02000 0 27166   1550        +4  TRA    AZX6
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    AZX8    NZT    AZXB1
27301  0 02000 0 00101   1562        +1  TRA    KMOVEB                    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 KMOVEB
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    KMOVEB,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    AS58,4
27342  0 32577 0 44107   1597        +2  PZE    LVSAC,,TCARD              NOZZLE TUBE PARAMETERS
27343  0 02000 0 27334   1598        +3  TRA    AZXC1
27344  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 50000 0 32620   1608        +2  CLA    P+2
27356  0 60100 0 32705   1609        +3  STO    P+55                      TC
27357  0 50000 0 32621   1610        +4  CLA    P+3
27360  0 60100 0 32704   1611        +5  STO    P+54                      PC
27361  0 50000 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 32632   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 50000 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 60000 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                 WOOTH TOO BIG
27427  0 60200 0 47333   1694      +21  SLW   PR+10                PHM
27430  0 50000 0 32674   1695      +22  CLA   P+46                 P2            EQN PT36
27431  0 30200 0 47333   1696      +23  FSB   PR+10                PHM
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   1660      +27  FMP   TP+3
27436  0 60100 0 34044   1661      +28  STO   TP+73                WOOTC
27437  0 60100 0 47403   1662      +29  STO   PR+90
27440  0 30000 0 34045   1663      +30  FAD   TP+72                WOOTH         EQN PT27A
27441  0 60100 0 34051   1664      +31  STO   TP+76                WOOTT
27442  0 24100 0 33754   1665      +32  FDP   TP+15                K12           EQN PT37
27443 -0 60000 0 47447   1666      +33  STQ   PR+86                V8
27444  0 50000 0 34045   1667      +34  CLA   TP+72                WOOTH         EQN PT38
27445  0 60100 0 47404   1668      +35  STO   PR+51
27446  0 24100 0 33755   1669      +36  FDP   TP+16
27447 -0 60000 0 47446   1670      +37  STQ   PR+85                VHM
27450  0 50000 0 34044   1671      +38  CLA   TP+73                WOOTC         EQN PT39
27451  0 24100 0 33762   1672      +39  FDP   TP+21
27452 -0 60000 0 47445   1673      +40  STQ   PR+84                VCM
27453  0 50000 0 34044   1674      +41  CLA   TP+73                WOOTC         EQN PT40
27454  0 24100 0 33763   1675      +42  FDP   TP+22
27455 -0 60000 0 12513   1676      +43  STQ   COMMON+1
27456  0 26000 0 12513   1677      +44  FMP   COMMON+1
27457  0 30200 0 32674   1678      +45  FSB   P+46                 P2
27460  0 12000 0 40624   1679      +46  TPL   BDXB                 WOOTC, THEREFORE WOOTH TOO BIG
27461  0 60200 0 47332   1680      +47  SLW   PR+9                 PCM
27462  0 50000 0 32633   1681      +48  LDQ   P+13                 T6(I)         EQN PT28
27463  0 26000 0 34045   1682      +49  FMP   TP+72                WOOTH
27464  0 60100 0 12514   1683      +50  STO   COMMON+2
27465  0 50000 0 32675   1684      +51  LDQ   P+47
27466  0 26000 0 34044   1685      +52  FMP   TP+73
27467  0 30000 0 12514   1686      +53  FAD   COMMON+2
27470  0 24100 0 34051   1687      +54  FDP   TP+76
27471  0 26000 0 34036   1688      +55  FMP   TP+65
27472  0 60100 0 34052   1689      +56  STO   TP+77                T8
27473  0 60100 0 34053   1690      +57  STO   TP+78                T11
27474  0 50000 0 47400   1691      +58  LDQ   PR+47                MH8(I)        EQN PT41
27475  0 26000 0 47400   1692      +59  FMP   PR+47
27476  0 13100 0 00000   1693      +60  XCA
27477  0 26000 0 32760   1694      +61  FMP   C+9
27500  0 30000 0 40213   1695      +62  FAD   FL1
27501  0 60100 0 33737   1696      +63  STO   TP+2
27502  0 50000 0 34052   1697      +64  CLA   TP+77
27503  0 24100 0 33737   1698      +65  FDP   TP+2
27504 -0 60000 0 47355   1699      +66  STQ   PR+28                T8 STATIC, ASSUME MH8 SAME AS TIME I
27505  0 07400 4 27034   1700      +67  TSX   AZQ,4                P8 STATIC     EQN PT42
27506  0 00000 0 36175   1701      +68  PZE   ORH
27507  0 50000 0 33737   1702      +69  CLA   TP+2                 MACH NO. TERM EQN PT43
27510  0 56000 0 32764   1703      +70  LDQ   C+13
27511  0 07400 4 27021   1704      +71  TSX   AZE,4
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27512  0 13100 0 00000   1705      +72  XCA
27513  0 26000 0 47324   1706      +73  FMP   PR+3                 P8 STATIC
27514  0 60100 0 34043   1707      +74  STO   TP+70                P8 STAGNATION
27515  0 56000 0 34052   1708      +75  LDQ   TP+77                T8            EQN PT29
27516  0 26000 0 34033   1709      +76  FMP   TP+62
27517  0 07400 4 24364   1710      +77  TSX   SQRT,4
27520  0 07400 4 42602   1711      +78  TSX   ERROR,4
27521  0 13100 0 00000   1712      +79  XCA
27522  0 26000 0 34051   1713      +80  FMP   TP+76
27523  0 60100 0 34044   1714      +81  STO   TP+71                P8 PRIME
27524  0 07400 4 40640   1715      +82  TSX   RAPB,4
27525  0 77400 4 00000   1716  AYAR     AXT   **0,4
27526  0 02000 4 00001   1717      +1   TRA   1,4
27527 -0 62500 0 32733   1718  AYA1     STL   X+13
27530  0 02000 0 27525   1719      +1   TRA   AYAR

                         1721*REGION TO SOLVE FOR ACTUAL WORK IN THE PUMP AND TURBINE
27531  0 63400 4 27641   1722  AYB      SXA   AYBR,4
27532  0 50060 1 27643   1723      +1   CLA*  AYBT,1                T11           EQN PT7
27533  0 07400 4 24364   1724      +2   TSX   SQRT,4
27534  0 07400 4 42602   1725      +3   TSX   ERROR,4
27535  0 60100 0 34006   1726      +4   STO   TP+41
27536  0 52000 0 32742   1727      +5   ZET   X+20
27537  0 02000 0 27647   1728      +6   TRA   AYB2                 P11 GIVEN
27540  0 24100 0 34037   1729      +7   FDP   TP+66                K T
