APPENDIX E

ANNOTATED STEADY-STATE INPUT-DATA TRACIN FILE

We present in Appendix E a complete input-data TRACIN file listing with annotation for a Westinghouse three-loop plant model. Various parts of this plant model are used to provide examples in Sections 5 and 7. If you understand this plant model and have the assembled database for the facility that you wish to model, you are prepared to develop your own TRAC-M input-data model. Although this sample TRAC-M model does not include all possible modeling features, we consider it to embody good practices for primary-side, secondary-side, and control-procedure modeling. The annotation should assist you in understanding the nature of the input-data model and its TRACIN file. This TRACIN was originally developed for TRAC–P, but it is also valid for TRAC-M.

The annotation is of two types. First, the input-data TRACIN file is well commented and has FORTRAN variable-name labels. The variable-name labels were generated by the GOCVRT program with the NAMELIST-variable INLAB option when it converted the TRAC-PF1/MOD1 Version 11.2 input-data TRACIN file in App. B of the TRAC-PF1/MOD1 User's Guide to the TRAC-PF1/MOD2 Version 5.3 input-data TRACIN file in Appendix B of the TRAC-PF1/MOD2 User's Guide. The developer's comments were transferred manually from the TRAC-PF1/MOD1 input-data TRACIN file to the TRAC-PF1/MOD2 input-data TRACIN file because the INLAB option does not transfer comments from the old input-data TRACIN file. After the title cards in the listing, diagrams on comment lines are provided of the VESSEL component with its internal PIPE and HTSTR components and of the component-network model for the primary-side loops and secondary-side steam and feedwater lines, which show the junction coupling of the hydraulic components. These diagrams have been provided to help the user more easily grasp the connectiveness and nature of the full-plant model. We consider this format for documenting an input-data TRACIN file to be exemplary and recommend that TRAC-M users follow these practices during the creation of their own input-data TRACIN file. Second, we have provided supplemental notes that should help one to understand the input data and the modeling they do. These notes reference the input-data TRACIN file listing in Section E.9. You will find it convenient to have the listing and notes side by side as you review this input-data model. The loose-leaf notebook format of the TRAC-M User's Manual permits you to do this.

We recognize that there are significant differences between analyzing an input-data TRACIN file prepared by someone else and generating an input-data model yourself. However, we believe TRAC-M users will find the annotated input-data TRACIN file to be a useful source of information to aid them in understanding the TRAC-M input-data format in Section 6.

As discussed in Section 6.1., an input-data TRACIN file is divided into eight major sections. We have grouped these notes in the same form. We will discuss references to the input-data TRACIN-file listing in Section E.9 within each section.

E.1. Main Data

The following supplemental notes refer to the input-data TRACIN file listing in Section E.8. by callouts that are marked on the listing; for example, 1 is for note 1. The text of the notes for the Main-Data card section follows:

1. Main-Data card 1 specifies a FREE-format for the input data.

2. Main-Data card 2 specifies that 27 title cards follow this record. With INOPT = 1, the user is exercising the NAMELIST option, which will specify its input data before Main-Data card 3. IEOS = 0 defines the gas phase as water vapor and noncondensable gas, NMAT = 0 specifies no user-defined materials will be input, and ID2O = 0 defines H_2O as the modeled fluid.

3. Diagrams on comment lines are shown here for the 3D VESSEL component and its internal PIPE and HTSTR components and the component network of each of the three primary-side loops, secondary-side steam lines, and secondary-side feedwater lines in the full-plant model. Such diagrams are helpful in relating the coupling of individual components to other components as well as relating their location in the overall network model.

4. With INOPT = 1 on Main-Data card 2, the user has specified values for 13 NAMELIST variables:

   a. FDFHL = 0.0 turns the Forslund-Rohsenow film-boiling correlation in standard blowdown heat transfer fully off;

   b. IADDED = 10 outputs a line of numerical-solution timestep results every 10 timesteps to the terminal and TRCMSG file;

   c. ICFLOW = 2 defines choked-flow option 2, which requires additional input for all 1D hydraulic components. See PIPE component 2 for an example of turning the choked-flow model off with all ICFLG array elements specified to be 0, and see VALVE component 45 for an example of specifying choked-flow modeling at a specified cell edge with one of it ICFLG array elements specified to be 1;

   d. IKFAC = 1 defines K-factor additive loss coefficients rather than FRIC additive loss coefficients to be input for the irreversible form losses (see note 78 on PIPE component 2);

   e. IMFR = 3 sends the VESSEL-component phasic mass flows to the graphics-data TRCGRF file;

   f. IOLAB = 1 with INLAB = 0 (default) generates no INLAB file in English units; what it does is require units labels to be input for control blocks and trips so that their unit symbols are output with their values because of IUNOUT = 1 (default) outputting unit symbols;

g. IPOWR = –1 and TPOWR = 2.0 s results in the steady-state power level in powered HTSTR (heat structure) component ROD 900 being set on at 2.0 s into the steady-state calculation;

h. IUNLAB = 8 states that 8 user-defined units-name labels are to be input for defining the units of some control blocks and trips;

i. NEWRFD = 1 turns on the reflood model when the IRFTR2 trip of powered HTSTR component ROD 900 is set ON;

j. NFRC1 = 2 specifies that forward KFAC and reverse RKFAC (because IKFAC = 1) additive loss coefficients are to be input for all 1D hydraulic components;

k. NHTSTR = 21 indicates that there are 21 HTSTR components defined after the NCOMP–NHTSTR = 132–21 = 111 hydraulic components in the component data section of the TRACIN file; and

l. NOAIR = 0 turns on the evaluation of the noncondensable-gas partial pressure.

5. Defining DSTEP = 0 indicates that this is an initial calculation (not a restart calculation based on the data dump of a previous calculation) that starts at time TIMET = 0.0 s. See Appendix F for changes in this card when restarting from a previous calculation data dump.

6. Defining STDYST = 2 indicates that a constrained steady-state calculation is to be performed. Be aware that there are some significant differences between user-specified steady-state and transient calculations. Section 3.6. TRAC-M/F90 and the Theory Manual describes these differences. See note 40 provided later for trip 1 and trip –407 for further information about trip definitions for a steady-state calculation. To define NCOMP and NJUN, the user needs to count the number of hydraulic and heat-structure components and the number of junctions connecting hydraulic components in the model. After reading all the component data, TRAC-M will print an error message if it has a different count and will suggest the value it expects based on the component data. TRAC-M needs the user to input these values in advance of the component data for it to reserve needed memory space for the component data that is to be read in. Common practice is to set the water-packer model on with IPAK = 1.

7. The CSS calculation is to be evaluated with NCONTR = 3 CSS controllers internally defined and evaluated by TRAC-M.

8. The number of each type of control parameter on Main-Data card 7 is known only after you have specified all the hydraulic and heat-structure component data and have defined the signal variables, control blocks, and trips required by their component actions in the control procedure. NTCF = 80 is obtained by summing the number of tabular-data values for control-

block function operations 100, 101, and 102. For example, in this input-data model, the following function operation 101 control blocks have tabular data: –15, –408, –436, –1160, –2160, –3160, –4242, –4243, –4304, –4318, –4320, –4334, –4336, and –4338. The total number of tabular-data pairs is 40 = 13+2+2+2+2+2+2+2+ 3+2+2+2+2+2 and the number of tabular-data values is twice the number of pairs (i.e., 80). See Secs. 3.5 and 6.3.5.2 and Section 2.4.6 in the Theory Manual for a discussion of the multipass control-parameter evaluation procedure. For this input-data model, only NTCP = 1 multipass control-parameter evaluation pass is performed to evaluate the control-parameter values each timestep.

9. All NCOMP = 132 hydraulic and heat-structure component numbers are specified here for the IORDER array. All hydraulic component numbers must be input before the heat-structure component numbers; the same order applies for their component data that are specified later. Within each of these two categories, the component numbers can be input in any order and not necessarily in the order that the component data are specified. The five numbers per line IORDER-array output from GOCVRT were replaced here with one to three numbers per line followed by a skip (s) LOAD-format directive so that similar component types and functions can be grouped and commented. The selection of FREE-format input (see Main-Data card 1, note 1) permits the entry of comments and data values on the same line. Note that the steam-generator secondary-side PIPE and TEE hydraulic components and HTSTR component heat-transfer paths (which previously were internal to the STGEN components) now are listed in the IORDER array and are counted as part of the NCOMP total number of components. The PIPE and TEE hydraulic-component junctions are counted as part of NJUN. Also note that no-flow FILL components 202 and 203 rather than PIPE component 202 are defined for the steady-state calculation to model conditions prior to the double-ended-guillotine break, single-tube transient initiator.

E.2. Countercurrent Flow-Limitation Data

This data block is not input because NCCFL = 0 on Main-Data card 6. Counter-current flow will be modeled directly by the phasic motion equations if it occurs during the hydraulic simulation.

E.3. Material-Properties Data

This data block is not input because NMAT = 0 on Main-Data card 2. The TRAC-M internally-defined material properties IDs 1 to 12 are appropriate for this problem.

E.4. Hydraulic-Path Steady-State Initialization Data

This data block is not input because STDYST = 2 on Main-Data card 4. This feature requires STDYST = 3 or 4 for its data block to be input and its initial temperature- and velocity-distribution solution estimate to be evaluated.

E.5. Control-Parameter Data

There are six subsections of data in this data block: CSS-controller data, multipass control-parameter evaluation data, signal-variable data, control-block data, trip data, and radiation-enclosure data.

E.5.1. CSS-controller data.

Only one of the four types of CSS controllers is input specified in this data block. These controllers are defined internally by TRAC-M and evaluated during a CSS calculation only. The CSS controller's action overrides the component-action procedure of the component (even when the component-action table is evaluated during the steady-state calculation because it is controlled by a trip whose set status is ON).

10. The NCONTR = 3 (Word 4 on Main-Data card 6) controllers are a CSS type 1 controller that adjusts the pump-impeller rotational speed of PUMP components 16, 26, and 36 to achieve a desired coolant mass flow across pump-impeller mesh-cell interface 2. The desired phasic coolant mass flows when NMPCSS = –1 (rather than the desired phasic velocities when NMPCSS = 0) are specified with the values ML = 4.2590E+03 kg s^{-1} (3.3802E+07 lb_m h^{-1}) and MV = 0.0 kg s^{-1} (0.0 lb_m h^{-1}) at interface 2 in the VL and VV array data of each PUMP component.

This problem in the TRAC-PF1/MOD2 Version 5.3 and 5.4 Users Guide had NCONTR = 12 CSS controllers, which also included:

a. three CSS type 2 controllers that adjusted the secondary-side steam-flow control VALVES for a desired upstream pressure,

b. three CSS type 3 controllers that adjusted the secondary-side feedwater control VALVES for a feedwater mass inflow that equals the steam mass outflow, and

c. three CSS type 4 controllers that adjusted the secondary-side pressure in one steam generator and the heat-transfer inner- and outer-surface areas in the other two steam generators for a desired primary-side downstream coolant temperature.

These controllers were eliminated because they desired the same secondary-side conditions in all three steam generators even though the secondary-side piping is different in each of the steam generators. We thought that applying these CSS controllers over-constrained the steady-state solution that caused it to have difficulty satisfying steady-state convergence. After eliminating these 9 CSS controllers, there was

diminished secondary-side oscillatory behavior, but oscillatory behavior still persisted such that EPS = 1.0000E-04 s^{-1} steady-state convergence still could not be satisfied.

E.5.2. Multipass control-parameter evaluation data.
This data block is not input because only NTCP = 1 multipass control-parameter evaluation pass is to be evaluated. This means that all signal variables, control blocks, and trips are evaluated during a single evaluation pass each timestep (see note 8).

E.5.3. Signal-variable data.
There are NTSV = 65 signal variables defined based on Main-Data card 7 (see note 8). Refer to the signal-variable parameters Table 6-1 in Sec. 6.3.5.3 for a listing of the system parameters that can be monitored by signal variables.

11. The specification of signal variables usually occurs in parallel with the definition of the control procedure for component actions. Thus, we recommend that the list of signal variables evolve as the input data are developed for the component actions of each hydraulic and heat-structure component.

12. Parameter variable ISVN = 0 is problem time when ILCN = 0.

13. Parameter variable ISVN = 18 is the reactor-core neutronic power in powered HTSTR component ROD ILCN = 900.

14. Parameter variable ISVN = 23 is the liquid coolant temperature in the intact-loop hot-leg PIPE component ILCN = 10 in cell ICN1 = 1 that has a junction 10 connection to VESSEL component 1.

15. Parameter variable ISVN = 21 is the loop 1 secondary-side steam-line pressure in TEE component ILCN = 110 in cell ICN1 = 3, which along with signal variable IDs 222 and 333 for loops 2 and 3 defines the signal-expression trip signals of trip IDs 1001, 1002, and 1003, respectively.

16. Parameter variable ISVN = 32 is the liquid mass flow in PUMP component ILCN = 16 at its mesh-cell interface ICN1 = 1.

17. Parameter variable ISVN = –21 is the pressure in the loop 1 accumulator check VALVE component ILCN = 52; its negative sign indicates that it defines the pressure difference between cell ICN1 = 2 and cell ICN2 = 3, which by Trip ID 520 controls the opening and closing of the adjustable VALVE interface of VALVE component 52.

18. Parameter variable ISVN = 69 is the total mixture mass flow of coolant (liquid feedwater) across the ICN1 = 1 interface (junction 100) of PIPE component ILCN = 100 that enters the boiler section of the loop 1 steam generator.

19. Parameter variable ISVN = 42 is the adjustable VALVE-interface flow-area fraction of the loop 1 feedwater control VALVE component ILCN = 154 that is an input signal to control block –1014 for defining the VALVE interface's adjusted flow-area fraction whose adjustment is controlled by trip IVTR = 1 of VALVE component 154.

20. Parameter variable ISVN = 56 is the set-status value of trip ILCN = 16.

E.5.4. Control-block data.

Control blocks are identified by negative-value ID numbers while signal variables are identified by positive-value ID numbers. The notes that follow will address the different control-block function operators that are used among the NTCB = 238 control blocks specified on Main-Data card 7. Eight user-defined units-name labels are defined on lines 596 to 606 to define control-block parameter units that are not defined internally by TRAC-M in Table 6-2.

21. Control block IDCB = –1 defines a "constant" value by function operation ICBN = 9. The constant is a temperature difference of CBCON1 = 0.0000E+00 K. Note that the CBXMIN minimum and CBXMAX maximum values for the control block are also 0.0000E+00 K for consistency because the constant value does not change.

22. Control block IDCB = –15 evaluates a "function of one independent variable," which is a linearly interpolated evaluation of tabular data by function operation ICBN = 101. The independent-variable dependence of the tabular data is the signal variable ICB1 = 4001 steam-line header pressure. There are ICB2 = 13 tabular-data pairs where each data pair has an independent-variable value of pressure and a dependent-variable value of the square root of the saturated-steam density. The square root of density units required the user-defined units-name label LUSQRDEN.

23. Control block IDCB = –22 evaluates a logical "and" operator by function operation ICBN = 5. If the values of input control blocks ICB1 = –142 and ICB2 = –242 are both 1.0, control block –22 will be assigned the CBGAIN = 1.0000E+00 value; otherwise, it will be assigned the value 0.0.

24. Control block IDCB = –28 evaluates a logical "inclusive or" operator by function operation ICBN = 25. If the values of input control blocks ICB1 = –22 and ICB2 = –24 sum to 0.0, control block –28 will be assigned the value 0.0; otherwise, it will be assigned the CBGAIN = 1.0000E+00 value.

25. Control block IDCB = –50 evaluates the "maximum of two signals" operator by function operation ICBN = 35. The maximum of the values of input control blocks ICB1 = –55 and ICB2 = –110 defines the output signal of control block –50.

Control blocks –108 through –170, –208 through –270, and –308 through –370 evaluate two limits for each of the three primary-coolant loops. The two limits are the high over-temperature ΔT limit and the high over-power ΔT limit. Control-block definitions will be annotated for the first loop only because the definitions are similar for each loop. Note that the control block ID numbering convention clearly identifies the loop number by the hundredths digit in the control-block ID number.

26. Control block IDCB = –108 evaluates the addition operator by function operation ICBN = 3. The sum of input signal variables ICB1 = 101 and ICB2 = 181 for the hot- and cold-leg temperatures of loop 1 gives an average temperature when multiplied by CBGAIN = 5.0000E-01. That average temperature is constrained between the limit values of CBXMIN = 0.0000E+00 K and CBXMAX = 2.0000E+03 K.

27. Control block IDCB = –110 evaluates the "weighted summer" operator by function operation ICBN = 59. Constants CBCON1 = 5.0000E-01 and CBCON2 = 5.0000E-01 are multiplied by the temperatures of input control blocks ICB1 = –108 and ICB2 = –109, respectively, and then summed. The value of control block –110 is initially the value 0.0 K and thereafter the value from its previous evaluation.

28. Control block IDCB = –118 evaluates the subtraction operator by function operation ICBN = 54. The input signal variable 181 cold-leg temperature of loop 1 is subtracted from the input signal variable 101 hot-leg temperature of loop 1 to define the output signal temperature difference of control block –118, which is constrained between the CBXMIN = –2.0000E+03 K and CBXMAX = 2.0000e+03 K temperature limits.

The high over-temperature ΔT limit is evaluated with control blocks –130, –132, –134, –136, –138, and –140. The measured ýT defined by tabular data is compared with the ΔT limit in control block –142. The high over-power ΔT limit is evaluated with control block –148, –149, –150, –152, –154, –156, –158, –160, –162, –164, –166, and –168. The measured ΔT defined by tabular data is compared with this evaluated ΔT limit in control block –170. The results of the limits comparisons from all three loops are evaluated by control blocks –22, –24, and –26 (based on control blocks –142, –242, and –342) and control blocks –32, –34, and –36 (based on control blocks –170, –270, and –370).

Control blocks –28 and –30 and control blocks –38 and –40 are used to evaluate whether either of the ΔT limits have been exceeded in two of the three loops. The values from control blocks –30 and –40 are compared with temperature limits by trip IDs 48 and 50. The set status on these trips is input to the definition of the trip-controlled-trip signals of trip IDs 120 and 160, which define the trip signals of reactor-trips-subset-1 trip ID 12 and turbine trip ID 16.

The objective of tracing the flow of this control block and trip network is to: (1) provide an example of using control blocks to evaluate logic that provides input for trip action, (2) show that control-block and trip evaluations require planning and organization of

information, and (3) show that developing a new model requires both a detailed understanding of what is to be modeled and how the control features are to be organized in the TRAC-M input-data file. The logic in a control schematic can have its operations modeled one-for-one by control blocks and trips. Sometimes with a little thought, however, a control schematic can have several of its operations combined into one control block or trip because of the multiple features they can be defined to perform. For example, a control block evaluates its function operation, multiplies that result by a gain factor, and constrains that product value between minimum and maximum limit values.

29. Control block IDCB = –132 evaluates a "lead-lag transfer function" operator by function operation ICBN = 30. The Laplace-transform operator (1.0+CBCON1 *s)/(1.0+CBCON2*s), where the constants CBCON1 = 2.0000E+01 s, and CBCON2 = 3.0000E+00 s, is applied to the control block ICB1 = –130 X1 input signal to evaluate the first-order differential equation CBCON2*dXOUT/dt + XOUT = CBCON1* dX1/dt +X1 for the control block –132 XOUT output signal.

30. Control block IDCB = –142 evaluates a "greater than" operator by function operation ICBN = 21. The control block is assigned the CBGAIN = 1.0000E+00 value if the value of the control block ICB1 = –120 output signal is greater than the value of the control block ICB2 = –140 output signal; otherwise, it is assigned the value 0.0.

31. Control block IDCB = –148 evaluates a "step" operator by function operation ICBN = 53. The control block has an output value of 0.0 until the problem time reaches CBCON1 = 1.0000E-04 s; thereafter, it has the CBGAIN = 1.0000E+00 value.

32. Control block IDCB = –149 evaluates a "derivative" operator by function operation ICBN = 12. The finite-difference time derivative of the control block ICB1 = –110 average-temperature output signal is multiplied by CBGAIN = 1.0000E+01 s and constrained between the CBXMIN = –1.0000E+02 K and CBXMAX = 1.0000E+02 K temperature-difference limits.

33. Control block IDCB = –150 evaluates a "multiply" operator by function operation ICBN = 39. The values of the control block ICB1 = –148 output signal and the control block ICB2 = –149 temperature-difference output signal are multiplied together and constrained between the CBXMIN = –1.0000E+02 K and CBXMAX = 1.0000E+02 K temperature-difference limits.

34. Control block IDCB = –152 evaluates a "first order lag" operator by function operation ICBN = 26. The Laplace-transform operator 1.0/(1.0+CBCON1*s), where the constant CBCON1 = 1.0000E+01 s, is applied to the control block ICB1 = –150 X1 input signal to evaluate the first-order

differential equation CBCON1*dXOUT/dt + XOUT = X1 for the control block –152 XOUT output signal.

The pressurizer control procedure is defined by control blocks –406 through –450. The overall procedure is subdivided into three coupled subsystems for level, pressure, and heater control. Figure E-1 shows a schematic of the pressurizer control procedure. In referring to Fig. E-1, you need to be aware of the following nomenclature: SV xxxx refers to a signal variable with ID number xxxx, CV –xxxx refers to a control block with ID number –xxxx, and OP xxx refers to a control-block function operation xxx. Function operations referenced in Fig. E-1 are arithmetic (+, -, *), integration (½), tabular-data (function) evaluation, value comparison (.GT.), and logical test (.OR.). The output signal from the level-control subsystem is used to define the pressurizer makeup/letdown flow requirement. Level information is also used in the pressurizer heater-control logic. The output signal from the pressure-control subsystem is used to define the pressurizer sprayer requirement (CV –434). Pressure information is also used in the heater-control logic. The output signal from the heater-control subsystem (CV –450) is used to define the pressurizer heater power and is based on level and pressure inputs. Only three control blocks –432, –444, and –450 will be described for the pressurizer control procedure. They contain control-block function operations that we have not previously discussed.

35. Control block IDCB = –432 evaluates an "integration" operator by function operation ICBN = 23. The pressure-difference output signal of control block ICB1 = –430 is integrated over problem time.

36. Control block IDCB = –444 evaluates a "input switch" operator by function operation ICBN = 22. If the logical value output signal of control block ICB3 = –442 is 1.0, control block –444 is assigned the output-signal value of control block ICB1 = –10; if the logical value of control block ICB3 = –442 is 0.0, control block –444 is assigned the output-signal value of control block ICB2 = –2.

37. Control block IDCB = –450 evaluates a "gate" operator by function operation ICBN = 19. If the logical value output signal of control block ICB2 = –448 is 1.0, control block –450 is assigned the output-signal value of control block ICB1 = –446; otherwise, it is assigned the value 0.0.

The loop 1 steam-generator level-control procedure is defined by control blocks –1004 to –1706 and control blocks –4241 to –4243, with the exception of control blocks –1110 to –1162, which define the loop 1 secondary-side main steam-isolation valve trip logic and PORV control logic. Similar control blocks are defined for loops 2 and 3. To help interpret the control logic, the user needs to refer to Fig. E-2. The overall control system is divided into two subsystems: level control and flow control. The output of the level-control subsystem is a level-error signal (CV –1008). The output of the flow-control subsystem is an error signal reflecting the difference between the steam flow leaving the steam-generator secondary and the feedwater flow (CV –1010). These two signals are summed to provide a combined flow and level error. After conditioning, the control-system

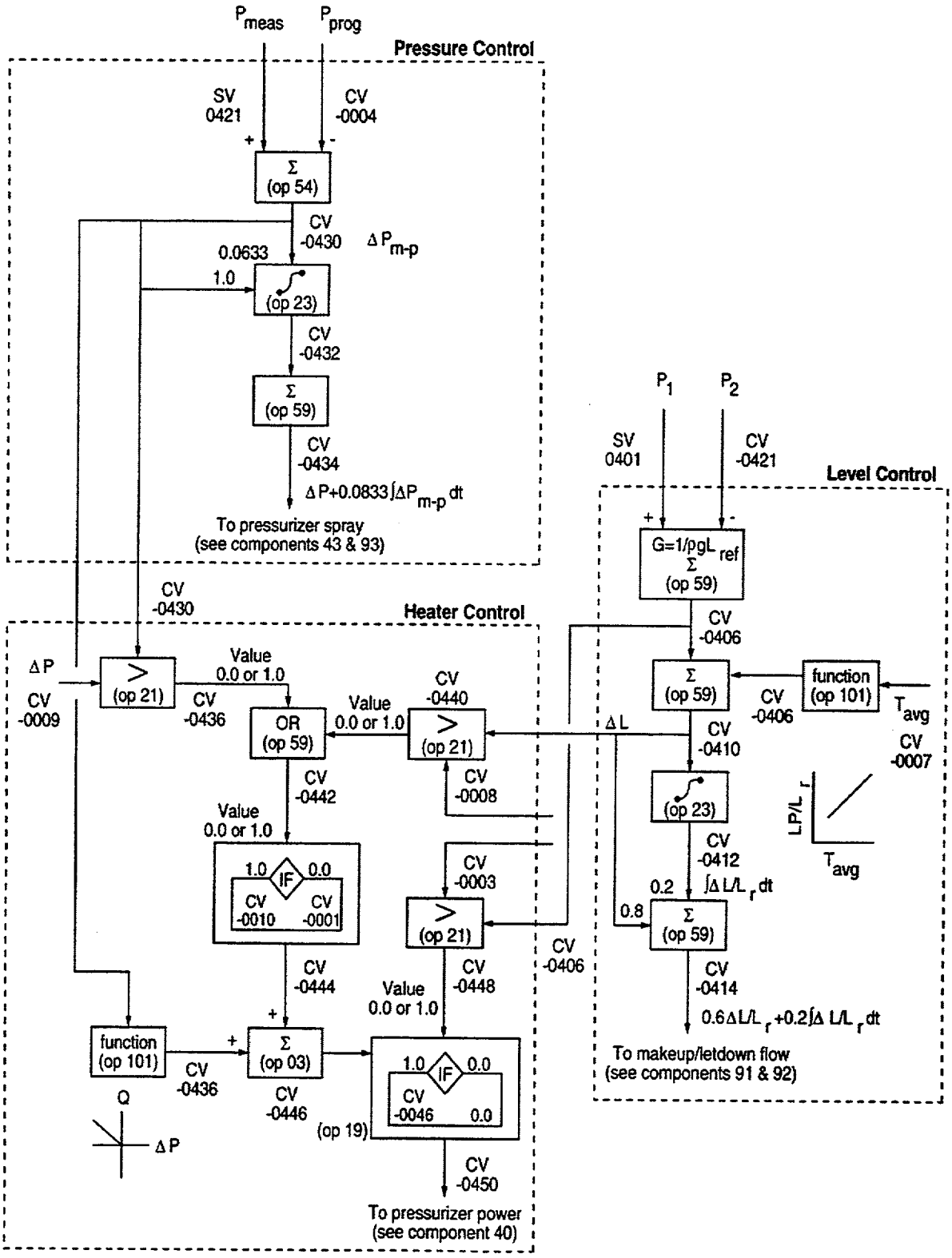


Fig. E-1 Pressurizer control procedure.

(CV–1014) is used to adjust the loop 1 main feedwater-regulation valve. We will discuss only control blocks –1104 and –1106, which contain control-block operations that we have not previously described.

38. Control block IDCB = –1104 evaluates an "absolute" operator by function operation ICBN = 1. The absolute value of the signal variable ICB1 = 1135 loop 1 steam-line pressure difference is evaluated to define the output signal of control block –1104.

39. Control block IDCB = –1106 evaluates a "square root" operator by function operation ICBN = 52. The square root of the loop 1 steam-line pressure-difference absolute value of the control block ICB1 = –1104 output signal is multiplied by CBGAIN = 8.4779E-01 m^2. The units of the control block –1106 output signal is defined by the user-defined units-name label LUASQRTP.

The remainder of the Westinghouse three-loop plant control logic is shown in Fig. E-3. You are urged to review the input-data file definitions of the other control block using Fig. E-3 as an aid. All the control-block function operations shown in Fig. E-3 have been discussed already in the notes.

E.5.5. Trip data.

The trip-dimension variable data are defined on the first card in this data subset (line 2648). There are NTSE = 3 signal-expression trip signals for trip IDs 1001, 1002, and 1003; and NTCT = 20 trip-controlled-trip trip signals for trip IDs 10 to 38 (in intervals of 2), 21, 46, 100, 200, 300, and 422 (2 of the 21 trips used the same trip-controlled-trip trip signal). No setpoint-factor tables are defined (NTSF = 0), no trips control the generation of a data-dump edit and end of the calculation (NTDP = 0), and no trip-controlled special timestep data are defined (NTSD = 0).

40. This trip is initiated to $ON_{forward}$ with ISET = 1 to have user-specified component actions (defined by the component data) that are controlled by this trip evaluated during the steady-state calculation. TRAC-M does not evaluate a component action during a steady-state calculation unless a controlling trip is defined and its set status is $ON_{forward}$ (ISET = 1) or $ON_{reverse}$ (ISET = –1). ISET is specified by the user through input (in this case) or evaluated by TRAC-M at the beginning of each timestep during a steady-state calculation for trips with a negative-valued ID number. Positive-valued ID number trips are not evaluated during a steady-state calculation. See hydraulic components 43, 91, 92, 93, 154, 254, and 354 for examples of component actions being controlled by trip ID 1 and are evaluated during the steady-state calculation. See trip ID –407 for an example of a trip that is evaluated during both the steady-state and transient calculations.

41. The signal-range type in the signal-range diagram above is ISRT = 2. Table 6-4 shows all 10 combinations of signal-range types that the user can select from.

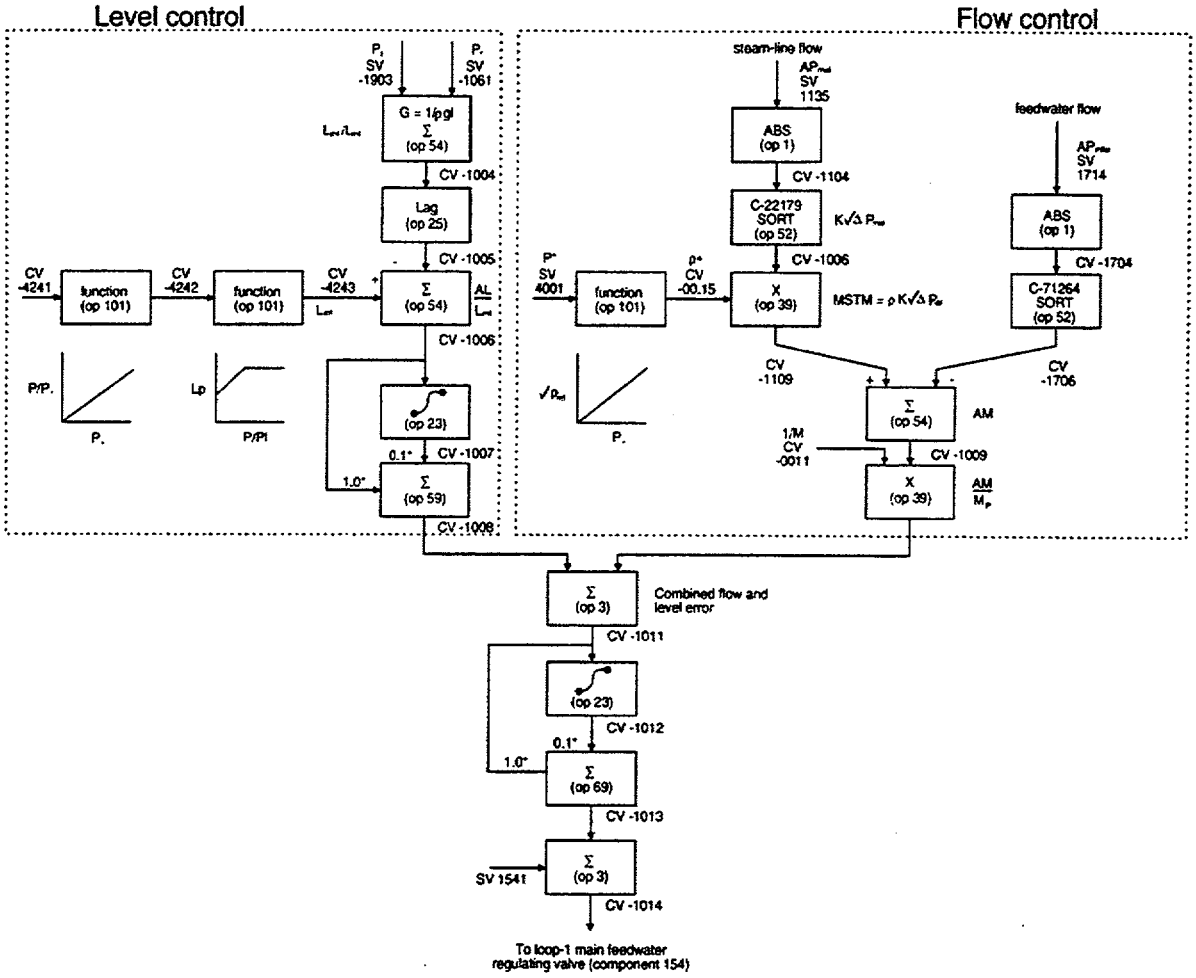
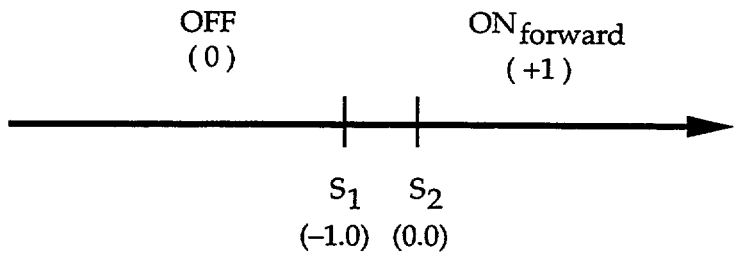


Fig. E-2 Steam-generator level-control procedure.

Trip ID 1 Signal-range diagram.



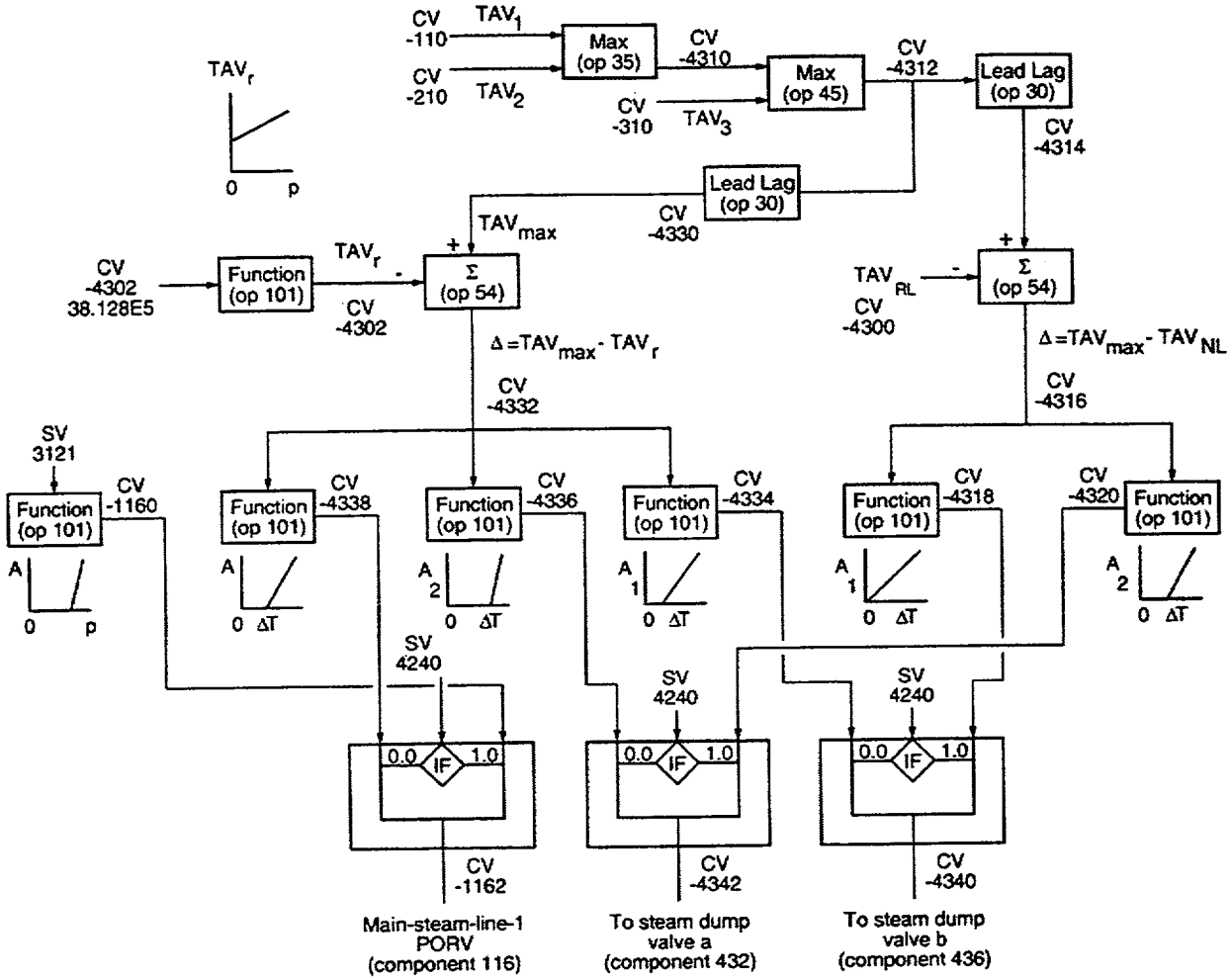


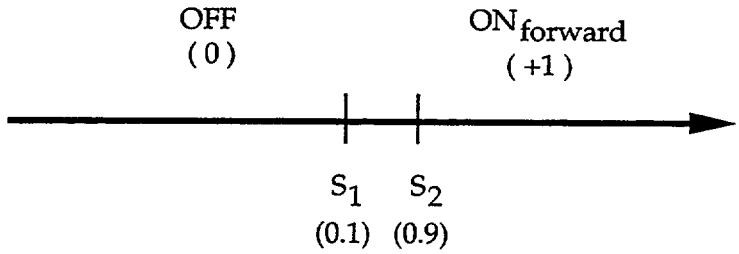
Fig. E-3 Steam-dump control procedure.

42. The trip signal is defined by signal variable IDSG = 1 (problem time) because ITST = –1 has a magnitude of 1 indicating the trip is a signal-variable/control-block trip (the trip signal of such a trip is defined by a signal variable when IDSG > 0 or by a control block when IDSG < 0). During the transient calculation (when the trip is evaluated because IDTP = 1 is positive), the trip signal will be compared with the defined setpoint values to determine the trip set status. ITST = –1 having a minus sign prevents the outputting of a message to the terminal and TRCMSG file when the trip signal crosses a tested setpoint and when its set status is changed.

43. Setpoints S_1 and S_2 have values SETP(1) = –1.0000E+00 and SETP(2) = 0.0000E+00, respectively. Evaluating the trip and a possible change in its set status during the transient calculation involves comparing the trip signal (signal variable ID 1) value with the S_1 setpoint value that it must cross to change its $ON_{forward}$ set status to OFF (when the trip is OFF, the trip

signal needs to cross the S_2 setpoint to change its OFF set status to $ON_{forward}$). Because problem time is not negative valued, the $ON_{forward}$ set status of trip ID 1 will remain $ON_{forward}$ throughout the entire transient calculation as well as the steady-state calculation.