27541  0 26060 1 27645   1730      +8   FMP*  AYBW,1               WOOTT
27542  0 60100 0 32662   1731      +9   STO   P+36                 P11
27543  0 60000 1 32740   1732  AYB1     STZ   X+18,1               ERROR FLAGS
27544  0 24100 0 40224   1733      +1   FDP   FL10
27545 -0 60000 0 32664   1734      +2   STQ   P+38                 P12 GUESS = P11/10
27546  0 50000 1 32665   1735      +3   CLA   P+39,1               N             EQN PT8
27547  0 24100 0 34006   1736      +4   FDP   TP+41
27550  0 13100 0 00000   1737      +5   XCA
27551  0 07400 4 30516   1738      +6   TSX   AYJ,4
27552  0 60100 0 34003   1739      +7   STO   TP+38                ETAT PRIME
27553  0 50060 1 27643   1740      +8   CLA*  AY[illegible]        T11           EQN PT9A
27554  0 56000 0 32662   1741      +9   LDQ   P+[illegible]        P11
27555 -0 60000 0 40632   1742      +10  STQ   NEWJ9
27556  0 60000 0 40633   1743      +11  STZ   NEWB9+1
27557  0 07400 4 25564   1744      +12  TSX   AZH,4
27560  0 07400 4 42602   1745      +13  TSX   ERROR,4
27561  0 50000 0 32750   1746      +14  CLA   C+1                  R/776
27562  0 24100 0 33731   1747      +15  FDP   WPR+7                CP(T11,P11)
27563 -0 60000 0 34012   1748      +16  STQ   TP+45
27564  0 50000 0 36113   1749      +17  CLA   DP12E                P12 EPSILON
27565  0 07400 4 40547   1750      +18  TSX   NEWB,4
27566  0 34011 0 32664   1751      +19  PZE   P+38,,TP+44
27567  0 00062 0 34013   1752      +20  PZE   TP+46,,50
27570  0 02000 0 27655   1753      +21  TRA   AYB3
27571  0 50000 0 32664   1754      +22  CLA   P+38                 P12
27572  0 24100 0 32662   1755      +23  FDP   P+36                 P11
27573 -0 60000 0 34013   1756      +24  STQ   TP+46
27574  0 13100 0 00000   1757      +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*   AYBT,1              T11
27602  0 60100 0 34001  1763      +31  STO    TP+36               T12
27603  0 30260 1 27643  1764      +32  FSB*   AYBT,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    FLRB
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  STO    TP+44               P12/P11 PRIME
27630  0 07400 4 40640  1785      +53  TSX    RAPB,4
27631  0 50200 0 34014  1786  AYB4    CLS    TP+47
27632  0 13100 0 00000  1787       +1  XCA
27633  0 26060 1 27645  1788       +2  FMP*   AYBW,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*   AYBT,1
27640  0 60100 1 32671  1793       +7  STO    P+43,1              WTACT
27641  0 77400 4 00000  1794  AYBR    AXT    **0,4
27642  0 02000 4 00001  1795       +1  TRA    1,4
27643  0 00000 0 32663  1796  AYBT    PZE    P+37
27644  0 00000 0 34053  1797       +1  PZE    TP+78
27645  0 00000 0 32647  1798  AYBW    PZE    P+25
27646  0 00000 0 34051  1799       +1  PZE    TP+76
27647  0 50000 0 32662  1800  AYB2    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*   AYBW,1              WDOT
27653  0 50000 0 32662  1804       +4  CLA    P+36
27654  0 02000 0 27543  1805       +5  TRA    AYB1
27655 -0 62500 1 32740  1806  AYB3    STL    X+18,1
27656  0 02000 0 27631  1807       +1  TRA    AYB4
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1809*REGION TO COMPUTE PROGRAM CONSTANTS

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27[illegible] 0 [illegible]0 [illegible]45[illegible]81[illegible] AY[illegible] S[illegible] [illegible]4
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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  STO    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  STO    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  STO    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  STO    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  STO    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 56000 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 26000 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 26000 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  STO   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    BDN8                    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  STO    TP+35                   Q/N
30124  0 50000 0 32636   1979        +39  CLA    P+16                    MSV
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  STO    TP+30                   MSV/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+48
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    BDN8                    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
[redacted]                                                                  ERR XIT
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 32664   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                   PHN
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  STO    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  STO    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  STO    TP+15                   K12
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30261  0 50000 0 32645  2078        +33  CLA    P+23                WDOTH          EQN PT38
30262  0 24100 0 47446  2079        +34  FDP    PR+85               VHM
30263 -0 60000 0 33759  2080        +35  STQ    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  STQ    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  STQ    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  STQ    TP+22               K15
30277  0 54000 0 34131  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
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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(IP1)
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   TMI     *+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   TMI     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