Trip ID 10 Signal-range diagram.



44. The signal-range type, shown in the signal-range diagram above, is ISRT = 2 with two subranges and two setpoints. The initial trip set status ISET = 0 is OFF and will stay OFF during the entire steady-state calculation because the trip has a positive-valued ID number and will not be evaluated during the steady-state calculation.

45. The trip-controlled-trip trip signal (ITST = 3) has the ID number IDSG = 100. Its definition at the end of the trip-data section (lines 3401 to 3405) is the sum (because IDSG has a positive value) of the set status of trips ITN(1) = 12 and ITN(2) = 14. Both these trips have a type 2 signal-range with possible ISET values of 0.0 or 1.0, so the trip-controlled-trip trip signal will have the value 0.0, 1.0, or 2.0.

46. Setpoints S_1 and S_2 have values SETP(1) = 1.0000E-01 and SETP(2) = 9.0000E-01. Trip ID 10 will be set to $ON_{forward}$ if either trip ID 12 or trip ID 14 is set to $ON_{forward}$ based on the trip-controlled-trip trip signal definition in note 45.

47. A huge DTSP(1) = 1.0000E+06 s setpoint delay time has been defined for setting trip ID 10 OFF. Because of this, once trip ID 10 is set to $ON_{forward}$, it will remain there even if the trip-controlled-trip trip-signal value changes to 0.0. Actually, this will not occur because both trips ID 12 and trip ID 14 have the same large setpoint delay time for setting their trips OFF.

Trip IDs 12 to 28.

48. These trips have the same form as trip ID 10. The only differences are in the defined form of their trip-controlled-trip trip signal, the nonzero DTSP(2) setpoint delay times for setting trip ID 21 (2.0000E+01 s), trip ID 22 (1.0000E+06 s), and trip IDs 26 and 28 (3.0000E+01 s) to $ON_{forward}$, and a SETP(2) = 1.8000E+00 setpoint for setting trip 24 to $ON_{forward}$. The later will occur only if two or three of the three trips ITN(1) = 40, ITN(2) = 42,

and ITN(3) = 44, whose summed set status defines the trip-controlled-trip trip signal IDSG = 240, are set to 1.0 to yield a cumulative value of 2.0 or 3.0. This is referred to as (2/3) logic of a coincidence trip.

Trip IDs 30 to 38.

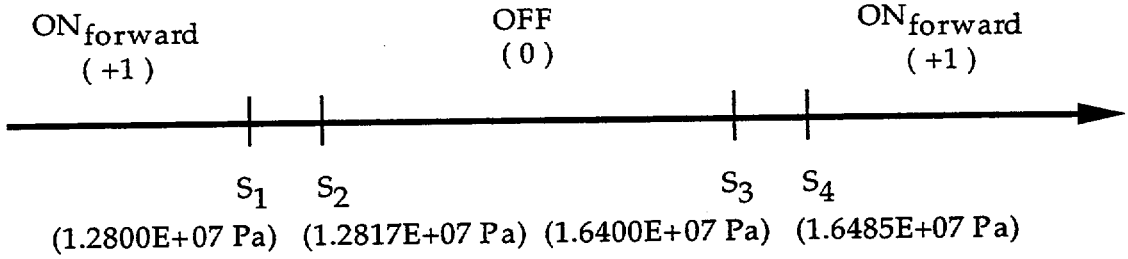
49. These trips have the same form as trip ID 10 except the setpoint delay time for setting these trips OFF is DTSP(1) = 0.0000E+00 s.

For the remaining trips in the input-data TRACIN file, the following notes will discuss only new features that are implemented. Only those trips will be annotated.

Trip ID 40.

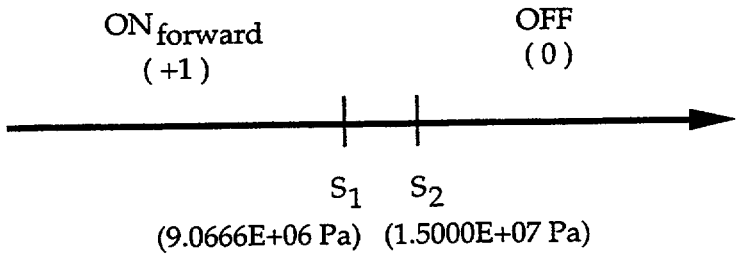
50. The trip signal IDSG = –1118 is a control-block output signal because ITST = –1 has a magnitude of 1.

Trip ID 54 Signal-range diagram.



51. The signal-range type in the signal-range diagram above is ISRT = 5 with three subranges and four setpoints. The initial trip set status is OFF (ISET = 0). When the pressurizer-pressure value of signal variable IDSG = 421 (because ITST = 1) is equal to or greater than SETP(4) = 1.6485E+07 Pa (2.3909E+03 psia) or equal to or less than SETP(1) = 1.2800E+07 Pa (1.8565E+03 psia), the trip status is set to $ON_{forward}$ with a setpoint delay time of 0.0000E+00 s Thereafter, resetting the set status to OFF requires that the value of signal variable 421 be equal to or less than SETP(3) = 1.6400E+07 Pa (2.3786E+03 psia) or equal to or greater than SETP(2) = 1.2817E+07 Pa (1.8589E+03 psia).

Trip ID 58 Signal-range diagram.



52. The signal-range type in the signal-range diagram above is ISRT = 1 with two subranges and two setpoints. The initial trip set status is OFF (ISET = 0). If the signal variable IDSG = 421 pressurizer-pressure value is equal to or less than SETP(1) = 9.0666E+06 Pa (1.3150E+03 psia), the trip set status is set to $ON_{forward}$ with a setpoint time delay of DTSP(1) = 0.0000E+00 s. Thereafter, resetting the set status to OFF requires that the pressure value of signal variable 421 be equal to or greater than SETP(2) = 1.5000E+07 Pa (2.1756E+03 psia).

Trip ID 60.

53. Trip ID 60 has a ISRT = 1 signal-range diagram like trip ID 58. When the signal-variable IDSG = 421 trip-signal pressurizer-pressure value falls below SETP(1) = 1.1928E+07 Pa (1.6744E+03 psia), the set status of trip ID 60 is changed to $ON_{forward}$ with no time delay in order to activate the safety-injection system based on this low-pressure trip.

Trip ID 100 (also IDs 200 and 300).

54. This trip illustrates (2/2) logic of a coincidence trip. In principle, this trip behaves like trip ID 24 discussed earlier (see note 48). In this case, however, trip-controlled-trip trip signal IDSG = 1000 sums only the set status of two trips ITN(1) = 1020 and ITN(2) = 1040. Both trips (2/2) are required to have an $ON_{forward}$ set status (because SETP(2) = 1.8000E+00) for trip 100 to be reset from OFF (its initial ISET = 0 specification) to $ON_{forward}$.

Trip ID –407.

55. Among the NTRP = 72 (word 4 on Main-Data card 7) trips, this is the only trip that will be evaluated during the steady-state calculation because its ID number has a negative value. All the other trips with positive-valued ID numbers will have their input-specified initial set status (defined by ISET) throughout the steady-state calculation. During the transient calculation, all 72 trips will be evaluated.

Trip ID 422 Signal-range diagram.

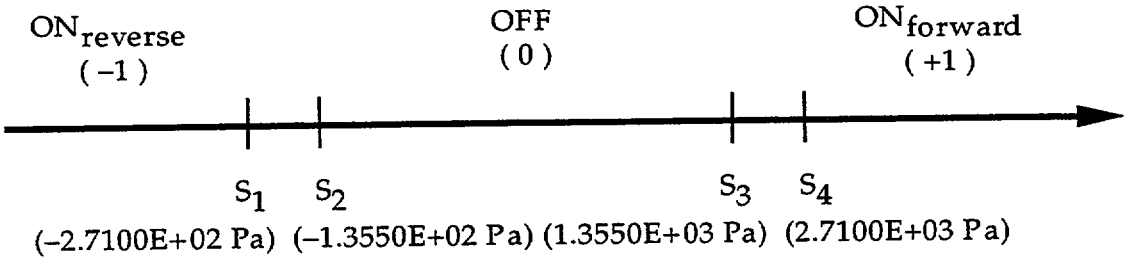
56. The signal-range type in the signal-range diagram above is ISRT = –2 with two subranges and two setpoints. A –2 signal-range type differs from the 2 signal-range type of trip ID 10 by switching the $ON_{forward}$ set-status label to an $ON_{reverse}$ set-status label.

57. Trip ID 422 is an example of a (1/5) logic coincidence trip. Its trip signal is defined by the trip-controlled-trip trip signal IDSG = 400, which sums the set status of five trips ITN(1) = 20, ITN(2) = 36, ITN(3) = 423, ITN(4) = 1500, and ITN(5) = 3500. Setting any one of these trips to $ON_{forward}$ will set the set status of trip ID 422 to $ON_{reverse}$ because SETP(2) = 1.0000E-01.

Trip ID 423.

58. This trip has an initial set status of OFF (ISET = 0) that will not change during the steady-state and transient calculations because both setpoint delay times DTSP(1) = DTSP(2) = 1.0000E+06 s.

Trip ID 520 Signal-range diagram.



59. The signal-range type in the signal-range diagram above is ISRT = –3 with three subranges and four setpoints. The initial trip set status is $ON_{reverse}$ (ISET = –1). When the pressure-difference value of signal variable IDSG = 521 (ITST = 1) is greater than or equal to SETP(2) = –1.3550E+02 Pa (1.9653E-02 psia) and less than SETP(4) = 2.7100E+03 Pa (3.9305E-01 psia), the trip set status is reset to OFF with a setpoint delay time of DTSP(2) = 0.0000E+00 s. When the pressure-difference value of signal variable IDSG = 521 is ± SETP(4) = 2.7100E+03 Pa (3.9305E-01 psia), the trip set status is reset to $ON_{forward}$ with a setpoint delay time of DTSP(4) = 0.0000E+00 s This signal-range type has three different set-status labels where it tests for a potential change of set status to either of the other two set-status labels. Based on the current set status, the trip signal is compared with only two of the four setpoint values. The setpoints tested are those that lie closest to the subrange of the other two set-status labels.

Trip ID 1001.

60. The trip signal is a signal-expression defined by IDSG = 1120 at the end of the trip-data section. The trip signal is a signal-expression because ITST = –2 has a magnitude of 2. The signal expression has INSE = 2

subexpressions with INCN = 0 constants. The subtraction arithmetic operator ISE(1,1) = 2 for the first subexpression subtracts the value of signal variable ISE(3,1) = 222 from the value of signal variable ISE(2,1) = 111 giving the difference of steam-line pressures in loops 1 and 2. The absolute value arithmetic operator ISE(1,2) = 8 for the second subexpression takes the absolute value of the pressure difference evaluated by the first subexpression ISE(2,2) = 901.

The above discussion on trip definitions addresses the different modeling features provided by trips that are used in this input-data model. The physical significance of what is being modeled has not been given the same emphasis. While both aspects are important to developing a model utilizing trip logic ON/OFF switches, a knowledge of the definable features of a trip is needed before trips can be applied as control switches in an actual control procedure. We hope that the above examples and those in Section 7, along with the trip input-data format description in Section 6.3.5.6 and the control-procedure description on trips in Section 3.3. and the TRAC-M/F90 Theory Manual, will provide a sufficient introduction for the TRAC-M user.

E.5.6. Radiation-enclosure data.

This data block is not input because NAMELIST variable NENCL = 0 (default) defines no HTSTR-component radiation enclosures.

E.6. Component Data

We have tried to reduce the amount of annotation that is needed for the component data. Two guidelines have been followed. First, beginning with the initial component in the input listing, we went through the listing and commented on all items we felt needed to be annotated. A subsequent appearance of a similar item was not annotated. Consequently, many components toward the end of the component-data section have not been annotated. The reader interested in a specific item in a component near the end of the listing that is not annotated will need to search through the components before it to see whether a note has been provided on that item. Second, because this is a three-loop plant model, we have chosen only to annotate the components in loop 1 that are input first and not their similar components in loops 2 and 3 that are input later. The loop-2 steam-generator double-ended-guillotine break, single-tube rupture to be modeled by PIPE component 202 but here replaced by no-flow FILL components 202 and 203 and the loop-3 pressurizer modeled by BREAK, FILL, PIPE, PRIZER, TEE, and VALVE components 40 through 48 also have been annotated. We have followed a similar approach of annotating the components on the secondary side of loop 1 that are input first but not their similar components of loops 2 and 3 that are input later.

VESSEL Component 1 : Reactor vessel.

61. The 3D VESSEL component 1 has the largest data requirement of any of the TRAC-M components. The reader should not be intimidated by the amount of data. Much of the data are repetitive. As with all TRAC-M model-development activities, a good noding diagram of the reactor

VESSEL component is helpful. See the VESSEL noding diagram in Fig. 5-6 and the diagram of the VESSEL component provided on comment lines at the beginning of this input-data TRACIN file listing.

62. There are NASX = 12 axial levels, NRSX = 2 radial rings, NTSX = 6 azimuthal sectors, and NCSR = 18 junction source connections of 1D hydraulic components to the VESSEL component (6 junction source connections to the hot and cold legs of each of the three primary-coolant loops and 12 junction source connections to the top and bottom ends of 6 guide-tube PIPE components).

63. The TRAC-M user who modeled the vessel did not exercise the VESSEL-component option of variables IDCU, IDCL, and IDCR where TRAC-M internally defines the axial and radial boundaries of the downcomer within the 3D VESSEL component mesh-cell grid. The reason for not having done this was to permit the user to model radial-direction leakage around the hot-leg pipe penetrations in level 8 and to specify a nonzero flow area at the top of the downcomer (the top axial interface of all six azimuthal-sector mesh cells in radial ring 2 of level 10). This requires the user to individually specify appropriate radial- and axial-interface flow areas to model the presence of the downcomer. The above leakage flow path was not modeled by a vent-valve between the downcomer and the upper plenum (NVENT = 0). Subsequent to the development of this VESSEL component input-data model, the INOPTS NAMELIST variable IGEOM3 now is provided to allow the user to set a non-zero flow areas between the downcomer and upper-plenum mesh cells of the VESSEL component when IDCU, IDCL, and IDCR are input with nonzero (positive) values. The user should always input positive values for variables IDCU, IDCL and IDCR because special flow-regime maps are used in the downcomer based on these parameters.

64. See Fig. 5-6 for the location of the core outer-radial interface at ICRR = 1 and the upper-axial interface level of the bottom and top of the core region at ICRL = ILCSP = 2 and ICRU = IUCSP = 6, respectively, and the top of the upper-head support plate at IUHP = 10. ICONC = 1 requires ISOLUT = 1 (word 3 on Main-Data card 6) to input CONC-array solute-concentration ratios in the liquid coolant.

65. SHELV = 0.0 m (0.0 ft) isn't needed to shift the Z-array elements on the next data record to define the height of the level interfaces because GRAV rather than ELEV values are input specified for the 1D hydraulic components that are connected to the VESSEL component. NAMELIST variable IELV = 1 would need to be specified to input ELEV values for 1D hydraulic components and require the value of SHELV for shifting the Z-array element values of the VESSEL component.

66. The mesh-cell outer-interface location values of Z, X or RAD, and Y or TH must increase monotonically to define the Cartesian (IGEOM = 1) or right-circular cylinder (IGEOM = 0) orthogonal mesh-cell grid of the VESSEL component.

67. LISRL identifies the VESSEL level number that a junction source connection connects to. All the horizontal hot- and cold-leg pipes connect to level 8 as shown in Fig. 5-6. The vertical guide-tube pipes within the VESSEL connect to the top interfaces of levels 7 or 9 at their bottom and level 12 at their top. Being connected to a level means fluid flows across the source-connection junction into or out of mesh cells in that level. LISRC identifies the "relative" cell number within each horizontal-plane level that a source-connection junction connects to. The relative cell number is a composite number of the y- or θ-direction cell number plus the product of the x- or r-direction cell number minus one and the total number of y- or θ-direction mesh cells. Being connected to a VESSEL-component mesh cell means fluid flows across the source-connection junction into or out of the mesh cell. LISRF identifies the mesh-cell interface face number a source-connection junction connects to. The face number is 1 for a y- or θ-direction interface, 2 for a z-direction interface, and 3 for a x- or r-direction interface. The face number has the same numerical sign as that of the interface's fluid velocity flowing out of the mesh cell (i.e., a + or – value for positive- or negative-direction flow). It is recommended that all 1D hydraulic-component loops starting and ending in a VESSEL component start and end with the same magnitude face number when SET3D numerics are evaluated (NAMELIST variable NOSETS = 0 or 2). Failure to do so may have a negative impact on the TRAC-M numerics by requiring a smaller timestep size. LJUNS defines the junction number of the source connection. Of the NCSR = 18 (word 4 on VESSEL Card number 2) source-connection junctions, the first three connect to the hot-leg side PIPE or TEE of each primary-coolant loop, the next three connect to the cold-leg side TEE of each primary-coolant loop, the next six connect to the bottom end of the six guide-tube PIPEs, and the last six connect to the top end of the six guide-tube PIPEs.

68. NRSX × NTSX = 2 × 6 = 12 values for each parameter array, defining the fluid state in a mesh cell or on one of its three positive face-number interfaces, are specified for each of the twelve mesh cells in the horizontal plane of a VESSEL level. Each of the parameter arrays, whose label is shown by a "* comment *", is defined in the input-format description of Section 6.3.7.11. The subsequent notes for VESSEL component 1 will try to provide further information on items that are commonly misinterpreted.

69. Because NAMELIST variable IKFAC = 1, CFZp-d (where p=L,V defines the fluid phase and d=T,Z,R or d=Y,Z,X defines the interface perpendicular-direction label in cylindrical or Cartesian geometry) specifies K factors rather than FRICs for defining the additive irreversible form losses. For

IKFAC = 0, the 3D CFZp-d values for TRAC-PF1/MOD2 have the same definition as FRICs for the 1D components, while for TRAC-PF1/MOD1 the CFZp-d values are not multiplied by the hydraulic diameter and have an inverse length dimension. The value of CFZp-d used by TRAC-M must be zero or positive. Although it is not modeled in this VESSEL component, applying a negative sign to a nonzero value of CFZL-d will result in TRAC-M internally evaluating the irreversible form loss of an abrupt flow-area change between the mesh cells adjacent to the interface. Then TRAC-M adds that value to the absolute value of CFZL-d and to the value of CFZV-d to define the phasic irreversible form losses.

70. VOL is the fraction of the VESSEL mesh-cell geometric volume occupied by coolant; 1.0–VOL is the fraction of the mesh-cell geometric volume occupied by structure. This is a different definition than the coolant volume in a mesh cell that VOL defines for 1D hydraulic components. For a 3D orthogonal mesh-cell volume, determining the coolant volume fraction for input usually is easier than determining the coolant volume.

71. FA-d (where d=T,Z,R or d=Y,Z,X defines the interface perpendicular-direction label in cylindrical or Cartesian geometry) is the fraction of the mesh-cell interface surface area for the positive face that is open to coolant flow (not blocked by structure). This is a different defining form than the flow area that FA defines for the mesh-cell interfaces in 1D hydraulic components.

72. The CONC solute concentration is the ratio of solute mass to liquid-coolant mass (not solute mass per unit volume). The ratio value of CONC does not necessarily go to zero as the ALPN gas-phase volume fraction goes to unity. The CONC array input is not required if ICONC = 0 (see input for note 64). ICONC = 1 only when ISOLUT = 1 (word 3 on Main-Data card 6).

73. Repeat level cards are useful for specifying input data for subsequent axial levels when two or more axial levels have identical data.

74. In level 8, the radial-interface flow-area fraction of 5.4000E-02 in "relative" cells 1, 3, and 5 models bypass flow from the downcomer to the upper plenum around the hot-leg pipe penetrations. Note that the flow-area fractions of the hot- and cold-leg pipe connections to their source-connection radial interfaces are not defined in the FA-R data. That area is defined by the source-connection junction interface flow area of the connecting 1D hydraulic components. Thus, for source-connection junction interfaces, FA-d = 0.0000E+00 is specified unless there is leakage flow across the interface (like the bypass flow internal to the VESSEL discussed above).

PIPE Component 2 : Guide tube 1.

75. This flow-tube PIPE component is inside the VESSEL component, see Fig. 5-6.

76. The PIPE-wall heat-transfer calculation will not be performed because NODES = 0. If NODES > 0 had been defined, the PIPE-wall heat-transfer calculation would be directly coupled only to the coolant inside the guide-tube PIPE component. A HTSTR component is needed if the PIPE-wall heat-transfer calculation is to couple the VESSEL coolant to the guide-tube coolant. Such heat-transfer coupling is not modeled.

77. The VESSEL-component source-connection junction data discussed in note 67 shows that JUN1 = 2 connects to the LISRF = 2 top interface of "relative" mesh cell LISRC = 1 in level LISRL = 7 of the VESSEL upper plenum and JUN2 = 94 connects to the LISRF = –2 bottom interface of "relative" mesh cell LISRC = 1 in level LISRL = 12 of the VESSEL upper head.

78. NAMELIST variable NFRC1 = 2 requires the user to input forward-direction and reverse-direction flow additive form-loss coefficients for all 1D hydraulic components. NAMELIST variable IKFAC = 1 also requires that the additive form-loss coefficients be defined as K factors rather than FRICs. Forward-direction flow models an abrupt contraction at the JUN1 junction interface (FRIC(1) = 0.5) and an abrupt expansion at the JUN2 junction interface (FRIC(5) = 1.0). Reverse-direction flow models the opposite condition.

79. NAMELIST variable ICFLOW = 2 requires that the choked-flow-model array ICFLG be input for all 1D hydraulic components. The choked-flow model is evaluated at each component interface I where ICFLG(I) = 1. For this component, the choked-flow model is not evaluated at any of its interfaces because ICFLG(I) = 0 for I=1,2,...,NCELLS+1.

80. When the flow-area change between adjacent mesh cells is abrupt, the user can define NFF(I) with a negative value and have TRAC-M internally evaluate the interface I irreversible form-loss KFAC (FRIC) or RKFAC (RFRIC) value. Otherwise, for an abrupt (as well as semiabrupt) flow-area change, the user needs to determine appropriate forward-direction and reverse-direction irreversible form-loss coefficient values and input them with the KFAC (FRI) and RKFAC (RFRIC) arrays. The later was done for this component as discussed in note 78. The former was not done because the abrupt flow-area change would have been based on the end mesh cell of PIPE component 2 and the source-connection junction mesh cell of VESSEL component 1. This would have resulted in the flow area in the VESSEL being dictated by the size of the VESSEL-component mesh cell. The actual flow area in the VESSEL may be larger or smaller than that of the VESSEL mesh cell. Because of this, a negative value of NFF(I) at a

source-connection junction to a VESSEL is not allowed. The user must input the flow-area change irreversible form-loss KFAC (FRIC) and RKFAC (RFRIC) values.

81. Zero velocities are input as the initial condition for the steady-state calculation. The CSS calculation then accelerates the primary-side coolant as a result of pump-impeller rotation and the secondary-side coolant as a result of different pressure boundary conditions until steady-state flow conditions are realized everywhere in the modeled system. Initiating steady-state calculations from no-flow conditions is easiest for the user to define. Otherwise, extreme care would need to be taken when defining nonzero velocities to avoid initial pack and stretch conditions in liquid-solid (ALP(I) = 0.0) mesh cells due to mismatched inflow and outflow. Such a steady-state initial solution estimate phasic velocity (and temperature) distribution can be defined internally by TRAC-M during the initialization phase of the calculation by using the hydraulic-path steady-state initialization procedure (see Section E.4.). Please note that for CSS type 1 controllers, the user's desired velocity or mass flow must be input to the VL and VV arrays at the PUMP-impeller interface.

82. The initial temperatures in the guide tubes in the VESSEL upper plenum are defined to be 581.0 K (586.1 °F). All components from the steam-generator outlets to the vessel cold-leg connections are defined to be the 559.1 K (546.7 °F) steady-state cold-leg temperature. Elsewhere on the primary side, except for the pressurizer, the initial temperatures have been defined to be the 591.1 K (604.3 °F) steady-state hot-leg temperature. Another approach would have been to define all primary-side temperatures (except for the pressurizer) to be the steady-state cold-leg temperature and then let the reactor-core power heat up the coolant to the hot-leg temperature condition. This avoids large variations in local temperature that would require more flow passes around the coolant loop to achieve converged steady-state conditions. This is especially true when CSS controllers are making inappropriate hardware adjustments based on local temperature conditions perturbed by the initial ramp-up in coolant flow.

83. The initial pressure in all primary-side components (except the PRIZER component) is defined by the 1.5500E+07 Pa (2.2481E+03 psia) steady-state hot-leg pressure. For ease in inputting the pressure distribution, hydraulic-head effects on the pressure in the initial stagnant coolant have been neglected. The CSS calculation will need to begin with a small initial timestep size (DTMIN = 1.0000E-03 s) to evaluate the initial rapid transient that establishes hydraulic-head effects in the pressure distribution.

PIPE Component 10 : Loop 1 hot-leg pipe (loop 3 has a TEE component whose side tube connects to the pressurizer).

84. A lumped-parameter heat-transfer model with NODES = 1 is defined for the PIPE wall. The accuracy requirements for this heat-transfer calculation depend upon the relative importance of the stored energy and/or heat losses through this PIPE wall during the accident scenario. NODES = 1 implies that the importance of this heat-transfer calculation accuracy is low. This noding would be appropriate for a very fast transient (i.e. LBLOCA) where there is insufficient time available for significant heat transfer to occur as compared with the reactor core or for a very slow transient (i.e. station blackout) where heat losses through the PIPE wall may be important but the actual transient response or small temperature gradient within the PIPE wall is not important.

85. The heat-transfer coefficients HOUTp (p=L,V defines the fluid phase) are 0.0000E+00 W m^{-2} K^{-1} (0.0000E+00 Btu h^{-1} ft^{-2} $°F^{-1}$) on the PIPE-wall outer surface defining an adiabatic boundary condition to the external environment. The external-environment fluid temperatures TOUTp are specified with realistic values of 3.0000E+02 K (8.0330E+01 °F) for air, but their values have no effect when their difference from the PIPE-wall outer-surface temperature is multiplied by HOUTp = 0.0000E+00 W m^{-2} K^{-1}. With an adiabatic boundary condition on the PIPE-wall outer surface, the heat-transfer calculation only couples the PIPE wall to the internal hot-leg coolant.

86. Defining NODES > 0 requires these additional records of input data be specified for the QPPP volumetric energy source, MATID material type, and TW temperature of the PIPE wall.

PIPE Component 12 : Loop 1 steam generator primary-coolant channel (a detailed noding diagram is shown in Fig. 5-7).

87. The steam-generator primary-coolant channel PIPE component 12 has NCELLS = 18 mesh cells with cells 3 through 16 having heat-transfer coupling to the secondary-coolant channel (see Fig. 5-7). The heat-transfer path between the primary and secondary sides is evaluated by HTSTR component ROD 910. The steam-generator secondary side is modeled by three components: PIPE component 100 models the boiler section which has heat-transfer coupling to the primary coolant of PIPE component 12, TEE component 105 models the steam separator and dome, and TEE component 190 models the downcomer and feedwater supply. A structure-surface roughness of EPSW = 0.0 m is defined for evaluating the wall-surface friction factor inside the steam-generator tubes.

88. Flow-area change and turning flow losses are specified in the KFAC and RKFAC additive loss coefficient K factors. The entrance and exit junction

interface values of 5.0000E-01 and 2.0000E-01 model expansion and contraction, respectively, for both flow directions, but the tube entrance and exit interface values of 3.0000e-01 and 5.0000e-01 model contraction and expansion, respectively, for only forward flow.

89. Nine of the NCELLS = 18 mesh cells are defined with the hot-leg temperature of 5.9110E+02 K (6.0431E+02 °F) and the other nine mesh cells are defined with the cold-leg temperature of 5.5910e+02 K (5.4671E+02°F). Without an initial coolant-flow condition, little is gained by modeling a gradual change in temperature from hot-leg temperature cell 2 to cold-leg temperature cell 16.

PUMP Component 16 : Loop 1 primary-coolant pump.

90. IPMPTR = 22 is the ID number of the trip that controls the PUMP component action. For pump type IPMPTY = 2, TRAC-M internally evaluates the pump-impeller rotation speed rather than defining it from the pump component-action table (which is not input by specifying IPMPSV = 0 and NPMPTB = 0). When trip ID 22 is set ON, the electrical power to the pump is tripped off and the pump-impeller rotational speed coasts down based on the inertia of its flywheel and its torque losses for pump type IPMPTY = 2.

91. ROMGMX = 5.0000E+01 rad s^{-2} (4.7746E+02 rpm s^{-1}) defines the maximum rate of change of the pump-impeller rotational speed. This maximum rate constrains the evaluated rate of change from pump type 2 (in this case) (or the defined rate of change from the pump component-action table for pump type IPMPTY = 1) and the controller-adjusted rate of change when a type 1 or type 3 CSS controller is applied to the PUMP component (in this case, a type 1 CSS controller is applied to PUMP component 16). A common modeling mistake is to define a value of 0.0000E+00 rad s^{-2} (0.0000E+00 rpm s^{-1}) for ROMGMX, which does not allow the pump-impeller rotational speed to change. The same situation applies to all other component-action types where an applied variation of the component action doesn't occur because the user specified a zero value for the component-action maximum rate of change parameter.

TEE Component 17 : Loop 1 cold-leg pipe section 1A.

92. IPOW1 = 1 models the component action of power deposited directly in the TEE main-tube coolant by the kinetic energy applied to the coolant by the upstream primary-coolant pump impeller rotation. IPOW2 = 0 deposits no power in the side-tube coolant.

93. Trip IPWTR1 = 22 controls the evaluation of the primary-side power-deposited-in-the-coolant component-action table. The table has |NPWTB1| = |–2| = 2 data pairs with a relative-value independent

variable (because NPWTB1 is negative valued). Its relative value is the summed change in problem time (defined by signal variable IPWSV1 = 1) during the time that trip ID 22 is set to $ON_{forward}$ (i.e., the timestep size multiplied by the trip set status, which is summed over all timesteps).

94. PWIN1 = 2.6670E+06 W (9.1002E+06 Btu h^{-1}) is the initial total power deposited in the coolant of the NCELL1 = 1 TEE main-tube mesh cell. If there is more than one main-tube mesh cell, the fractional portions of that total power that are deposited in each mesh cell are based on a constant power per unit length. The PWIN1 initial power is applied to the main-tube coolant if trip IPWTR1 = 22 is initially OFF. When trip 22 is set to $ON_{forward}$, the POWTB1 table is evaluated to determine the total power deposited in the main-tube coolant. The ordinate values of the input POWTB1 table were not renormalized during input because they are multiplied by PWSCL1 = 1.0000E+00. The user-specified RPWMX1 = 1.0000E+10 W s^{-1} (3.4121E+10 Btu h^{-1} s^{-1}) maximum rate of change of power deposited in the main-tube coolant will not constrain the maximum rate of 2.6670E+06 W s^{-1} (9.1002E+06 Btu h^{-1} s^{-1}) that the table evaluates between 0.0000E+00 s and 1.0000E+00 s. When trip ID 22 is set OFF after being $ON_{forward}$, the power deposited in the main-tube coolant is defined by PWOFF1 = 2.6670E+06 W (9.1002E+06 Btu h^{-1}). That means that setting trip ID 22 OFF after being $ON_{forward}$ [during which time the table-evaluated power decreases to 0.0 W (0.0 Btu h^{-1}) in one second] will result in the power being set back to its initial level at a maximum rate of RPWMX1 = 1.0000E+10 W s^{-1} (3.4121E+10 Btu h^{-1} s^{-1}). That requires PWOFF1/RPWMX1 = 2.6670E-04 s to ramp back up from zero to the PWOFF1 power level. The value of RPWMX1 is too large, because 2.667E-04 s is too short a time interval for ramping the pump-impeller rotational speed and its power deposited in the coolant back to its nominal operating condition. Because the setpoint delay times of trip ID 22 are DTSP(I) = 1.0000E+06 s, the initial OFF set status of trip ID 22 will not change during the transient calculation, and the power level will be constant at PWIN1 = 2.6670E+06 W (9.1002E+06 Btu h^{-1}) throughout the steady-state and transient calculations. Even though defining these large setpoint delay times prevents a pump trip from happening (and a ramp down of the power it deposits in the coolant directly), the modeling capability is already provided in the input data to model the effect of tripping the pump power off by redefining the trip 22 setpoint delay times to realistic delay-time values. Such is the case for this input-data TRACIN file where the transient calculation may be evaluated with or without the primary-coolant pumps being tripped depending upon the delay times of trip ID 22. This is a good example of the care that one must take in understanding an existing input-data model. All parameters of a model except one parameter may be set up to initiate a certain transient behavior. Not considering the value of that one parameter may lead the user to believe that the modeled transient behavior is being simulated in the TRAC-M calculation when it is not. A comment should be made at trip ID 22 and at PUMP components 16, 26, and 36 that the trip

ID 22 setpoint delay times of 1.0000E+06 s prevent a pump coastdown simulation.

TEE Component 22 : Loop 2 steam-generator primary-coolant channel.

95. TEE component 22 differs from PIPE component 12 in that it has a TEE rather than a PIPE modeling the steam-generator primary-coolant channel and a TEE rather than a PIPE component 200 modeling the boiler-section of the secondary-coolant channel. The side tubes of both these TEEs are connected to no-flow FILL components 202 and 203 for the steady-state calculation and to a PIPE component 202 for the transient calculation to model a single-tube, double-ended-guillotine break. The loop 2 steam generator in Fig. 5-9 doesn't show this modeling for a single-tube rupture because it is a generic model of the loop 2 steam generator for all possible transient-initiator conditions.

TEE Component 30 : Loop 3 hot-leg channel.

96. The modeling of this TEE component 30 hot-leg coolant channel is similar to that of PIPE component 10 except for its side tube that connects to the pressurizer modeled by components 40 through 48.

PIPE Component 40 : Pressurizer heater section.

97. IPOW = 1 models the heaters that deposit power directly in the coolant in the lower section of the pressurizer. This modeling feature of depositing power directly in the coolant is discussed for TEE component 17 (notes 92, 93, and 94) where power from the primary-coolant pump impeller rotation is deposited directly in the coolant.

98. POWIN = 2.0000E+05 W (6.8243E+05 Btu h^{-1}) defines the initial heater power deposited in the NCELLS = 3 mesh cells of PIPE component 40. Trip IPOWTR = –407 (evaluated during the steady-state calculation, because IPOWTR is negative as well as evaluated during the transient calculation) controls the evaluation of the component-action table for which there is no tabular data (NPOWTB = 0). This means that the table's independent variable, control block IPOWSV = –450, defines the heater power directly. The control-procedure logic that determines the output signal of control block –450 is shown in Fig. E-1.

99. The PIPE wall has heat-transfer coupling to the gas phase in the external environment with a heat-transfer coefficient of HOUTV = 4.0000E+01 W m^{-2} K^{-1} (7.0444E+00 Btu ft^{-2} $°F^{-1}$ h^{-1}) and an external gas temperature of TOUTV = 3.1000E+02 K (9.8330E+01 °F).

100. The input specified thermal-hydraulic state of PIPE component 40 should be near its steady-state values (slightly below or at saturated conditions) in

the lower heater section of the pressurizer. If the defined liquid is superheated (TL > TSAT), liquid inventory will be lost because of liquid flashing to vapor and vapor flowing out of the PRIZER component 42 lower junction (because a PRIZER is similar to a pressure boundary condition during a steady-state calculation; see note 101) from TEE component 41; if the liquid is too subcooled, the low heater power and near no-flow conditions will require a large amount of problem time to reach the steady-state condition. A similar comment applies to the other components modeling the pressurizer.

PRIZER Component 42 : Pressurizer steam dome and sprayer.

101. This is the upper-most steam-dome section of the pressurizer, which is modeled with a PRIZER component to maintain the pressurizer steady-state pressure during the steady-state calculation. TRAC-M achieves this during a steady-state calculation by internally modeling the physical size of a PRIZER component (except for its two junction flow areas) 1.0E+35 times larger.

102. PSET = 1.5500E+07 Pa (2.2481E+03 psia) is the desired pressure setpoint for heater/sprayer control during the transient calculation. DPMAX = 3.4400E+05 Pa (4.9893E+01 psia) is the pressure range for ramping the heater/sprayer power on. When the pressure falls below PSET, power is ramped on from zero to its maximum value of QHEAT as the pressure falls from PSET to PSET–DPMAX; when the pressure rises above PSET, power is ramped on from zero to its minimum value of –QHEAT as the pressure rises from PSET to PSET+DPMAX. The maximum heater power QHEAT has been set to 0.0000E+00 W (0.0000E+00 Btu h^{-1}) to turn this modeling feature off because the heater is being modeled by PIPE component 40 in the liquid lower section of the pressurizer. Doing this results in the sprayer (its effect approximated by power removal) also not being modeled by PRIZER component 42. The sprayer coolant mass flow is modeled more appropriately by FILL component 43 (see note 103).

FILL Component 43 : Pressurizer-sprayer mass-flow boundary condition.

103. The pressure-control subsystem of the pressurizer control procedure in Fig. E-1 evaluates a control block –434 output signal that is input to the mass-flow component actions of FILL components 43 and 93. Their mass-flow component-action tables are identical but have opposite numerical signs. Mass flow is withdrawn from the loop 3 cold leg by FILL component 93 and is injected into the pressurizer by FILL component 43 without modeling the physical piping and valve control that exists between the two locations.

VALVE Component 45 : Power operated relief valve (PORV).

104. Trip IVTR = 450 controls the opening and closing of the adjustable flow-area (at mesh-cell interface IVPS = 2) component action of VALVE component 45. The VTB1-array table defines a VALVE flow-area fraction adjustment rate of (1.0 – 0.0)/(2.0 s – 0.0 s) = 0.5 s^{-1} (based on its tabular data and its independent variable IVSV = 1 being a signal variable defining problem time). This is less than the RVMX = 2.0000E+00 s^{-1} maximum rate of adjustment. The adjustable-valve flow-area fraction will increase at a rate of 0.5 s^{-1} when the trip ID 450 set status is $ON_{forward}$ and will decrease at the same rate when the trip ID 450 set status is $ON_{reverse}$. The VALVE's adjustable flow-area fraction stays constant at its last evaluated flow-area fraction when trip ID 450 is OFF.

105. The FA(IVPS) = FA(2) = 1.9000E-02 m^2 (2.0451E-01 ft^2) interface flow-area input is replaced by the product of FAVLVE = 0.0000E+00 initially and AVLVE = 2.0400E-03 m^2 (2.1958E-02 ft^2) evaluated at the being of each timestep.

106. ICFLG(2) = 1 has been specified to have TRAC-M evaluate the choked-flow model at the VALVE's adjustable IVPS = 2 interface.

BREAK Component 47 : PORV atmospheric-pressure boundary condition.

107. BREAK component 47 defines a PIN = 1.0135E+05 Pa (1.4700E+01 psia) atmospheric-pressure boundary condition adjacent to the PORV adjustable interface.

108. Coolant flow through the PORV adjustable interface (when it is open) under-goes an expansion from an average flow area of VOL(1)/DX(1) = 1.9000E-02 m^2 (2.0451E-01 ft^2) in VALVE component 45 to an average flow area of VOLIN/DXIN = 2.9210E-01 m^2 (3.1441E+00 ft^2) in BREAK component 47 while passing through an orifice adjustable-valve flow area no greater than AVLVE = 2.0400E-03 m^2 (2.1958E-02 ft^2). VALVE component 45 needs to model both orifice and flow-area change irreversible form losses at VALVE interface IVPS = 2 with appropriate values for KFAC(2) and RKFAC(2).

FILL Component 49 : no-flow top end of the loop 1 accumulator.

109. The loop 1 accumulator is modeled by PIPE component 50, which requires the no-flow FILL component 49 connected to its JUN1 = 49 top end. The ACCUM component has been eliminated from TRAC-P, so a no-flow FILL and PIPE component replace it.

PIPE Component 50 : loop 1 accumulator.

110. PIPE component 50 replaces ACCUM component 50 because the ACCUM component is no longer modeled by TRAC-P. The PIPE's accumulator model option IACC = 1 is used to calculate the liquid level, volumetric liquid outflow, and discharged liquid volume and to implement the interface sharpener for an ACCUM-like model. The liquid-separator ACCUM-like model at the JUN2 junction (which doesn't allow the gas phase to cross the JUN2 interface) requires IACC = 2 and is not modeled by PIPE component 50.

111. Unlike the ACCUM component with no wall heat transfer, PIPE component 50 evaluates wall heat transfer with a NODES = 1 lumped parameter model. Heat transfer is evaluated from the PIPE's internal fluid to the gas phase in the external environment [where HOUTV = 5.0000E+00 W m^{-2} K^{-1} (8.8055E-01 Btu h^{-1} ft^{-2} $°F^{-1}$) and TOUTV = 3.2200E+02 K (1.1993E+02°F) for a very hot air environment].

VALVE Component 52 : Loop 1 accumulator check valve.

112. The accumulator check VALVE component 52 opens or closes in 1.0000E-01 s based on the VTB1 table where its independent variable is problem time defined by signal variable IVSV = 1. Evaluating the VTB1-table valve adjustment is based on trip IVTR = 520 control. The VTB1 table is linearly interpolated based on its independent variable being relative time (timestep size multiplied by the trip ID 520 set status that is summed each timestep) because NVTB1 = –2 has a negative value. Refer to note 58 for a description of how trip ID 520 changes its set status based on the trip signal's pressure difference across the VALVE's adjustable interface.

FILL Component 56 High-pressure injection system.

113. FILL component 56 models the high-pressure injection system (HPIS) mass flow as a function of the loop 1 cold-leg pressure. Trip IFTR = 21 is a safety-injection delivery signal trip (with a trip-controlled-trip trip signal defined by trips ITN(1) = 24, ITN(2) = 38, and ITN(3) = 60), which controls the mass-flow component-action table evaluation. Trip ID 21 is initially OFF and the FILL mass flow is FLOWIN = 0.0000E+00 kg s^{-1} (0.0000E+00 lb_m h^{-1}). When any one of the trip IDs 24, 38, and 60 is set to $ON_{forward}$, trip ID 21 is set to $ON_{forward}$ and the FILL mass-flow versus cold-leg pressure component-action table is evaluated. The mass flow evaluated from this table is constrained by a maximum rate of change of RFMX = 1.0000E+10 kg s^{-2} (7.9366E+13 lb_m h^{-1} s^{-1}). The VMTB table that is defined has its ordinate values (second, fourth, sixth, etc., values entered) scaled by the VMSCL = 2.4700E-01 factor. This is done because the table being input is the total HPIS mass flow for the plant vs pressure. The VMSCL scale factor indicates the fraction of the total HPIS mass flow going to loop 1, which is

based on the relative lengths of HPIS piping in each loop. If trip ID 21 is set OFF after being set to $ON_{forward}$, the mass flow is reset to FLWOFF = 0.0000E+00 kg s^{-1} (0.0000e+00 lb_m h^{-1}) at a RFMX maximum rate of change in mass flow to get there.

PIPE Component 100 : Loop 1 steam-generator boiler section.

114. PIPE component 100, which had been an internal secondary-side component of STGEN component 12, is modeled identically as a separate component.

TEE Component 105 : Loop 1 steam-generator separator and dome sections.

115. TEE component 105, which had been an internal secondary-side component of STGEN component 12, is modeled as a separate component. Its previous JCELL = 5 cell has been divided into 3 equal size cells 5, 6, and 7 with JCELL = 6 to satisfy the TEE user guideline that the main-tube flow area not changed between JCELL–1 and JCELL+1.

TEE Component 110 : Loop 1 main steam line.

116. The choked-flow model evaluation flag ICFLG is set to 1 at two mesh-cell interfaces. The first location is at the flow-limiter orifice junction 110 where the main steam line connects to the steam-generator steam dome; the second location is at a flow-area reduction (venturi meter). These flags are set to model choked-flow conditions that may occur at these locations if a main-steam-line break is modeled in a transient calculation that restarts from the final data dump of this steady-state calculation.

117. NFF = –1 is defined at five mesh-cell interfaces to model the irreversible form losses of flow-area changes that are assumed to be abrupt between the mesh cells on each side of the interface. The irreversible form loss due to the flow-limiter orifice at mesh-cell interface 1 is not modeled by KFAC(1) and RKFAC(1), and its irreversible form loss should be modeled. NFF < 0 only models the irreversible form loss effect of flow-area change between mesh cells on each side of the interface and not between a mesh cell and its interface for an orifice plate.

118. NFF(1) = –1 at the internal junction to the TEE side tube does not model the irreversible form losses due to flow turning into or out of the side tube and due to an abrupt change in flow area between the main tube and side tube. To make the user aware of this, NFF(1) < 0 is not allowed at the internal-junction interface. KFAC(1) and RKFAC(1) need to be defined with those irreversible form losses. A flow-area change between JCELL and the first cell of the TEE side tube requires that KFAC(1) and RKFAC(1) be defined with a positive value. That positive value has been defined to be very

small, KFAC(1) = RKFAC(1) = 1.0000E-10. The TEE JCELL-interface motion-equation momentum-convection terms in TRAC-M have derivational errors that evaluate additional flow losses across the three JCELL interfaces. These additional flow losses are assumed to approximate the irreversible form losses such that they do not need to be input specified by the KFAC(1) and RKFAC(1) values.

FILL Component 114 : Loop 1 main steam-line safety-relief valve.

119. FILL component 114 is used to model a bank of four safety-relief valves. This is a good example of using a simple model to describe a complex hardware system. In cases such as this, a simple model is sufficient for modeling the essential nature of the hardware system as it affects the phenomena of interest in the transient.

120. The VMTB component-action table, which is not trip controlled (IFTR = 0) and is evaluated each timestep only during the transient calculation, defines coolant mass flow as a function of signal variable IVSV = 1121, the pressure in the steam-line header of TEE component 112 upstream of the safety-relief valves. There is no mass flow for pressures <7.5500E+06 Pa (1.0950E+03 psia); mass flow increases from 0.0000E+00 kg s^{-1} (0.0000E+00 $lb_m h^{-1}$) to a maximum value of 4.3200E+02 kg s^{-1} (3.4286E+06 $lb_m h^{-1}$) (when all four safety-relief values are open) as the pressure increases from 7.5500E+06 Pa (1.0950E+03 psia) to 8.2000E+06 Pa (1.1893E+03 psia).

VALVE Component 116 : Loop 1 main steam-line power-operated relief valve.

121. VALVE component 116 has its adjustable-interface flow-area fraction defined by control block IVSV = –1162 because its component-action table has no tabular data (NVTB1 = 0). Control block –1162 is defined by the control logic in Fig. E-3. The rate of flow-area fraction change defined by control block –1162 is constrained by RVMX = 5.0000E+00 s^{-1} before applying it to the VALVE's adjustable interface at IVPS = 2.

122. ICFLG(2) = 1 specifies that TRAC-M is to evaluate the choked-flow model at the VALVE's adjustable interface at IVPS = 2.

VALVE Component 120 : Loop 1 main steam-line isolation (control) valve.

123. VALVE component 120 models both the main steam-line isolation valve and the downstream piping. This practice minimizes the number of components as suggested in the general guidelines.

124. The adjustable flow-area fraction of this VALVE is specified to be FAVLVE = 4.0000E-01 at steady state. This closure state is highly uncertain. Its should be adjusted to give an upstream cell pressure of 5.4158E+06 Pa

(7.8550E+02 psia), which corresponds to a steam-generator steam dome pressure of 5.5158E+06 Pa (8.0000E+02 psia). This had been done by a CSS type 2 controller in the previous input-data model, but was eliminated from this input-data model because of an over-constraint concern as to why steady-state convergence wasn't being satisfied. While secondary-side oscillatory behavior continues to prevent steady-state convergence, the magnitude of the oscillatory behavior is less without the CCS type 2, 3, and 4 (now 5) controllers. This is probably the result of eliminating the over-constraint condition of the CSS type 4 (now 5) controllers. The CSS type 2 and 3 controllers should be reintroduced to this steady-state calculation model the next time it is evaluated to adjust appropriately the secondary-side pressure and feedwater mass flow of each steam generator. If this isolation valve is to be kept 100% open rather than operated as a steam-flow control valve (SFCV), then the turbine-pressure boundary condition of BREAK component 424 should be adjusted.

VALVE Component 154 : Loop 1 main feedwater-control valve.

125. VALVE component 154 has two control procedures applied to it during the transient calculation:

a. before trip IVTROV = 422 was set from OFF to $ON_{reverse}$, control block IVSV = –1014 adjusts the VALVE's adjustable-interface flow-area fraction with a RVMX = 1.0000E-02 s^{-1} maximum rate of change because the VALVE component-action table has no tabular data (NVTB1 = 0); the level-control logic in Fig. E-2 defines control block –1014 to maintain the steam-generator secondary-side liquid level, and

b. when trip IVTROV = 422 is set to $ON_{reverse}$, the VALVE's adjustable-interface flow area is ramped closed at a flow-area fraction closure rate of RVOV = 5.0000E-02 s^{-1}.

FILL Component 169 : Loop 1 steam-driven auxiliary feedwater mass flow.

126. Initially, the auxiliary feedwater mass flow is FLOWIN = 0.0000E+00 kg s^{-1} (0.0000E+00 lb_m h^{-1}) until the component-action table controlling trip IFTR = 28 is set from OFF to $ON_{forward}$. Control block IFSV = –1005, which defines the loop 1 steam-generator secondary-side liquid level, is the auxiliary feedwater mass-flow component-action table independent variable. Fig. E-2 shows the steam-generator liquid-level control logic defining control block –1005. The VMTB table has NFTB = 2 tabular data pairs. Trip ID 28 requires that trip ID 46 be set to $ON_{forward}$ followed by a 30.0 s setpoint delay time before trip ID 28 is set to $ON_{forward}$. Trip ID 46 requires that 2 of the 3 trips (IDs 1010, 2010, and 3010) that monitor the liquid level in each of the steam generators be set to $ON_{forward}$ before trip ID 46 is set to $ON_{forward}$. Because of the magnitude of their trip ID numbers affecting the order of their evaluation each timestep, trip ID 46 will be set to $ON_{forward}$ one

timestep after 2 of its 3 trips are set to $ON_{forward}$ and trip ID 28 will be set to $ON_{forward}$ 1 timestep after that. Therefore, a time delay of 30.0 s plus 2 timesteps have been built into this trip-control logic.

FILL Components 202 and 203: Loop 2 steam-generator double-ended guillotine-break single-tube rupture modeling.

127. FILL components 202 and 203 define no-flow boundary conditions at the junction 201 and 203 connections to the primary- and secondary-coolant sides of the loop 2 steam generator during the steady-state calculation. At the start of the transient calculation, both FILL components will be eliminated and replaced by a new PIPE component 202 to provide a leakage path between the steam generator primary- and secondary-coolant sides. The PIPE's flow area is twice the inside flow area of a single tube because the double-ended-guillotine break, single-tube initiator for the transient results in flow out of both break ends of the single tube. The two halves of the single tube provide a two-tube leakage path between the primary- and secondary-coolant sides.

VALVE Component 432 : Steam-dump valve A in bank 2.

128. Refer to Fig. E-3 for the control-system logic used by VALVE component 432 to model two steam-dump valves.

HTSTR Component ROD 900 : Reactor-core fuel rods.

129. HTSTR component ROD 900 evaluates a 2D heat-transfer calculation (IAXCND = 1) in powered (NOPOWR = 0) cylindrical-geometry ROD elements. The heat-transfer calculation in the axial direction is evaluated with explicit numerics because NAMELIST variable NRSLV = 0 (default value). Specifying NRSLV = 1 to evaluated implicit numerics is recommended when a fine axial-mesh calculation is to be performed. The fine mesh may be either input defined or automatically generated by TRAC-M (see notes 137 and 138). Trip IRFTR = 9997 controls the automatic generation of a fine axial mesh by TRAC-P.

130. The neutronic power in NCRX = 6 average ROD elements and NRODS – NCRX = 12 – 6 = 6 supplemental (peak-power) ROD elements will be determined from the solution of the reactor point-kinetics equations (IRPWTY = 4) with no reactivity feedback (IRPWTY < 10). Reactivity feedback (based on the fuel temperature, coolant temperature, gas volume fraction, and solute concentration changing in the fueled-core region) is modeled when 10 is added to the value of IRPWTY. Each of the I = 1,...,6 average ROD elements represents RDX(I) = 5.3380E+03 fuel-rod elements in the reactor core.

131. Programmed reactivity is initially REACT = 0.0000E+00 and defined by the trip IRPWTR = 10 controlled component-action table RPWTB to simulate control-rod insertion into the reactor core. The independent variable of table RPWTB is relative problem time (based on signal variable IRPWSV = 1 and the number of tabular data pairs NRPWTB = –4 having a negative value). Relative problem time is the summed time intervals during which trip ID 10 is set to $ON_{forward}$ (evaluated as the timestep size multiplied by the trip ID 10 set status and summed overall all timesteps).

132. During the steady-state calculation, the reactor-core power is initially zero until NAMELIST-variable problem time TPOWR = 2.0 s when the power is set on at its RPOWRI = 2.3000E+09 W (7.8479E+09 Btu h^{-1}) steady-state power level. During the transient calculation, the total power is held constant at its initial RPOWRI power level (because REACT = 0.0) until trip IRPWTR = 10 is set from OFF to $ON_{forward}$ and the reactor point-kinetics equations are evaluated for the total reactor-core power.

133. NDGX = 6 delayed-neutron groups and NDHX = 11 decay-heat groups are modeled as part of the reactor point-kinetics equation calculation. Because NDGX and NDHX are input specified with positive values rather than 0, their group constants and concentrations are input in the array-data section rather than defined by the default 6 delayed-neutron and 69 decay-heat group parameters in TRAC-P.

134. The axial power-shape component-action table has only NZPWTB = 1 datum pair with one problem time (signal variable IZPWSV = 1) value and one axial-power shape with NCRZ + 1 = 5 values. Thus, the axial-power shape will be constant and will not change its shape during the transient as well as the steady-state calculation. Because NZPWZ = 0 is not > 1, the axial-power shape defined by the table has NCRZ + 1 = 5 values rather than NZPWZ values. NZPWI = 0 indicates the input axial-power shape has a histogram shape with step changes at the midpoints between the axial node rows of the ROD element.

135. Each ROD element has NODES = 8 radial nodes (NODES – 1 = 7 radial intervals) and NCRZ = 4 axial intervals between node rows (NCRZ + 1 = 5 axial node rows).

136. The NODES – 1 = 7 radial intervals between nodes have mixed-oxide fuel in the first four intervals [MATRD(I) = 1 for I=1,2,3,4], gap gases in the fifth interval [MATRD(5) = 3], and zircaloy cladding in the last two intervals [MATRD(I) = 2 for I=6,7]. Material-type assignments to intervals can be made arbitrarily except that gap gases cannot be assigned to the first or last interval because the gas needs to be contained between structures within the element. The radial location of each node in the ROD element is defined by array RADRD.

137. Trip IRFTR = 9997 controls the addition of fine axial-mesh permanent and temporary node rows to the input-specified axial mesh (see note 135). Trip 9997 is defined to be set from OFF to $ON_{forward}$ at 1.0000E+10 s. Thus, such an addition of node rows will not take place during the normal evaluation of the TEND = 2.0000E+02 s steady-state calculation. This modeling capability to add axial-direction fine-mesh node rows, however, can be implemented by changing the trip 9997 setpoint SETP(2) = 1.0000E+10 s to a problem time that will be reached during the steady-state calculation.

138. The permanent axial mesh addition defined by NFAX(I) = 5 adds 5 node rows to each of the 4 axial intervals for a total of 25 axial node rows when trip 9997 is set to $ON_{forward}$. The addition of up to 175 additional temporary node rows (up to a maximum of NZMAX = 200 node rows) may be done by TRAC-M based on internally programmed criteria. When trip 9997 is set OFF, both the temporary and permanent node rows that were added are removed from the 2D heat-transfer calculation's axial mesh (leaving the input axial mesh of NCRZ + 1 = 5 node rows).

139. Each of the NCRX = 6 average and NRODS–NCRX = 6 supplemental ROD elements (discussed in note 130) have their RADRD(8) = 5.3848E-03 m (1.7667E-02 ft) outer radial surface (IDBCO = 2) heat-transfer coupled to the hydraulic cells in each of the 6 azimuthal (theta) sectors of ring 1 (based on array IDROD input) of VESSEL component NHCOMO = 1 in axial levels 3 through 6 of the fueled reactor-core region (based on array NHCELO input).

140. The RADRD(1) = 0.0000E+00 m (0.0000E+00 ft) inner radial surface has an adiabatic (IDBCI = 0) heat-transfer boundary condition.

141. The Z array defining the axial location of the axial node rows must have the same ΔZ interval widths as the ΔZ (DX for 1D hydraulic components) interval widths of the hydraulic cells the node-row intervals are coupled to. The Z-array element values, however, can be shifted by a constant amount between their heat structure and hydraulic component definitions. In the present case, both the Z-array elements and their ΔZ intervals in HTSTR component ROD 900 are the same as the Z array defined for VESSEL component NHCOMO = 1 that the ROD-element outer surface is coupled to.

HTSTR Component SLAB 901 : Structure SLABs in the VESSEL.

142. HTSTR component SLAB 901 evaluates a 1D heat-transfer calculation (IAXCND = 0) in unpowered (NOPOWR = 1) Cartesian-geometry SLAB elements.

143. There are NCRX = 12 average SLAB elements that are heat-transfer coupled on their outer surface (IDBCO = 2) to the hydraulic cells in the 6

azimuthal (theta) sectors of ring 1 and 6 azimuthal sectors of ring 2 in level 1 of VESSEL component NHCOMO = 1. Array IDROD defines the azimuthal and ring relative-cell locations; array NHCELO defines the axial location. For coupling to a VESSEL component, the axial-level number below node row 1 should be the NHCELO(2) = 1 axial-level number above node row 1 with a negative value (i.e., NHCELO(1) = –1), and the axial-level number above node-row NCRZ + 1 = 2 should be the NHCELO(2) = 1 axial-level number below node-row NCRZ + 1 plus 1 (i.e., NHCELO(3) = 2). There are no supplemental SLAB elements because NRODS – NCRX = 6 – 6 = 0. This should be the case for all unpowered (NOPOWR = 1) ROD or SLAB elements.

HTSTR Component ROD 910 : Loop 1 steam-generator tubes.

144. The 14 heat-transfer paths between the loop 1 steam-generator primary- and secondary-coolant sides of STGEN component 12 are now modeled by HTSTR component ROD 910 with NCRX = 1 element having NCRZ = 14 axial intervals between node rows. HTSTR component RODs 920 and 930 do the same for STGEN components 22 and 32 of loops 2 and 3. The geometry modeling is identical except that the HTSTR nodes are at the hydraulic-cell edges while the STGEN nodes were at the hydraulic-cell centers. This results in a slight difference in their numerical solution for coarse mesh-cell sizes.

HTSTR Component SLAB 931: Loops 1, 2, and 3 steam-generator wrapper wall between the boiler and downcomer sections.

145. The 10 heat-transfer paths between the steam-generator 7 boiler cells plus 3 steam-separator cells and the 10 downcomer cells of STGEN components 12, 22, and 32 are now modeled by HTSTR component SLAB 931 with NCRX = 3 elements (one for each loop's steam generator) having NCRZ = 12 axial intervals between node rows. There are 2 more axial intervals than STGEN heat-transfer paths because the downcomer TEE JCELL = 2 was divided equally into 3 cells to satisfy the TEE user guideline. One STGEN heat-transfer path became 3 axial intervals between node rows.

146. Each of the NCRX = 3 SLAB elements of this HTSTR are coupled to different 1D hydraulic components of the 3 coolant loops. This multiple 1D hydraulic-component coupling is modeled by specifying M1D > 0 and inputting multiple sets of the NHCOMI, NHCELI, NHCOMO, and NHCELO arrays to define the hydraulic coupling of each SLAB element. HTSTR components RODs 932 to 938 model the remaining heat-transfer structures of all 3 steam generators in a similar manner. TRAC-M requires that such multiple 1D hydraulic-component coupled HTSTRs (with M1D > 0) be input after all single hydraulic-component coupled HTSTRs (with M1D = 0). Their M1D identification numbers must be different and

increase in value with the order of inputting such multiple 1D hydraulic-component coupled HTSTRs.

E.7. Timestep Data

Three sets of timestep data have been defined for the CSS calculation. Each set, applied during a specific problem-time domain, provides the user with the ability to define the timestep-size range and the frequency of generating various solution-state output edits. The TRAC-M user needs to have insight into the dynamics of the solution and the times that solution information is needed in order to specify these output-edit frequencies appropriately.

147. DTMIN defines the minimum timestep size that TRAC-M will use until problem time TEND. A TRAC-M error message will be generated and the calculation terminated if the timestep size needs to be reduced below the DTMIN value. DTMIN is used as the initial timestep size for an initial (nonrestart) calculation unless NAMELIST variable DTSTRT > 0.0 s or NAMELIST variable ICDELT = 1 is defined. DTMAX defines the maximum timestep size that TRAC-M will use until problem time TEND. Selecting an appropriate value is important. Selecting too small a value for DTMAX will result in TRAC-M executing at that timestep size for most of the calculation and requiring more timesteps than it would if a larger timestep size had been used to evaluate a given amount of problem time. Selecting too large a value for DTMAX may result in TRAC-M internally increasing the timestep size to a large value and then getting into numerical difficulty converging a timestep solution when the solution varies more rapidly. Trying to recover with backup calculations that reduce the timestep size to a very small value may end up requiring more calculative effort than if a smaller DTMAX value had been used. Sometimes after numerous backups, the TRAC-M calculation is unable to recover, even after reducing the timestep size to DTMIN, and the calculation terminates with a warning message saying that the timestep size cannot be reduced further. TEND is the ending problem time for using the parameters in the timestep data set. The last timestep data set TEND (before DTMIN < 0.0) defines the problem time to end the calculation. Heat transfer is evaluated with the timestep size multiplied by |RTWFP| in a steady-state calculation when RTWFP is positive valued and in a transient calculation when RTWFP is negative valued. Numerical solution difficulties can occur when too large a value of RTWFP is used when axial heat-transfer is evaluated with explicit numerics. RTWFP = 100.0 is larger than the recommended value of 10.0, but a larger value can be used when the axial distance between node rows is large (>1.0000E-01 m, >3.2808E-01 ft). The magnitude of RTWFP should be reduced toward the value of 1.0 with each timestep data set. Accelerated convergence of the heat-transfer solution to its steady-state solution is no longer needed after the initial 5 or 10 s of problem time, and temperature oscillations that may prevent steady-state convergence can be avoided. POWERC = 1.0000E+20 turns off

the convection-power difference timestep-size control that limits the explicit temporal error of evaluating HTSTR-component surface convection heat-transfer coupling to the fluid of hydraulic components.

148. The parameters EDINT, GFINT, DMPINT, and SEDINT on the second record of a timestep data set define the time intervals between large edits to the TRCOUT file, graphics edits to the TRCXTV file, data-dump edits to the TRCDMP file, and short edits to the TRCOUT file, respectively. A short edit also is generated every time a large edit is generated. For a large system model, the printout from each large edit can be 5,000 to 10,000 lines, so you need to select the EDINT edit interval with care to avoid generating data that is too voluminous to effectively use. The short and large edits from this Westinghouse three-loop plant model require 33 and 9722 lines, respectively, in the TRCOUT file. At Los Alamos, XTV-generated graphics are used extensively to examine and understand calculative results. The GFINT graphics interval you select should depend on the time frame of the calculation that is to be plotted. Slowly varying results may require only 100 time points of data; rapidly varying results may require 400 to 800 time points of data. When both situations occur in a single calculation, different timestep data sets with GFINT being large during the slow portion/s and small during the rapid portion/s can provide appropriate detail where needed in time. The DMPINT time interval between restart data dumps needs to reflect the amount of TRAC-M calculative effort between data dumps (that would have to be partially redone when a restart calculation has to go back further in time than desired to the first available data dump), the likelihood that such a restart calculation would ever need to be done (because of the unforeseen times for branch calculations or because of a TRAC-M error exit), and the problem times when planned branch calculations are to be started. The cost of storing massive restart data-dump files (because of frequent data dumps) for long periods of time should also be considered.

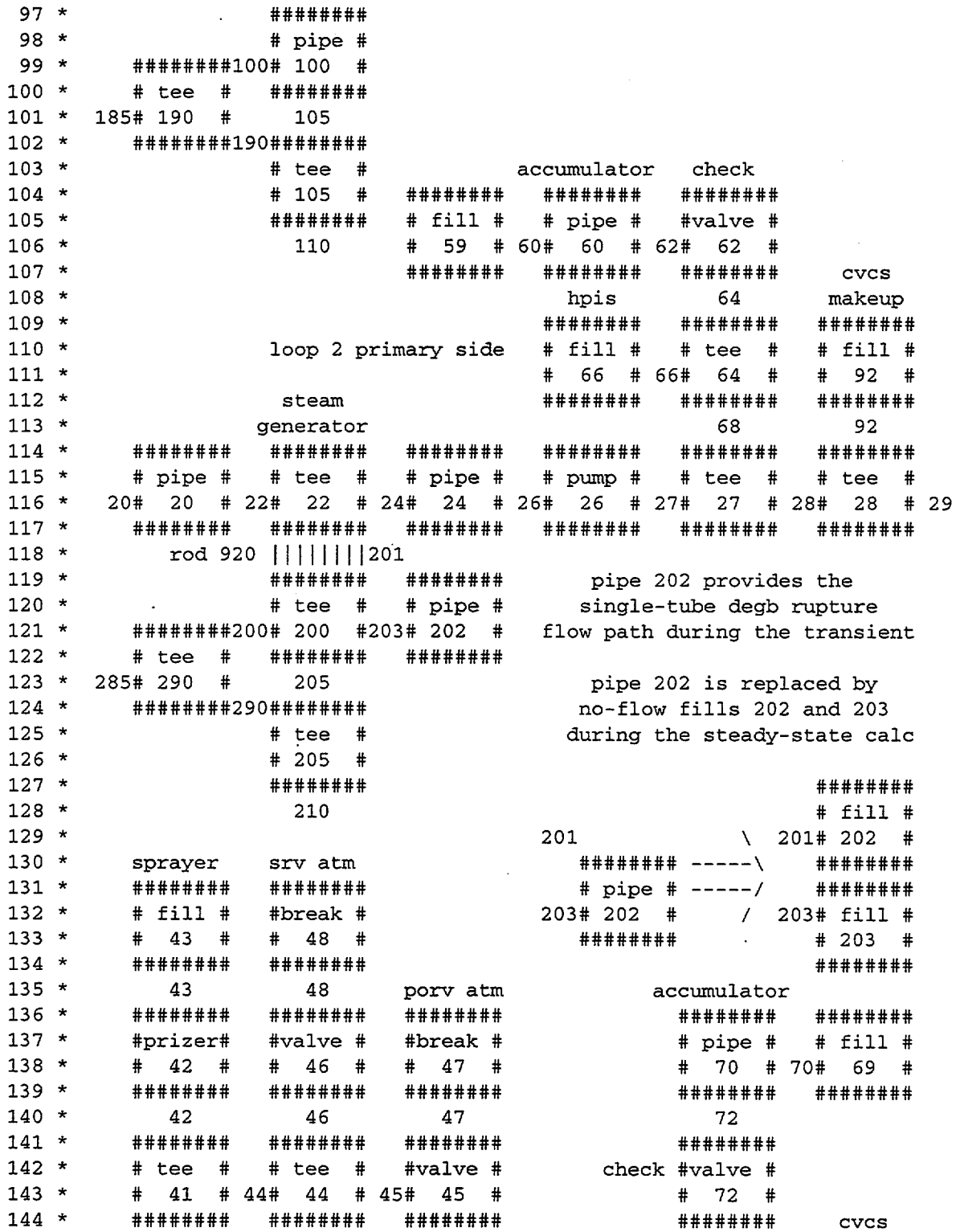
149. A record with a negative real value in the first fourteen-character word field (to be read in for DTMIN) must follow the last timestep data set.

E.8. Input-Data TRACIN File Listing

The input-data TRACIN file listing for the Westinghouse three-loop plant model begins on the next page.

```
 1 free format
 2 *
 3 *************
 4 * main data *
 5 *************
 6 *
 7 *       numtcr          ieos          inopt          nmat          id2o
 8             27             0              1             0             0
 9 this is a sample problem for the trac-p users guide manual.  it models
10 a westinghouse 2308-mwt powered nuclear-core, three-loop pressurized
11 water reactor with constrained steady-state and transient calculations.
12 this full-plant model evaluates a steam-generator single-tube double-
13 ended-guillotine break transient with primary-coolant pumps operating.
14 this input-data model contains the following components and subsystems:
15   1) three-dimensional (r=2,t=6,z=12) reactor vessel;
16   2) vessel upper-plenum guide tubes;
17   3) powered-rod and unpowered-slab heat structures in the vessel;
18   4) three primary- and secondary-coolant loops modeled individually;
19   5) makeup, letdown, and pressurizer-sprayer cvcs flows;
20   6) accumulator and hpsi fills in each primary-coolant loop;
21   7) pressurizer and pressurizer porv and srv;
22   8) pressurizer, steam generator, and steam-dump control systems;
23   9) single-tube degb leakage path in loop 2 steam generator;
24  10) main-steam and steam-dump lines;
25  11) high-pressure feedwater system after hp heaters; and
26  12) auxiliary-feedwater fills (motor and steam driven).
27 the w3loop input-data model has the following developmental history:
28   james lime created the trac-pf1/mod1 input-data model on 7/84.
29   robert steinke converted the trac-pf1/mod1 input-data model with
30   gocnvt to a trac-pf1/mod2 input-data model and added component-
31   network diagrams on 9/90. marvin salazar added units labels to
32   the control blocks and trips for si/english units i/o on 10/93.
33   robert steinke replaced stgen components with htstr, pipe, and tee
34   components on 2/96.  James lime upgraded the w3loop input-data model
35   to be consistent with the current h.b.robinson plant model on 5/96.
36 *
37 *              vessel component 1 contains:
38 *                   6 guide-tube pipe components 2 to 7,
39 *                   1 powered rod heat-structure component 900
40 *                and 9 unpowered slab htstr components 901 to 909
41 *
42 *              ##########################################
43 *     level 12 ########## slab 909  94,96,98 95,97,99 #####
44 *              ##########-----------|-| |---| |--##########
45 *           11 #slab 908| slab 905  | | |   | |pipes 3,5,7#
46 *              #--------|-----------|-| |---| |--|--------#
47 *           10 #slab 908| slab 905  | | |   | |  |        #
48 *              #--------|-----------|-| |---| |--|--------#
```

```
49 *            9 #slab 907| slab 905  | | |  3,5,7 |        #
50 *              #--------|----------|-| |--------|--------#
51 *            8 #slab 906| slab 905  | | |pipes 2,4,6      #
52 *              #--------|----------|-| |--------|--------#
53 *            7 #slab 903| slab 905  |2,4,6       |        #
54 *              #--------|----------|------------|--------#
55 *            6 #slab 903| slab 904  |  rod 900   |        #
56 *              #--------|----------|------------|--------#
57 *            5 #slab 903| slab 904  |  rod 900   |        #
58 *              #--------|----------|------------|--------#
59 *            4 #slab 903| slab 904  |  rod 900   |        #
60 *              #--------|----------|------------|--------#
61 *            3 #slab 903| slab 904  |  rod 900   |        #
62 *              #--------|----------|------------|--------#
63 *            2 #slab 903| slab 902  |            |        #
64 *              #--------|----------|------------|--------#
65 *            1 #slab 901| slab 901  |            |        #
66 *              ##############################################
67 *                ring 2   ring 1   c.l.  ring 1    ring 2
68 *
69 *                    the vessel has 6 azimuthal sectors with
70 *       level 8, ring 1, +3 face source connections in sectors 1,3,5
71 *                      with junction numbers 10,20,30 and
72 *       level 8, ring 2, +3 face source connections in sectors 2,4,6
73 *                      with junction numbers 19,29,39
74 *
75 *         guide-tube pipe components 2, 3, ..., 7 junction numbers
76 *         are 2&94, 3&95, ..., 7&99 with +2 and -2 face connections
77 *
78 *                  these rod and slab heat-structure components
79 *        have a structure element in each of the 6 azimuthal sectors
80 *
81 *                                          accumulator   check
82 *                                 ########   ########   ########
83 *                                 # fill #   # pipe #   #valve #
84 *                                 #  49  # 50#  50  # 52#  52  #
85 *                                 ########   ########   ########     cvcs
86 *                                              hpis         54       letdown
87 *                                            ########   ########   ########
88 *                    loop 1 primary side     # fill #   # tee  #   # fill #
89 *                                            #  56  # 56#  54  #   #  91  #
90 *                     steam                  ########   ########   ########
91 *                    generator                            58         91
92 *          ########   ########   ########   ########   ########   ########
93 *          # pipe #   # pipe #   # pipe #   # pump #   # tee  #   # tee  #
94 *       10#  10  # 12#  12  # 14#  14  # 16#  16  # 17#  17  # 18#  18  # 19
95 *          ########   ########   ########   ########   ########   ########
96 *             rod 910 ||||||||
```