30[illegible]  0[illegible]00 [illegible]2533 234[illegible]  [illegible]  [illegible]ON+[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  STQ    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  STQ    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 B 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 71745  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*   AYLO,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 34064  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   AYLW     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   AYN      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    1B8
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    1B8
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 31667  3009       +23  TRA    AYPB2
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31657  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    AZFT,,AYPB3
31667  0 02000 0 31663   2618         +1  TRA    AYPBR
31670  2 15470 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    DKDPI,1
31704 -0 05400 0 00001   2631         +3  LFT    1
31705  0 50200 1 36073   2632         +4  CLS    DKDPO,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 40214   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 04000 0 32072   2714        +3  TLQ    PRP7                ERROR RETURN FOR PRESS TOO BIG
32026  0 60000 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  STQ    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    THAL,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  STQ    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  STQ    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 01400 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 SIGIO 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 00001 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 60000 0 40310   2782       +15  STZ    CUT
32133  0 77400 2 00000   2783       +16  AXT    ,2
32134  0 52000 2 36064   2784   PR02     ZET    D,2
32135  0 02000 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
[illegible]              [illegible] [illegible]
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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 COLDB 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  O=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 40314   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 15947 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 15947 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    PP075,4
32514  1 00010 4 32515   2943        +1  TXI    *+1,4,8
32515  0 63400 4 32504   2944        +2  SXA    PP075,4
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    *PP99   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 [illegible] 00001 2982        +1  [illegible]
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                         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    DMMAX   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
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36071   3034    DPX     BSS     1,F     *WALL THICK, IN, NOT 0= 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 0= RESTART PROGRAM
36100   3044    DELT    BSS     1,F     TIME INCREMENT, SEC
36101   3045    DNOT    BSS     1,F     NO. TIME INCREMENTS
36102   3046    DMOT    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, 0= USE CURVE
36110   3052    DTI     BSS     1,F     TANK TEMPERATURE, DEGR
36111   3053    DPO     BSS     1,F     *MIN OUTLET PRESS, 0= 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, 0= 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, 0=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    DDCO    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
36153   3087    DB      BSS     1,F     THICKNESS OF HOT BLEED CLOSURE
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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,P08,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 P08
36177   3108    DK9     BSS     1,F     K9 FOR P08
36200   3109    DKE     BSS     1,F     KE FOR P08
36201   3110    DP11    BSS     1,F     *TURBINE INLET PRESS, PSIA, 0=NO BOT
36202   3111    DT11    BSS     1,F     TURBINE INLET TEMP, DEGR
36203   3112    DKFLG   BSS     1,F     *NOT 0=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

402C0   0 00000 0 00001   3119    FX1     PZE     1
40201   0 00000 0 00002   3120    FX2     PZE     2
402C2   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 0 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    188      DEC       188
40302  0 02000 0 00000   3186    288      DEC       288
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
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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      L(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   STO*    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 30000 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              TO INITIALIZE
40711  0 63400 2 41000   3479        +1  SXA    CURVR+1,2                TSX ICURV,4
40712  0 63400 4 41001   3480        +2  SXA    CURVR+2,4                PZE NO. Z CURVES (ADDRESS),,DELTA
40713  0 50000 4 00001   3481        +3  CLA    1,4                      PZE NO. X,Y PAIRS (ADDRESS)
40714  0 10000 4 00004   3482        +4  TZE    4,4                      PZE TABLE (Z1,X1,Y1,X2,Y2,...)
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                  TO INTERPOLATE  X IN AC
40721  0 73400 1 00000   3487        +9  PAX    0,1                      Z IN MQ
40722 -0 63400 1 40730   3488       +10  SXD    CURV1,1                  TSX  SCURV,4
40723  0 50000 4 00003   3489       +11  CLA    3,4                      PZE  SAME
40724  0 40000 0 41004   3490       +12  ADD    CURVC+1                  PZE  SAME
40725  0 62100 0 40730   3491       +13  STA    CURV1                    PZE  SAME
40726  0 77400 1 00000   3492       +14  AXT    0,1                      Y IN ACC.