########
pipe
########100# 100 #
tee #
185# 190 # 105
########190########
tee
105 # ######## # fill
######## 110 # 59 #
########
loop 2 primary side
steam
generator
######## ######## ######## ######## ######## ########
pipe # # tee # # pipe # # pump # # tee # # tee
20# 20 # 22# 22 # 24# 24 # 26# 26 # 27# 27 # 28# 28 # 29
######## ######## ######## ######## ######## ########
rod 920 ||||||||201
######## ########
tee # # pipe
########200# 200 #203# 202 #
tee # ########
285# 290 # 205
########290########
tee
205
########
210
accumulator check
######## ########
pipe # #valve
60# 60 # 62# 62 #
######## ########
hpis 64
######## ######## ########
fill # # tee # # fill
66 # 66# 64 # # 92
######## ######## ########
68 92
pipe 202 provides the
single-tube degb rupture
flow path during the transient
pipe 202 is replaced by
no-flow fills 202 and 203
during the steady-state calc
########
fill
201 \ 201# 202 #
######## -----\ ########
pipe # -----/
203# 202 # / 203# fill #
######## · # 203 #
########
sprayer srv atm
######## ########
fill # #break
43 # # 48
######## ########
43 48 porv atm accumulator
######## ######## ######## ######## ########
#prizer# #valve # #break # # pipe # # fill #
42 # # 46 # # 47 # # 70 # 70# 69
######## ######## ######## ######## ########
42 46 47 72
######## ######## ######## ########
tee # # tee # #valve # check #valve
41 # 44# 44 # 45# 45 # # 72
######## ######## ######## ######## cvcs

```
145 *        41                                  hpis        74        sprayer
146 *     ########                              ########    ########    ########
147 *     # pipe #   loop 3 primary side       # fill #    # tee  #    # fill #
148 *     #  40  #                             #  76  # 76#  74  #    #  93  #
149 *     ########    steam                    ########    ########    ########
150 *        40     generator                                 78          93
151 *     ########   ########   ########    ########    ########    ########
152 *     # tee  #   # pipe #   # pipe #    # pump #    # tee  #    # tee  #
153 *   30#  30  # 32#  32  # 34#  34  # 36#  36  # 37#  37  # 38#  38  # 39
154 *     ########   ########   ########    ########    ########    ########
155 *        rod 930 ||||||||
156 *                ########
157 *                # pipe #
158 *     ########300# 300  #
159 *     # tee  #    ########
160 *  385# 390  #      305
161 *     ########390########
162 *                # tee  #
163 *                # 305  #
164 *                ########
165 *                  310
166 *
167 *     the tubes of each steam generator are modeled by rods 910,920,930
168 *     remaining structure of all three steam generators are modeled by
169 *     slab 931 for the wrapper between the boiler/st.dome and downcomer
170 *     rods 932 and 933 for the lower and upper outer shells
171 *     rods 934 and 935 for the inlet and outlet tube sheets
172 *     rods 936 and 937 for the inlet and outlet lower plena
173 *      rod 938 for the secondary dryers
174 *
175 *     loop 1 secondary side                loop 2 secondary side
176 *       srv      porv atm                  porv atm     srv
177 *     ########   ########                  ########   ########
178 *     # fill #   #break #                  #break #   # fill #
179 *     # 114  #   # 118  #                  # 218  #   # 214  #
180 *     ########   ########                  ########   ########
181 *       114        118                       218        214
182 *     ########   ########                  ########   ########
183 *     # tee  #   #valve #                  #valve #   # tee  #
184 *     # 112  #116# 116  #                  # 216  #216# 212  #
185 *     ########   ########                  ########   ########
186 *       112                                             212
187 *     ########   ########   ########   ########   ########
188 *     # tee  #   #valve #   # tee  #   #valve #   # tee  #
189 *  110# 110  #120# 120  #122# 400  #222# 220  #220# 210  #210
190 *     ########   ########   ########   ########   ########
191 *                             410              turbine-stop  turbine b.c.
192 *     ########   ########   ########   ########   ########   ########
193 *     # tee  #   #valve #   # tee  #   # tee  #   #valve #   #break #
```

```
*  310# 310  #320# 320  #322# 410  #420# 420  #422# 422  #424# 424  #
*     ########   ########   ########   ########   ########   ########
*       312                              430
*     ########   ########              ########   ########   ########
*     # tee  #   #valve #              # tee  #   #valve #   #break #
*     # 312  #316# 316  #              # 430  #436# 436  #438# 438  #
*     ########   ########              ########   ########   ########
*       314        318                   432   steam-dump b  condenser
*     ########   ########              ########   ########     b  b.c.
*     # fill #   #break #              #valve #   #break #
*     # 314  #   # 318  #              # 432  #434# 434  #
*     ########   ########              ########   ########
*       srv      porv atm           steam-dump a  condenser a b.c.
*     loop 3 secondary side         steam-dump and turbine-stop valves
*
*      mdafw     sdafw
*     ########   ########
*     # fill #   # fill #   loop 1 secondary-
*     # 179  #   # 169  #    side feedwater
*     ########   ########
*       179        170
*     ########   ########   ########   ########   ########
*     # tee  #   # tee  #   #valve #   # tee  #   #break #
*  185# 180  #180# 170  #158# 154  #154# 150  #150# 576  #
*     ########   ########   ########   ########   ########
*                                         151      mfw b.c.
*     ########   ########
*     # fill #   # fill #   loop 2 secondary-
*     # 279  #   # 269  #    side feedwater
*     ########   ########
*       279        270                   151
*     ########   ########   ########   ########
*     # tee  #   # tee  #   #valve #   # tee  #
*  285# 280  #280# 270  #258# 254  #254# 250  #
*     ########   ########   ########   ########
*                                         351
*     ########   ########
*     # fill #   # fill #   loop 3 secondary-
*     # 379  #   # 369  #    side feedwater
*     ########   ########
*       379        370                   351      mfw b.c.
*     ########   ########   ########   ########   ########
*     # tee  #   # tee  #   #valve #   # tee  #   #break #
*  385# 380  #380# 370  #358# 354  #354# 350  #350# 578  #
*     ########   ########   ########   ########   ########
*
*****************
* namelist data *
*****************
```

```
 *
 &inopts
  fdfhl=0.0, iadded=10, icflow=2, ikfac=1, imfr=3, iolab=1, ipowr=-1,
  iunlab=8, newrfd=1, nfrc1=2, nhtstr=21, noair=0, tpowr=2.0
 &end
 *
 *        dstep          timet
                0     0.0000e+00
 *       stdyst          transi          ncomp           njun           ipak
                2               0            132            123              1
 *         epso           epss
      1.0000e-04     1.0000e-04
 *       oitmax          sitmax         isolut         ncontr          nccfl
               10              10              1              3              0
 *          ntsv           ntcb           ntcf           ntrp           ntcp
               65             238             80             72              1
 *
 ************************
 * component-number data *
 ************************
 *
 *iorder*                  1 s    * reactor vessel
 *iorder*      2      3     4 s    * rod guide-tube pipes
 *iorder*      5      6     7 s    * rod guide-tube pipes
 *iorder*     10     20    30 s    * loops 1, 2, & 3 hot-leg sections
 *iorder*     12     22    32 s    * loops 1, 2, & 3 steam generators
 *iorder*     14     24    34 s    * loops 1, 2, & 3 loop seals
 *iorder*     16     26    36 s    * loops 1, 2, & 3 primary-coolant pumps
 *iorder*     17     27    37 s    * loops 1a, 2a, & 3a cold-leg sections
 *iorder*     18     28    38 s    * loops 1b, 2b, & 3b cold-leg sections
 *iorder*     40     41    42 s    * prizer heater, middle, & sprayer sects.
 *iorder*     43     44    45 s    * prizer sprayer vel.b.c., rv hd., & porv
 *iorder*     46     47    48 s    * prizer srv & porv and srv pressure b.c.
 *iorder*     49     59    69 s    * loops 1, 2, & 3 accumulator top boundary
 *iorder*     50     60    70 s    * loops 1, 2, & 3 accumulators
 *iorder*     52     62    72 s    * loops 1, 2, & 3 accum. check valves.
 *iorder*     54     64    74 s    * loops 1, 2, & 3 accum/hpsi tees
 *iorder*     56     66    76 s    * loops 1, 2, & 3 hpsi velocity b.c.
 *iorder*     91     92    93 s    * loops 1, 2, & 3 cvcs velocity b.c.
 *iorder*    100    200   300 s    * loops 1, 2, & 3 steam-gen. boilers
 *iorder*    105    205   305 s    * loops 1, 2, & 3 steam-gen. domes
 *iorder*    110    210   310 s    * loops 1, 2, & 3 main steam lines
 *iorder*    112    212   312 s    * main steam-line porv/srv junctions
 *iorder*    114    214   314 s    * main steam-line srvs
 *iorder*    116    216   316 s    * main steam-line porvs
 *iorder*    118    218   318 s    * main steam-line porv pressure b.c.
 *iorder*    120    220   320 s    * loops 1, 2, & 3 main steam-isol. valves
 *iorder*    150    250   350 s    * hp-heater discharge lines
 *iorder*    154    254   354 s    * loops 1, 2, & 3 mfw regulating valves
```

```
*iorder*   169   269   369 s   * loops 1, 2, & 3 sdafw velocity b.c.
*iorder*   170   270   370 s   * loops 1, 2, & 3 mfwcv discharge headers
*iorder*   179   279   379 s   * loops 1, 2, & 3 mdafw velocity b.c.
*iorder*   180   280   380 s   * loops 1, 2, & 3 mfw lines
*iorder*   190   290   390 s   * loops 1, 2, & 3 steam-gen. downcomers
*iorder*         202   203 s   * st.gen.tube rupture fill no-flow b.c.
*iorder*         400   410 s   * main-steam-line header tees
*iorder*               420 s   * combined turbine & steam-dump line
*iorder*         422   424 s   * turbine stop valve & pressure b.c.
*iorder*               430 s   * combined steam-dump line
*iorder*         432   436 s   * steam-dump valves a & b
*iorder*         434   438 s   * steam-dump pressure b.c.
*iorder*         576   578 s   * feedwater pressure b.c.
*iorder*               900 s   * reactor-core fuel rods
*iorder*   901   902   903 s   * vessel structure 11,r1&2 12,r1 12-7,r2
*iorder*   904   905   906 s   * vessel structure 13-6,r1 17-11,r1 18,r2
*iorder*   907   908   909 s   * vessel structure 19,r2 110&11,r2 112,r1
*iorder*   910   920   930 s   * st.gen.tubes in loops 1,2,3
*iorder*               931 s   * boiler/steam-dome to downcomer wrapper
*iorder*         932   933 s   * lower and upper outer shells
*iorder*         934   935 s   * inlet and outlet tube sheets
*iorder*         936   937 s   * inlet and outlet lower plena
*iorder*               938 e   * secondary dryers
*
**************************
* control-parameter data *
**************************
*
* constrained steady-state controller data
*                                                                    91
* type 1 controller to adjust the loop 1 pump-impeller rotational speed
*       numcss         amncss         amxcss         nmpcss         napcss
            16   0.0000e+00   2.0000e+02             -1              0   <- 10
*
* type 1 controller to adjust the loop 2 pump-impeller rotational speed
*       numcss         amncss         amxcss         nmpcss         napcss
            26   0.0000e+00   2.0000e+02             -1              0
*
* type 1 controller to adjust the loop 3 pump-impeller rotational speed
*       numcss         amncss         amxcss         nmpcss         napcss
            36   0.0000e+00   2.0000e+02             -1              0
*
* signal variables  <-- 11
*
*    problem time
*         idsv           isvn           ilcn           icn1           icn2
              1              0              0              0              0   <- 12
*
*    reactor-core power
```

```
341 *          idsv          isvn          ilcn          icn1          icn2
342              11            18           900             0             0
343 *
344 *    loop 1 hot-leg liquid temperature
345 *          idsv          isvn          ilcn          icn1          icn2
346             101            23            10             1             0
347 *
348 *    loop 1 steam-line pressure for signal-expression trip
349 *          idsv          isvn          ilcn          icn1          icn2
350             111            21           110             3             0
351 *
352 *    loop 1 primary-coolant pump mass flow
353 *          idsv          isvn          ilcn          icn1          icn2
354             161            32            16             1             0
355 *
356 *    loop 1 cold-leg pressure
357 *          idsv          isvn          ilcn          icn1          icn2
358             171            21            17             1             0
359 *
360 *    loop 1 cold-leg liquid temperature
361 *          idsv          isvn          ilcn          icn1          icn2
362             181            23            18             4             0
363 *
364 *    loop 2 hot-leg liquid temperature
365 *          idsv          isvn          ilcn          icn1          icn2
366             201            23            20             1             0
367 *
368 *    loop 2 steam-line pressure for signal-expression trip
369 *          idsv          isvn          ilcn          icn1          icn2
370             222            21           210             3             0
371 *
372 *    loop 2 primary-coolant pump mass flow
373 *          idsv          isvn          ilcn          icn1          icn2
374             261            32            26             1             0
375 *
376 *    loop 2 cold-leg pressure
377 *          idsv          isvn          ilcn          icn1          icn2
378             271            21            27             1             0
379 *
380 *    loop 2 cold-leg liquid temperature
381 *          idsv          isvn          ilcn          icn1          icn2
382             281            23            28             4             0
383 *
384 *    loop 3 hot-leg liquid temperature
385 *          idsv          isvn          ilcn          icn1          icn2
386             301            23            30             1             0
387 *
388 *    loop 3 steam-line pressure for signal-expression trip
389 *          idsv          isvn          ilcn          icn1          icn2
390             333            21           310             3             0
```

```
391 *
392 *    loop 3 primary-coolant pump mass flow
393 *         idsv          isvn          ilcn          icn1          icn2
394           361            32            36             1             0
395 *
396 *    loop 3 cold-leg pressure
397 *         idsv          isvn          ilcn          icn1          icn2
398           371            21            37             1             0
399 *
400 *    loop 3 cold-leg liquid temperature
401 *         idsv          isvn          ilcn          icn1          icn2
402           381            23            38             4             0
403 *
404 *    lower-tap pressurizer pressure
405 *         idsv          isvn          ilcn          icn1          icn2
406           401            21            40             1             0
407 *
408 *    upper-tap pressurizer pressure
409 *         idsv          isvn          ilcn          icn1          icn2
410           421            21            42             1             0
411 *
412 *    loop 1 accumulator-tank pressure
413 *         idsv          isvn          ilcn          icn1          icn2
414           501            21            50             1             0
415 *
416 *    loop 2 accumulator-tank pressure
417 *         idsv          isvn          ilcn          icn1          icn2
418           601            21            60             1             0
419 *
420 *    loop 3 accumulator-tank pressure
421 *         idsv          isvn          ilcn          icn1          icn2
422           701            21            70             1             0
423 *
424 *    loop 1 accumulator check-valve delta-p
425 *         idsv          isvn          ilcn          icn1          icn2
426           521           -21            52             2             3   <-- 17
427 *
428 *    loop 2 accumulator check-valve delta-p
429 *         idsv          isvn          ilcn          icn1          icn2
430           621           -21            62             2             3
431 *
432 *    loop 3 accumulator check-valve delta-p
433 *         idsv          isvn          ilcn          icn1          icn2
434           721           -21            72             2             3
435 *
436 *    steam generator 1 boiler flow
437 *         idsv          isvn          ilcn          icn1          icn2
438          1000            69           100             1             0   <-- 18
439 *
```

```
440 *    loop 1 steam-generator upper-tap pressure
441 *         idsv          isvn          ilcn          icn1          icn2
442           1051           21           105             8             0
443 *
444 *    steam generator 1 steam line total mass flow
445 *         idsv          isvn          ilcn          icn1          icn2
446           1100           69           110             5             0
447 *
448 *    loop 1 steam-line pressure
449 *         idsv          isvn          ilcn          icn1          icn2
450           1101           21           110             3             0
451 *
452 *    loop 1 steam-line srv pressure
453 *         idsv          isvn          ilcn          icn1          icn2
454           1121           21           112             1             0   <-- 120
455 *
456 *    loop 1 steam-line delta pressure
457 *         idsv          isvn          ilcn          icn1          icn2
458           1135          -21           110             3             5
459 *
460 *    loop 1 main-feedwater pump a mass flow
461 *         idsv          isvn          ilcn          icn1          icn2
462           1501           32           150             1             0
463 *
464 *    loop 1 main-feedwater control-valve flow area
465 *         idsv          isvn          ilcn          icn1          icn2
466           1541           42           154             0             0   <-- 19
467 *
468 *    steam generator 1 feedwater flow
469 *         idsv          isvn          ilcn          icn1          icn2
470           1700           69           170             4             0
471 *
472 *    loop 1 feedwater-line delta pressure
473 *         idsv          isvn          ilcn          icn1          icn2
474           1714          -21           170             1             4
475 *
476 *    loop 1 steam-generator narrow-range-tap pressure
477 *         idsv          isvn          ilcn          icn1          icn2
478           1903           21           190             5             0
479 *
480 *    loop 1 steam-generator lower-tap pressure
481 *         idsv          isvn          ilcn          icn1          icn2
482           1910           21           190            12             0
483 *
484 *    steam generator 2 boiler flow
485 *         idsv          isvn          ilcn          icn1          icn2
486           2000           69           200             1             0
487 *
```

```
488 *    loop 2 steam-generator upper-tap pressure
489 *         idsv          isvn          ilcn          icn1          icn2
490           2051            21           205             8             0
491 *
492 *    steam generator 2 steam line total mass flow
493 *         idsv          isvn          ilcn          icn1          icn2
494           2100            69           210             5             0
495 *
496 *    loop 2 steam-line pressure
497 *         idsv          isvn          ilcn          icn1          icn2
498           2101            21           210             3             0
499 *
500 *    loop 2 steam-line srv pressure
501 *         idsv          isvn          ilcn          icn1          icn2
502           2121            21           212             1             0
503 *
504 *    loop 2 steam-line delta pressure
505 *         idsv          isvn          ilcn          icn1          icn2
506           2135           -21           210             3             5
507 *
508 *    loop 2 main-feedwater control-valve flow area
509 *         idsv          isvn          ilcn          icn1          icn2
510           2541            42           254             0             0
511 *
512 *    steam generator 2 feedwater flow
513 *         idsv          isvn          ilcn          icn1          icn2
514           2700            69           270             4             0
515 *
516 *    loop 2 feedwater-line delta pressure
517 *         idsv          isvn          ilcn          icn1          icn2
518           2714           -21           270             1             4
519 *
520 *    loop 2 steam-generator narrow-range-tap pressure
521 *         idsv          isvn          ilcn          icn1          icn2
522           2903            21           290             5             0
523 *
524 *    loop 2 steam-generator lower-tap pressure
525 *         idsv          isvn          ilcn          icn1          icn2
526           2910            21           290            12             0
527 *
528 *    steam generator 3 boiler flow
529 *         idsv          isvn          ilcn          icn1          icn2
530           3000            69           300             1             0
531 *
532 *    loop 3 steam-generator upper-tap pressure
533 *         idsv          isvn          ilcn          icn1          icn2
534           3051            21           305             8             0
535 *
```

```
536 *    steam generator 3 steam line total mass flow
537 *         idsv          isvn          ilcn          icn1          icn2
538           3100            69           310             5             0
539 *
540 *    loop 3 steam-line pressure
541 *         idsv          isvn          ilcn          icn1          icn2
542           3101            21           310             3             0
543 *
544 *    loop 3 steam-line srv pressure
545 *         idsv          isvn          ilcn          icn1          icn2
546           3121            21           312             1             0
547 *
548 *     loop 3 steam-line delta pressure
549 *         idsv          isvn          ilcn          icn1          icn2
550           3135           -21           310             3             5
551 *
552 *    loop 3 main-feedwater pump b mass flow
553 *         idsv          isvn          ilcn          icn1          icn2
554           3501            32           350             1             0
555 *
556 *    loop 3 main-feedwater control-valve flow area
557 *         idsv          isvn          ilcn          icn1          icn2
558           3541            42           354             0             0
559 *
560 *    steam generator 3 feedwater flow
561 *         idsv          isvn          ilcn          icn1          icn2
562           3700            69           370             4             0
563 *
564 *    loop 3 feedwater-line delta pressure
565 *         idsv          isvn          ilcn          icn1          icn2
566           3714           -21           370             1             4
567 *
568 *    loop 3 steam-generator narrow-range-tap pressure
569 *         idsv          isvn          ilcn          icn1          icn2
570           3903            21           390             5             0
571 *
572 *    loop 3 steam-generator lower-tap pressure
573 *         idsv          isvn          ilcn          icn1          icn2
574           3910            21           390            12             0
575 *
576 *    steam-line header pressure
577 *         idsv          isvn          ilcn          icn1          icn2
578           4001            21           410             2             0
579 *
580 *    turbine stop valve flow-area fraction
581 *         idsv          isvn          ilcn          icn1          icn2
582           4220            42           422             0             0
583 *
```

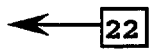
```
584 *    turbine-trip set-status
585 *         idsv          isvn          ilcn          icn1          icn2
586          4240            56            16             0             0
587 *
588 *    average-rod peak cladding temperature
589 *         idsv          isvn          ilcn          icn1          icn2
590          9000            59           900             0             0
591 *
592 *    hot-rod peak cladding temperature
593 *         idsv          isvn          ilcn          icn1          icn2
594          9010            60           900             0             0
595 *
596 * user defined unit labels
597 *
598 *      lulabel       lunitsi      luniteng       ufactor       ushift
599       lusqrden lusqrt(kg/m3) lusqr(lb/ft3)    2.4986e-01    0.0000e+00
600        ludtpdp        luk/pa       luf/psid    1.2411e+04    0.0000e+00
601       lurpress        lul/pa       lul/psia    6.8948e+03    0.0000e+00
602       lupresst        lupaxs       lupsidxs    1.4504e-04    0.0000e+00
603        lurtime         lul/s          lul/s    1.0000e+00    0.0000e+00
604       luasqrtp lum2xsqrt(pa) luft2sq(psid)    1.2963e-01    0.0000e+00
605       lusqrtml  lusqrt(kgxm) lusqr(lbmxft)    2.6894e+00    0.0000e+00
606       lurmflow        lus/kg       luhr/lbm    1.2600e-04    0.0000e+00
607 *
608 * control blocks
609 *
610 *    constant zero temperature difference
611 *         idcb          icbn          icb1          icb2          icb3
612            -1             9             0             0             0
613 *       lugain        luxmin        luxmax       lucon1       lucon2
614      lunounit       lutempd       lutempd       lutempd       lutempd
615 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
616    1.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
617 *
618 *    constant zero power
619 *         idcb          icbn          icb1          icb2          icb3
620            -2             9             0             0             0
621 *       lugain        luxmin        luxmax       lucon1       lucon2
622      lunounit       lupower       lupower       lupower       lupower
623 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
624    1.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
625 *
626 *    constant pressurizer low-level heater setpoint
627 *         idcb          icbn          icb1          icb2          icb3
628            -3             9             0             0             0
629 *       lugain        luxmin        luxmax       lucon1       lucon2
630      lunounit      lunounit      lunounit      lunounit      lunounit
631 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
632    1.0000e+00    1.4400e-01    1.4400e-01    1.4400e-01    1.4400e-01
```

20

21

```
633 *
634 *    constant nominal primary-side operating pressure
635 *          idcb           icbn           icb1           icb2           icb3
636              -4              9              0              0              0
637 *       lugain         luxmin         luxmax         lucon1         lucon2
638       lunounit       lupressa       lupressa       lupressa       lupressa
639 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
640     1.0000e+00     1.5513e+07     1.5513e+07     1.5513e+07     1.5513e+07
641 *
642 *    constant porv setpoint
643 *          idcb           icbn           icb1           icb2           icb3
644              -5              9              0              0              0
645 *       lugain         luxmin         luxmax         lucon1         lucon2
646       lunounit       lupressa       lupressa       lupressa       lupressa
647 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
648     1.0000e+00     1.6203e+07     1.6203e+07     1.6203e+07     1.6203e+07
649 *
650 *    constant srv setpoint
651 *          idcb           icbn           icb1           icb2           icb3
652              -6              9              0              0              0
653 *       lugain         luxmin         luxmax         lucon1         lucon2
654       lunounit       lupressa       lupressa       lupressa       lupressa
655 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
656     1.0000e+00     1.7237e+07     1.7237e+07     1.7237e+07     1.7237e+07
657 *
658 *    constant tave for prizer-level control
659 *          idcb           icbn           icb1           icb2           icb3
660              -7              9              0              0              0
661 *       lugain         luxmin         luxmax         lucon1         lucon2
662       lunounit       lutemp         lutemp         lutemp         lutemp
663 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
664     1.0000e+00     5.7420e+02     5.7420e+02     5.7420e+02     5.7420e+02
665 *
666 *    constant back-up heater gate setpoint
667 *          idcb           icbn           icb1           icb2           icb3
668              -8              9              0              0              0
669 *       lugain         luxmin         luxmax         lucon1         lucon2
670       lunounit       lunounit       lunounit       lunounit       lunounit
671 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
672     1.0000e+00     5.0000e-02     5.0000e-02     5.0000e-02     5.0000e-02
673 *
674 *    constant back-up heater delta-pressure setpoint
675 *          idcb           icbn           icb1           icb2           icb3
676              -9              9              0              0              0
677 *       lugain         luxmin         luxmax         lucon1         lucon2
678       lunounit       lupressd       lupressd       lupressd       lupressd
679 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
680     1.0000e+00    -1.3790e+05    -1.3790e+05    -1.3790e+05    -1.3790e+05
681 *
```

```
682 *    constant back-up heater power
683 *         idcb          icbn          icb1          icb2          icb3
684           -10             9             0             0             0
685 *       lugain        luxmin        luxmax        lucon1        lucon2
686      lunounit       lupower       lupower       lupower       lupower
687 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
688    1.0000e+00    4.0870e+05    4.0870e+05    4.0870e+05    4.0870e+05
689 *
690 *    constant 412.7 kg/s ref steam mass flow, 1/412.7 = 2.423e-03 s/kg
691 *         idcb          icbn          icb1          icb2          icb3
692           -11             9             0             0             0
693 *       lugain        luxmin        luxmax        lucon1        lucon2
694      lunounit      lurmflow      lurmflow      lurmflow      lurmflow
695 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
696    1.0000e+00    2.4230e-03    2.4230e-03    2.4230e-03    2.4230e-03
697 *
698 *    constant high-steam-mass-flow setpoint
699 *         idcb          icbn          icb1          icb2          icb3
700           -12             9             0             0             0
701 *       lugain        luxmin        luxmax        lucon1        lucon2
702      lunounit      lumassfw      lumassfw      lumassfw      lumassfw
703 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
704    1.0000e+00    4.5400e+02    4.5400e+02    4.5400e+02    4.5400e+02
705 *
706 *    constant low steam-pressure setpoint
707 *         idcb          icbn          icb1          icb2          icb3
708           -13             9             0             0             0
709 *       lugain        luxmin        luxmax        lucon1        lucon2
710      lunounit      lupressa      lupressa      lupressa      lunounit
711 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
712    1.0000e+00    4.3300e+06    4.3300e+06    4.3300e+06    4.3300e+06
713 *
714 *    constant low tavg setpoint
715 *         idcb          icbn          icb1          icb2          icb3
716           -14             9             0             0             0
717 *       lugain        luxmin        luxmax        lucon1        lucon2
718      lunounit        lutemp        lutemp        lutemp        lutemp
719 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
720    1.0000e+00    5.5700e+02    5.5700e+02    5.5700e+02    5.5700e+02
721 *
722 *    sqrt(saturated-steam density) vs pressure table
723 *         idcb          icbn          icb1          icb2          icb3
724           -15           101          4001            13             0
725 *       lugain        luxmin        luxmax        lucon1        lucon2
726      lunounit      lusqrden      lusqrden      lunounit      lusqrden
727 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
728    1.0000e+00    7.7356e-01    7.5000e+00    0.0000e+00    4.5813e+00
729 *       luytab        luxtab
730      lusqrden      lupressa
```



```
731 *
732 * cbftb *     1.0000e+05    7.7356e-01    5.0000e+05    1.6685e+00    1.0000e+06
733 * cbftb *     2.2985e+00    1.5000e+06    2.7742e+00    2.0000e+06    3.1875e+00
734 * cbftb *     3.0000e+06    3.9064e+00    4.0000e+06    4.5200e+00    5.0000e+06
735 * cbftb *     5.0715e+00    6.0000e+06    5.5857e+00    7.0000e+06    6.0762e+00
736 * cbftb *     8.0000e+06    6.5544e+00    9.0000e+06    7.0264e+00    1.0000e+07
737 * cbftb *     7.5000e+00e
738 *
739 *    constant reference full-power tavg (tavgo)
740 *         idcb          icbn          icb1          icb2          icb3
741           -16             9             0             0             0
742 *       lugain        luxmin        luxmax        lucon1        lucon2
743      lunounit        lutemp        lutemp        lutemp        lutemp
744 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
745    1.0000e+00    5.7510e+02    5.7510e+02    5.7510e+02    5.7510e+02
746 *
747 *    constant over-temperature dt (k1)
748 *         idcb          icbn          icb1          icb2          icb3
749           -17             9             0             0             0
750 *       lugain        luxmin        luxmax        lucon1        lucon2
751      lunounit       lutempd       lutempd       lutempd       lutempd
752 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
753    1.0000e+00    1.1620e+00    1.1620e+00    1.1620e+00    1.1620e+00
754 *
755 *    constant axial neutron flux factor (fdi)
756 *         idcb          icbn          icb1          icb2          icb3
757           -18             9             0             0             0
758 *       lugain        luxmin        luxmax        lucon1        lucon2
759      lunounit       lutempd       lutempd       lutempd       lutempd
760 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
761    1.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
762 *
763 *    constant over-power dt constant (k4)
764 *         idcb          icbn          icb1          icb2          icb3
765           -19             9             0             0             0
766 *       lugain        luxmin        luxmax        lucon1        lucon2
767      lunounit       lutempd       lutempd       lutempd       lutempd
768 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
769    1.0000e+00    1.0720e+00    1.0720e+00    1.0720e+00    1.0720e+00
770 *
771 *    high over-temperature dt in 2/3 loops
772 *
773 *    dt1 and dt2 .gt. dt limit
774 *         idcb          icbn          icb1          icb2          icb3
775           -22             5          -142          -242             0   <-- 23
776 *       lugain        luxmin        luxmax        lucon1        lucon2
777      lunounit      lunounit      lunounit      lunounit      lunounit
778 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
779    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
```

```
780 *
781 *    dt1 and dt3 .gt. dt limit
782 *         idcb          icbn          icb1          icb2          icb3
783            -24             5          -142          -342             0
784 *       lugain        luxmin        luxmax        lucon1        lucon2
785       lunounit      lunounit      lunounit      lunounit      lunounit
786 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
787    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
788 *
789 *    dt2 and dt3 .gt. dt limit
790 *         idcb          icbn          icb1          icb2          icb3
791            -26             5          -242          -342             0
792 *       lugain        luxmin        luxmax        lucon1        lucon2
793       lunounit      lunounit      lunounit      lunounit      lunounit
794 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
795    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
796 *
797 *    dt1 and dt2 .or. dt1 and dt3 .gt. dt limit
798 *         idcb          icbn          icb1          icb2          icb3
799            -28            25           -22           -24             0   <-- 24
800 *       lugain        luxmin        luxmax        lucon1        lucon2
801       lunounit      lunounit      lunounit      lunounit      lunounit
802 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
803    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
804 *
805 *    dt1 and dt2 .or. dt1 and dt3 .or. dt2 and dt3 .gt. dt limit
806 *         idcb          icbn          icb1          icb2          icb3
807            -30            25           -28           -26             0
808 *       lugain        luxmin        luxmax        lucon1        lucon2
809       lunounit      lunounit      lunounit      lunounit      lunounit
810 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
811    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
812 *
813 *    high over-power dt in 2/3 loops
814 *
815 *    dt1 and dt2 .gt. dt limit
816 *         idcb          icbn          icb1          icb2          icb3
817            -32             5          -170          -270             0
818 *       lugain        luxmin        luxmax        lucon1        lucon2
819       lunounit      lunounit      lunounit      lunounit      lunounit
820 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
821    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
822 *
823 *    dt1 and dt3 .gt. dt limit
824 *         idcb          icbn          icb1          icb2          icb3
825            -34             5          -170          -370             0
826 *       lugain        luxmin        luxmax        lucon1        lucon2
827       lunounit      lunounit      lunounit      lunounit      lunounit
828 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
829    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
```

```
*
*    dt2 and dt3 .gt. dt limit
*         idcb           icbn           icb1           icb2           icb3
           -36              5           -270           -370              0
*       lugain         luxmin         luxmax         lucon1         lucon2
        lunounit       lunounit       lunounit       lunounit       lunounit
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
*
*    dt1 and dt2 .or. dt1 and dt3 .gt. dt limit
*         idcb           icbn           icb1           icb2           icb3
           -38             25            -32            -34              0
*       lugain         luxmin         luxmax         lucon1         lucon2
        lunounit       lunounit       lunounit       lunounit       lunounit
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
*
*    dt1 and dt2 .or. dt1 and dt3 .or. dt2 and dt3 .gt. dt limit
*         idcb           icbn           icb1           icb2           icb3
           -40             25            -38            -36              0
*       lugain         luxmin         luxmax         lucon1         lucon2
        lunounit       lunounit       lunounit       lunounit       lunounit
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
*
*    amax1(tavg1,tavg2,tavg3)
*         idcb           icbn           icb1           icb2           icb3
           -50             35            -55           -110              0   <-- 25
*       lugain         luxmin         luxmax         lucon1         lucon2
        lunounit       lutemp         lutemp       lunounit         lutemp
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
     1.0000e+00     0.0000e+00     2.0000e+03     0.0000e+00     0.0000e+00
*
*    amax1(tavg2,tavg3)
*         idcb           icbn           icb1           icb2           icb3
           -55             35           -210           -310              0
*       lugain         luxmin         luxmax         lucon1         lucon2
        lunounit       lutemp         lutemp       lunounit         lutemp
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
     1.0000e+00     0.0000e+00     2.0000e+03     0.0000e+00     0.0000e+00
*
*    loop 1 tavg = 0.5x(thot+tcold)
*         idcb           icbn           icb1           icb2           icb3
           -108             3            101            181              0   <-- 26
*       lugain         luxmin         luxmax         lucon1         lucon2
        lunounit       lutemp         lutemp       lunounit         lutemp
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
     5.0000e-01     0.0000e+00     2.0000e+03     0.0000e+00     0.0000e+00
*
```

```
879 *    loop 1 tavg1=0.5x(tavg1+tavg1) initializes tavg1=575.1
880 *         idcb          icbn          icb1          icb2          icb3
881          -109             3          -110          -110             0
882 *       lugain        luxmin        luxmax        lucon1        lucon2
883       lunounit        lutemp        lutemp      lunounit      lunounit
884 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
885    5.0000e-01    0.0000e+00    2.0000e+03    0.0000e+00    5.7510e+02
886 *
887 *    loop 1 smoothed tavg1
888 *         idcb          icbn          icb1          icb2          icb3
889          -110            59          -108          -109             0   <-- 27
890 *       lugain        luxmin        luxmax        lucon1        lucon2
891       lunounit        lutemp        lutemp      lunounit      lunounit
892 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
893    1.0000e+00    0.0000e+00    2.0000e+03    5.0000e-01    5.0000e-01
894 *
895 *    loop 1 dt = thot-tcold
896 *         idcb          icbn          icb1          icb2          icb3
897          -118            54           101           181             0   <-- 28
898 *       lugain        luxmin        luxmax        lucon1        lucon2
899       lunounit       lutempd       lutempd      lunounit      lunounit
900 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
901    1.0000e+00   -2.0000e+03    2.0000e+03    0.0000e+00    0.0000e+00
902 *
903 *    loop 1 dt1 = 0.5x(dt1+dt1) initializes dt1 = 32.0
904 *         idcb          icbn          icb1          icb2          icb3
905          -119             3          -120          -120             0
906 *       lugain        luxmin        luxmax        lucon1        lucon2
907       lunounit       lutempd       lutempd      lunounit      lunounit
908 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
909    5.0000e-01   -2.0000e+03    2.0000e+03    0.0000e+00    3.2000e+01
910 *
911 *    loop 1 smoothed dt1
912 *         idcb          icbn          icb1          icb2          icb3
913          -120            59          -118          -119             0
914 *       lugain        luxmin        luxmax        lucon1        lucon2
915       lunounit       lutempd       lutempd      lunounit      lunounit
916 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
917    1.0000e+00   -2.0000e+03    2.0000e+03    5.0000e-01    5.0000e-01
918 *
919 *    loop 1 high over-temperature dt limit calculation
920 *
921 *     dt limit = dtox(k1-k2x(tavg-tavgo)x
922 *                ((1.0+t1xs)/(1.0+t2xs))+k3x(p-po)-fdi)
923 *
924 *    k2x(tavg-tavgo)
925 *         idcb          icbn          icb1          icb2          icb3
926          -130            54          -110           -16             0
927 *       lugain        luxmin        luxmax        lucon1        lucon2
```

```
928        lunounit        lutempd        lutempd        lunounit        lutempd
929 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
930      1.8630e-02    -5.0000e-01     5.0000e-01     0.0000e+00     0.0000e+00
931 *
932 *     k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))
933 *          idcb           icbn           icb1           icb2           icb3
934            -132             30           -130              0              0
935 *        lugain         luxmin         luxmax         lucon1         lucon2
936        lunounit        lutempd        lutempd         lutime         lutime
937 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
938      1.0000e+00    -5.0000e-01     5.0000e-01     2.0000e+01     3.0000e+00
939 *
940 *     k3x(p-po)
941 *          idcb           icbn           icb1           icb2           icb3
942            -134             54            421             -4              0
943 *        lugain         luxmin         luxmax         lucon1         lucon2
944         ludtpdp        lutempd        lutempd        lunounit        lutempd
945 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
946      1.1572e-07    -1.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
947 *
948 *     k1-k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))
949 *          idcb           icbn           icb1           icb2           icb3
950            -136             54            -17           -132              0
951 *        lugain         luxmin         luxmax         lucon1         lucon2
952        lunounit        lutempd        lutempd        lunounit        lutempd
953 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
954      1.0000e+00     0.0000e+00     1.1620e+00     0.0000e+00     0.0000e+00
955 *
956 *     k1-k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))+k3x(p-po)
957 *          idcb           icbn           icb1           icb2           icb3
958            -138              3           -136           -134              0
959 *        lugain         luxmin         luxmax         lucon1         lucon2
960        lunounit        lutempd        lutempd        lunounit        lutempd
961 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
962      1.0000e+00     0.0000e+00     2.0000e+00     0.0000e+00     0.0000e+00
963 *
964 *     dt limit
965 *          idcb           icbn           icb1           icb2           icb3
966            -140             54           -138            -18              0
967 *        lugain         luxmin         luxmax         lucon1         lucon2
968        lunounit        lutempd        lutempd        lunounit        lutempd
969 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
970      3.2000e+01     0.0000e+00     6.4000e+01     0.0000e+00     0.0000e+00
971 *
972 *     dt measured .gt. dt limit
973 *          idcb           icbn           icb1           icb2           icb3
974            -142             21           -120           -140              0
975 *        lugain         luxmin         luxmax         lucon1         lucon2
976        lunounit        lunounit        lunounit        lunounit        lunounit
```