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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40740 -0 60000 0 41006   3462        +4  STO    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
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                         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    NEWA,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,,LQ1-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  OCT
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  OCT
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42654  0 02000 0 424[illegible]  4307        +14  TRA    0+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 34049  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 44462  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 44156  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  C 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  MZE    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
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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                              L SUB HI
43305  0 26000 0 44231  4589      +14  FMP    KON54                 .026
43306  0 60100 0 44511  4590      +15  STO    TEMP+9
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  STO    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 44412  4684     +32  FMP    CH                     HOT CIRCUM. AREA
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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    AZNW,4                 FIND CRITICAL FLOW IN THROAT
43504  0 63400 0 43606  4716     +15  SXA    Q1NU,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  STO    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  STO    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    THW
43616  0 60000 0 44327   4792       +8  STZ    TY+24
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43617  0 60000 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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                    44103   4055    SWT     BSS     1,X
44106 -1 00012 0 00012      4056    MODE    FVE     KPRINT,,10
                            4057* DISTANCE VS COLD FLOW HEAT TRANSFER AREA
                    44107   4058    LVSAC   BSS     14,F
                            4059* DISTANCE VS COLD FLOW WETTED PERIMETER
                    44125   4060    LVSCC   BSS     14,F
                            4061* DISTANCE VS DIAMETER TABLE
                    44143   4062    LVSDH   BSS     8,F
                            4063* DISTANCE VS RECOVERY FACTOR TABLE
                    44153   4064    LVSRN   BSS     8,F
                            4065*  DISTANCE VS CIRCUMFERENCE TABLE OF HOT FLOW AREA
                    44163   4066    LVSCH   BSS     14,F
                            4067* DISTANCE VS SIGMA
                    44201   4068    LVSIG   BSS     18,F
                    44223   4069    KON39   BSS     1,F
                    44224   4070    NTOTL   BSS     1,F
                    44225   4071    KON50   BSS     1,F
                    44226   4072    KON51   BSS     1,F
                    44227   4073    KON52   BSS     1,F
                    44230   4074    KON53   BSS     1,F
                    44231   4075    KON54   BSS     1,F
                    44232   4076    KON55   BSS     1,F
                    44233   4077    AZN3    BSS     2,F                     Z AT THROAT, THROAT AREA
44235  0 63600 4 44514     4078    DIVCK   SCA     LAST,4
44236  0 02000 0 43556     4079        +1  TRA     BUG
44237  2 43165 3 12431     4080        +2  BCI     4,DIVIDING BY 0 AT LOC
44243  0 63600 4 44514     4081    ERLN    SCA     LAST,4
44244  0 02000 0 43556     4082        +1  TRA     BUG
44245  2 55151 4 65160     4083        +2  BCI     7,ERROR WHEN TAKING LN OF A NUMBER   LOC
44254  0 63600 4 44514     4084    EREXP   SCA     LAST,4
44255  0 02000 0 43556     4085        +1  TRA     BUG
44256  2 55151 4 65160     4086        +2  BCI     7,ERROR WHEN GETTING EXP. OF A NUMBER   LOC
44265 -2 33066 6 06060     4087    LTHW    BCI     1,THW
44266 -2 32366 6 06060     4088    LTCW    BCI     1,TCW
44267 -2 33033 3 14563     4089        +1  BCI     1,TH.INT
44270  2 14347 3 02160     4090        +2  BCI     1,ALPHA
44271  2 72144 4 42160     4091        +3  BCI     1,GAMMA
44272  2 22563 2 16060     4092        +4  BCI     1,BETA
44273 -2 62143 4 36063     4093        +5  BCI     2,WALL THICK.
44276  2 65131 2 33360     4094        +7  BCI     2,FRIC. FACTOR
                    44277   4095    TY      BSS     48,H                        STORAGE USE WITH ITERATION ROUTINE
                    44357   4096    INDAT   BSS     8,H
                    44367   4097    NLEFT   BSS     1,D
                    44370   4098            BSS     3
                    44373   4099    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                     INLET PRESSURE
                    44463   5027    AZN2    BSS     1,F
                            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
4453C  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 44654   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


                         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      +1  TNZ   *+2                        *CHECKOUT ONLY
44662  0 50000 0 32702   5144      +2  CLA   P+52                       *CHECKOUT ONLY
44663  0 60100 0 47321   5145      +3  STO   PR
44664  0 60100 0 47325   5146      +4  STO   PR+4
44665  0 60000 0 47322   5147      +5  STZ   PR+1                       PH
44666  0 50000 0 32656   5148      +6  CLA   P+32                       P6
44667  0 60100 0 47323   5149      +7  STO   PR+2
44670  0 60000 0 47324   5150      +8  STZ   PR+3                       P8
44671  0 60000 0 47334   5151      +9  STZ   PR+11                      P08
44672  0 50000 0 32705   5152     +10  CLA   P+55                       TC
44673 -0 10000 0 44675   5153     +11  TNZ   *+2                        *CHECKOUT ONLY
44674  0 50000 0 32703   5154     +12  CLA   P+53                       *CHECKOUT ONLY
44675  0 60100 0 47352   5155     +13  STO   PR+25
44676  0 60100 0 47356   5156     +14  STO   PR+29
44677  0 60000 0 47353   5157     +15  STZ   PR+26                      TH
44700  0 50000 0 32633   5158     +16  CLA   P+13                       T6
44701  0 60100 0 47354   5159     +17  STO   PR+27
44702  0 60000 0 47355   5160     +18  STZ   PR+28                      T8
44703  0 60000 0 47365   5161     +19  STZ   PR+36                      T08
44704  0 50000 0 32644   5162     +20  CLA   P+22
44705  0 60100 0 47403   5163     +21  STO   PR+50                      WDOTC
44706  0 50000 0 34045   5164     +22  CLA   TP+72                      WDOTH
44707  0 60100 0 47404   5165     +23  STO   PR+51
44710  0 50000 0 32657   5166     +24  CLA   P+33
44711  0 60100 0 47350   5167     +25  STO   PR+23                      G.P.