29

30

```
977 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
978      1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
979 *
980 *     loop 1 high over-power dt limit calculation
981 *
982 *     dt limit = dtox(k4-k5xt3sxtavg/(1.0+t3s)-k6x(tavg-tavgo)-fdi)
983 *
984 *     step time delay on t3sxtavg evaluation
985 *          idcb           icbn           icb1           icb2           icb3
986             -148             53              0              0              0   <-- 31
987 *       lugain         luxmin         luxmax         lucon1         lucon2
988        lunounit       lunounit       lunounit         lutime       lunounit
989 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
990      1.0000e+00     0.0000e+00     1.0000e+00     1.0000e-04     0.0000e+00
991 *
992 *     t3sxtavg, t3 = 10 s
993 *          idcb           icbn           icb1           icb2           icb3
994             -149             12           -110              0              0   <-- 32
995 *       lugain         luxmin         luxmax         lucon1         lucon2
996          lutime         lutempd        lutempd        lunounit       lutempd
997 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
998      1.0000e+01    -1.0000e+02     1.0000e+02     0.0000e+00     0.0000e+00
999 *
1000 *     t3sxtavg after time delay
1001 *          idcb           icbn           icb1           icb2           icb3
1002            -150             39           -148           -149              0   <-- 33
1003 *       lugain         luxmin         luxmax         lucon1         lucon2
1004        lunounit       lutempd        lutempd        lunounit       lutempd
1005 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1006     1.0000e+00    -1.0000e+02     1.0000e+02     0.0000e+00     0.0000e+00
1007 *
1008 *     t3sxtavg/(1.0+t3s)
1009 *          idcb           icbn           icb1           icb2           icb3
1010            -152             26           -150              0              0   <-- 34
1011 *       lugain         luxmin         luxmax         lucon1         lucon2
1012        lunounit       lutempd        lutempd          lutime       lutempd
1013 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1014     1.0000e+00    -1.0000e+02     1.0000e+02     1.0000e+01     0.0000e+00
1015 *
1016 *     k5 = 0.036 if tavg is increasing, k5 = 0.0 otherwise
1017 *          idcb           icbn           icb1           icb2           icb3
1018            -154             21           -150             -1              0
1019 *       lugain         luxmin         luxmax         lucon1         lucon2
1020        lunounit       lunounit       lunounit       lunounit       lunounit
1021 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1022     3.6000e-02     0.0000e+00     3.6000e-02     0.0000e+00     0.0000e+00
1023 *
1024 *     k5xt3sxtavg/(1.0+t3s)
1025 *          idcb           icbn           icb1           icb2           icb3
1026            -156             39           -154           -152              0
```

```
1027 *       lugain          luxmin          luxmax          lucon1          lucon2
1028        lunounit        lutempd         lutempd         lunounit        lutempd
1029 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1030     1.0000e+00      0.0000e+00      1.0000e+00      0.0000e+00      0.0000e+00
1031 *
1032 *     k4-k5xt3sxtavg/(1.0+t3s)
1033 *          idcb            icbn            icb1            icb2            icb3
1034            -158              54             -19            -156               0
1035 *       lugain          luxmin          luxmax          lucon1          lucon2
1036        lunounit        lutempd         lutempd         lunounit        lutempd
1037 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1038     1.0000e+00      0.0000e+00      1.0720e+00      0.0000e+00      0.0000e+00
1039 *
1040 *     tavg-tavgo
1041 *          idcb            icbn            icb1            icb2            icb3
1042            -160              54            -110             -16               0
1043 *       lugain          luxmin          luxmax          lucon1          lucon2
1044        lunounit        lutempd         lutempd         lunounit        lutempd
1045 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1046     1.0000e+00     -2.0000e+03      2.0000e+03      0.0000e+00      0.0000e+00
1047 *
1048 *     k6 = 0.004023 if tavg .gt. tavgo, k6 = 0.0 otherwise
1049 *          idcb            icbn            icb1            icb2            icb3
1050            -162              21            -160              -1               0
1051 *       lugain          luxmin          luxmax          lucon1          lucon2
1052        lunounit        lunounit        lunounit        lunounit        lunounit
1053 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1054     4.0230e-03      0.0000e+00      4.0230e-03      0.0000e+00      0.0000e+00
1055 *
1056 *     k6x(tavg-tavgo)
1057 *          idcb            icbn            icb1            icb2            icb3
1058            -164              39            -162            -160               0
1059 *       lugain          luxmin          luxmax          lucon1          lucon2
1060        lunounit        lutempd         lutempd         lunounit        lutempd
1061 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1062     1.0000e+00      0.0000e+00      1.0720e+00      0.0000e+00      0.0000e+00
1063 *
1064 *     k4-k5xt3sxtavg/(1.0+t3s)-k6x(tavg-tavgo)
1065 *          idcb            icbn            icb1            icb2            icb3
1066            -166              54            -158            -164               0
1067 *       lugain          luxmin          luxmax          lucon1          lucon2
1068        lunounit        lutempd         lutempd         lunounit        lutempd
1069 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1070     1.0000e+00      0.0000e+00      1.0720e+00      0.0000e+00      0.0000e+00
1071 *
1072 *     dt limit
1073 *          idcb            icbn            icb1            icb2            icb3
1074            -168              54            -166             -18               0
1075 *       lugain          luxmin          luxmax          lucon1          lucon2
```

```
1076       lunounit        lutempd        lutempd        lunounit        lutempd
1077 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1078     3.2000e+01     0.0000e+00     3.5000e+01     0.0000e+00     0.0000e+00
1079 *
1080 *     dt measured .gt. dt limit
1081 *          idcb           icbn           icb1           icb2           icb3
1082          -170             21           -120           -168              0
1083 *       lugain         luxmin         luxmax         lucon1         lucon2
1084       lunounit       lunounit       lunounit       lunounit       lunounit
1085 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1086     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1087 *
1088 *     loop 2 tavg = 0.5x(thot+tcold)
1089 *          idcb           icbn           icb1           icb2           icb3
1090          -208              3            201            281              0
1091 *       lugain         luxmin         luxmax         lucon1         lucon2
1092       lunounit        lutemp         lutemp       lunounit        lutemp
1093 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1094     5.0000e-01     0.0000e+00     2.0000e+03     0.0000e+00     0.0000e+00
1095 *
1096 *     loop 2 tavg2=0.5x(tavg2+tavg2) initializes tavg2=575.1
1097 *          idcb           icbn           icb1           icb2           icb3
1098          -209              3           -210           -210              0
1099 *       lugain         luxmin         luxmax         lucon1         lucon2
1100       lunounit        lutemp         lutemp       lunounit        lutemp
1101 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1102     5.0000e-01     0.0000e+00     2.0000e+03     0.0000e+00     5.7510e+02
1103 *
1104 *     loop 2 smoothed tavg2
1105 *          idcb           icbn           icb1           icb2           icb3
1106          -210             59           -208           -209              0
1107 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1108       lunounit        lutemp         lutemp       lunounit        lutemp
1109 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1110     1.0000e+00     0.0000e+00     2.0000e+03     5.0000e-01     5.0000e-01
1111 *
1112 *     loop 2 dt = thot-tcold
1113 *          idcb           icbn           icb1           icb2           icb3
1114          -218             54            201            281              0
1115 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1116       lunounit        lutemp         lutemp       lunounit        lutemp
1117 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1118     1.0000e+00    -2.0000e+03     2.0000e+03     0.0000e+00     0.0000e+00
1119 *
1120 *     loop 2 dt2 = 0.5x(dt2+dt2) initializes dt2 = 32.0
1121 *          idcb           icbn           icb1           icb2           icb3
1122          -219              3           -220           -220              0
1123 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1124       lunounit        lutemp         lutemp       lunounit        lutemp
```

```
1125 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1126     5.0000e-01    -2.0000e+03     2.0000e+03     0.0000e+00     3.2000e+01
1127 *
1128 *     loop 2 smoothed dt2
1129 *          idcb           icbn           icb1           icb2           icb3
1130            -220             59           -218           -219              0
1131 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1132       lunounit         lutemp         lutemp       lunounit         lutemp
1133 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1134     1.0000e+00    -2.0000e+03     2.0000e+03     5.0000e-01     5.0000e-01
1135 *
1136 *     loop 2 high over-temperature dt limit calculation
1137 *
1138 *      dt limit = dtox(k1-k2x(tavg-tavgo)x
1139 *                     ((1.0+t1xs)/(1.0+t2xs))+k3x(p-po)-fdi)
1140 *
1141 *     k2x(tavg-tavgo)
1142 *          idcb           icbn           icb1           icb2           icb3
1143            -230             54           -210            -16              0
1144 *       lugain         luxmin         luxmax         lucon1         lucon2
1145       lunounit        lutempd        lutempd       lunounit        lutempd
1146 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1147     1.8630e-02    -5.0000e-01     5.0000e-01     0.0000e+00     0.0000e+00
1148 *
1149 *     k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))
1150 *          idcb           icbn           icb1           icb2           icb3
1151            -232             30           -230              0              0
1152 *       lugain         luxmin         luxmax         lucon1         lucon2
1153       lunounit        lutempd        lutempd        lutime         lutime
1154 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1155     1.0000e+00    -5.0000e-01     5.0000e-01     2.0000e+01     3.0000e+00
1156 *
1157 *     k3x(p-po)
1158 *          idcb           icbn           icb1           icb2           icb3
1159            -234             54            421             -4              0
1160 *       lugain         luxmin         luxmax         lucon1         lucon2
1161       ludtpdp        lutempd        lutempd       lunounit        lutempd
1162 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1163     1.1572e-07    -1.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1164 *
1165 *     k1-k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))
1166 *          idcb           icbn           icb1           icb2           icb3
1167            -236             54            -17           -232              0
1168 *       lugain         luxmin         luxmax         lucon1         lucon2
1169       lunounit        lutempd        lutempd       lunounit        lutempd
1170 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1171     1.0000e+00     0.0000e+00     1.1620e+00     0.0000e+00     0.0000e+00
1172 *
1173 *     k1-k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))+k3x(p-po)
```

```
1174 *         idcb          icbn          icb1          icb2          icb3
1175           -238             3          -236          -234             0
1176 *       lugain        luxmin        luxmax       lucon1       lucon2
1177      lunounit       lutempd       lutempd      lunounit       lutempd
1178 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1179    1.0000e+00    0.0000e+00    2.0000e+00    0.0000e+00    0.0000e+00
1180 *
1181 *    dt limit
1182 *         idcb          icbn          icb1          icb2          icb3
1183           -240            54          -238           -18             0
1184 *       lugain        luxmin        luxmax       lucon1       lucon2
1185      lunounit       lutempd       lutempd      lunounit       lutempd
1186 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1187    3.2000e+01    0.0000e+00    6.4000e+01    0.0000e+00    0.0000e+00
1188 *
1189 *    dt measured .gt. dt limit
1190 *         idcb          icbn          icb1          icb2          icb3
1191           -242            21          -220          -240             0
1192 *       lugain        luxmin        luxmax       lucon1       lucon2
1193      lunounit      lunounit      lunounit      lunounit      lunounit
1194 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1195    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1196 *
1197 *    loop 2 high over-power dt limit calculation
1198 *
1199 *    dt limit = dtox(k4-k5xt3sxtavg/(1.0+t3s)-k6x(tavg-tavgo)-fdi)
1200 *
1201 *    step time delay on t3sxtavg evaluation
1202 *         idcb          icbn          icb1          icb2          icb3
1203           -248            53             0             0             0
1204 *       lugain        luxmin        luxmax       lucon1       lucon2
1205      lunounit      lunounit      lunounit       lutime      lunounit
1206 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1207    1.0000e+00    0.0000e+00    1.0000e+00    1.0000e-04    0.0000e+00
1208 *
1209 *    t3sxtavg, t3 = 10 s
1210 *         idcb          icbn          icb1          icb2          icb3
1211           -249            12          -210             0             0
1212 *       lugain        luxmin        luxmax       lucon1       lucon2
1213       lutime       lutempd       lutempd      lunounit       lutempd
1214 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1215    1.0000e+01   -1.0000e+02    1.0000e+02    0.0000e+00    0.0000e+00
1216 *
1217 *    t3sxtavg after time delay
1218 *         idcb          icbn          icb1          icb2          icb3
1219           -250            39          -248          -249             0
1220 *       lugain        luxmin        luxmax       lucon1       lucon2
1221      lunounit       lutempd       lutempd      lunounit       lutempd
1222 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1223    1.0000e+00   -1.0000e+02    1.0000e+02    0.0000e+00    0.0000e+00
```

```
1224 *
1225 *     t3sxtavg/(1.0+t3s)
1226 *          idcb          icbn          icb1          icb2          icb3
1227           -252            26          -250             0             0
1228 *        lugain        luxmin        luxmax        lucon1        lucon2
1229       lunounit       lutempd       lutempd       lutime        lutempd
1230 *        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1231     1.0000e+00   -1.0000e+02    1.0000e+02    1.0000e+01    0.0000e+00
1232 *
1233 *     k5 = 0.036 if tavg is increasing, k5 = 0.0 otherwise
1234 *          idcb          icbn          icb1          icb2          icb3
1235           -254            21          -250            -1             0
1236 *        lugain        luxmin        luxmax        lucon1        lucon2
1237       lunounit       lunounit       lunounit       lunounit       lunounit
1238 *        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1239     3.6000e-02    0.0000e+00    3.6000e-02    0.0000e+00    0.0000e+00
1240 *
1241 *     k5xt3sxtavg/(1.0+t3s)
1242 *          idcb          icbn          icb1          icb2          icb3
1243           -256            39          -254          -252             0
1244 *        lugain        luxmin        luxmax        lucon1        lucon2
1245       lunounit       lutempd       lutempd       lunounit       lutempd
1246 *        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1247     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1248 *
1249 *     k4-k5xt3sxtavg/(1.0+t3s)
1250 *          idcb          icbn          icb1          icb2          icb3
1251           -258            54           -19          -256             0
1252 *        lugain        luxmin        luxmax        lucon1        lucon2
1253       lunounit       lutempd       lutempd       lunounit       lutempd
1254 *        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1255     1.0000e+00    0.0000e+00    1.0720e+00    0.0000e+00    0.0000e+00
1256 *
1257 *     tavg-tavgo
1258 *          idcb          icbn          icb1          icb2          icb3
1259           -260            54          -210           -16             0
1260 *        lugain        luxmin        luxmax        lucon1        lucon2
1261       lunounit       lutempd       lutempd       lunounit       lutempd
1262 *        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1263     1.0000e+00   -2.0000e+03    2.0000e+03    0.0000e+00    0.0000e+00
1264 *
1265 *     k6 = 0.004023 if tavg .gt. tavgo, k6 = 0.0 otherwise
1266 *          idcb          icbn          icb1          icb2          icb3
1267           -262            21          -260            -1             0
1268 *        lugain        luxmin        luxmax        lucon1        lucon2
1269       lunounit       lunounit       lunounit       lunounit       lunounit
1270 *        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1271     4.0230e-03    0.0000e+00    4.0230e-03    0.0000e+00    0.0000e+00
1272 *
```

```
1273 *    k6x(tavg-tavgo)
1274 *         idcb          icbn          icb1          icb2          icb3
1275           -264            39          -262          -260             0
1276 *       lugain        luxmin        luxmax        lucon1        lucon2
1277       lunounit       lutempd       lutempd       lunounit       lutempd
1278 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1279    1.0000e+00    0.0000e+00    1.0720e+00    0.0000e+00    0.0000e+00
1280 *
1281 *    k4-k5xt3sxtavg/(1.0+t3s)-k6x(tavg-tavgo)
1282 *         idcb          icbn          icb1          icb2          icb3
1283           -266            54          -258          -264             0
1284 *       lugain        luxmin        luxmax        lucon1        lucon2
1285       lunounit       lutempd       lutempd       lunounit       lutempd
1286 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1287    1.0000e+00    0.0000e+00    1.0720e+00    0.0000e+00    0.0000e+00
1288 *
1289 *    dt limit
1290 *         idcb          icbn          icb1          icb2          icb3
1291           -268            54          -266           -18             0
1292 *       lugain        luxmin        luxmax        lucon1        lucon2
1293       lunounit       lutempd       lutempd       lunounit       lutempd
1294 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1295    3.2000e+01    0.0000e+00    3.5000e+01    0.0000e+00    0.0000e+00
1296 *
1297 *    dt measured .gt. dt limit
1298 *         idcb          icbn          icb1          icb2          icb3
1299           -270            21          -220          -268             0
1300 *       lugain        luxmin        luxmax        lucon1        lucon2
1301       lunounit      lunounit      lunounit      lunounit      lunounit
1302 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1303    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1304 *
1305 *    loop 3 tavg = 0.5x(thot+tcold)
1306 *         idcb          icbn          icb1          icb2          icb3
1307           -308             3           301           381             0
1308 *       lugain        luxmin        luxmax        lucon1        lucon2
1309       lunounit       lutemp        lutemp       lunounit       lutemp
1310 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1311    5.0000e-01    0.0000e+00    2.0000e+03    0.0000e+00    0.0000e+00
1312 *
1313 *    loop 3 tavg3=0.5x(tavg3+tavg3) initializes tavg3=575.1
1314 *         idcb          icbn          icb1          icb2          icb3
1315           -309             3          -310          -310             0
1316 *       lugain        luxmin        luxmax        lucon1        lucon2
1317       lunounit       lutemp        lutemp       lunounit       lutemp
1318 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1319    5.0000e-01    0.0000e+00    2.0000e+03    0.0000e+00    5.7510e+02
1320 *
```

```
1321 *    loop 3 smoothed tavg3
1322 *         idcb          icbn          icb1          icb2          icb3
1323           -310            59          -308          -309             0
1324 *       lugain        luxmin        luxmax       lucon1       lucon2
1325       lunounit        lutemp        lutemp     lunounit       lutemp
1326 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1327    1.0000e+00    0.0000e+00    2.0000e+03    5.0000e-01    5.0000e-01
1328 *
1329 *    loop 3 dt = thot-tcold
1330 *         idcb          icbn          icb1          icb2          icb3
1331           -318            54           301           381             0
1332 *       lugain        luxmin        luxmax       lucon1       lucon2
1333       lunounit        lutemp        lutemp     lunounit       lutemp
1334 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1335    1.0000e+00   -2.0000e+03    2.0000e+03    0.0000e+00    0.0000e+00
1336 *
1337 *    loop 3 dt3 = 0.5x(dt3+dt3) initializes dt3 = 32.0
1338 *         idcb          icbn          icb1          icb2          icb3
1339           -319               3          -320          -320             0
1340 *       lugain        luxmin        luxmax       lucon1       lucon2
1341       lunounit        lutemp        lutemp     lunounit       lutemp
1342 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1343    5.0000e-01   -2.0000e+03    2.0000e+03    0.0000e+00    3.2000e+01
1344 *
1345 *    loop 3 smoothed dt3
1346 *         idcb          icbn          icb1          icb2          icb3
1347           -320            59          -318          -319             0
1348 *       lugain        luxmin        luxmax       lucon1       lucon2
1349       lunounit       lutempd       lutempd     lunounit     lunounit
1350 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1351    1.0000e+00   -2.0000e+03    2.0000e+03    5.0000e-01    5.0000e-01
1352 *
1353 *    loop 3 high over-temperature dt limit calculation
1354 *
1355 *     dt limit = dtox(k1-k2x(tavg-tavgo)x
1356 *                ((1.0+t1xs)/(1.0+t2xs))+k3x(p-po)-fdi)
1357 *
1358 *    k2x(tavg-tavgo)
1359 *         idcb          icbn          icb1          icb2          icb3
1360           -330            54          -310           -16             0
1361 *       lugain        luxmin        luxmax       lucon1       lucon2
1362       lunounit       lutempd       lutempd     lunounit       lutempd
1363 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
1364    1.8630e-02   -5.0000e-01    5.0000e-01    0.0000e+00    0.0000e+00
1365 *
1366 *    k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))
1367 *         idcb          icbn          icb1          icb2          icb3
1368           -332            30          -330             0             0
1369 *       lugain        luxmin        luxmax       lucon1       lucon2
```

```
1370       lunounit        lutempd        lutempd         lutime         lutime
1371 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1372     1.0000e+00   -5.0000e-01     5.0000e-01     2.0000e+01     3.0000e+00
1373 *
1374 *     k3x(p-po)
1375 *          idcb           icbn           icb1           icb2           icb3
1376            -334             54            421             -4              0
1377 *       lugain         luxmin         luxmax         lucon1         lucon2
1378       ludtpdp        lutempd        lutempd       lunounit        lutempd
1379 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1380     1.1572e-07   -1.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1381 *
1382 *     k1-k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))
1383 *          idcb           icbn           icb1           icb2           icb3
1384            -336             54            -17           -332              0
1385 *       lugain         luxmin         luxmax         lucon1         lucon2
1386       lunounit        lutempd        lutempd       lunounit        lutempd
1387 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1388     1.0000e+00     0.0000e+00     1.1620e+00     0.0000e+00     0.0000e+00
1389 *
1390 *     k1-k2x(tavg-tavgo)x((1.0+t1xs)/(1.0+t2xs))+k3x(p-po)
1391 *          idcb           icbn           icb1           icb2           icb3
1392            -338              3           -336           -334              0
1393 *       lugain         luxmin         luxmax         lucon1         lucon2
1394       lunounit        lutempd        lutempd       lunounit        lutempd
1395 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1396     1.0000e+00     0.0000e+00     2.0000e+00     0.0000e+00     0.0000e+00
1397 *
1398 *     dt limit
1399 *          idcb           icbn           icb1           icb2           icb3
1400            -340             54           -338            -18              0
1401 *       lugain         luxmin         luxmax         lucon1         lucon2
1402       lunounit        lutempd        lutempd       lunounit        lutempd
1403 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1404     3.2000e+01     0.0000e+00     6.4000e+01     0.0000e+00     0.0000e+00
1405 *
1406 *     dt measured .gt. dt limit
1407 *          idcb           icbn           icb1           icb2           icb3
1408            -342             21           -320           -340              0
1409 *       lugain         luxmin         luxmax         lucon1         lucon2
1410       lunounit       lunounit       lunounit       lunounit       lunounit
1411 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1412     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1413 *
1414 *     loop 3 high over-power dt limit calculation
1415 *
1416 *     dt limit = dtox(k4-k5xt3sxtavg/(1.0+t3s)-k6x(tavg-tavgo)-fdi)
1417 *
1418 *     time delay on t3sxtavg evaluation
```

```
1419 *         idcb           icbn           icb1           icb2           icb3
1420           -348             53              0              0              0
1421 *       lugain         luxmin         luxmax         lucon1         lucon2
1422       lunounit       lunounit       lunounit        lutime       lunounit
1423 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1424    1.0000e+00     0.0000e+00     1.0000e+00     1.0000e-04     0.0000e+00
1425 *
1426 *    t3sxtavg, t3 = 10 s
1427 *         idcb           icbn           icb1           icb2           icb3
1428           -349             12           -310              0              0
1429 *       lugain         luxmin         luxmax         lucon1         lucon2
1430       lutime        lutempd        lutempd       lunounit        lutempd
1431 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1432    1.0000e+01    -1.0000e+02     1.0000e+02     0.0000e+00     0.0000e+00
1433 *
1434 *    t3sxtavg after time delay
1435 *         idcb           icbn           icb1           icb2           icb3
1436           -350             39           -348           -349              0
1437 *       lugain         luxmin         luxmax         lucon1         lucon2
1438       lunounit       lutempd        lutempd       lunounit        lutempd
1439 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1440    1.0000e+00    -1.0000e+02     1.0000e+02     0.0000e+00     0.0000e+00
1441 *
1442 *    t3sxtavg/(1.0+t3s)
1443 *         idcb           icbn           icb1           icb2           icb3
1444           -352             26           -350              0              0
1445 *       lugain         luxmin         luxmax         lucon1         lucon2
1446       lunounit       lutempd        lutempd        lutime        lutempd
1447 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1448    1.0000e+00    -1.0000e+02     1.0000e+02     1.0000e+01     0.0000e+00
1449 *
1450 *    k5 = 0.036 if tavg is increasing, k5 = 0.0 otherwise
1451 *         idcb           icbn           icb1           icb2           icb3
1452           -354             21           -350             -1              0
1453 *       lugain         luxmin         luxmax         lucon1         lucon2
1454       lunounit       lunounit       lunounit       lunounit       lunounit
1455 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1456    3.6000e-02     0.0000e+00     3.6000e-02     0.0000e+00     0.0000e+00
1457 *
1458 *    k5xt3sxtavg/(1.0+t3s)
1459 *         idcb           icbn           icb1           icb2           icb3
1460           -356             39           -354           -352              0
1461 *       lugain         luxmin         luxmax         lucon1         lucon2
1462       lunounit       lutempd        lutempd       lunounit        lutempd
1463 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1464    1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1465 *
1466 *    k4-k5xt3sxtavg/(1.0+t3s)
1467 *         idcb           icbn           icb1           icb2           icb3
1468           -358             54            -19           -356              0
```

```
1469 *       lugain        luxmin        luxmax        lucon1        lucon2
1470       lunounit       lutempd       lutempd       lunounit       lutempd
1471 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1472     1.0000e+00    0.0000e+00    1.0720e+00    0.0000e+00    0.0000e+00
1473 *
1474 *     tavg-tavgo
1475 *          idcb          icbn          icb1          icb2          icb3
1476            -360            54          -310           -16             0
1477 *       lugain        luxmin        luxmax        lucon1        lucon2
1478       lunounit       lutempd       lutempd       lunounit       lutempd
1479 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1480     1.0000e+00   -2.0000e+03    2.0000e+03    0.0000e+00    0.0000e+00
1481 *
1482 *     k6 = 0.004023 if tavg .gt. tavgo, k6 = 0.0 otherwise
1483 *          idcb          icbn          icb1          icb2          icb3
1484            -362            21          -360            -1             0
1485 *       lugain        luxmin        luxmax        lucon1        lucon2
1486       lunounit      lunounit      lunounit      lunounit      lunounit
1487 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1488     4.0230e-03    0.0000e+00    4.0230e-03    0.0000e+00    0.0000e+00
1489 *
1490 *     k6x(tavg-tavgo)
1491 *          idcb          icbn          icb1          icb2          icb3
1492            -364            39          -362          -360             0
1493 *       lugain        luxmin        luxmax        lucon1        lucon2
1494       lunounit       lutempd       lutempd       lunounit       lutempd
1495 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1496     1.0000e+00    0.0000e+00    1.0720e+00    0.0000e+00    0.0000e+00
1497 *
1498 *     k4-k5xt3sxtavg/(1.0+t3s)-k6x(tavg-tavgo)
1499 *          idcb          icbn          icb1          icb2          icb3
1500            -366            54          -358          -364             0
1501 *       lugain        luxmin        luxmax        lucon1        lucon2
1502       lunounit       lutempd       lutempd       lunounit       lutempd
1503 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1504     1.0000e+00    0.0000e+00    1.0720e+00    0.0000e+00    0.0000e+00
1505 *
1506 *     dt limit
1507 *          idcb          icbn          icb1          icb2          icb3
1508            -368            54          -366           -18             0
1509 *       lugain        luxmin        luxmax        lucon1        lucon2
1510       lunounit       lutempd       lutempd       lunounit       lutempd
1511 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1512     3.2000e+01    0.0000e+00    3.5000e+01    0.0000e+00    0.0000e+00
1513 *
1514 *     dt measured .gt. dt limit
1515 *          idcb          icbn          icb1          icb2          icb3
1516            -370            21          -320          -368             0
1517 *       lugain        luxmin        luxmax        lucon1        lucon2
```

```
1518       lunounit      lunounit      lunounit      lunounit      lunounit
1519 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1520     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1521 *
1522 *    pressurizer level control
1523 *
1524 *    prizer fractional level = dp/(rhoxgxlref)
1525 *    where rhog = 5993.8 kg/m2/s2 and lref = 9.794 m
1526 *    such that 1.0/(rhogxlref) = 1.7304e-05 1/pa
1527 *         idcb          icbn          icb1          icb2          icb3
1528           -406            54           401           421             0
1529 *       lugain        luxmin        luxmax        lucon1        lucon2
1530       lurpress      lunounit      lunounit      lunounit      lunounit
1531 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1532     1.7304e-05    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1533 *
1534 *    prizer level versus tave table
1535 *         idcb          icbn          icb1          icb2          icb3
1536           -408           101            -7             2             0
1537 *       lugain        luxmin        luxmax        lucon1        lucon2
1538       lunounit      lunounit      lunounit      lunounit      lunounit
1539 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1540     1.0000e+00    3.9200e-01    4.5800e-01    0.0000e+00    0.0000e+00
1541 *       luytab        luxtab
1542       lunounit        lutemp
1543 *
1544 * cbftb *     5.4980e+02    3.9200e-01    5.5380e+02    4.5800e-01e
1545 *
1546 *    delta level = l(evaluated)-l(table)
1547 *         idcb          icbn          icb1          icb2          icb3
1548           -410            54          -406          -408             0
1549 *       lugain        luxmin        luxmax        lucon1        lucon2
1550       lunounit      lunounit      lunounit      lunounit      lunounit
1551 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1552     1.0000e+00   -1.0000e-01    1.0000e-01    0.0000e+00    0.0000e+00
1553 *
1554 *    integrator for pi controller
1555 *         idcb          icbn          icb1          icb2          icb3
1556           -412            23          -410             0             0
1557 *       lugain        luxmin        luxmax        lucon1        lucon2
1558       lunounit      lunounit      lunounit      lunounit      lunounit
1559 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1560     1.0000e+00   -1.0000e-01    1.0000e-01    0.0000e+00    0.0000e+00
1561 *
1562 *    weighted sum for pi controller
1563 *         idcb          icbn          icb1          icb2          icb3
1564           -414            59          -410          -412             0
1565 *       lugain        luxmin        luxmax        lucon1        lucon2
1566       lunounit      lunounit      lunounit      lunounit      lunounit
```

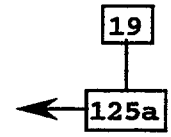
```
1567 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1568      5.0000e+01    -1.0000e+00     1.0000e+00     8.0000e-01     2.0000e-01
1569 *
1570 *     pressurizer pressure control
1571 *
1572 *     prizer delta pressure = p(evaluated)-p(table)
1573 *          idcb           icbn           icb1           icb2           icb3
1574            -430             54            421             -4              0
1575 *        lugain         luxmin         luxmax         lucon1         lucon2
1576        lunounit       lupressd       lupressd       lunounit       lupressd
1577 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1578     1.0000e+00    -2.0000e+07     2.0000e+07     0.0000e+00     0.0000e+00
1579 *
1580 *     pi controller integrator
1581 *          idcb           icbn           icb1           icb2           icb3
1582            -432             23           -430              0              0   <-- 35
1583 *        lugain         luxmin         luxmax         lucon1         lucon2
1584        lunounit       lupresst       lupresst       lunounit       lupresst
1585 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1586     1.0000e+00    -1.0000e+02     1.0000e+02     0.0000e+00     0.0000e+00
1587 *
1588 *     pi controller weighted sum
1589 *     output controls pressurizer spray taken from loop 3 cold leg
1590 *          idcb           icbn           icb1           icb2           icb3
1591            -434             59           -430           -432              0   <-- 103
1592 *        lugain         luxmin         luxmax         lucon1         lucon2
1593        lunounit       lupressd       lupressd       lunounit       lurtime
1594 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1595     1.0000e+00    -1.0000e+20     1.0000e+20     1.0000e+00     8.3300e-02
1596 *
1597 *     pressurizer heater control
1598 *
1599 *     proportional heaters power versus delta pressure table
1600 *          idcb           icbn           icb1           icb2           icb3
1601            -436            101           -430              2              0
1602 *        lugain         luxmin         luxmax         lucon1         lucon2
1603        lunounit       lupower        lupower       lunounit       lupower
1604 *        cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1605     1.0000e+00     0.0000e+00     4.0000e+05     0.0000e+00     0.0000e+00
1606 *        luytab         luxtab
1607        lupower       lupressd
1608 *
1609 * cbftb *    -1.0340e+05     1.8170e+05     1.0340e+05     0.0000e+00e
1610 *
1611 *     delta pressure .gt. setpoint
1612 *          idcb           icbn           icb1           icb2           icb3
1613            -438             21             -9           -430              0
1614 *        lugain         luxmin         luxmax         lucon1         lucon2
1615        lunounit       lunounit       lunounit       lunounit       lunounit
```

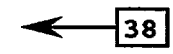
```
1616 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1617     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1618 *
1619 *    delta level .gt. 0.05
1620 *         idcb           icbn           icb1           icb2           icb3
1621           -440             21           -410             -8              0
1622 *       lugain         luxmin         luxmax         lucon1         lucon2
1623       lunounit       lunounit       lunounit       lunounit       lunounit
1624 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1625     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1626 *
1627 *    gate signal for pressure or level limit exceeded
1628 *         idcb           icbn           icb1           icb2           icb3
1629           -442             25           -438           -440              0
1630 *       lugain         luxmin         luxmax         lucon1         lucon2
1631       lunounit       lunounit       lunounit       lunounit       lunounit
1632 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1633     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1634 *
1635 *    input switch for zero or full b/u heater output
1636 *         idcb           icbn           icb1           icb2           icb3
1637           -444             22            -10             -2           -442   <-- 36
1638 *       lugain         luxmin         luxmax         lucon1         lucon2
1639       lunounit       lupower        lupower        lunounit       lupower
1640 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1641     1.0000e+00     0.0000e+00     4.0870e+05     0.0000e+00     0.0000e+00
1642 *
1643 *    sum of b/u plus proportional heater power
1644 *         idcb           icbn           icb1           icb2           icb3
1645           -446              3           -444           -436              0
1646 *       lugain         luxmin         luxmax         lucon1         lucon2
1647       lunounit       lupower        lupower        lunounit       lupower
1648 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1649     1.0000e+00     0.0000e+00     1.3000e+06     0.0000e+00     0.0000e+00
1650 *
1651 *    l(evaluated)/fs .gt. 0.144
1652 *         idcb           icbn           icb1           icb2           icb3
1653           -448             21           -406             -3              0
1654 *       lugain         luxmin         luxmax         lucon1         lucon2
1655       lunounit       lunounit       lunounit       lunounit       lunounit
1656 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1657     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1658 *                                                                    98
1659 *    low level gated total heater power                              |
1660 *         idcb           icbn           icb1           icb2           icb3
1661           -450             19           -446           -448              0   <-- 37
1662 *       lugain         luxmin         luxmax         lucon1         lucon2
1663       lunounit       lupower        lupower        lunounit       lupower
1664 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1665     1.0000e+00     0.0000e+00     1.3000e+06     0.0000e+00     0.0000e+00
```

```
1666 *
1667 *    loop 1 accumulator-valve delta pressure
1668 *         idcb          icbn          icb1          icb2          icb3
1669           -521            54           521           171             0
1670 *       lugain        luxmin        luxmax        lucon1        lucon2
1671       lunounit      lupressd      lupressd      lunounit      lupressd
1672 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1673    1.0000e+00   -1.0000e+07    1.0000e+07    0.0000e+00    0.0000e+00
1674 *
1675 *    loop 2 accumulator-valve delta pressure
1676 *         idcb          icbn          icb1          icb2          icb3
1677           -621            54           621           271             0
1678 *       lugain        luxmin        luxmax        lucon1        lucon2
1679       lunounit      lupressd      lupressd      lunounit      lupressd
1680 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1681    1.0000e+00   -1.0000e+07    1.0000e+07    0.0000e+00    0.0000e+00
1682 *
1683 *    loop 3 accumulator-valve delta pressure
1684 *         idcb          icbn          icb1          icb2          icb3
1685           -721            54           721           371             0
1686 *       lugain        luxmin        luxmax        lucon1        lucon2
1687       lunounit      lupressd      lupressd      lunounit      lupressd
1688 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1689    1.0000e+00   -1.0000e+07    1.0000e+07    0.0000e+00    0.0000e+00
1690 *
1691 *    loop 1 steam-gen level control
1692 *
1693 *    constant one
1694 *         idcb          icbn          icb1          icb2          icb3
1695          -1000             9             0             0             0
1696 *       lugain        luxmin        luxmax        lucon1        lucon2
1697       lurpress      lunounit      lunounit      lunounit      lunounit
1698 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1699    1.0000e+00    1.0000e+00    1.0000e+00    1.0000e+00    0.0000e+00
1700 *
1701 *    steam generator 1 non-zero steam flow
1702 *         idcb          icbn          icb1          icb2          icb3
1703          -1001            39         -1000          1100             0
1704 *       lugain        luxmin        luxmax        lucon1        lucon2
1705       lurpress      lunounit      lunounit      lunounit      lunounit
1706 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1707    1.0000e+00    1.0000e-06    1.0000e+06    0.0000e+00    0.0000e+00
1708 *
1709 *    steam generator 1 recirculation ratio (boiler flow/steam flow)
1710 *         idcb          icbn          icb1          icb2          icb3
1711          -1002            14          1000         -1001             0
1712 *       lugain        luxmin        luxmax        lucon1        lucon2
1713       lurpress      lunounit      lunounit      lunounit      lunounit
1714 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1715    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
```

```
1716 *
1717 *    loop 1 steam-gen level fraction = dp/(rhogxlref)
1718 *    where rhog = 8173.2 kg/m2/s2 and lref = 4.461 m
1719 *    such that 1.0/(rhogxlref) = 2.6363e-05 1/pa
1720 *         idcb          icbn          icb1          icb2          icb3
1721           -1004            54          1903          1051             0
1722 *       lugain        luxmin        luxmax        lucon1        lucon2
1723        lurpress      lunounit      lunounit      lunounit      lunounit
1724 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1725     2.6363e-05    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1726 *
1727 *    loop 1 steam-gen level signal lag
1728 *         idcb          icbn          icb1          icb2          icb3
1729           -1005            26         -1004             0             0   <-- 126
1730 *       lugain        luxmin        luxmax        lucon1        lucon2
1731        lunounit      lunounit      lunounit      lunounit      lunounit
1732 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1733     1.0000e+00    0.0000e+00    1.0000e+02    1.0000e+00    0.0000e+00
1734 *
1735 *    loop 1 steam-gen level error = l(table)-l(evaluated)
1736 *         idcb          icbn          icb1          icb2          icb3
1737           -1006            54         -4243         -1005             0
1738 *       lugain        luxmin        luxmax        lucon1        lucon2
1739        lunounit      lunounit      lunounit      lunounit      lunounit
1740 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1741     1.0000e+00   -1.0000e+02    1.0000e+02    0.0000e+00    0.0000e+00
1742 *
1743 *    loop 1 steam-gen integration for level pi controller
1744 *         idcb          icbn          icb1          icb2          icb3
1745           -1007            23         -1006             0             0
1746 *       lugain        luxmin        luxmax        lucon1        lucon2
1747        lunounit      lutime        lutime        lunounit      lutime
1748 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1749     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    0.0000e+00
1750 *
1751 *    loop 1 steam-gen weighted sum for level pi controller
1752 *         idcb          icbn          icb1          icb2          icb3
1753           -1008            59         -1006         -1007             0
1754 *       lugain        luxmin        luxmax        lucon1        lucon2
1755        lunounit      lunounit      lunounit      lunounit      lurtime
1756 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1757     1.0000e+00   -1.0000e+02    1.0000e+02    1.0000e+00    1.0000e-01
1758 *
1759 *    loop 1 steam-gen flow error, mstm-mfw
1760 *         idcb          icbn          icb1          icb2          icb3
1761           -1009            54         -1109         -1706             0
1762 *       lugain        luxmin        luxmax        lucon1        lucon2
1763        lunounit      lumassfw      lumassfw      lunounit      lumassfw
1764 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1765     1.0000e+00   -1.0000e+03    1.0000e+03    0.0000e+00    0.0000e+00
```

```
1766 *
1767 *    loop 1 steam-gen flow error fraction, (mstm-mfw)/mss
1768 *         idcb          icbn          icb1          icb2          icb3
1769          -1010            39         -1009           -11             0
1770 *       lugain        luxmin        luxmax        lucon1        lucon2
1771       lunounit      lunounit      lunounit      lunounit      lunounit
1772 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1773     1.0000e+00   -2.0000e+00    2.0000e+00    0.0000e+00    0.0000e+00
1774 *
1775 *    loop 1 steam-gen combined flow and level error
1776 *         idcb          icbn          icb1          icb2          icb3
1777          -1011             3         -1008         -1010             0
1778 *       lugain        luxmin        luxmax        lucon1        lucon2
1779       lunounit      lunounit      lunounit      lunounit      lunounit
1780 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1781     1.0000e+00   -2.0000e+01    2.0000e+01    0.0000e+00    0.0000e+00
1782 *
1783 *    loop 1 steam-gen integration for error of pi controller
1784 *         idcb          icbn          icb1          icb2          icb3
1785          -1012            23         -1011             0             0
1786 *       lugain        luxmin        luxmax        lucon1        lucon2
1787       lunounit        lutime        lutime      lunounit        lutime
1788 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1789     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    0.0000e+00
1790 *
1791 *    loop 1 steam-gen weighted sum error for pi controller
1792 *         idcb          icbn          icb1          icb2          icb3
1793          -1013            59         -1011         -1012             0
1794 *       lugain        luxmin        luxmax        lucon1        lucon2
1795       lunounit      lunounit      lunounit      lunounit       lurtime
1796 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1797     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    1.0000e-01
1798 *
1799 *    loop 1 steam-gen adjusted main-fdw control-valve flow area
1800 *         idcb          icbn          icb1          icb2          icb3
1801          -1014             3         -1013          1541             0
1802 *       lugain        luxmin        luxmax        lucon1        lucon2
1803       lunounit      lunounit      lunounit      lunounit      lunounit
1804 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1805     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1806 *
1807 *    loop 1 steam-line abs(delta pressure)
1808 *         idcb          icbn          icb1          icb2          icb3
1809          -1104             1          1135             0             0
1810 *       lugain        luxmin        luxmax        lucon1        lucon2
1811       lunounit      lupressd      lupressd      lunounit      lupressd
1812 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1813     1.0000e+00    0.0000e+00    1.0000e+08    0.0000e+00    0.0000e+00
1814 *
```





```
1815 *    loop 1 steam-line kxsqrt(delta pressure) where k = 0.84779
1816 *         idcb           icbn           icb1           icb2           icb3
1817          -1106             52          -1104              0              0
1818 *       lugain         luxmin         luxmax         lucon1         lucon2
1819        luarea       luasqrtp       luasqrtp       lunounit       luasqrtp
1820 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1821     8.4779e-01   -1.0000e+08    1.0000e+08    0.0000e+00    0.0000e+00
1822 *
1823 *    loop 1 steam-line mass flow
1824 *         idcb           icbn           icb1           icb2           icb3
1825          -1109             39          -1106            -15              0
1826 *       lugain         luxmin         luxmax         lucon1         lucon2
1827      lunounit       lumassfw       lumassfw       lunounit       lumassfw
1828 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1829     1.0000e+00    0.0000e+00    1.0000e+06    0.0000e+00    0.0000e+00
1830 *
1831 *    loop 1 steam-gen main steam-isolation valve (msiv) trip logic
1832 *         idcb           icbn           icb1           icb2           icb3
1833          -1110             34           -110            -14              0
1834 *       lugain         luxmin         luxmax         lucon1         lucon2
1835      lunounit       lunounit       lunounit       lunounit       lunounit
1836 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1837     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1838 *
1839 *    loop 1 low steam pressure trip signal
1840 *         idcb           icbn           icb1           icb2           icb3
1841          -1112             34            111            -13              0
1842 *       lugain         luxmin         luxmax         lucon1         lucon2
1843      lunounit       lunounit       lunounit       lunounit       lunounit
1844 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1845     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1846 *
1847 *    loop 1 high steam flow trip signal
1848 *         idcb           icbn           icb1           icb2           icb3
1849          -1114             21          -1109            -12              0
1850 *       lugain         luxmin         luxmax         lucon1         lucon2
1851      lunounit       lunounit       lunounit       lunounit       lunounit
1852 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1853     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1854 *
1855 *    loop 1 low tavg or low steam pressure trip signal
1856 *         idcb           icbn           icb1           icb2           icb3
1857          -1116             25          -1110          -1112              0
1858 *       lugain         luxmin         luxmax         lucon1         lucon2
1859      lunounit       lunounit       lunounit       lunounit       lunounit
1860 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1861     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1862 *
1863 *    loop 1 high mass flow and (low tavg or low press) trip signal
```