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                                 5169*REGION TO OUTPUT HB QUANTITIES
44713  0 50000 0 47334  5170    HBO      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 47404  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    HBZ      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    DOCO
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    HB       SXA    HBR,4
44760  0 63400 2 47052  5209        +1   SXA    HBR+1,2
44761  0 63400 3 47053  5210        +2   SXA    HBR+2,3
44762  0 63400 1 47054  5211        +3   SXA    HBR+3,1
44763  0 63400 5 47055  5212        +4   SXA    HBR+4,5
44764  0 63400 6 47056  5213        +5   SXA    HBR+5,6
44765  0 63400 7 47057  5214        +6   SXA    HBR+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              ERROR RETURN
45004  0 07400 4 44660  5229       +21   TSX    HBI,4                INPUT
45005  0 50000 0 47354  5230       +22   CLA    PR+27                T6
45006  0 56000 0 47323  5231       +23   LDQ    PR+2                 P6
45007  0 07400 4 25564  5232       +24   TSX    AZH,4
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
45013  0 50000 0 47356  5236       +28   CLA    PR+29                H06
45014  0 56000 0 47325  5237       +29   LDQ    PR+4                 T2C
45015  0 07400 4 25564  5238       +30   TSX    AZH,4                P2C
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
45021  0 56000 0 47404  5242       +34   LDQ    PR+51                H02C
45022  0 26000 0 40262  5243       +35   FMP    FL3.7                WH
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 26000 0 36167  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 47530  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 50000 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 26000 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 30000 0 40213  5308     +12  FAD   FL1
45124  0 60100 0 47473  5309     +13  STO   Z+6
45125  0 50000 0 47367  5310     +14  CLA   PR+38
45126  0 24100 0 47473  5311     +15  FDP   Z+6
45127 -0 60000 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 50000 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 60000 0 47513  5372      +5  STO   Z+22                     K/K-1
45224  0 50000 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 60000 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
45260  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   RHOHR,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

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   KOM
45362  0 50000 0 47461   5468      +8  CLA   PR+96                   MR H INPUT
45363  0 24100 0 12512   5469      +9  FDP   KOM
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 HCT 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                    TO8 IN AC
45411  0 02000 0 45415   5491     +18  TRA   *+4
                         5492*CAVEMAN INTERPOLATION
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45412  0 07400 4 44515   5493        +19  TSX    TIN1,4                    HOB VS. TOB
45413  0 00000 0 47760   5494        +20  HTR    THOT,0,0
45414  0 00022 0 00001   5495        +21  HTR    1,0,18
45415  0 60100 0 47365   5496        +22  STO    PR+36                     TOB
45416  0 60100 0 47353   5497        +23  STO    PR+26                     TH
                         5498*COMPUTE PO 8 ON EACH PASS
45417  0 50000 0 47530   5499        +24  CLA    Z+35                      CALCULATE  PO 8
45420 -3 00000 6 45423   5500        +25  TXL    *+3,6,0                   MR HOT NOT INPUT
45421  0 24160 7 47750   5501        +26  FDP*   NEWR+2,7                  IR =2 RHOT,IR=1 R MIX      IR7=1
45422  0 26060 7 47747   5502        +27  FMP*   NEWR+1,7                  IR =2 RHOT,IR=1 R MIX      IR7=1
45423  0 07400 4 24364   5503        +28  TSX    SQRT,4
45424  0 07400 4 42602   5504        +29  TSX    ERROR,4
45425  0 13100 0 00000   5505        +30  XCA
45426  0 26000 0 47431   5506        +31  FMP    PR+72                     ATN
45427  0 60100 0 47531   5507        +32  STO    Z+36                      KT
45430  0 13100 0 00000   5508        +33  XCA
45431  0 26000 0 47531   5509        +34  FMP    Z+36
45432  0 60100 0 47532   5510        +35  STO    Z+37                      KT2
45433  0 56000 0 47350   5511        +36  LDQ    PR+23                     GATE POS
45434  0 26000 0 47456   5512        +37  FMP    PR+93                     A
45435  0 30200 0 47457   5513        +38  FSB    PR+94                     B
45436  0 60100 0 47460   5514        +39  STO    PR+95                     KV
45437  0 13100 0 00000   5515        +40  XCA
45440  0 26000 0 47460   5516        +41  FMP    PR+95
45441  0 60100 0 47533   5517        +42  STO    Z+38                      KV SQUARE
45442  0 50000 0 40265   5518        +43  CLA    FL128.
45443  0 24100 0 47533   5519        +44  FDP    Z+38                      KV2
45444  0 26060 7 47750   5520        +45  FMP*   NEWR+2,7                  R HOT IR=2, R MIX IR=1
45445  0 24100 0 40244   5521        +46  FDP    FL144
45446  0 26000 0 47532   5522        +47  FMP    Z+37                      KT2
45447  0 60100 0 47534   5523        +48  STO    Z+39                      F
45450  0 50000 0 36176   5524        +49  CLA    TK+17                     K11
45451  0 30000 0 36177   5525        +50  FAD    TK+18                     K9
45452  0 60100 0 47466   5526        +51  STO    Z+1
45453  0 56000 0 47340   5527        +52  LDQ    PR+15                     DTL EQU. DH
45454  0 26000 0 47340   5528        +53  FMP    PR+15                     DTL EQU. DH
45455  0 24100 0 40216   5529        +54  FDP    FL4
45456  0 26000 0 40271   5530        +55  FMP    FLPI
45457  0 60100 0 47535   5531        +56  STO    Z+40                      ATL
45460  0 13100 0 00000   5532        +57  XCA
45461  0 26000 0 47535   5533        +58  FMP    Z+40                      ATL
45462  0 60100 0 47535   5534        +59  STO    Z+40                      ATL SQUARE
45463  0 50060 7 47750   5535        +60  CLA*   NEWR+2,7                  R HOT IR=2, R MIX IR=1
45464  0 24100 0 47535   5536        +61  FDP    Z+40                      ATL SQUARE
45465  0 26000 0 47532   5537        +62  FMP    Z+37                      KT2
45466  0 24100 0 40272   5538        +63  FDP    FLGF
45467 -0 60000 0 47536   5539        +64  STO    Z+41                      L
45470  0 26000 0 47466   5540        +65  FMP    Z+1                       K11+K9
45471  0 30000 0 47534   5541        +66  FAD    Z+39                      F
45472  0 30000 0 40213   5542        +67  FAD    FL1
45473  0 07400 4 24364   5543        +68  TSX    SQRT,4
45474  0 07400 4 42602   5544        +69  TSX    ERROR,4
45475  0 60100 0 47537   5545        +70  STO    Z+42
45476  0 50000 0 47365   5546        +71  CLA    PR+36                     TOB

45477  0 07400 4 24364   5547        +72  TSX    SQRT,4
45500  0 07400 4 42602   5548        +73  TSX    ERROR,4
45501  0 24100 0 47531   5549        +74  FDP    Z+36                      KT
45502  0 26000 0 47405   5550        +75  FMP    PR+52                     WT
45503  0 13100 0 00000   5551        +76  XCA
45504  0 26000 0 47537   5552        +77  FMP    Z+42
45505  0 60100 0 47322   5553        +78  STO    PR+1                      NEW PH
45506  0 60100 0 47334   5554    21.05    STO    PR+11                     POB
45507  0 60000 0 47545   5555    21.99    STZ    Z+48                      INITIALIZE FOR BELLOW SECTIONS
45510  0 77400 1 00000   5556        +1  AXT    0,1
45511  0 63400 1 46220   5557        +2  SXA    23.93,1
                         5558* HEAT TRANSFER PROGRAM  8/23/63
45512 -3 00000 6 45515   5559    22.00    TXL    *+3,6,0                   MR HCT NOT INPUT
45513  0 50060 7 47752   5560        +1  CLA*   NEWCP+2,7                  C SUB P MIX
45514  0 02000 0 45522   5561        +2  TRA    *+6
45515  0 50000 0 47353   5562        +3  CLA    PR+26                     TH I
45516  0 56000 0 47322   5563        +4  LDQ    PR+1                      PH I
45517  0 07400 4 25564   5564        +5  TSX    AZH,4
45520  0 07400 4 42602   5565        +6  TSX    ERROR,4
45521  0 50000 0 33731   5566        +7  CLA    WPR+7
45522  0 60100 0 47465   5567        +8  STO    Z                         CSUBP HOT
45523  0 50000 0 47453   5568        +9  CLA    PR+90                     QI
45524  0 24100 0 47465   5569       +10  FDP    Z
45525  0 13100 0 00000   5570       +11  XCA
45526  0 24100 0 47405   5571       +12  FDP    PR+52                      f
45527  0 13100 0 00000   5572       +13  XCA
45530  0 30000 0 47353   5573       +14  FAD    PR+26                     THI
45531  0 60100 0 47362   5574       +15  STO    PR+33                     TH I+1
45532  0 30000 0 47353   5575    22.10    FAD    PR+26
45533  0 24100 0 40214   5576        +1  FDP    FL2
45534 -0 60000 0 47413   5577        +2  STO    PR+58                     TH I+1/2
45535  0 50000 0 47352   5578    22.20    CLA    PR+25                     TC I
45536  0 56000 0 47321   5579        +1  LDQ    PR                        PC I
45537  0 16200 0 45541   5580        +2  TQP    *+2
45540  0 02000 0 47063   5581        +3  TRA    HB8                   NEGATIVE PC (I)
45541  0 07400 4 25564   5582        +4  TSX    AZH,4
45542  0 07400 4 42602   5583        +5  TSX    ERROR,4
45543  0 50000 0 33731   5584        +6  CLA    WPR+7
45544  0 60100 0 47465   5585        +7  STO    Z                         CSUBP COLD
45545  0 50000 0 47453   5586        +8  CLA    PR+90                     Q I
45546  0 24100 0 47465   5587        +9  FDP    Z
45547  0 13100 0 00000   5588       +10  XCA
45550  0 24100 0 47403   5589       +11  FDP    PR+50                     WC
45551  0 13100 0 00000   5590       +12  XCA