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```
1864 *         idcb           icbn           icb1           icb2           icb3
1865          -1118              5          -1114          -1116              0
1866 *       lugain         luxmin         luxmax         lucon1         lucon2
1867       lunounit       lunounit       lunounit       lunounit       lunounit
1868 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1869     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1870 *
1871 *    loop 1 steam-line porv control logic
1872 *
1873 *    loop 1 steam-line porv area fr vs presstable (turb-trip mode)
1874 *         idcb           icbn           icb1           icb2           icb3
1875          -1160            101           1121              2              0
1876 *       lugain         luxmin         luxmax         lucon1         lucon2
1877       lunounit       lunounit       lunounit       lunounit       lunounit
1878 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1879     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1880 *       luytab         luxtab
1881       lunounit       lupressa
1882 *
1883 * cbftb *      7.2400e+06     0.0000e+00     7.4500e+06     1.0000e+00e
1884 *
1885 *    loop 1 steam-line porv area (turbine trip or load rejection)
1886 *         idcb           icbn           icb1           icb2           icb3
1887          -1162             22          -1160          -4338           4240
1888 *       lugain         luxmin         luxmax         lucon1         lucon2
1889       lunounit       lunounit       lunounit       lunounit       lunounit
1890 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1891     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
1892 *
1893 *    loop 1 feedwater line abs(delta pressure)
1894 *         idcb           icbn           icb1           icb2           icb3
1895          -1704              1           1714              0              0
1896 *       lugain         luxmin         luxmax         lucon1         lucon2
1897       lunounit       lupressd       lupressd       lunounit       lupressd
1898 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1899     1.0000e+00     0.0000e+00     1.0000e+08     0.0000e+00     0.0000e+00
1900 *
1901 *    loop 1 feedwater mass flow = kxsqrt(delta pressure), k=1.46999
1902 *         idcb           icbn           icb1           icb2           icb3
1903          -1706             52          -1704              0              0
1904 *       lugain         luxmin         luxmax         lucon1         lucon2
1905       lusqrtml       lumassfw       lumassfw       lunounit       lumassfw
1906 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
1907    1.46999e00     0.0000e+00     1.0000e+04     0.0000e+00     0.0000e+00
1908 *
1909 *    loop 2 steam-gen level control
1910 *
1911 *    constant one
1912 *         idcb           icbn           icb1           icb2           icb3
1913          -2000              9              0              0              0
```

```
1914 *       lugain        luxmin        luxmax        lucon1        lucon2
1915        lusqrtml      lumassfw      lumassfw      lunounit      lumassfw
1916 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1917     1.0000e+00    1.0000e+00    1.0000e+00    1.0000e+00    0.0000e+00
1918 *
1919 *    steam generator 2 non-zero steam flow
1920 *         idcb          icbn          icb1          icb2          icb3
1921         -2001            39         -2000          2100             0
1922 *       lugain        luxmin        luxmax        lucon1        lucon2
1923        lusqrtml      lumassfw      lumassfw      lunounit      lumassfw
1924 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1925     1.0000e+00    1.0000e-06    1.0000e+06    0.0000e+00    0.0000e+00
1926 *
1927 *    steam generator 2 recirculation ratio (boiler flow/steam flow)
1928 *         idcb          icbn          icb1          icb2          icb3
1929         -2002            14          2000         -2001             0
1930 *       lugain        luxmin        luxmax        lucon1        lucon2
1931        lusqrtml      lumassfw      lumassfw      lunounit      lumassfw
1932 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1933     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
1934 *
1935 *    loop 2 steam-gen level fraction = dp/(rhogxlref)
1936 *     where rhog = 8173.2 kg/m2/s2 and lref = 4.461 m
1937 *     such that 1.0/(rhogxlref) = 2.6363e-05 1/pa
1938 *         idcb          icbn          icb1          icb2          icb3
1939         -2004            54          2903          2051             0
1940 *       lugain        luxmin        luxmax        lucon1        lucon2
1941        lurpress      lunounit      lunounit      lunounit      lunounit
1942 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1943     2.6363e-05    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
1944 *
1945 *    loop 2 steam-gen level signal lag
1946 *         idcb          icbn          icb1          icb2          icb3
1947         -2005            26         -2004             0             0
1948 *       lugain        luxmin        luxmax        lucon1        lucon2
1949        lunounit      lunounit      lunounit      lunounit      lunounit
1950 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1951     1.0000e+00    0.0000e+00    1.0000e+02    1.0000e+00    0.0000e+00
1952 *
1953 *    loop 2 steam-gen level error = l(table)-l(evaluated)
1954 *         idcb          icbn          icb1          icb2          icb3
1955         -2006            54         -4243         -2005             0
1956 *       lugain        luxmin        luxmax        lucon1        lucon2
1957        lunounit      lunounit      lunounit      lunounit      lunounit
1958 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1959     1.0000e+00   -1.0000e+02    1.0000e+02    0.0000e+00    0.0000e+00
1960 *
1961 *    loop 2 steam-gen integration of level for pi controller
1962 *         idcb          icbn          icb1          icb2          icb3
1963         -2007            23         -2006             0             0
```

```
1964 *       lugain          luxmin          luxmax          lucon1          lucon2
1965       lunounit          lutime          lutime        lunounit          lutime
1966 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1967     1.0000e+00    -1.0000e-01     1.0000e-01     1.0000e+00     0.0000e+00
1968 *
1969 *    loop 2 steam-gen weighted sum for level of pi controller
1970 *          idcb            icbn            icb1            icb2            icb3
1971          -2008              59           -2006           -2007               0
1972 *       lugain          luxmin          luxmax          lucon1          lucon2
1973       lunounit        lunounit        lunounit        lunounit        lurtime
1974 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1975     1.0000e+00    -1.0000e+02     1.0000e+02     1.0000e+00     1.0000e-01
1976 *
1977 *    loop 2 steam-gen mass flow error, mstm-mfw
1978 *          idcb            icbn            icb1            icb2            icb3
1979          -2009              54           -2109           -2706               0
1980 *       lugain          luxmin          luxmax          lucon1          lucon2
1981       lunounit        lumassfw        lumassfw        lunounit        lumassfw
1982 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1983     1.0000e+00    -1.0000e+03     1.0000e+03     0.0000e+00     0.0000e+00
1984 *
1985 *    loop 2 steam-gen mass flow error fraction, (mstm-mfw)/mss
1986 *          idcb            icbn            icb1            icb2            icb3
1987          -2010              39           -2009             -11               0
1988 *       lugain          luxmin          luxmax          lucon1          lucon2
1989       lunounit        lunounit        lunounit        lunounit        lunounit
1990 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1991     1.0000e+00    -2.0000e+00     2.0000e+00     0.0000e+00     0.0000e+00
1992 *
1993 *    loop 2 steam-gen combined flow and level error
1994 *          idcb            icbn            icb1            icb2            icb3
1995          -2011               3           -2008           -2010               0
1996 *       lugain          luxmin          luxmax          lucon1          lucon2
1997       lunounit        lunounit        lunounit        lunounit        lunounit
1998 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
1999     1.0000e+00    -2.0000e+01     2.0000e+01     0.0000e+00     0.0000e+00
2000 *
2001 *    loop 2 steam-gen integration for error of pi controller
2002 *          idcb            icbn            icb1            icb2            icb3
2003          -2012              23           -2011               0               0
2004 *       lugain          luxmin          luxmax          lucon1          lucon2
2005       lunounit          lutime          lutime        lunounit          lutime
2006 *       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
2007     1.0000e+00    -1.0000e-01     1.0000e-01     1.0000e+00     0.0000e+00
2008 *
2009 *    loop 2 steam-gen weighted sum for error of pi controller
2010 *          idcb            icbn            icb1            icb2            icb3
2011          -2013              59           -2011           -2012               0
2012 *       lugain          luxmin          luxmax          lucon1          lucon2
```

```
2013       lunounit      lunounit      lunounit      lunounit      lurtime
2014 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2015     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    1.0000e-01
2016 *
2017 *    loop 2 steam-gen adjusted main-fdw control-valve flow area
2018 *         idcb          icbn          icb1          icb2          icb3
2019        -2014             3         -2013          2541             0
2020 *       lugain        luxmin        luxmax        lucon1        lucon2
2021       lunounit      lunounit      lunounit      lunounit      lunounit
2022 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2023     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2024 *
2025 *    loop 2 steam-line abs(delta pressure)
2026 *         idcb          icbn          icb1          icb2          icb3
2027        -2104             1          2135             0             0
2028 *       lugain        luxmin        luxmax        lucon1        lucon2
2029       lunounit      lupressd      lupressd      lunounit      lupressd
2030 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2031     1.0000e+00    0.0000e+00    1.0000e+08    0.0000e+00    0.0000e+00
2032 *
2033 *    loop 2 steam-line kxsqrt(delta pressure) where k = 0.84779
2034 *         idcb          icbn          icb1          icb2          icb3
2035        -2106            52         -2104             0             0
2036 *       lugain        luxmin        luxmax        lucon1        lucon2
2037       luarea      luasqrtp      luasqrtp      lunounit      luasqrtp
2038 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2039    0.84779-01   -1.0000e+08    1.0000e+08    0.0000e+00    0.0000e+00
2040 *
2041 *    loop 2 steam-line mass flow
2042 *         idcb          icbn          icb1          icb2          icb3
2043        -2109            39         -2106           -15             0
2044 *       lugain        luxmin        luxmax        lucon1        lucon2
2045       lunounit      lumassfw      lumassfw      lunounit      lumassfw
2046 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2047     1.0000e+00    0.0000e+00    1.0000e+06    0.0000e+00    0.0000e+00
2048 *
2049 *    loop 2 steam-gen main steam-isolation valve (msiv) trip logic
2050 *         idcb          icbn          icb1          icb2          icb3
2051        -2110            34          -210           -14             0
2052 *       lugain        luxmin        luxmax        lucon1        lucon2
2053       lunounit      lunounit      lunounit      lunounit      lunounit
2054 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2055     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2056 *
2057 *    loop 2 low steam pressure trip signal
2058 *         idcb          icbn          icb1          icb2          icb3
2059        -2112            34           222           -13             0
2060 *       lugain        luxmin        luxmax        lucon1        lucon2
2061       lunounit      lunounit      lunounit      lunounit      lunounit
```

```
2062 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2063     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2064 *
2065 *    loop 2 high steam flow trip signal
2066 *         idcb          icbn          icb1          icb2          icb3
2067          -2114            21         -2109           -12             0
2068 *       lugain        luxmin        luxmax        lucon1        lucon2
2069       lunounit      lunounit      lunounit      lunounit      lunounit
2070 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2071     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2072 *
2073 *    loop 2 low tavg or low steam pressure trip signal
2074 *         idcb          icbn          icb1          icb2          icb3
2075          -2116            25         -2110         -2112             0
2076 *       lugain        luxmin        luxmax        lucon1        lucon2
2077       lunounit      lunounit      lunounit      lunounit      lunounit
2078 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2079     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2080 *
2081 *    loop 2 high flow and (low tavg or low pressure) trip signal
2082 *         idcb          icbn          icb1          icb2          icb3
2083          -2118             5         -2114         -2116             0
2084 *       lugain        luxmin        luxmax        lucon1        lucon2
2085       lunounit      lunounit      lunounit      lunounit      lunounit
2086 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2087     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2088 *
2089 *    loop 2 steam-line porv control logic
2090 *
2091 *    loop 2 steam-line porv area fr vs press table (turb-trip mode)
2092 *         idcb          icbn          icb1          icb2          icb3
2093          -2160           101          2121             2             0
2094 *       lugain        luxmin        luxmax        lucon1        lucon2
2095       lunounit      lunounit      lunounit      lunounit      lunounit
2096 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2097     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2098 *       luytab        luxtab
2099       lunounit      lupressa
2100 *
2101 * cbftb *     7.2400e+06    0.0000e+00    7.4500e+06    1.0000e+00e
2102 *
2103 *    loop 2 steam-line porv area (turbine trip or load rejection)
2104 *         idcb          icbn          icb1          icb2          icb3
2105          -2162            22         -2160         -4338          4240
2106 *       lugain        luxmin        luxmax        lucon1        lucon2
2107       lunounit      lunounit      lunounit      lunounit      lunounit
2108 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2109     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2110 *
```

```
2111 *    loop 2 feedwater-line abs(delta pressure)
2112 *         idcb          icbn          icb1          icb2          icb3
2113          -2704             1          2714             0             0
2114 *       lugain        luxmin        luxmax       lucon1       lucon2
2115       lunounit      lupressd      lupressd      lunounit      lupressd
2116 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
2117    1.0000e+00    0.0000e+00    1.0000e+08    0.0000e+00    0.0000e+00
2118 *
2119 *    loop 2 feedwater mass flow = kxsqrt(delta pressure), k = 0.74264
2120 *         idcb          icbn          icb1          icb2          icb3
2121          -2706            52         -2704             0             0
2122 *       lugain        luxmin        luxmax       lucon1       lucon2
2123       lusqrtml      lumassfw      lumassfw      lunounit      lumassfw
2124 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
2125    7.4264e-01    0.0000e+00    1.0000e+04    0.0000e+00    0.0000e+00
2126 *
2127 *    loop 3 steam-gen level control
2128 *
2129 *    loop 3 steam-gen level fraction = dp/(rhogxlref)
2130 *    where rhog = 8173.2 kg/m2/s2 and lref = 4.461 m
2131 *    such that 1.0/(rhogxlref) = 2.6363e-05 1/pa
2132 *         idcb          icbn          icb1          icb2          icb3
2133          -3004            54          3903          3051             0
2134 *       lugain        luxmin        luxmax       lucon1       lucon2
2135       lurpress      lunounit      lunounit      lunounit      lunounit
2136 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
2137    2.6363e-05    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2138 *
2139 *    loop 3 steam-gen level signal lag
2140 *         idcb          icbn          icb1          icb2          icb3
2141          -3005            26         -3004             0             0
2142 *       lugain        luxmin        luxmax       lucon1       lucon2
2143       lunounit      lunounit      lunounit      lunounit      lunounit
2144 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
2145    1.0000e+00    0.0000e+00    1.0000e+02    1.0000e+00    0.0000e+00
2146 *
2147 *    loop 3 steam-gen level error = 1(table)-1(evaluated)
2148 *         idcb          icbn          icb1          icb2          icb3
2149          -3006            54         -4243         -3005             0
2150 *       lugain        luxmin        luxmax       lucon1       lucon2
2151       lunounit      lunounit      lunounit      lunounit      lunounit
2152 *       cbgain        cbxmin        cbxmax       cbcon1       cbcon2
2153    1.0000e+00   -1.0000e+02    1.0000e+02    0.0000e+00    0.0000e+00
2154 *
2155 *    loop 3 steam-gen level integration for pi controller
2156 *         idcb          icbn          icb1          icb2          icb3
2157          -3007            23         -3006             0             0
2158 *       lugain        luxmin        luxmax       lucon1       lucon2
2159       lunounit        lutime        lutime      lunounit        lutime
```

```
2160 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2161     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    0.0000e+00
2162 *
2163 *    loop 3 steam-gen weighted sum for level of pi controller
2164 *         idcb          icbn          icb1          icb2          icb3
2165         -3008            59         -3006         -3007             0
2166 *       lugain        luxmin        luxmax        lucon1        lucon2
2167       lunounit      lunounit      lunounit      lunounit       lurtime
2168 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2169     1.0000e+00   -1.0000e+02    1.0000e+02    1.0000e+00    1.0000e-01
2170 *
2171 *    loop 3 steam-gen flow error, mstm-mfw
2172 *         idcb          icbn          icb1          icb2          icb3
2173         -3009            54         -3109         -3706             0
2174 *       lugain        luxmin        luxmax        lucon1        lucon2
2175       lunounit      lumassfw      lumassfw      lunounit      lumassfw
2176 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2177     1.0000e+00   -1.0000e+03    1.0000e+03    0.0000e+00    0.0000e+00
2178 *
2179 *    loop 3 steam-gen flow error fraction, (mstm-mfw)/mss
2180 *         idcb          icbn          icb1          icb2          icb3
2181         -3010            39         -3009           -11             0
2182 *       lugain        luxmin        luxmax        lucon1        lucon2
2183       lunounit      lunounit      lunounit      lunounit      lunounit
2184 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2185     1.0000e+00   -2.0000e+00    2.0000e+00    0.0000e+00    0.0000e+00
2186 *
2187 *    loop 3 steam-gen combined flow and level error
2188 *         idcb          icbn          icb1          icb2          icb3
2189         -3011             3         -3008         -3010             0
2190 *       lugain        luxmin        luxmax        lucon1        lucon2
2191       lunounit      lunounit      lunounit      lunounit      lunounit
2192 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2193     1.0000e+00   -2.0000e+01    2.0000e+01    0.0000e+00    0.0000e+00
2194 *
2195 *    loop 3 steam-gen integration of error for pi controller
2196 *         idcb          icbn          icb1          icb2          icb3
2197         -3012            23         -3011             0             0
2198 *       lugain        luxmin        luxmax        lucon1        lucon2
2199       lunounit       lutime        lutime      lunounit        lutime
2200 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2201     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    0.0000e+00
2202 *
2203 *    loop 3 steam-gen weighted sum for pi controller
2204 *         idcb          icbn          icb1          icb2          icb3
2205         -3013            59         -3011         -3012             0
2206 *       lugain        luxmin        luxmax        lucon1        lucon2
2207       lunounit      lunounit      lunounit      lunounit       lurtime
2208 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2209     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    1.0000e-01
```

```
2210 *
2211 *    loop 3 steam-gen adjusted main-fdw control-valve flow area
2212 *         idcb          icbn          icb1          icb2          icb3
2213          -3014             3         -3013          3541             0
2214 *       lugain        luxmin        luxmax        lucon1        lucon2
2215       lunounit      lunounit      lunounit      lunounit      lunounit
2216 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2217    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2218 *
2219 *    loop 3 steam-line abs(delta pressure)
2220 *         idcb          icbn          icb1          icb2          icb3
2221          -3104             1          3135             0             0
2222 *       lugain        luxmin        luxmax        lucon1        lucon2
2223       lunounit      lupressd      lupressd      lunounit      lupressd
2224 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2225    1.0000e+00    0.0000e+00    1.0000e+08    0.0000e+00    0.0000e+00
2226 *
2227 *    loop 3 steam-line kxsqrt(delta pressure) where k= 0.22179 m2
2228 *         idcb          icbn          icb1          icb2          icb3
2229          -3106            52         -3104             0             0
2230 *       lugain        luxmin        luxmax        lucon1        lucon2
2231       luarea      luasqrtp      luasqrtp      lunounit      luasqrtp
2232 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2233    1.46999    0.0000e+00    1.0000e+04    0.0000e+00    0.0000e+00
2234 *
2235 *    loop 3 steam-gen level control
2236 *
2237 *    constant one
2238 *         idcb          icbn          icb1          icb2          icb3
2239          -3000             9             0             0             0
2240 *       lugain        luxmin        luxmax        lucon1        lucon2
2241       luarea      luasqrtp      luasqrtp      lunounit      luasqrtp
2242 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2243    1.0000e+00    1.0000e+00    1.0000e+00    1.0000e+00    0.0000e+00
2244 *
2245 *    steam generator 3 non-zero steam flow
2246 *         idcb          icbn          icb1          icb2          icb3
2247          -3001            39         -3000          3100             0
2248 *       lugain        luxmin        luxmax        lucon1        lucon2
2249       luarea      luasqrtp      luasqrtp      lunounit      luasqrtp
2250 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2251    1.0000e+00    1.0000e-06    1.0000e+06    0.0000e+00    0.0000e+00
2252 *
2253 *    steam generator 3 recirculation ratio (boiler flow/steam flow)
2254 *         idcb          icbn          icb1          icb2          icb3
2255          -3002            14          3000         -3001             0
2256 *       lugain        luxmin        luxmax        lucon1        lucon2
2257       luarea      luasqrtp      luasqrtp      lunounit      luasqrtp
2258 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2259    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
```

```
2260 *
2261 *    loop 3 steam-gen level fraction = dp/(rhogxlref)
2262 *    where rhog = 8173.2 kg/m2/s2 and lref = 4.461 m
2263 *    such that 1.0/(rhogxlref) = 2.6363e-05 1/pa
2264 *         idcb          icbn          icb1          icb2          icb3
2265          -3004            54          3903          3051             0
2266 *       lugain        luxmin        luxmax        lucon1        lucon2
2267       lurpress      lunounit      lunounit      lunounit      lunounit
2268 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2269     2.6363e-05    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2270 *
2271 *    loop 3 steam-gen level signal lag
2272 *         idcb          icbn          icb1          icb2          icb3
2273          -3005            26         -3004             0             0
2274 *       lugain        luxmin        luxmax        lucon1        lucon2
2275       lunounit      lunounit      lunounit      lunounit      lunounit
2276 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2277     1.0000e+00    0.0000e+00    1.0000e+02    1.0000e+00    0.0000e+00
2278 *
2279 *    loop 3 steam-gen level error = l(table)-l(evaluated)
2280 *         idcb          icbn          icb1          icb2          icb3
2281          -3006            54         -4243         -3005             0
2282 *       lugain        luxmin        luxmax        lucon1        lucon2
2283       lunounit      lunounit      lunounit      lunounit      lunounit
2284 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2285     1.0000e+00   -1.0000e+02    1.0000e+02    0.0000e+00    0.0000e+00
2286 *
2287 *    loop 3 steam-gen level integration for pi controller
2288 *         idcb          icbn          icb1          icb2          icb3
2289          -3007            23         -3006             0             0
2290 *       lugain        luxmin        luxmax        lucon1        lucon2
2291       lunounit        lutime        lutime      lunounit        lutime
2292 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2293     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    0.0000e+00
2294 *
2295 *    loop 3 steam-gen weighted sum for level of pi controller
2296 *         idcb          icbn          icb1          icb2          icb3
2297          -3008            59         -3006         -3007             0
2298 *       lugain        luxmin        luxmax        lucon1        lucon2
2299       lunounit      lunounit      lunounit      lunounit       lurtime
2300 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2301     1.0000e+00   -1.0000e+02    1.0000e+02    1.0000e+00    1.0000e-01
2302 *
2303 *    loop 3 steam-gen flow error, mstm-mfw
2304 *         idcb          icbn          icb1          icb2          icb3
2305          -3009            54         -3109         -3706             0
2306 *       lugain        luxmin        luxmax        lucon1        lucon2
2307       lunounit      lumassfw      lumassfw      lunounit      lumassfw
2308 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2309     1.0000e+00   -1.0000e+03    1.0000e+03    0.0000e+00    0.0000e+00
```

```
2310 *
2311 *    loop 3 steam-gen flow error fraction, (mstm-mfw)/mss
2312 *         idcb          icbn          icb1          icb2          icb3
2313          -3010            39         -3009           -11             0
2314 *       lugain        luxmin        luxmax        lucon1        lucon2
2315       lunounit      lunounit      lunounit      lunounit      lunounit
2316 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2317     1.0000e+00   -2.0000e+00    2.0000e+00    0.0000e+00    0.0000e+00
2318 *
2319 *    loop 3 steam-gen combined flow and level error
2320 *         idcb          icbn          icb1          icb2          icb3
2321          -3011             3         -3008         -3010             0
2322 *       lugain        luxmin        luxmax        lucon1        lucon2
2323       lunounit      lunounit      lunounit      lunounit      lunounit
2324 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2325     1.0000e+00   -2.0000e+01    2.0000e+01    0.0000e+00    0.0000e+00
2326 *
2327 *    loop 3 steam-gen integration of error for pi controller
2328 *         idcb          icbn          icb1          icb2          icb3
2329          -3012            23         -3011             0             0
2330 *       lugain        luxmin        luxmax        lucon1        lucon2
2331       lunounit        lutime        lutime      lunounit        lutime
2332 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2333     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    0.0000e+00
2334 *
2335 *    loop 3 steam-gen weighted sum for pi controller
2336 *         idcb          icbn          icb1          icb2          icb3
2337          -3013            59         -3011         -3012             0
2338 *       lugain        luxmin        luxmax        lucon1        lucon2
2339       lunounit      lunounit      lunounit      lunounit       lurtime
2340 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2341     1.0000e+00   -1.0000e-01    1.0000e-01    1.0000e+00    1.0000e-01
2342 *
2343 *    loop 3 steam-gen adjusted main-fdw control-valve flow area
2344 *         idcb          icbn          icb1          icb2          icb3
2345          -3014             3         -3013          3541             0
2346 *       lugain        luxmin        luxmax        lucon1        lucon2
2347       lunounit      lunounit      lunounit      lunounit      lunounit
2348 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2349     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2350 *
2351 *    loop 3 steam-line abs(delta pressure)
2352 *         idcb          icbn          icb1          icb2          icb3
2353          -3104             1          3135             0             0
2354 *       lugain        luxmin        luxmax        lucon1        lucon2
2355       lunounit      lupressd      lupressd      lunounit      lupressd
2356 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2357     1.0000e+00    0.0000e+00    1.0000e+08    0.0000e+00    0.0000e+00
2358 *
```

```
2359 *    loop 3 steam-line kxsqrt(delta pressure) where k= 0.22179 m2
2360 *         idcb          icbn          icb1          icb2          icb3
2361          -3106            52         -3104             0             0
2362 *       lugain        luxmin        luxmax        lucon1        lucon2
2363        luarea      luasqrtp      luasqrtp      lunounit      luasqrtp
2364 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2365      0.84779   -1.0000e+08    1.0000e+08    0.0000e+00    0.0000e+00
2366 *
2367 *    loop 3 steam-line mass flow
2368 *         idcb          icbn          icb1          icb2          icb3
2369          -3109            39         -3106           -15             0
2370 *       lugain        luxmin        luxmax        lucon1        lucon2
2371      lunounit      lumassfw      lumassfw      lunounit      lumassfw
2372 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2373    1.0000e+00    0.0000e+00    1.0000e+06    0.0000e+00    0.0000e+00
2374 *
2375 *    loop 3 steam-gen main steam-isolation valve (msiv) trip logic
2376 *         idcb          icbn          icb1          icb2          icb3
2377          -3110            34          -310           -14             0
2378 *       lugain        luxmin        luxmax        lucon1        lucon2
2379      lunounit      lunounit      lunounit      lunounit      lunounit
2380 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2381    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2382 *
2383 *    loop 3 low steam pressure trip signal
2384 *         idcb          icbn          icb1          icb2          icb3
2385          -3112            34           333           -13             0
2386 *       lugain        luxmin        luxmax        lucon1        lucon2
2387      lunounit      lunounit      lunounit      lunounit      lunounit
2388 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2389    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2390 *
2391 *    loop 3 high steam flow trip signal
2392 *         idcb          icbn          icb1          icb2          icb3
2393          -3114            21         -3109           -12             0
2394 *       lugain        luxmin        luxmax        lucon1        lucon2
2395      lunounit      lunounit      lunounit      lunounit      lunounit
2396 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2397    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2398 *
2399 *    loop 3 low tavg or low steam pressure trip signal
2400 *         idcb          icbn          icb1          icb2          icb3
2401          -3116            25         -3110         -3112             0
2402 *       lugain        luxmin        luxmax        lucon1        lucon2
2403      lunounit      lunounit      lunounit      lunounit      lunounit
2404 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2405    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2406 *
2407 *    loop 3 high flow and (low tavg or low pressure) trip signal
```

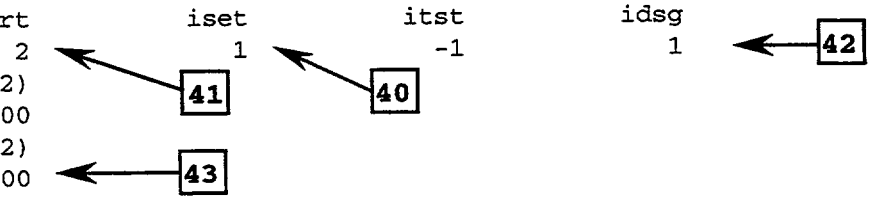
```
2408 *         idcb          icbn          icb1          icb2          icb3
2409          -3118             5         -3114         -3116             0
2410 *       lugain        luxmin        luxmax        lucon1        lucon2
2411       lunounit      lunounit      lunounit      lunounit      lunounit
2412 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2413     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2414 *
2415 *    loop 3 steam-line porv control logic
2416 *
2417 *    loop 3 steam-line porv area fr vs press table (turb-trip mode)
2418 *         idcb          icbn          icb1          icb2          icb3
2419          -3160           101          3121             2             0
2420 *       lugain        luxmin        luxmax        lucon1        lucon2
2421       lunounit      lunounit      lunounit      lunounit      lunounit
2422 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2423     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2424 *       luytab        luxtab
2425       lunounit      lupressa
2426 *
2427 * cbftb *     7.2400e+06    0.0000e+00    7.4500e+06    1.0000e+00e
2428 *
2429 *    loop 3 steam-line porv area (turbine trip or load rejection)
2430 *         idcb          icbn          icb1          icb2          icb3
2431          -3162             22         -3160         -4338          4240
2432 *       lugain        luxmin        luxmax        lucon1        lucon2
2433       lunounit      lunounit      lunounit      lunounit      lunounit
2434 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2435     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2436 *
2437 *    loop 3 feedwater-line abs(delta pressure)
2438 *         idcb          icbn          icb1          icb2          icb3
2439          -3704             1          3714             0             0
2440 *       lugain        luxmin        luxmax        lucon1        lucon2
2441       lunounit      lupressd      lupressd      lunounit      lupressd
2442 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2443     1.0000e+00    0.0000e+00    1.0000e+08    0.0000e+00    0.0000e+00
2444 *
2445 *    loop 3 feedwater mass flow = kxsqrt(delta pressure), k = 1.46999
2446 *         idcb          icbn          icb1          icb2          icb3
2447          -3706             52         -3704             0             0
2448 *       lugain        luxmin        luxmax        lucon1        lucon2
2449       lusqrtml      lumassfw      lumassfw      lunounit      lumassfw
2450 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2451        1.46999    0.0000e+00    1.0000e+04    0.0000e+00    0.0000e+00
2452 *
2453 *    programmed steam-generator level
2454 *
2455 *    constant reference turbine pressure
2456 *         idcb          icbn          icb1          icb2          icb3
2457          -4241             9             0             0             0
```

```
2458 *       lugain        luxmin        luxmax        lucon1        lucon2
2459       lupressa      lupressa      lupressa      lupressa      lupressa
2460 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2461     1.0000e+00    5.6172e+06    5.6172e+06    5.6172e+06    5.6172e+06
2462 *
2463 *    power fraction versus turbine pressure table
2464 *         idcb          icbn          icb1          icb2          icb3
2465         -4242           101         -4241             2             0
2466 *       lugain        luxmin        luxmax        lucon1        lucon2
2467       lunounit      lunounit      lunounit      lunounit      lunounit
2468 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2469     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2470 *       luytab        luxtab
2471       lunounit      lupressa
2472 *
2473 * cbftb *     1.0135e+05    0.0000e+00    5.6172e+06    1.0000e+00e
2474 *
2475 *    steam-generator level fraction versus power fraction table
2476 *         idcb          icbn          icb1          icb2          icb3
2477         -4243           101         -4242             2             0
2478 *       lugain        luxmin        luxmax        lucon1        lucon2
2479       lunounit      lunounit      lunounit      lunounit      lunounit
2480 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2481     1.0000e+00    0.0000e+00    5.2000e-01    0.0000e+00    0.0000e+00
2482 *       luytab        luxtab
2483       lunounit      lunounit
2484 *
2485 * cbftb *     0.0000e+00    3.9000e-01    2.0000e-01    5.2000e-01e
2486 *
2487 *    steam-dump control system
2488 *
2489 *    constant no-load tavg temperature = 559.3 k
2490 *         idcb          icbn          icb1          icb2          icb3
2491         -4300             9             0             0             0
2492 *       lugain        luxmin        luxmax        lucon1        lucon2
2493       lunounit      lutemp        lutemp        lutemp        lutemp
2494 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2495     1.0000e+00    5.5930e+02    5.5930e+02    5.5930e+02    5.5930e+02
2496 *
2497 *    constant turbine impulse-stage pressure (tip)
2498 *         idcb          icbn          icb1          icb2          icb3
2499         -4302             9             0             0             0
2500 *       lugain        luxmin        luxmax        lucon1        lucon2
2501       lunounit      lupressa      lupressa      lupressa      lupressa
2502 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2503     1.0000e+00    3.8128e+06    3.8128e+06    3.8128e+06    3.8128e+06
2504 *
2505 *    reference tavg temperature table versus pressure (tip)
2506 *         idcb          icbn          icb1          icb2          icb3
2507         -4304           101         -4302             3             0
```

```
2508 *       lugain         luxmin         luxmax         lucon1         lucon2
2509       lunounit         lutemp         lutemp       lunounit         lutemp
2510 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
2511     1.0000e+00     5.5930e+02     5.7510e+02     0.0000e+00     5.6890e+02
2512 *       luytab         luxtab
2513         lutemp       lupressa
2514 *
2515 * cbftb *      0.0000e+00     5.5930e+02     3.6542e+06     5.6890e+02     3.8128e+06
2516 * cbftb *      5.7510e+02e
2517 *
2518 *    amax1(tavg1,tavg2)
2519 *          idcb           icbn           icb1           icb2           icb3
2520          -4310             35           -110           -210              0
2521 *       lugain         luxmin         luxmax         lucon1         lucon2
2522       lunounit         lutemp         lutemp       lunounit         lutemp
2523 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
2524     1.0000e+00     0.0000e+00     1.0000e+03     0.0000e+00     0.0000e+00
2525 *
2526 *    amax1(tavg1,tavg2,tavg3)
2527 *          idcb           icbn           icb1           icb2           icb3
2528          -4312             35          -4310           -310              0
2529 *       lugain         luxmin         luxmax         lucon1         lucon2
2530       lunounit         lutemp         lutemp       lunounit         lutemp
2531 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
2532     1.0000e+00     0.0000e+00     1.0000e+03     0.0000e+00     0.0000e+00
2533 *
2534 *    turbine-trip lead/lag maximum tavg
2535 *          idcb           icbn           icb1           icb2           icb3
2536          -4314             30          -4312              0              0
2537 *       lugain         luxmin         luxmax         lucon1         lucon2
2538       lunounit         lutemp         lutemp         lutime         lutime
2539 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
2540     1.0000e+00     0.0000e+00     1.0000e+03     5.0000e-01     5.0000e-01
2541 *
2542 *    tavg(maximum) - tavg(no-load)
2543 *          idcb           icbn           icb1           icb2           icb3
2544          -4316             54          -4314          -4300              0
2545 *       lugain         luxmin         luxmax         lucon1         lucon2
2546       lunounit        lutempd        lutempd       lunounit        lutempd
2547 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
2548     1.0000e+00    -1.0000e+03     1.0000e+03     0.0000e+00     0.0000e+00
2549 *
2550 *    bank 1 turbine-trip cdv area fraction table
2551 *          idcb           icbn           icb1           icb2           icb3
2552          -4318            101          -4316              2              0
2553 *       lugain         luxmin         luxmax         lucon1         lucon2
2554       lunounit       lunounit       lunounit       lunounit       lunounit
2555 *       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
2556     1.0000e+00     0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
```

```
2557 *       luytab        luxtab
2558       lunounit       lutempd
2559 *
2560 * cbftb * r02 0.0000e+00    1.0000e+01    1.0000e+00e
2561 *
2562 *    bank 2 turbine-trip cdv area fraction table
2563 *         idcb          icbn          icb1          icb2          icb3
2564          -4320           101         -4316             2             0
2565 *       lugain        luxmin        luxmax        lucon1        lucon2
2566       lunounit      lunounit      lunounit      lunounit      lunounit
2567 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2568     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2569 *       luytab        luxtab
2570       lunounit       lutempd
2571 *
2572 * cbftb *     1.0000e+01    0.0000e+00    1.6700e+01    1.0000e+00e
2573 *
2574 *    load-rejection control mode (turbine not tripped)
2575 *
2576 *    load-reject lead/lag maxiumu tavg
2577 *         idcb          icbn          icb1          icb2          icb3
2578          -4330             30         -4312             0             0
2579 *       lugain        luxmin        luxmax        lucon1        lucon2
2580       lunounit       lutemp        lutemp        lutime        lutime
2581 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2582     1.0000e+00    0.0000e+00    1.0000e+03    2.5000e+01    5.0000e+00
2583 *
2584 *    tavg(maximum) - tavg(reference)
2585 *         idcb          icbn          icb1          icb2          icb3
2586          -4332             54         -4330         -4304             0
2587 *       lugain        luxmin        luxmax        lucon1        lucon2
2588       lunounit      lutempd       lutempd      lunounit       lutempd
2589 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2590     1.0000e+00   -1.0000e+03    1.0000e+03    0.0000e+00    0.0000e+00
2591 *
2592 *    bank 1 load-reject cdv area fraction table
2593 *         idcb          icbn          icb1          icb2          icb3
2594          -4334           101         -4332             2             0
2595 *       lugain        luxmin        luxmax        lucon1        lucon2
2596       lunounit      lunounit      lunounit      lunounit      lunounit
2597 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2598     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2599 *       luytab        luxtab
2600       lunounit       lutempd
2601 *
2602 * cbftb *     1.1100e+00    0.0000e+00    6.7200e+00    1.0000e+00e
2603 *
2604 *    bank 2 load-reject cdv area fraction table
2605 *         idcb          icbn          icb1          icb2          icb3
2606          -4336           101         -4332             2             0
```

```
2607 *       lugain        luxmin        luxmax        lucon1        lucon2
2608       lunounit      lunounit      lunounit      lunounit      lunounit
2609 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2610     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2611 *       luytab        luxtab
2612       lunounit      lutempd
2613 *
2614 * cbftb *     6.7200e+00    0.0000e+00    9.2000e+00    1.0000e+00e
2615 *
2616 *    porv load-reject area fraction
2617 *          idcb          icbn          icb1          icb2          icb3
2618          -4338           101         -4332             2             0
2619 *       lugain        luxmin        luxmax        lucon1        lucon2
2620       lunounit      lunounit      lunounit      lunounit      lunounit
2621 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2622     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2623 *       luytab        luxtab
2624       lunounit      lutempd
2625 *
2626 * cbftb *     9.2000e+00    0.0000e+00    1.8100e+01    1.0000e+00e
2627 *
2628 *    bank 1 cdv area fraction (turbine-trip or load-reject)
2629 *          idcb          icbn          icb1          icb2          icb3
2630          -4340             22         -4318         -4334          4240
2631 *       lugain        luxmin        luxmax        lucon1        lucon2
2632       lunounit      lunounit      lunounit      lunounit      lunounit
2633 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2634     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2635 *
2636 *    bank 2 cdv area fraction (turbine-trip or load-reject)
2637 *          idcb          icbn          icb1          icb2          icb3
2638          -4342             22         -4320         -4336          4240
2639 *       lugain        luxmin        luxmax        lucon1        lucon2
2640       lunounit      lunounit      lunounit      lunounit      lunounit
2641 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2642     1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
2643 *
2644 * trips
2645 *
2646 *    trip-dimension variables data
2647 *          ntse          ntct          ntsf          ntdp          ntsd
2648             3             20             0             0             0
2649 *
2650 *    0.0 s problem time steady-state trip
2651 *          idtp          isrt          iset          itst          idsg
2652             1             2             1            -1             1
2653 *       setp(1)       setp(2)
2654    -1.0000e+00    0.0000e+00
2655 *       dtsp(1)       dtsp(2)
2656     0.0000e+00    0.0000e+00
```