45552  0 30000 0 47352   5591       +13  FAD    PR+25                     TCI
45553  0 60100 0 47361   5592       +14  STO    PR+32                     TCI+1
45554  0 30000 0 47352   5593    22.30    FAD    PR+25
45555  0 24100 0 40214   5594        +1  FDP    FL2
45556 -0 60000 0 47412   5595        +2  STO    PR+57                     TC I+1/2
45557  0 56000 0 47340   5596    22.40    LDQ    PR+15                     DH
45560  0 26000 0 40271   5597        +1  FMP    FLPI
45561  0 60100 0 47465   5598        +2  STO    Z                         F PH
45562  0 56000 0 47424   5599        +3  LDQ    PR+67                     AH
45563  0 26000 0 40216   5600        +4  FMP    FL4
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45564  0 24100 0 47465   5601      +5  FDP   Z
45565 -0 60000 0 47347   5602      +6  STQ   PR+22                    D SLA H
45566  0 50000 0 47362   5603      +7  CLA   PR+33                    TH I+1
45567  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 HOT
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  STQ   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 HOT 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   AZH,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  STQ   Z
45613  0 50000 0 40244   5624     +28  CLA   FL144
45614  0 24100 0 47465   5625     +29  FDP   Z                       RHO HI
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  STQ   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   AZH,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  STQ   PR+65                    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  STQ   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 HOT
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 HOT
45650  0 60100 0 47465   5653     +11  STQ   Z
45651  0 50000 0 40270   5654     +12  CLA   1000.
45652 -0 52000 0 47416   5655     +13  NZT   PR+61                    THW I+1/2
45653  0 60100 0 47416   5656     +14  STQ   PR+61
45654  0 50000 0 47413   5657     +15  CLA   PR+58                    TH I+1/2
45655  0 24100 0 47416   5658     +16  FDP   PR+61
45656  0 13100 0 00000   5659     +17  XCA
45657  0 56000 0 36161   5660     +18  LDQ   TK+4                     A HOT
45660  0 07400 1 47752   5661     +19  TSX   POWER,1
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  STQ   Z
45664  0 56000 0 47340   5665     +23  LDQ   PR+15                    DH
45665  0 26000 0 40271   5666     +24  FMP   FLPI
45666  0 60100 0 47500   5667     +25  STQ   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  STQ   Z+1
45672  0 56000 0 47405   5671     +29  LDQ   PR+52                    WT
45673  0 26000 0 40271   5672     +30  FMP   FLPI
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
45702  0 13100 0 00000   5679     +37  XCA
45703  0 26000 0 47376   5680     +38  FMP   PR+65                    LH I+1/2
45704  0 60100 0 47374   5681     +39  STQ   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
45710  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  STQ   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  STQ   PR+46                    KM
45734  0 50000 0 47340   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                   THW 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
46012  0 24100 0 47342   5752     +12  FDP   PR+17                   R
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   HB8                     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 47503   5817      +2  STO    Z+14                    DH+2T
46114  0 50000 0 47453   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                   KH
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 04C00 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 56C00 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  [illegible]
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46265  0 60100 0 47546  5925        +3  STO    Z+49                    DELTA X
46266  0 77400 1 00002  5926        +4  AXT    2,1
46267  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 45912  5932       +10  TRA    22.00
46275  0 50000 0 47370  5933    25.00   CLA    PR+39
                                                                        RESTORING DELTA FOR HEAT TRANSFER
46276  0 60100 0 47546  5934        +1  STO    Z+49
46277  0 50000 0 32704  5935        +2  CLA    P+54                    PC, THIS ASSUMES PH, TH TO BE ZERO
46300  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
46306  0 56000 0 47330  5942        +9  LDQ    PR+7                        TC I+1
46307  0 07400 4 25564  5943       +10  TSX    AZH,4                       PC I+1
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
46313  0 60100 0 47504  5947       +14  STO    Z+15
46314  0 56000 0 47343  5948    25.10   LDQ    PR+18                       DCO
46315  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.