```
*      ifsp(1)       ifsp(2)
             0             0
*
*    reactor trip subsets 1 and 2
*         idtp          isrt          iset          itst          idsg
            10             2             0             3           100
*      setp(1)       setp(2)
    1.0000e-01    9.0000e-01
*      dtsp(1)       dtsp(2)
    1.0000e+06    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*    reactor trips subset 1
*         idtp          isrt          iset          itst          idsg
            12             2             0            -3           120
*      setp(1)       setp(2)
    1.0000e-01    9.0000e-01
*      dtsp(1)       dtsp(2)
    1.0000e+06    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*    reactor trips subset 2
*         idtp          isrt          iset          itst          idsg
            14             2             0            -3           140
*      setp(1)       setp(2)
    1.0000e-01    9.0000e-01
*      dtsp(1)       dtsp(2)
    1.0000e+06    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*    turbine trip
*         idtp          isrt          iset          itst          idsg
            16             2             0             3           160
*      setp(1)       setp(2)
    1.0000e-01    9.0000e-01
*      dtsp(1)       dtsp(2)
    1.0000e+06    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*    tsv trip
*         idtp          isrt          iset          itst          idsg
            18             2             0             3           180
*      setp(1)       setp(2)
    1.0000e-01    9.0000e-01
*      dtsp(1)       dtsp(2)
    1.0000e+06    0.0000e+00
```

```
2707 *      ifsp(1)       ifsp(2)
2708              0             0
2709 *
2710 *    safety-injection actuation signal (sias) trip
2711 *         idtp          isrt          iset          itst          idsg
2712              20             2             0             3           200
2713 *       setp(1)       setp(2)                                          <- 57
2714     1.0000e-01    9.0000e-01
2715 *       dtsp(1)       dtsp(2)
2716     1.0000e+06    0.0000e+00
2717 *       ifsp(1)       ifsp(2)
2718              0             0
2719 *
2720 *    safety-injection (si) delivery signal trip
2721 *         idtp          isrt          iset          itst          idsg
2722              21             2             0             3           200   <- 113
2723 *       setp(1)       setp(2)
2724     1.0000e-01    9.0000e-01
2725 *       dtsp(1)       dtsp(2)
2726     1.0000e+06    2.0000e+01   <- 48
2727 *       ifsp(1)       ifsp(2)
2728              0             0
2729 *
2730 *    primary-coolant pump trip   <- 94
2731 *         idtp          isrt          iset          itst          idsg
2732              22             2             0             3           220
2733 *       setp(1)       setp(2)
2734     1.0000e-01    9.0000e-01
2735 *       dtsp(1)       dtsp(2)
2736     1.0000e+06    1.0000e+06   <- 48
2737 *       ifsp(1)       ifsp(2)
2738              0             0
2739 *
2740 *    (2/3) logic msiv trip
2741 *         idtp          isrt          iset          itst          idsg
2742              24             2             0             3           240
2743 *       setp(1)       setp(2)                                          <- 113
2744     1.0000e-01    1.8000e+00   <- 48
2745 *       dtsp(1)       dtsp(2)
2746     1.0000e+06    0.0000e+00
2747 *       ifsp(1)       ifsp(2)
2748              0             0
2749 *
2750 *    mdafw trip (30.0 s flow delay)
2751 *         idtp          isrt          iset          itst          idsg
2752              26             2             0             3           260
2753 *       setp(1)       setp(2)
2754     1.0000e-01    9.0000e-01
2755 *       dtsp(1)       dtsp(2)
2756     1.0000e+06    3.0000e+01   <- 48
```

```
2757 *      ifsp(1)       ifsp(2)
2758             0             0
2759 *
2760 *    sdafw trip (30.0 s flow delay)
2761 *         idtp          isrt          iset          itst          idsg
2762              28             2             0             3           280   <-- 126
2763 *      setp(1)       setp(2)
2764    1.0000e-01    9.0000e-01
2765 *      dtsp(1)       dtsp(2)
2766    1.0000e+06    3.0000e+01   <-- 48
2767 *      ifsp(1)       ifsp(2)
2768             0             0
2769 *
2770 *    low primary-coolant flow trip
2771 *         idtp          isrt          iset          itst          idsg
2772              30             2             0             3           300
2773 *      setp(1)       setp(2)
2774    1.0000e-01    9.0000e-01
2775 *      dtsp(1)       dtsp(2)
2776    0.0000e+00    0.0000e+00   <-- 49
2777 *      ifsp(1)       ifsp(2)
2778             0             0
2779 *
2780 *    loops 1, 2, and 3 steam-generator mismatch trip
2781 *         idtp          isrt          iset          itst          idsg
2782              32             2             0             3           320
2783 *      setp(1)       setp(2)
2784    1.0000e-01    9.0000e-01
2785 *      dtsp(1)       dtsp(2)
2786    0.0000e+00    0.0000e+00   <-- 49
2787 *      ifsp(1)       ifsp(2)
2788             0             0
2789 *
2790 *    steam-generator low level trip
2791 *         idtp          isrt          iset          itst          idsg
2792              34             2             0             3           340
2793 *      setp(1)       setp(2)
2794    1.0000e-01    9.0000e-01
2795 *      dtsp(1)       dtsp(2)
2796    0.0000e+00    0.0000e+00   <-- 49
2797 *      ifsp(1)       ifsp(2)
2798             0             0
2799 *
2800 *    steam-generator high level trip
2801 *         idtp          isrt          iset          itst          idsg
2802              36             2             0             3           360
2803 *      setp(1)       setp(2)                    <-- 57
2804    1.0000e-01    9.0000e-01
2805 *      dtsp(1)       dtsp(2)
2806    0.0000e+00    0.0000e+00   <-- 49
```

```
2807 *      ifsp(1)       ifsp(2)
2808              0             0
2809 *
2810 *    high steam-generator delta pressure trip
2811 *         idtp          isrt          iset          itst          idsg
2812              38             2             0             3           380
2813 *      setp(1)       setp(2)                      113
2814     1.0000e-01    9.0000e-01
2815 *      dtsp(1)       dtsp(2)
2816     0.0000e+00    0.0000e+00                  49
2817 *      ifsp(1)       ifsp(2)
2818              0             0
2819 *
2820 *    loop 1 msiv trip signal
2821 *         idtp          isrt          iset          itst          idsg
2822              40             2             0            -1         -1118
2823 *      setp(1)       setp(2)                      48            50
2824     1.0000e-01    9.0000e-01
2825 *      dtsp(1)       dtsp(2)
2826     0.0000e+00    0.0000e+00
2827 *      ifsp(1)       ifsp(2)
2828              0             0
2829 *
2830 *    loop 2 msiv trip signal
2831 *         idtp          isrt          iset          itst          idsg
2832              42             2             0            -1         -2118
2833 *      setp(1)       setp(2)                      48
2834     1.0000e-01    9.0000e-01
2835 *      dtsp(1)       dtsp(2)
2836     0.0000e+00    0.0000e+00
2837 *      ifsp(1)       ifsp(2)
2838              0             0
2839 *
2840 *    loop 3 msiv trip signal
2841 *         idtp          isrt          iset          itst          idsg
2842              44             2             0            -1         -3118
2843 *      setp(1)       setp(2)                      48
2844     1.0000e-01    9.0000e-01
2845 *      dtsp(1)       dtsp(2)
2846     0.0000e+00    0.0000e+00
2847 *      ifsp(1)       ifsp(2)
2848              0             0
2849 *
2850 *    2/3 low steam-generator level trip
2851 *         idtp          isrt          iset          itst          idsg
2852              46             2             0             3           460          126
2853 *      setp(1)       setp(2)
2854     1.0000e-01    1.8000e+00
2855 *      dtsp(1)       dtsp(2)
2856     0.0000e+00    0.0000e+00
```

```
2857 *      ifsp(1)       ifsp(2)
2858              0             0
2859 *
2860 *    over-temperature delta temperature
2861 *         idtp          isrt          iset          itst          idsg
2862              48             2             0             1           -30
2863 *      setp(1)       setp(2)
2864    0.0000e+00    1.0000e+01
2865 *      dtsp(1)       dtsp(2)
2866    0.0000e+00    0.0000e+00
2867 *      ifsp(1)       ifsp(2)
2868              0             0
2869 *
2870 *    over-power delta temperature
2871 *         idtp          isrt          iset          itst          idsg
2872              50             2             0             1           -40
2873 *      setp(1)       setp(2)
2874    0.0000e+00    1.0000e+01
2875 *      dtsp(1)       dtsp(2)
2876    0.0000e+00    0.0000e+00
2877 *      ifsp(1)       ifsp(2)
2878              0             0
2879 *
2880 *    high reactor-core power
2881 *         idtp          isrt          iset          itst          idsg
2882              52             2             0             1            11
2883 *      setp(1)       setp(2)
2884    1.0000e+07    2.4840e+09
2885 *      dtsp(1)       dtsp(2)
2886    0.0000e+00    0.0000e+00
2887 *      ifsp(1)       ifsp(2)
2888              0             0
2889 *
2890 *    high or low pressurizer pressure
2891 *         idtp          isrt          iset          itst          idsg
2892              54             5             0             1           421   <-- 51
2893 *      setp(1)       setp(2)       setp(3)       setp(4)
2894    1.2800e+07    1.2817e+07    1.6400e+07    1.6485e+07
2895 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
2896    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
2897 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
2898              0             0             0             0
2899 *
2900 *    pressurizer level trip
2901 *         idtp          isrt          iset          itst          idsg
2902              56             2             0             1          -406
2903 *      setp(1)       setp(2)
2904    5.0000e-01    9.1000e-01
2905 *      dtsp(1)       dtsp(2)
2906    0.0000e+00    0.0000e+00
```

```
2907 *      ifsp(1)       ifsp(2)
2908              0             0
2909 *
2910 *    primary-coolant pump low-pressure trip
2911 *         idtp          isrt          iset          itst          idsg
2912              58             1             0             1           421   <-- 52
2913 *      setp(1)       setp(2)
2914     9.0666e+06    1.5000e+07
2915 *      dtsp(1)       dtsp(2)
2916     0.0000e+00    0.0000e+00
2917 *      ifsp(1)       ifsp(2)
2918              0             0
2919 *
2920 *    safety-injection actuation signal (sias) low-pressure trip
2921 *         idtp          isrt          iset          itst          idsg
2922              60             1             0             1           421   <-- 53
2923 *      setp(1)       setp(2)                    <-- 113
2924     1.1928e+07    1.5000e+07
2925 *      dtsp(1)       dtsp(2)
2926     0.0000e+00    0.0000e+00
2927 *      ifsp(1)       ifsp(2)
2928              0             0
2929 *
2930 *    loop 1 steam-generator mismatch trip (2/2)
2931 *         idtp          isrt          iset          itst          idsg
2932             100             2             0            -3          1000   <-- 54
2933 *      setp(1)       setp(2)
2934     1.0000e-01    1.8000e+00
2935 *      dtsp(1)       dtsp(2)
2936     0.0000e+00    0.0000e+00
2937 *      ifsp(1)       ifsp(2)
2938              0             0
2939 *
2940 *    loop 1 low-flow trip
2941 *         idtp          isrt          iset          itst          idsg
2942             110             1             0            -1           161
2943 *      setp(1)       setp(2)
2944     3.8760e+03    4.2000e+03
2945 *      dtsp(1)       dtsp(2)
2946     0.0000e+00    0.0000e+00
2947 *      ifsp(1)       ifsp(2)
2948              0             0
2949 *
2950 *    loop 1 low tavg trip
2951 *         idtp          isrt          iset          itst          idsg
2952             120             1             0            -1          -110
2953 *      setp(1)       setp(2)
2954     5.5700e+02    5.7000e+02
2955 *      dtsp(1)       dtsp(2)
2956     0.0000e+00    0.0000e+00
```

```
2957 *      ifsp(1)       ifsp(2)
2958             0             0
2959 *
2960 *    loop 2 steam-generator mismatch trip (2/2)
2961 *         idtp          isrt          iset          itst          idsg
2962            200             2             0            -3          2000
2963 *      setp(1)       setp(2)
2964    1.0000e-01    1.8000e+00
2965 *      dtsp(1)       dtsp(2)
2966    0.0000e+00    0.0000e+00
2967 *      ifsp(1)       ifsp(2)
2968             0             0
2969 *
2970 *    loop 2 low-flow trip
2971 *         idtp          isrt          iset          itst          idsg
2972            210             1             0            -1           261
2973 *      setp(1)       setp(2)
2974    3.8760e+03    4.2000e+03
2975 *      dtsp(1)       dtsp(2)
2976    0.0000e+00    0.0000e+00
2977 *      ifsp(1)       ifsp(2)
2978             0             0
2979 *
2980 *    loop 2 low tavg trip
2981 *         idtp          isrt          iset          itst          idsg
2982            220             1             0            -1          -210
2983 *      setp(1)       setp(2)
2984    5.5700e+02    5.7000e+02
2985 *      dtsp(1)       dtsp(2)
2986    0.0000e+00    0.0000e+00
2987 *      ifsp(1)       ifsp(2)
2988             0             0
2989 *
2990 *    loop 3 steam-generator mismatch trip (2/2)
2991 *         idtp          isrt          iset          itst          idsg
2992            300             2             0            -3          3000
2993 *      setp(1)       setp(2)
2994    1.0000e-01    1.8000e+00
2995 *      dtsp(1)       dtsp(2)
2996    0.0000e+00    0.0000e+00
2997 *      ifsp(1)       ifsp(2)
2998             0             0
2999 *
3000 *    loop 3 low-flow trip
3001 *         idtp          isrt          iset          itst          idsg
3002            310             1             0            -1           361
3003 *      setp(1)       setp(2)
3004    3.8760e+03    4.2000e+03
3005 *      dtsp(1)       dtsp(2)
3006    0.0000e+00    0.0000e+00
```

```
3007 *      ifsp(1)        ifsp(2)
3008              0              0
3009 *
3010 *    loop 3 low tavg trip
3011 *         idtp           isrt           iset           itst           idsg
3012             320              1              0             -1           -310
3013 *      setp(1)        setp(2)
3014    5.5700e+02     5.7000e+02
3015 *      dtsp(1)        dtsp(2)
3016    0.0000e+00     0.0000e+00
3017 *      ifsp(1)        ifsp(2)
3018              0              0
3019 *
3020 *    pressurizer heater low-level  trip
3021 *         idtp           isrt           iset           itst           idsg
3022             -407              2              0              1           -406
3023 *      setp(1)        setp(2)
3024    1.4400e-01     1.5000e-01
3025 *      dtsp(1)        dtsp(2)
3026    0.0000e+00     0.0000e+00
3027 *      ifsp(1)        ifsp(2)
3028              0              0
3029 *
3030 *    main feedwater control valve closure trip (to simulate mfw-pump trip)
3031 *         idtp           isrt           iset           itst           idsg
3032             422             -2              0              3            400
3033 *      setp(1)        setp(2)
3034    0.0000e+00     1.0000e-01
3035 *      dtsp(1)        dtsp(2)
3036    0.0000e+00     0.0000e+00
3037 *      ifsp(1)        ifsp(2)
3038              0              0
3039 *
3040 *    main feedwater pump manual trip (trips mfwcvs)
3041 *         idtp           isrt           iset           itst           idsg
3042             423              2              0             -1              1
3043 *      setp(1)        setp(2)
3044    0.0000e+00     9.0000e-01
3045 *      dtsp(1)        dtsp(2)
3046    1.0000e+06     1.0000e+06
3047 *      ifsp(1)        ifsp(2)
3048              0              0
3049 *
3050 *    pressurizer porv high-pressure trip
3051 *         idtp           isrt           iset           itst           idsg
3052             450             -3             -1              1            421
3053 *      setp(1)        setp(2)        setp(3)        setp(4)
3054    1.5720e+07     1.5950e+07     1.5960e+07     1.6200e+07
3055 *      dtsp(1)        dtsp(2)        dtsp(3)        dtsp(4)
3056    0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
```

```
3057 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
3058             0             0             0             0
3059 *
3060 *    pressurizer srv high-pressure trip
3061 *         idtp          isrt          iset          itst          idsg
3062          460            -3            -1             1           421
3063 *      setp(1)       setp(2)       setp(3)       setp(4)
3064    1.6720e+07    1.6950e+07    1.6960e+07    1.7240e+07
3065 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
3066    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
3067 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
3068             0             0             0             0
3069 *
3070 *    loop 1 accumulator check-valve trip
3071 *         idtp          isrt          iset          itst          idsg
3072          520            -3            -1            -1           521
3073 *      setp(1)       setp(2)       setp(3)       setp(4)
3074   -2.7100e+02   -1.3550e+02    1.3550e+03    2.7100e+03
3075 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
3076    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
3077 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
3078             0             0             0             0
3079 *
3080 *    loop 2 accumulator check-valve trip
3081 *         idtp          isrt          iset          itst          idsg
3082          620            -3            -1            -1           621
3083 *      setp(1)       setp(2)       setp(3)       setp(4)
3084   -2.7100e+02   -1.3550e+02    1.3550e+03    2.7100e+03
3085 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
3086    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
3087 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
3088             0             0             0             0
3089 *
3090 *    loop 3 accumulator check-valve trip
3091 *         idtp          isrt          iset          itst          idsg
3092          720            -3            -1            -1           721
3093 *      setp(1)       setp(2)       setp(3)       setp(4)
3094   -2.7100e+02   -1.3550e+02    1.3550e+03    2.7100e+03
3095 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
3096    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
3097 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
3098             0             0             0             0
3099 *
3100 *    steam-line high delta-pressure (p1-p2) trip
3101 *         idtp          isrt          iset          itst          idsg
3102         1001             2             0            -2          1120
3103 *     lutrpsig
3104      lupressd
3105 *      setp(1)       setp(2)
3106    1.0000e+05    6.8950e+05
```

```
3107 *      dtsp(1)       dtsp(2)
3108     0.0000e+00    0.0000e+00
3109 *      ifsp(1)       ifsp(2)
3110             0             0
3111 *
3112 *    steam-line high delta-pressure (p1-p3) trip
3113 *         idtp          isrt          iset          itst          idsg
3114         1002             2             0            -2          1130   <-- 15
3115 *     lutrpsig
3116      lupressd
3117 *      setp(1)       setp(2)
3118     1.0000e+05    6.8950e+05
3119 *      dtsp(1)       dtsp(2)
3120     0.0000e+00    0.0000e+00
3121 *      ifsp(1)       ifsp(2)
3122             0             0
3123 *
3124 *    steam-line high delta-pressure (p2-p3) trip
3125 *         idtp          isrt          iset          itst          idsg
3126         1003             2             0            -2          1230   <-- 15
3127 *     lutrpsig
3128      lupressd
3129 *      setp(1)       setp(2)
3130     1.0000e+05    6.8950e+05
3131 *      dtsp(1)       dtsp(2)
3132     0.0000e+00    0.0000e+00
3133 *      ifsp(1)       ifsp(2)
3134             0             0
3135 *
3136 *    loop 1 steam-generator 15% low-level signal trip
3137 *         idtp          isrt          iset          itst          idsg
3138         1010             1             0            -1         -1005   <-- 126
3139 *      setp(1)       setp(2)
3140     1.5000e-01    5.0000e-01
3141 *      dtsp(1)       dtsp(2)
3142     0.0000e+00    0.0000e+00
3143 *      ifsp(1)       ifsp(2)
3144             0             0
3145 *
3146 *    loop 1 steam-generator 30% low-level signal trip
3147 *         idtp          isrt          iset          itst          idsg
3148         1020             1             0            -1         -1005   <-- 54
3149 *      setp(1)       setp(2)
3150     3.0000e-01    5.0000e-01
3151 *      dtsp(1)       dtsp(2)
3152     0.0000e+00    0.0000e+00
3153 *      ifsp(1)       ifsp(2)
3154             0             0
3155 *
```

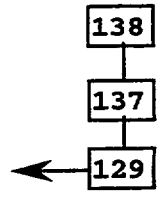
```
3156 *    loop 1 steam-generator 75% high-level signal trip
3157 *         idtp          isrt          iset          itst          idsg
3158           1030             2             0            -1         -1005
3159 *      setp(1)       setp(2)
3160    5.4000e-01    7.5000e-01
3161 *      dtsp(1)       dtsp(2)
3162    0.0000e+00    0.0000e+00
3163 *      ifsp(1)       ifsp(2)
3164             0             0
3165 *
3166 *    loop 1 steam-generator flow mismatch signal trip
3167 *         idtp          isrt          iset          itst          idsg
3168           1040             2             0            -1         -1009
3169 *      setp(1)       setp(2)
3170    8.0000e+00    8.0640e+01
3171 *      dtsp(1)       dtsp(2)
3172    0.0000e+00    0.0000e+00
3173 *      ifsp(1)       ifsp(2)
3174             0             0
3175 *
3176 *    loop 1 steam-generator high steam flow trip
3177 *         idtp          isrt          iset          itst          idsg
3178           1050             2             0            -1         -1109
3179 *      setp(1)       setp(2)
3180    4.2000e+02    4.5400e+02
3181 *      dtsp(1)       dtsp(2)
3182    0.0000e+00    0.0000e+00
3183 *      ifsp(1)       ifsp(2)
3184             0             0
3185 *
3186 *    loop 1 steam-generator low steam pressure trip
3187 *         idtp          isrt          iset          itst          idsg
3188           1060             1             0            -1          1101
3189 *      setp(1)       setp(2)
3190    4.3300e+06    5.0000e+06
3191 *      dtsp(1)       dtsp(2)
3192    0.0000e+00    0.0000e+00
3193 *      ifsp(1)       ifsp(2)
3194             0             0
3195 *
3196 *    main feedwater pump a low-flow signal trip
3197 *         idtp          isrt          iset          itst          idsg
3198           1500             1             0            -1          1501
3199 *      setp(1)       setp(2)
3200    6.5400e+01    1.0000e+02
3201 *      dtsp(1)       dtsp(2)
3202    0.0000e+00    0.0000e+00
3203 *      ifsp(1)       ifsp(2)
3204             0             0
3205 *
```

```
3206 *    loop 2 steam-generator 15% low-level signal trip
3207 *         idtp          isrt          iset          itst          idsg
3208           2010             1             0            -1         -2005
3209 *       setp(1)       setp(2)
3210     1.5000e-01    5.0000e-01
3211 *       dtsp(1)       dtsp(2)
3212     0.0000e+00    0.0000e+00
3213 *       ifsp(1)       ifsp(2)
3214              0             0
3215 *
3216 *    loop 2 steam-generator 30% low-level signal trip
3217 *         idtp          isrt          iset          itst          idsg
3218           2020             1             0            -1         -2005
3219 *       setp(1)       setp(2)
3220     3.0000e-01    5.0000e-01
3221 *       dtsp(1)       dtsp(2)
3222     0.0000e+00    0.0000e+00
3223 *       ifsp(1)       ifsp(2)
3224              0             0
3225 *
3226 *    loop 2 steam-generator 75% high-level signal trip
3227 *         idtp          isrt          iset          itst          idsg
3228           2030             2             0            -1         -2005
3229 *       setp(1)       setp(2)
3230     5.4000e-01    7.5000e-01
3231 *       dtsp(1)       dtsp(2)
3232     0.0000e+00    0.0000e+00
3233 *       ifsp(1)       ifsp(2)
3234              0             0
3235 *
3236 *    loop 2 steam-generator flow mismatch signal trip
3237 *         idtp          isrt          iset          itst          idsg
3238           2040             2             0            -1         -2009
3239 *       setp(1)       setp(2)
3240     8.0000e+00    8.0640e+01
3241 *       dtsp(1)       dtsp(2)
3242     0.0000e+00    0.0000e+00
3243 *       ifsp(1)       ifsp(2)
3244              0             0
3245 *
3246 *    loop 2 steam-generator high steam flow trip
3247 *         idtp          isrt          iset          itst          idsg
3248           2050             2             0            -1         -2109
3249 *       setp(1)       setp(2)
3250     4.2000e+02    4.5400e+02
3251 *       dtsp(1)       dtsp(2)
3252     0.0000e+00    0.0000e+00
3253 *       ifsp(1)       ifsp(2)
3254              0             0
3255 *
```

126

```
3256 *    loop 2 steam-generator low steam pressure trip
3257 *         idtp          isrt          iset          itst          idsg
3258           2060             1             0            -1          2101
3259 *       setp(1)       setp(2)
3260     4.3300e+06    5.0000e+06
3261 *       dtsp(1)       dtsp(2)
3262     0.0000e+00    0.0000e+00
3263 *       ifsp(1)       ifsp(2)
3264              0             0
3265 *
3266 *    loop 3 steam-generator 15% low-level signal trip
3267 *         idtp          isrt          iset          itst          idsg
3268           3010             1             0            -1         -3005   <-- 126
3269 *       setp(1)       setp(2)
3270     1.5000e-01    5.0000e-01
3271 *       dtsp(1)       dtsp(2)
3272     0.0000e+00    0.0000e+00
3273 *       ifsp(1)       ifsp(2)
3274              0             0
3275 *
3276 *    loop 3 steam-generator 30% low-level signal trip
3277 *         idtp          isrt          iset          itst          idsg
3278           3020             1             0            -1         -3005
3279 *       setp(1)       setp(2)
3280     3.0000e-01    5.0000e-01
3281 *       dtsp(1)       dtsp(2)
3282     0.0000e+00    0.0000e+00
3283 *       ifsp(1)       ifsp(2)
3284              0             0
3285 *
3286 *    loop 3 steam-generator 75% high-level signal trip
3287 *         idtp          isrt          iset          itst          idsg
3288           3030             2             0            -1         -3005
3289 *       setp(1)       setp(2)
3290     5.4000e-01    7.5000e-01
3291 *       dtsp(1)       dtsp(2)
3292     0.0000e+00    0.0000e+00
3293 *       ifsp(1)       ifsp(2)
3294              0             0
3295 *
3296 *    loop 3 steam-generator flow mismatch signal trip
3297 *         idtp          isrt          iset          itst          idsg
3298           3040             2             0            -1         -3009
3299 *       setp(1)       setp(2)
3300     8.0000e+00    8.0640e+01
3301 *       dtsp(1)       dtsp(2)
3302     0.0000e+00    0.0000e+00
3303 *       ifsp(1)       ifsp(2)
3304              0             0
3305 *
```

```
3306 *    loop 3 steam-generator high steam flow trip
3307 *         idtp          isrt          iset          itst          idsg
3308           3050             2             0            -1         -3109
3309 *      setp(1)       setp(2)
3310    4.2000e+02    4.5400e+02
3311 *      dtsp(1)       dtsp(2)
3312    0.0000e+00    0.0000e+00
3313 *      ifsp(1)       ifsp(2)
3314             0             0
3315 *
3316 *    loop 3 steam-generator low steam pressure trip
3317 *         idtp          isrt          iset          itst          idsg
3318           3060             1             0            -1          3101
3319 *      setp(1)       setp(2)
3320    4.3300e+06    5.0000e+06
3321 *      dtsp(1)       dtsp(2)
3322    0.0000e+00    0.0000e+00
3323 *      ifsp(1)       ifsp(2)
3324             0             0
3325 *
3326 *    main feedwater pump b low-flow signal trip
3327 *         idtp          isrt          iset          itst          idsg
3328           3500             1             0            -1          3501
3329 *      setp(1)       setp(2)
3330    6.5400e+01    1.0000e+02
3331 *      dtsp(1)       dtsp(2)
3332    0.0000e+00    0.0000e+00
3333 *      ifsp(1)       ifsp(2)
3334             0             0
3335 *
3336 *    user-specified pump trip
3337 *         idtp          isrt          iset          itst          idsg
3338           9996             2             0             1             1
3339 *      setp(1)       setp(2)
3340    0.0000e+00    1.0000e+10 *set for no trip
3341 *      dtsp(1)       dtsp(2)
3342    0.0000e+00    0.0000e+00
3343 *      ifsp(1)       ifsp(2)
3344             0             0
3345 *
3346 *    heat-structure fine-mesh trip
3347 *         idtp          isrt          iset          itst          idsg
3348           9997             2             0             1             1
3349 *      setp(1)       setp(2)
3350   -1.0000e+00    1.0000e+10 * set to not trip on axial fine mesh
3351 *      dtsp(1)       dtsp(2)
3352    0.0000e+00    0.0000e+00
3353 *      ifsp(1)       ifsp(2)
3354             0             0
3355 *
```



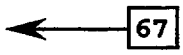
```
3356 *    reflood trip
3357 *         idtp          isrt          iset          itst          idsg
3358           9998             2             0            -1             1
3359 *       setp(1)       setp(2)
3360     0.0000e+00    1.0000e+10 * set to not trip on reflood model
3361 *       dtsp(1)       dtsp(2)
3362     0.0000e+00    0.0000e+00
3363 *       ifsp(1)       ifsp(2)
3364                0             0
3365 *
3366 *    no-trip problem-time trip (used in tct trip signals)
3367 *         idtp          isrt          iset          itst          idsg
3368           9999             2             0            -1             1
3369 *       setp(1)       setp(2)
3370     0.0000e+00    1.0000e+10
3371 *       dtsp(1)       dtsp(2)
3372     0.0000e+00    0.0000e+00
3373 *       ifsp(1)       ifsp(2)
3374                0             0
3375 *
3376 *    signal expression defining data
3377 *
3378 *    abs(p1-p2)
3379 *         idse          inse          incn
3380           1120             2             0      <-- 60 -- 15
3381 *      ise(1,j)      ise(2,j)      ise(3,j)
3382                2           111           222
3383                8           901             0
3384 *
3385 *    abs(p1-p3)
3386 *         idse          inse          incn
3387           1130             2             0      <-- 15
3388 *      ise(1,j)      ise(2,j)      ise(3,j)
3389                2           111           333
3390                8           901             0
3391 *
3392 *    abs(p2-p3)
3393 *         idse          inse          incn
3394           1230             2             0      <-- 15
3395 *      ise(1,j)      ise(2,j)      ise(3,j)
3396                2           222           333
3397                8           901             0
3398 *
3399 *    trip-controlled-trip (tct) signal defining data
3400 *
3401 *    reactor-core-power scram trip tct signals 1 and 2
3402 *         idtn          intn
3403            100             2      <-- 45
3404 *       itn(1)        itn(2)
3405               12            14
```

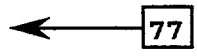
```
3406 *
3407 *    reactor-core-power scram trip tct signal 1
3408 *         idtn          intn
3409              120            10
3410 *       itn(1)        itn(2)        itn(3)        itn(4)        itn(5)
3411                16            18            20            30            48
3412 *       itn(6)        itn(7)        itn(8)        itn(9)        itn(10)
3413                50            52            54            56            58
3414 *
3415 *    reactor-core-power scram trip tct signal 2
3416 *         idtn          intn
3417              140             2
3418 *       itn(1)        itn(2)
3419                32            34
3420 *
3421 *    turbine-trip tct signal
3422 *         idtn          intn
3423              160             4
3424 *       itn(1)        itn(2)        itn(3)        itn(4)
3425                10            36            48            50
3426 *
3427 *    tsv-trip tct signal
3428 *         idtn          intn
3429              180             2
3430 *       itn(1)        itn(2)
3431                16          9999
3432 *
3433 *    safety-injection actuation signal (sias) trip tct signal
3434 *         idtn          intn
3435              200             3
3436 *       itn(1)        itn(2)        itn(3)
3437                24            38            60  <-- 113
3438 *
3439 *    primary-coolant pump trip tct signal
3440 *         idtn          intn
3441              220             2
3442 *       itn(1)        itn(2)
3443                58          9996
3444 *
3445 *    msiv-trip tct signal
3446 *         idtn          intn
3447              240             3  <-- 48
3448 *       itn(1)        itn(2)        itn(3)
3449                40            42            44
3450 *
3451 *    mdafw-trip tct signal
3452 *         idtn          intn
3453              260             2
3454 *       itn(1)        itn(2)
3455                20            34
```

```
3456 *
3457 *    sdafw-trip tct signal
3458 *         idtn          intn
3459           280             2  <-- 126
3460 *       itn(1)        itn(2)
3461            46          9999
3462 *
3463 *    low primary-coolant flow trip tct signal
3464 *         idtn          intn
3465           300             3
3466 *       itn(1)        itn(2)        itn(3)
3467           110           210           310
3468 *
3469 *    loops 1, 2, and 3 steam-generator mismatch tct signal
3470 *         idtn          intn
3471           320             3
3472 *       itn(1)        itn(2)        itn(3)
3473           100           200           300
3474 *
3475 *    low steam-generator level trip tct signal
3476 *         idtn          intn
3477           340             3
3478 *       itn(1)        itn(2)        itn(3)
3479          1010          2010          3010
3480 *
3481 *    high steam-generator level trip tct siganl
3482 *         idtn          intn
3483           360             3
3484 *       itn(1)        itn(2)        itn(3)
3485          1030          2030          3030
3486 *
3487 *    high steam-generator delta-pressure trip tct signal
3488 *         idtn          intn
3489           380             3
3490 *       itn(1)        itn(2)        itn(3)
3491          1001          1002          1003
3492 *
3493 *    main feedwater pump trip tct signal
3494 *         idtn          intn
3495           400             5
3496 *       itn(1)        itn(2)        itn(3)        itn(4)        itn(5)
3497            20            36           423          1500          3500
3498 *
3499 *    steam-generator low-level trip (2/3) tct signal
3500 *         idtn          intn
3501           460             3
3502 *       itn(1)        itn(2)        itn(3)
3503          1010          2010          3010
3504 *
```

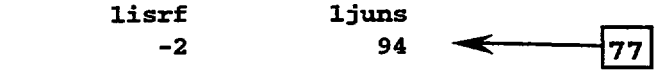
```
3505 *     loop 1 steam-generator mismatch tct signal
3506 *          idtn           intn
3507            1000              2
3508 *        itn(1)         itn(2)
3509            1020           1040
3510 *
3511 *     loop 2 steam-generator mismatch tct signal
3512 *          idtn           intn
3513            2000              2
3514 *        itn(1)         itn(2)
3515            2020           2040
3516 *
3517 *     loop 3 steam-generator mismatch tct signal
3518 *          idtn           intn
3519            3000              2
3520 *        itn(1)         itn(2)
3521            3030           3040
3522 *
3523 ******************
3524 * component data *
3525 ******************
3526 *
3527 ********************************************************************************
3528 *******    type            num             id        ctitle
3529 vessel                       1              1 $1$ reactor vessel
3530 *          nasx           nrsx           ntsx           ncsr          ivssbf
3531             12              2              6             18               0
3532 *          idcu           idcl           idcr           icru           icrl
3533               0              0              0              6              2
3534 *          icrr          ilcsp          iucsp           iuhp          iconc
3535               1              2              6             10              1
3536 *         igeom          nvent          nvvtb         nsgrid          iext
3537               0              0              0              0              0
3538 *         shelv                         epsw
3539      0.0000e+00     0.0000e+00
3540 *
3541 * geometry mesh-cell size data
3542 * z      *      1.7526e+00    3.0004e+00    3.9148e+00    4.8292e+00    5.7436e+00
3543 * z      *      6.6580e+00    7.6714e+00    8.5287e+00    9.3613e+00    1.0194e+01
3544 * z      *      1.1127e+01    1.2245e+01e
3545 * rad    *      1.7002e+00    1.9749e+00e
3546 * th     *      6.0000e+01    1.2000e+02    1.8000e+02    2.4000e+02    3.0000e+02
3547 * th     *      3.6000e+02e
3548 *
3549 * fraction of unheated structure
3550 * funh * f     0.0000e+00e
3551 * nhsca *f             900e
3552 *
3553 * source connections to the vessel
3554 *
```

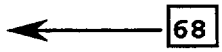
```
3555 * loop 1 hot-leg connection
3556 *        lisrl          lisrc          lisrf          ljuns
3557             8              1              3             10
3558 *
3559 * loop 2 hot-leg connection
3560 *        lisrl          lisrc          lisrf          ljuns
3561             8              3              3             20
3562 *
3563 * loop 3 hot-leg connection
3564 *        lisrl          lisrc          lisrf          ljuns
3565             8              5              3             30
3566 *
3567 * loop 1 cold-leg connection
3568 *        lisrl          lisrc          lisrf          ljuns
3569             8              8              3             19
3570 *
3571 * loop 2 cold-leg connection
3572 *        lisrl          lisrc          lisrf          ljuns
3573             8             10              3             29
3574 *
3575 * loop 3 cold-leg connection
3576 *        lisrl          lisrc          lisrf          ljuns
3577             8             12              3             39
3578 *
3579 * theta sector 1 upper-plenum connection
3580 *        lisrl          lisrc          lisrf          ljuns
3581             7              1              2              2
3582 *
3583 * theta sector 2 upper-plenum connection
3584 *        lisrl          lisrc          lisrf          ljuns
3585             9              2              2              3
3586 *
3587 * theta sector 3 upper-plenum connection
3588 *        lisrl          lisrc          lisrf          ljuns
3589             7              3              2              4
3590 *
3591 * theta sector 4 upper-plenum connection
3592 *        lisrl          lisrc          lisrf          ljuns
3593             9              4              2              5
3594 *
3595 * theta sector 5 upper-plenum connection
3596 *        lisrl          lisrc          lisrf          ljuns
3597             7              5              2              6
3598 *
3599 * theta sector 6 upper-plenum connection
3600 *        lisrl          lisrc          lisrf          ljuns
3601             9              6              2              7
3602 *
3603 * theta sector 1 upper-head connection
```

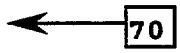


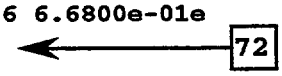