46320  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 56000 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  STO    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 56000 0 47403  6019    26.01   LDQ    PR+50
46421  0 26000 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 10000 0 46427  6024        +2  TNZ    26.10
46426  0 60000 0 47402  6025        +3  STZ    PR+49
46427  0 50000 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 47472   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
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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    WPR+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    HB3     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   STO    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   STO    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   STO    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   STO    PR+28                  T8
46674  0 26000 0 40272   6192   27.40   FMP    FLGF
46675  0 13100 0 00000   6193      +1   XCA
46676  0 [illegible] 0 [illegible]167   6194      [illegible]   FMP    [illegible]

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   STO    Z+20                   CH 8
46704  0 13100 0 00000   6200   27.50   XCA
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    AZO,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   STO    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+50
46767  0 60100 0 47404   6251        +35  STO    PR+51
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+51
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    2
47010  0 02000 0 47061   6268         +5  TRA    HB7                     WDOTH NEG 2ND TIME
47011  0 56000 0 47404   6269         +6  LDQ    PR+51                   LOWER WDOTH GUESS
47012  0 26000 0 40256   6270         +7  FMP    FL.8
47013  0 60100 0 47404   6271    HB2      STO    PR+51
47014  0 30000 0 47407   6272         +1  FAD    PR+54                        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    SWT
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 11655 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    HBO,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    HB8      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  STR    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+1PCM
47117 -0 73044 6 06060   6321        +10  BCI     ,PHM   PO 8  DELTAPPHIC        DH    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+1TCM
47155 -2 33044 6 06060   6324        +40  BCI     ,THM   TO 8        TH1C  DELTASDELTAXLENGTHHC**F HH**F LCI
47167 -0 33031 6 06060   6325        +50  BCI     ,LHI   KM    M H8  M HM  M CM
47201 -2 62360 6 06060   6326    HD3      BCI     ,WC    WH    WT    WR    WN                TCI   THI   THI
47213 -2 32366 3 16060   6327        +10  BCI     ,TCWI  THWI                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-IVCM
47251 -2 53044 6 06060   6330        +10  BCI     ,VHM   V8    V6    VIN2        QSUBI HT FLGK FLAGA     B
47263 -0 26560 6 06060   6331        +20  BCI     ,KV    MR HOTMR MIXMR FLG
47275 -0 43044 6 06060   6332    XHD      BCI     ,MHM   Q     THW   TCW   THI   WC    MCM   MHB   WT    WH
47307 -0 43044 6 06060   6333    YHD      BCI     ,MHM   Q     THW   TCW   THI   WC    PCM   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                      MR HOT IR=2, MR MIX IR=1
47716  0 30000 0 40213   6341         +1  FAD    FL1
47717  0 60100 0 12512   6342         +2  STO    KOM
47720  0 56000 0 40260   6343         +3  LDQ    FL48.2
47721  0 26000 7 47463   6344         +4  FMP    PR+98,7                      MR HOT IR=2, MR MIX IR=1
47722  0 30000 0 40242   6345         +5  FAD    FL776
47723  0 24100 0 12512   6346         +6  FDP    KOM
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                      MR HOT IR=2, MR MIX IR=1
47727  0 30000 0 40257   6350        +10  FAD    FL3.45
47730  0 24100 0 12512   6351        +11  FDP    KOM
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    KOM                          P
47734 -0 60000 0 12513   6355         +1  STQ    KOM+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 0 00000  6359          +5  XCA
47741  0 02000 4 00001  6360          +6  TRA    1,4
47742  0 30200 0 40263  6361     NEWH     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 0 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
*KISDRG *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
*KMCVEB  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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AYPB3	0048	AZC	0011	AZK	0017	AZNI1	0019	AZQ	0025		
AYPBR	0048	AZC1	0011	AZK1	0018	AZNIR	0019	AZQR	0025		
AYQ	0048	AZC2	0011	AZK2	0018	AZNR	0074	AZT	0005		
AYQ1	0048	AZCR	0011	AZK3	0018	AZNW	0019	AZT1	0006		
AYQR	0048	AZD	0057	AZK4	0018	AZNW1	0019	AZT2	0006		
AYR	0048	AZE	0025	AZKR	0018	AZNW2	0019	AZT3	0007		
AYR1	0049	AZE1	0025	AZL	0018	AZNWR	0019	AZT4	0007		
AYR2	0049	AZER	0025	AZLR	0018	AZP3	0021	AZTR	0006		
AYR3	0049	AZF	0011	AZM01	0005	AZPC	0019	AZU	0026		
AYRR	0049	AZF1	0012	AZM1	*0003	AZPC1	0020	AZU1	0026		
AYT	0049	AZF2	0012	AZM10	0004	AZPC2	0020	AZU2	0026		
AYT1	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	AZMTB	0055	AZPN1	0023	AZXB	0028		
AZACR	0009	AZJ11	0017	AZMTC	0057	AZPN2	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		

AZY	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		
BCDD	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	EXP13	*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	*0057		
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	DT11	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	DNMAX	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		

HEDER	0039	LN	0001	NUTHI	0066	PR98	0052	RHO4	*0079
HHI	0079	LO	0065	NUTHW	0071	PR99	0052	RHOMR	0103
ICURV	0063	LQ1	0079	NZMAX	0104	PRESS	0064	ROTAT	*0073
IN	0065	LT6	0079	P	0055	PRIN1	0102	RSUBN	0079
INDAT	*0078	LTCW	0078	P3	0079	PRINT	0053	SCURV	0063
INT	*0001	LTH	0079	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
ITDCD	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