```
3604 *        lisrl          lisrc          lisrf          ljuns
3605             12              1             -2             94
3606 *
3607 * theta sector 2 upper-head connection
3608 *        lisrl          lisrc          lisrf          ljuns
3609             12              2             -2             95
3610 *
3611 * theta sector 3 upper-head connection
3612 *        lisrl          lisrc          lisrf          ljuns
3613             12              3             -2             96
3614 *
3615 * theta sector 4 upper-head connection
3616 *        lisrl          lisrc          lisrf          ljuns
3617             12              4             -2             97
3618 *
3619 * theta sector 5 upper-head connection
3620 *        lisrl          lisrc          lisrf          ljuns
3621             12              5             -2             98
3622 *
3623 * theta sector 6 upper-head connection
3624 *        lisrl          lisrc          lisrf          ljuns
3625             12              6             -2             99
3626 *
3627 * level   1   bottom lower plenum
3628 *
3629 * cfzl-t* f   0.0000e+00e
3630 * cfzl-z* r06 0.0000e+00r06 1.0000e-02e
3631 * cfzl-r* f   0.0000e+00e
3632 * cfzv-t* f   0.0000e+00e
3633 * cfzv-z* r06 0.0000e+00r06 1.0000e-02e
3634 * cfzv-r* f   0.0000e+00e
3635 * vol   * r06 7.5260e-01r06 3.1510e-01e
3636 * fa-t  * r06 7.5260e-01r06 2.5000e-01e
3637 * fa-z  * r06 4.1060e-01r06 3.1500e-01e
3638 * fa-r  * r06 3.4000e-01r06 0.0000e+00e
3639 * hd-t  * r06 9.7200e-01r06 6.6800e-01e
3640 * hd-z  * r06 2.0830e-01r06 6.6800e-01e
3641 * hd-r  * r06 9.7200e-01r06 6.6800e-01e
3642 * alpn  * f   0.0000e+00e
3643 * vvn-t * f   0.0000e+00e
3644 * vvn-z * f   0.0000e+00e
3645 * vvn-r * f   0.0000e+00e
3646 * vln-t * f   0.0000e+00e
3647 * vln-z * f   0.0000e+00e
3648 * vln-r * f   0.0000e+00e
3649 * tvn   * f   5.5910e+02e
3650 * tln   * f   5.5910e+02e
3651 * pn    * f   1.5500e+07e
3652 * pan   * f   0.0000e+00e
```





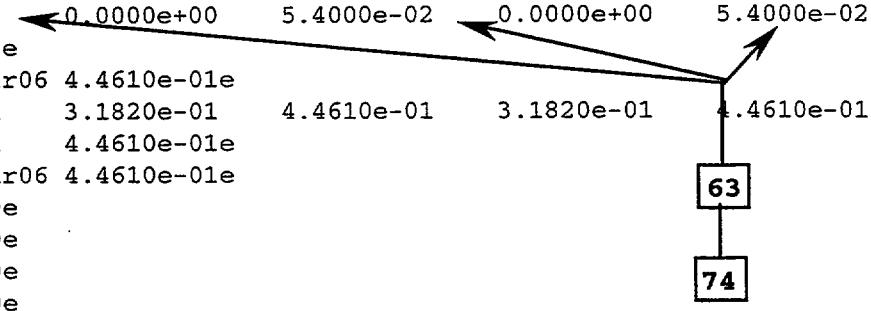




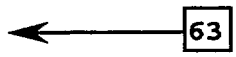
```
3653 * conc   * f    0.0000e+00e
3654 *
3655 * level    2    top lower plenum
3656 *
3657 * cfzl-t* f    0.0000e+00e
3658 * cfzl-z* r06 2.4900e+00r06 0.0000e+00e
3659 * cfzl-r* f    0.0000e+00e
3660 * cfzv-t* f    0.0000e+00e
3661 * cfzv-z* r06 2.4900e+00r06 0.0000e+00e
3662 * cfzv-r* f    0.0000e+00e
3663 * vol    * r06 5.9500e-01r06 7.3630e-01e
3664 * fa-t   * r06 5.9500e-01r06 5.6350e-01e
3665 * fa-z   * r06 4.2630e-01r06 5.7390e-01e
3666 * fa-r   * f    0.0000e+00e
3667 * hd-t   * r06 2.0800e-01r06 1.5620e-01e
3668 * hd-z   * r06 1.3410e-02r06 1.5620e-01e
3669 * hd-r   * r06 2.0800e-01r06 1.5620e-01e
3670 * alpn   * f    0.0000e+00e
3671 * vvn-t  * f    0.0000e+00e
3672 * vvn-z  * f    0.0000e+00e
3673 * vvn-r  * f    0.0000e+00e
3674 * vln-t  * f    0.0000e+00e
3675 * vln-z  * f    0.0000e+00e
3676 * vln-r  * f    0.0000e+00e
3677 * tvn    * r06 5.7510e+02r06 5.5910e+02e
3678 * tln    * r06 5.7510e+02r06 5.5910e+02e
3679 * pn     * f    1.5500e+07e
3680 * pan    * f    0.0000e+00e
3681 * conc   * f    0.0000e+00e
3682 *
3683 * level    3    fueled-core region (levels 3 to 6)
3684 *
3685 * cfzl-t* r06 2.7000e+01r06 0.0000e+00e
3686 * cfzl-z* r06 1.2499e+00r06 0.0000e+00e
3687 * cfzl-r* r06 2.7000e+01r06 0.0000e+00e
3688 * cfzv-t* r06 2.7000e+01r06 0.0000e+00e
3689 * cfzv-z* r06 1.2499e+00r06 0.0000e+00e
3690 * cfzv-r* r06 2.7000e+01r06 0.0000e+00e
3691 * vol    * r06 4.4840e-01r06 5.7390e-01e
3692 * fa-t   * r06 1.9000e-01r06 5.6350e-01e
3693 * fa-z   * r06 4.2630e-01r06 5.7390e-01e
3694 * fa-r   * f    0.0000e+00e
3695 * hd-t   * r06 1.3410e-02r06 1.5620e-01e
3696 * hd-z   * r06 1.3410e-02r06 1.5620e-01e
3697 * hd-r   * r06 1.3410e-02r06 1.5620e-01e
3698 * alpn   * f    0.0000e+00e
3699 * vvn-t  * f    0.0000e+00e
3700 * vvn-z  * f    0.0000e+00e
3701 * vvn-r  * f    0.0000e+00e
```

```
3702 * vln-t * f    0.0000e+00e
3703 * vln-z * f    0.0000e+00e
3704 * vln-r * f    0.0000e+00e
3705 * tvn   * r06 5.9110e+02r06 5.5910e+02e
3706 * tln   * r06 5.9110e+02r06 5.5910e+02e
3707 * pn    * f    1.5500e+07e
3708 * pan   * f    0.0000e+00e
3709 * conc  * f    0.0000e+00e
3710 *
3711 repeat level    3 <-------- 73
3712 *
3713 repeat level    3
3714 *
3715 repeat level    3
3716 *
3717 * level    7    upper plenum (level 1 of 4)
3718 *
3719 * cfzl-t* f    0.0000e+00e
3720 * cfzl-z* f    0.0000e+00e
3721 * cfzl-r* f    0.0000e+00e
3722 * cfzv-t* f    0.0000e+00e
3723 * cfzv-z* f    0.0000e+00e
3724 * cfzv-r* f    0.0000e+00e
3725 * vol   * r06 7.5880e-01r06 6.7330e-01e
3726 * fa-t  * r06 7.5880e-01r06 6.8800e-01e
3727 * fa-z  * r06 7.5880e-01    3.8770e-01    8.2350e-01    3.8770e-01    8.2350e-01
3728 * fa-z  *     3.8770e-01    8.2350e-01e
3729 * fa-r  * f    0.0000e+00e
3730 * hd-t  * r06 5.3000e-01r06 4.4610e-01e
3731 * hd-z  * r06 5.3000e-01    3.1820e-01    4.4610e-01    3.1820e-01    4.4610e-01
3732 * hd-z  *     3.1820e-01    4.4610e-01e
3733 * hd-r  * r06 5.3000e-01r06 4.4610e-01e
3734 * alpn  * f    0.0000e+00e
3735 * vvn-t * f    0.0000e+00e
3736 * vvn-z * f    0.0000e+00e
3737 * vvn-r * f    0.0000e+00e
3738 * vln-t * f    0.0000e+00e
3739 * vln-z * f    0.0000e+00e
3740 * vln-r * f    0.0000e+00e
3741 * tvn   * r06 5.9110e+02r06 5.5910e+02e
3742 * tln   * r06 5.9110e+02r06 5.5910e+02e
3743 * pn    * f    1.5500e+07e
3744 * pan   * f    0.0000e+00e
3745 * conc  * f    0.0000e+00e
3746 *
3747 * level    8    upper plenum (level 2 of 4)
3748 *
3749 * cfzl-t* r06 0.0000e+00r06 1.0000e-02e
3750 * cfzl-z* r06 0.0000e+00r06 1.0000e-02e
```

```
3751 * cfzl-r*     2.0000e+03    0.0000e+00    2.0000e+03    0.0000e+00    2.0000e+03
3752 * cfzl-r* r07 0.0000e+00e
3753 * cfzv-t* r06 0.0000e+00r06 1.0000e-02e
3754 * cfzv-z* r06 0.0000e+00r06 1.0000e-02e
3755 * cfzv-r*     2.0000e+03    0.0000e+00    2.0000e+03    0.0000e+00    2.0000e+03
3756 * cfzv-r* r07 0.0000e+00e
3757 * vol    * r06 9.3580e-01    4.1040e-01    8.2350e-01    4.1040e-01    8.2350e-01
3758 * vol    *     4.1040e-01    8.2350e-01e
3759 * fa-t   * r06 9.3580e-01r06 8.1200e-01e
3760 * fa-z   * r06 9.3580e-01    3.8770e-01    8.2350e-01    3.8770e-01    8.2350e-01
3761 * fa-z   *     3.8770e-01    8.2350e-01e
3762 * fa-r   *     5.4000e-02    0.0000e+00    5.4000e-02    0.0000e+00    5.4000e-02
3763 * fa-r   * r07 0.0000e+00e
3764 * hd-t   * r06 5.3000e-01r06 4.4610e-01e
3765 * hd-z   * r06 5.3000e-01    3.1820e-01    4.4610e-01    3.1820e-01    4.4610e-01
3766 * hd-z   *     3.1820e-01    4.4610e-01e
3767 * hd-r   * r06 5.3000e-01r06 4.4610e-01e
3768 * alpn   * f   0.0000e+00e
3769 * vvn-t  * f   0.0000e+00e
3770 * vvn-z  * f   0.0000e+00e
3771 * vvn-r  * f   0.0000e+00e
3772 * vln-t  * f   0.0000e+00e
3773 * vln-z  * f   0.0000e+00e
3774 * vln-r  * f   0.0000e+00e
3775 * tvn    * r06 5.9110e+02r06 5.5910e+02e
3776 * tln    * r06 5.9110e+02r06 5.5910e+02e
3777 * pn     * f   1.5500e+07e
3778 * pan    * f   0.0000e+00e
3779 * conc   * f   0.0000e+00e
3780 *
3781 * level    9   upper plenum (level 3 or 4)
3782 *
3783 * cfzl-t* f   0.0000e+00e
3784 * cfzl-z* f   0.0000e+00e
3785 * cfzl-r* f   0.0000e+00e
3786 * cfzv-t* f   0.0000e+00e
3787 * cfzv-z* f   0.0000e+00e
3788 * cfzv-r* f   0.0000e+00e
3789 * vol    * r06 9.3910e-01r06 8.2350e-01e
3790 * fa-t   * r06 9.3910e-01r06 8.1200e-01e
3791 * fa-z   * r06 9.3910e-01r06 8.2350e-01e
3792 * fa-r   * f   0.0000e+00e
3793 * hd-t   * r06 5.3000e-01r06 4.4610e-01e
3794 * hd-z   * r06 5.3000e-01r06 4.4610e-01e
3795 * hd-r   * r06 5.3000e-01r06 4.4610e-01e
3796 * alpn   * f   0.0000e+00e
3797 * vvn-t  * f   0.0000e+00e
3798 * vvn-z  * f   0.0000e+00e
3799 * vvn-r  * f   0.0000e+00e
```



```
3800 * vln-t * f    0.0000e+00e
3801 * vln-z * f    0.0000e+00e
3802 * vln-r * f    0.0000e+00e
3803 * tvn   * r06 5.9110e+02r06 5.5910e+02e
3804 * tln   * r06 5.9110e+02r06 5.5910e+02e
3805 * pn    * f    1.5500e+07e
3806 * pan   * f    0.0000e+00e
3807 * conc  * f    0.0000e+00e
3808 *
3809 * level  10    upper plenum (level 4 of 4)
3810 *
3811 * cfzl-t* f    0.0000e+00e
3812 * cfzl-z* r06 0.0000e+00r06 3.5000e+03e
3813 * cfzl-r* f    0.0000e+00e
3814 * cfzv-t* f    0.0000e+00e
3815 * cfzv-z* r06 0.0000e+00r06 3.5000e+03e
3816 * cfzv-r* f    0.0000e+00e
3817 * vol   * r06 9.3910e-01r06 4.5740e-01e
3818 * fa-t  * r06 9.3910e-01r06 4.5700e-01e
3819 * fa-z  * r06 0.0000e+00r06 2.2040e-02e
3820 * fa-r  * f    0.0000e+00e
3821 * hd-t  * r06 5.3000e-01r06 4.4610e-01e
3822 * hd-z  * r06 5.3000e-01r06 4.4610e-01e
3823 * hd-r  * r06 5.3000e-01r06 4.4610e-01e
3824 * alpn  * f    0.0000e+00e
3825 * vvn-t * f    0.0000e+00e
3826 * vvn-z * f    0.0000e+00e
3827 * vvn-r * f    0.0000e+00e
3828 * vln-t * f    0.0000e+00e
3829 * vln-z * f    0.0000e+00e
3830 * vln-r * f    0.0000e+00e
3831 * tvn   * r06 5.9110e+02r06 5.5910e+02e
3832 * tln   * r06 5.9110e+02r06 5.5910e+02e
3833 * pn    * f    1.5500e+07e
3834 * pan   * f    0.0000e+00e
3835 * conc  * f    0.0000e+00e
3836 *
3837 * level  11    bottom upper head
3838 *
3839 * cfzl-t* f    0.0000e+00e
3840 * cfzl-z* f    0.0000e+00e
3841 * cfzl-r* f    0.0000e+00e
3842 * cfzv-t* f    0.0000e+00e
3843 * cfzv-z* f    0.0000e+00e
3844 * cfzv-r* f    0.0000e+00e
3845 * vol   * r06 9.0010e-01r06 5.6550e-01e
3846 * fa-t  * r06 9.0010e-01r06 5.0000e-01e
3847 * fa-z  * r06 9.0010e-01r06 0.0000e+00e
3848 * fa-r  * r06 4.5000e-01r06 0.0000e+00e
```



```
3849 * hd-t   * r06 1.0440e+00r06 6.0400e-01e
3850 * hd-z   * r06 1.0440e+00r06 6.0400e-01e
3851 * hd-r   * r06 1.0440e+00r06 6.0400e-01e
3852 * alpn   * f   0.0000e+00e
3853 * vvn-t  * f   0.0000e+00e
3854 * vvn-z  * f   0.0000e+00e
3855 * vvn-r  * f   0.0000e+00e
3856 * vln-t  * f   0.0000e+00e
3857 * vln-z  * f   0.0000e+00e
3858 * vln-r  * f   0.0000e+00e
3859 * tvn    * f   5.8100e+02e
3860 * tln    * f   5.8100e+02e
3861 * pn     * f   1.5500e+07e
3862 * pan    * f   0.0000e+00e
3863 * conc   * f   0.0000e+00e
3864 *
3865 * level  12   top upper head
3866 *
3867 * cfzl-t* f   0.0000e+00e
3868 * cfzl-z* f   0.0000e+00e
3869 * cfzl-r* f   0.0000e+00e
3870 * cfzv-t* f   0.0000e+00e
3871 * cfzv-z* f   0.0000e+00e
3872 * cfzv-r* f   0.0000e+00e
3873 * vol    * r06 5.1640e-01r06 0.0000e+00e
3874 * fa-t   * r06 5.1640e-01r06 0.0000e+00e
3875 * fa-z   * f   0.0000e+00e
3876 * fa-r   * f   0.0000e+00e
3877 * hd-t   * r06 1.0060e+00r06 0.0000e+00e
3878 * hd-z   * r06 1.0060e+00r06 0.0000e+00e
3879 * hd-r   * r06 1.0060e+00r06 0.0000e+00e
3880 * alpn   * f   0.0000e+00e
3881 * vvn-t  * f   0.0000e+00e
3882 * vvn-z  * f   0.0000e+00e
3883 * vvn-r  * f   0.0000e+00e
3884 * vln-t  * f   0.0000e+00e
3885 * vln-z  * f   0.0000e+00e
3886 * vln-r  * f   0.0000e+00e
3887 * tvn    * f   5.8100e+02e
3888 * tln    * f   5.8100e+02e
3889 * pn     * f   1.5500e+07e
3890 * pan    * f   0.0000e+00e
3891 * conc   * f   0.0000e+00e
3892 *
3893 ************************************************************************
3894 *******   type          num           id       ctitle
3895 pipe                    2            2 $2$ rod guide tube 1 (long)
3896 *       ncells        nodes         jun1          jun2          epsw
3897             4            0            2            94    0.0000e+00
```

```
3898 *          ichf          iconc           iacc           ipow
3899               1              1              0              0
3900 *         radin             th          houtl          houtv          toutl
3901     4.0945e-01     6.3500e-03     0.0000e+00     0.0000e+00     3.0000e+02
3902 *         toutv          powin         powoff         rpowmx         powscl
3903     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
3904 *
3905 * dx     *      8.5725e-01r02 8.3264e-01     9.3345e-01e
3906 * vol    *      1.7880e-02r02 1.7370e-02     1.9470e-02e
3907 * fa     * f    2.0860e-02e
3908 * kfac   *      5.0000e-01r03 0.0000e+00     1.0000e+00e
3909 * rkfac  *      1.0000e+00r03 0.0000e+00     5.0000e-01e
3910 * grav   * f    1.0000e+00e
3911 * hd     * f    6.0000e-02e
3912 * icflg  * f             0e
3913 * nff    * f             1e
3914 * alp    * f    0.0000e+00e
3915 * vl     * f    0.0000e+00e
3916 * vv     * f    0.0000e+00e
3917 * tl     * f    5.8100e+02e
3918 * tv     * f    5.8100e+02e
3919 * p      * f    1.5500e+07e
3920 * pa     * f    0.0000e+00e
3921 * conc   * f    0.0000e+00e
3922 *
3923 ************************************************************************
3924 *******   type            num             id        ctitle
3925 pipe                      3              3 $3$ rod guide tube 2 (short)
3926 *        ncells          nodes           jun1           jun2           epsw
3927               2              0              3             95     0.0000e+00
3928 *          ichf          iconc           iacc           ipow
3929               1              1              0              0
3930 *         radin             th          houtl          houtv          toutl
3931     4.0945e-01     6.3500e-03     0.0000e+00     0.0000e+00     3.0000e+02
3932 *         toutv          powin         powoff         rpowmx         powscl
3933     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
3934 *
3935 * dx     *      8.3264e-01     9.3345e-01e
3936 * vol    *      1.7370e-02     1.9470e-02e
3937 * fa     * f    2.0860e-02e
3938 * kfac   *      5.0000e-01     0.0000e+00     1.0000e+00e
3939 * rkfac  *      1.0000e+00     0.0000e+00     5.0000e-01e
3940 * grav   * f    1.0000e+00e
3941 * hd     * f    6.0000e-02e
3942 * icflg  * f             0e
3943 * nff    * f             1e
3944 * alp    * f    0.0000e+00e
3945 * vl     * f    0.0000e+00e
3946 * vv     * f    0.0000e+00e
3947 * tl     * f    5.8100e+02e
```

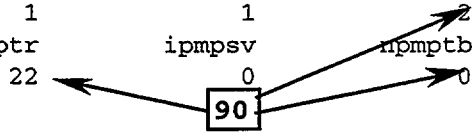
```
3948 * tv     * f   5.8100e+02e
3949 * p      * f   1.5500e+07e
3950 * pa     * f   0.0000e+00e
3951 * conc   * f   0.0000e+00e
3952 *
3953 ************************************************************************
3954 *******   type           num            id        ctitle
3955 pipe                      4             4 $4$ rod guide tube 3 (long)
3956 *       ncells         nodes          jun1          jun2          epsw
3957              4             0             4            96    0.0000e+00
3958 *         ichf         iconc          iacc          ipow
3959              1             1             0             0
3960 *        radin            th         houtl         houtv         toutl
3961     4.0945e-01    6.3500e-03    0.0000e+00    0.0000e+00    3.0000e+02
3962 *        toutv         powin        powoff        rpowmx        powscl
3963     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
3964 *
3965 * dx     *     8.5725e-01r02 8.3264e-01    9.3345e-01e
3966 * vol    *     1.7880e-02r02 1.7370e-02    1.9470e-02e
3967 * fa     * f   2.0860e-02e
3968 * kfac   *     5.0000e-01r03 0.0000e+00    1.0000e+00e
3969 * rkfac  *     1.0000e+00r03 0.0000e+00    5.0000e-01e
3970 * grav   * f   1.0000e+00e
3971 * hd     * f   6.0000e-02e
3972 * icflg  * f            0e
3973 * nff    * f            1e
3974 * alp    * f   0.0000e+00e
3975 * vl     * f   0.0000e+00e
3976 * vv     * f   0.0000e+00e
3977 * tl     * f   5.8100e+02e
3978 * tv     * f   5.8100e+02e
3979 * p      * f   1.5500e+07e
3980 * pa     * f   0.0000e+00e
3981 * conc   * f   0.0000e+00e
3982 *
3983 ************************************************************************
3984 *******   type           num            id        ctitle
3985 pipe                      5             5 $5$ rod guide tube 4 (short)
3986 *       ncells         nodes          jun1          jun2          epsw
3987              2             0             5            97    0.0000e+00
3988 *         ichf         iconc          iacc          ipow
3989              1             1             0             0
3990 *        radin            th         houtl         houtv         toutl
3991     4.0945e-01    6.3500e-03    0.0000e+00    0.0000e+00    3.0000e+02
3992 *        toutv         powin        powoff        rpowmx        powscl
3993     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
3994 *
3995 * dx     *     8.3264e-01    9.3345e-01e
3996 * vol    *     1.7370e-02    1.9470e-02e
3997 * fa     * f   2.0860e-02e
```

```
3998 * kfac  *     5.0000e-01    0.0000e+00    1.0000e+00e
3999 * rkfac *     1.0000e+00    0.0000e+00    5.0000e-01e
4000 * grav  * f   1.0000e+00
4001 * hd    * f   6.0000e-02e
4002 * icflg * f            0e
4003 * nff   * f            1e
4004 * alp   * f   0.0000e+00e
4005 * vl    * f   0.0000e+00e
4006 * vv    * f   0.0000e+00e
4007 * tl    * f   5.8100e+02e
4008 * tv    * f   5.8100e+02e
4009 * p     * f   1.5500e+07e
4010 * pa    * f   0.0000e+00e
4011 * conc  * f   0.0000e+00e
4012 *
4013 ************************************************************************
4014 *******   type           num            id        ctitle
4015 pipe                      6             6 $6$ rod guide tube 5 (long)
4016 *       ncells         nodes          jun1          jun2          epsw
4017              4             0             6            98    0.0000e+00
4018 *         ichf         iconc          iacc          ipow
4019              1             1             0             0
4020 *        radin            th         houtl         houtv         toutl
4021     4.0945e-01    6.3500e-03    0.0000e+00    0.0000e+00    3.0000e+02
4022 *        toutv         powin        powoff        rpowmx        powscl
4023     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4024 *
4025 * dx    *     8.5725e-01r02 8.3264e-01    9.3345e-01e
4026 * vol   *     1.7880e-02r02 1.7370e-02    1.9470e-02e
4027 * fa    * f   2.0860e-02e
4028 * kfac  *     5.0000e-01r03 0.0000e+00    1.0000e+00e
4029 * rkfac *     1.0000e+00r03 0.0000e+00    5.0000e-01e
4030 * grav  * f   1.0000e+00e
4031 * hd    * f   6.0000e-02e
4032 * icflg * f            0e
4033 * nff   * f            1e
4034 * alp   * f   0.0000e+00e
4035 * vl    * f   0.0000e+00e
4036 * vv    * f   0.0000e+00e
4037 * tl    * f   5.8100e+02e
4038 * tv    * f   5.8100e+02e
4039 * p     * f   1.5500e+07e
4040 * pa    * f   0.0000e+00e
4041 * conc  * f   0.0000e+00e
4042 *
4043 ************************************************************************
4044 *******   type           num            id        ctitle
4045 pipe                      7             7 $7$ rod guide tube 6 (short)
4046 *       ncells         nodes          jun1          jun2          epsw
4047              2             0             7            99    0.0000e+00
```

```
4048 *          ichf          iconc          iacc          ipow
4049               1              1             0             0
4050 *         radin             th         houtl         houtv         toutl
4051     4.0945e-01    6.3500e-03    0.0000e+00    0.0000e+00    3.0000e+02
4052 *         toutv          powin         powoff         rpowmx         powscl
4053     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4054 *
4055 * dx     *      8.3264e-01    9.3345e-01e
4056 * vol    *      1.7370e-02    1.9470e-02e
4057 * fa     * f    2.0860e-02
4058 * kfac   *      5.0000e-01    0.0000e+00    1.0000e+00e
4059 * rkfac  *      1.0000e+00    0.0000e+00    5.0000e-01e
4060 * grav   * f    1.0000e+00e
4061 * hd     * f    6.0000e-02e
4062 * icflg  * f             0e
4063 * nff    * f             1e
4064 * alp    * f    0.0000e+00e
4065 * vl     * f    0.0000e+00e
4066 * vv     * f    0.0000e+00e
4067 * tl     * f    5.8100e+02e
4068 * tv     * f    5.8100e+02e
4069 * p      * f    1.5500e+07e
4070 * pa     * f    0.0000e+00e
4071 * conc   * f    0.0000e+00e
4072 *
4073 ********************************************************************************
4074 *******   type            num             id        ctitle
4075 pipe                       10             84 10 $10$ hot leg 1
4076 *        ncells         nodes           jun1          jun2          epsw
4077               6             1             10            12    0.0000e+00
4078 *          ichf          iconc          iacc          ipow
4079               1              1             0             0
4080 *        iqp3tr         iqp3sv        nqp3tb        nqp3sv        nqp3rf
4081               0              0             0             0             0
4082 *         radin             th         houtl         houtv         toutl
4083     3.6830e-01    6.3500e-02    0.0000e+00    0.0000e+00    3.0000e+02
4084 *         toutv          powin         powoff         rpowmx         powscl
4085     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4086 *         qp3in         qp3off         rqp3mx         qp3scl
4087     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4088 *
4089 * dx     * r04 1.2090e+00    5.9250e-01    1.1970e+00e
4090 * vol    * r04 5.1520e-01    2.5250e-01    5.1007e-01e
4091 * fa     * r06 4.2614e-01    4.8695e-01e
4092 * kfac   *     3.0000e-01r05 0.0000e+00    5.0000e-01e
4093 * rkfac  *     6.0000e-01r05 0.0000e+00    2.0000e-01e
4094 * grav   * r06 0.0000e+00    7.6600e-01e
4095 * hd     * r06 7.3660e-01    7.8740e-01e
4096 * icflg  * f             0e
4097 * nff    * f             1e
```

```
4098 * alp    * f    0.0000e+00
4099 * vl     * f    0.0000e+00
4100 * vv     * f    0.0000e+00
4101 * tl     * f    5.9110e+02
4102 * tv     * f    5.9110e+02
4103 * p      * f    1.5500e+07
4104 * pa     * f    0.0000e+00
4105 * qppp   * f    0.0000e+00
4106 * matid  *              7e
4107 * tw     * f    5.9110e+02
4108 * conc   * f    0.0000e+00
4109 *
4110 ********************************************************************************
4111 *******   type           num            id        ctitle
4112 pipe                     12            12 $12$ steam-gen primary 1
4113 *        ncells         nodes          jun1          jun2          epsw
4114               18             0            12            14    0.0000e+00
4115 *          ichf         iconc          iacc          ipow
4116                1             1             0             0
4117 *         radin            th         houtl         houtv         toutl
4118      9.8400e-03    1.2700e-03    0.0000e+00    0.0000e+00    3.0000e+02
4119 *         toutv          powin        powoff        rpowmx        powscl
4120      3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4121 *
4122 * dx     *      1.0668e+00    1.2192e+00r14 1.3320e+00    1.2192e+00    1.0668e+00
4123 * dx     * e
4124 * vol    *      1.4640e+00    2.8320e+00r14 1.2573e+00    2.8320e+00    1.4640e+00
4125 * vol    * e
4126 * fa     *      4.8695e-01    2.3226e+00r15 9.4392e-01    2.3226e+00    4.8695e-01
4127 * fa     * e
4128 * kfac   *      5.0000e-01    0.0000e+00    3.0000e-01r13 1.3530e-02    0.5000e+00
4129 * kfac   *      0.0000e+00    2.0000e-01e
4130 * rkfac  *      2.0000e-01    0.0000e+00    3.0000e-01r13 1.3530e-02    0.5000e+00
4131 * rkfac  *      0.0000e+00    5.0000e-01e
4132 * grav   *      7.6600e-01r08 1.0000e+00    0.0000e+00r08-1.0000e+00   -7.6600e-01
4133 * grav   * e
4134 * hd     *      7.8740e-01    1.4844e+00r15 1.9685e-02    1.4844e+00    7.8740e-01
4135 * hd     * e
4136 * icflg  * f               0e
4137 * nff    * f               1e
4138 * alp    * f    0.0000e+00e
4139 * vl     * f    0.0000e+00e
4140 * vv     * f    0.0000e+00e
4141 * tl     * r09  5.9110e+02r09 5.5910e+02e
4142 * tv     * r09  5.9110e+02r09 5.5910e+02e
4143 * p      * f    1.5500e+07e
4144 * pa     * f    0.0000e+00e
4145 * conc   * f    0.0000e+00e
4146 *
```

```
4147 ******************************************************************************
4148 *******   type           num            id        ctitle
4149 pipe                     14            14 $14$ loop seal 1
4150 *       ncells         nodes          jun1          jun2          epsw
4151              6             1            14            16    0.0000e+00
4152 *         ichf         iconc          iacc          ipow
4153              1             1             0             0
4154 *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
4155              0             0             0             0             0
4156 *        radin            th         houtl         houtv         toutl
4157     3.9370e-01    6.6680e-02    0.0000e+00    0.0000e+00    3.0000e+02
4158 *        toutv         powin        powoff        rpowmx        powscl
4159     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4160 *         qp3in        qp3off        rqp3mx        qp3scl
4161     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4162 *
4163 * dx    *     9.5768e-01    8.3972e-01    1.1484e+00r02 1.6961e+00    1.1484e+00
4164 * dx    * e
4165 * vol   *     4.6634e-01    4.0890e-01    5.5921e-01r02 8.2589e-01    5.5921e-01
4166 * vol   * e
4167 * fa    * f   4.8695e-01e
4168 * kfac  *     2.0000e-01r06 0.0000e+00e
4169 * rkfac *     5.0000e-01r06 0.0000e+00e
4170 * grav  *    -7.6600e-01r02-1.0000e+00   -5.6067e-01    0.0000e+00    5.6067e-01
4171 * grav  *     1.0000e+00e
4172 * hd    * f   7.8740e-01e
4173 * icflg * f            0e
4174 * nff   * f            1e
4175 * alp   * f   0.0000e+00e
4176 * vl    * f   0.0000e+00e
4177 * vv    * f   0.0000e+00e
4178 * tl    * f   5.5910e+02e
4179 * tv    * f   5.5910e+02e
4180 * p     * f   1.5500e+07e
4181 * pa    * f   0.0000e+00e
4182 * qppp  * f   0.0000e+00e
4183 * matid *              7e
4184 * tw    * f   5.5910e+02e
4185 * conc  * f   0.0000e+00e
4186 *
4187 ******************************************************************************
4188 *******   type           num            id        ctitle
4189 pump                     16            16 $16$ reactor-coolant pump 1
4190 *       ncells         nodes          jun1          jun2          epsw
4191              3             5            16            17    0.0000e+00
4192 *         ichf         iconc        ipmpty           irp          ipm
4193              1             1             2             0             1
4194 *       ipmptr        ipmpsv        npmptb        npmpsv        npmprf
4195             22             0             0             0             0
```



```
4196 *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
4197              0             0             0             0             0
4198 *        radin            th         houtl         houtv         toutl
4199     1.7052e-01    4.6656e-01    0.0000e+00    0.0000e+00    3.0000e+02
4200 *        toutv         effmi
4201     3.0000e+02    2.9500e+03
4202 *         tfr0          tfr1          tfr2          tfr3          tfrb
4203     6.4800e+01    0.0000e+00    1.5554e+03    0.0000e+00    0.0000e+00
4204 *        tfrl0         tfrl1         tfrl2         tfrl3
4205     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4206 *        rhead         rtork         rflow         rrho          romega
4207     7.8000e+02    3.2404e+04    5.5835e+00    7.5575e+02    1.2360e+02
4208 *        omegan        omgoff        romgmx        omgscl        npmpsd
4209     1.2360e+02    0.0000e+00    5.0000e+01    1.0000e+00             0
4210 *        qp3in         qp3off        rqp3mx        qp3scl
4211     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4212 *        option
4213              2
4214 *
4215 * dx     *      2.4640e+00    4.5000e+00    9.8640e-01e
4216 * vol    *      1.6850e+00    3.3738e+00    3.7799e-01e
4217 * fa     *      4.8695e-01r02 6.8384e-01    3.8320e-01e
4218 * kfac   * f    0.0000e+00e
4219 * rkfac  * f    0.0000e+00e
4220 * grav   *      1.0000e+00r03 0.0000e+00e
4221 * hd     *      7.8740e-01r02 9.3311e-01    6.9850e-01e
4222 * icflg  * f             0e
4223 * nff    * f             1e
4224 * alp    * f    0.0000e+00e
4225 * ml     *      0.0000e+00    4.2590e+03r02 0.0000e+00e
4226 * vl     x f    0.0000e+00e
4227 * vv     * f    0.0000e+00e
4228 * tl     * f    5.5910e+02e
4229 * tv     * f    5.5910e+02e
4230 * p      * f    1.5500e+07e
4231 * pa     * f    0.0000e+00e
4232 * qppp   * f    0.0000e+00e
4233 * matid  * f             7e
4234 * tw     * f    5.5910e+02e
4235 * conc   * f    0.0000e+00e
4236 *
4237 ********************************************************************************
4238 *******   type            num             id        ctitle
4239 tee                        17             17 $17$ cold leg section 1a
4240 *         jcell         nodes          ichf          cost          epsw
4241               1             1             1    0.0000e+00    0.0000e+00
4242 *        iconc1        ncell1          jun1          jun2          ipow1
4243               1             1            17            18             1
4244 *        ipwtr1        ipwsv1        npwtb1        npwsv1        npwrf1
4245               22            1            -2             0             0
```

```
4246 *       iqptr1         iqpsv1         nqptb1         nqpsv1         nqprf1
4247              0              0              0              0              0
4248 *       radin1           th1         houtl1         houtv1         toutl1
4249     3.4925e-01     6.6680e-02     0.0000e+00     0.0000e+00     3.0000e+02
4250 *       toutv1          pwin1         pwoff1         rpwmx1         pwscl1
4251     3.0000e+02     2.6670e+06     2.6670e+06     1.0000e+10     1.0000e+00
4252 *        qpin1         qpoff1         rqpmx1         qpscl1
4253     0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
4254 *       iconc2         ncell2           jun3          ipow2
4255              1              1             58              0
4256 *       iqptr2         iqpsv2         nqptb2         nqpsv2         nqprf2
4257              0              0              0              0              0
4258 *       radin2           th2         houtl2         houtv2         toutl2
4259     1.1113e-01     2.5400e-02     0.0000e+00     0.0000e+00     3.0000e+02
4260 *       toutv2          pwin2         pwoff2         rpwmx2         pwscl2
4261     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
4262 *        qpin2         qpoff2         rqpmx2         qpscl2
4263     0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
4264 *
4265 * main-cell arrays
4266 * dx     *      1.1686e+00e
4267 * vol    *      4.4781e-01e
4268 * fa     * f    3.8320e-01e
4269 * kfac   * f    0.0000e+00e
4270 * rkfac  * f    0.0000e+00e
4271 * grav   * f    0.0000e+00e
4272 * hd     * f    6.9850e-01e
4273 * icflg  * f             0e
4274 * nff    * f             1e
4275 * alp    *      0.0000e+00e
4276 * vl     * f    0.0000e+00e
4277 * vv     * f    0.0000e+00e
4278 * tl     *      5.5910e+02e
4279 * tv     *      5.5910e+02e
4280 * p      *      1.5500e+07e
4281 * pa     *      0.0000e+00e
4282 * qppp   *      0.0000e+00e
4283 * matid  *               7e
4284 * tw     *      5.5910e+02e
4285 * conc   *      0.0000e+00e
4286 * powtb1*      0.0000e+00     2.6670e+06     1.0000e+00     0.0000e+00e
4287 *
4288 * side-cell arrays (eccs junction)
4289 * dx     *      0.762e+00e
4290 * vol    *      2.9489e-02e
4291 * fa     * f    3.8700e-02e
4292 * kfac   *      1.0000e-10     0.0000e+00e
4293 * rkfac  *      1.0000e-10     0.0000e+00e
4294 * grav   *      1.0000e+00     0.0000e+00e
4295 * hd     * f    2.2225e-01e
```

```
4296 * icflg * f            0e
4297 * nff   *             1            1e
4298 * alp   *     0.0000e+00e
4299 * vl    * f   0.0000e+00e
4300 * vv    * f   0.0000e+00e
4301 * tl    *     5.5910e+02e
4302 * tv    *     5.5910e+02e
4303 * p     *     1.5500e+07e
4304 * pa    *     0.0000e+00e
4305 * qppp  *     0.0000e+00e
4306 * matid *              7e
4307 * tw    *     5.5910e+02e
4308 * conc  *     0.0000e+00e
4309 *
4310 ************************************************************************
4311 *******   type           num            id        ctitle
4312 tee                      18            18 $18$ cold leg section 1b
4313 *        jcell         nodes          ichf          cost          epsw
4314              1             1             1    0.0000e+00    0.0000e+00
4315 *       iconc1        ncell1          jun1          jun2          ipow1
4316              1             4            18            19              0
4317 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
4318              0             0             0             0              0
4319 *       radin1           th1        houtl1        houtv1        toutl1
4320     3.4925e-01    6.6680e-02    0.0000e+00    0.0000e+00    3.0000e+02
4321 *       toutv1          pwin1         pwoff1        rpwmx1        pwscl1
4322     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4323 *        qpin1         qpoff1        rqpmx1        qpscl1
4324     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4325 *       iconc2        ncell2          jun3          ipow2
4326              1             1            91              0
4327 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
4328              0             0             0             0              0
4329 *       radin2           th2        houtl2        houtv2        toutl2
4330     3.3400e-02    1.1100e-02    0.0000e+00    0.0000e+00    3.0000e+02
4331 *       toutv2          pwin2         pwoff2        rpwmx2        pwscl2
4332     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4333 *        qpin2         qpoff2        rqpmx2        qpscl2
4334     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4335 *
4336 * main-cell arrays
4337 * dx    * f   1.1033e+00e
4338 * vol   * r03 4.2278e-01    4.9953e-01e
4339 * fa    * r04 3.8320e-01    5.7717e-01e
4340 * kfac  * r04 0.0000e+00    3.0000e-01e
4341 * rkfac * r04 0.0000e+00    3.0000e-01e
4342 * grav  * f   0.0000e+00e
4343 * hd    * r04 6.9850e-01    8.5725e-01e
4344 * icflg * f            0e
4345 * nff   * f            1e
```

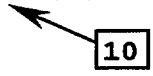
```
4346 * alp    * f   0.0000e+00
4347 * vl     * f   0.0000e+00
4348 * vv     * f   0.0000e+00
4349 * tl     * f   5.5910e+02e
4350 * tv     * f   5.5910e+02e
4351 * p      * f   1.5500e+07e
4352 * pa     * f   0.0000e+00e
4353 * qppp   * f   0.0000e+00e
4354 * matid *              7e
4355 * tw     * f   5.5910e+02e
4356 * conc   * f   0.0000e+00e
4357 *
4358 * side-cell arrays (cvcs junction)
4359 * dx     *     3.0480e+00e
4360 * vol    *     1.0640e-02e
4361 * fa     * f   3.4900e-03e
4362 * kfac   *     1.0000e-10    0.0000e+00e
4363 * rkfac  *     1.0000e-10    0.0000e+00e
4364 * grav   * f   0.0000e+00e
4365 * hd     * f   6.6700e-02e
4366 * icflg  * f            0e
4367 * nff    * f            1e
4368 * alp    *     0.0000e+00e
4369 * vl     * f   0.0000e+00e
4370 * vv     * f   0.0000e+00e
4371 * tl     *     5.5910e+02e
4372 * tv     *     5.5910e+02e
4373 * p      *     1.5500e+07e
4374 * pa     *     0.0000e+00e
4375 * qppp   *     0.0000e+00e
4376 * matid *              7e
4377 * tw     *     5.5910e+02e
4378 * conc   *     0.0000e+00e
4379 *
4380 ********************************************************************************
4381 *******   type           num            id        ctitle
4382 pipe                     20            20 $20$ hot leg 2
4383 *       ncells         nodes          jun1          jun2          epsw
4384              6             1            20            22    0.0000e+00
4385 *         ichf         iconc          iacc          ipow
4386              1             1             0             0
4387 *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
4388              0             0             0             0             0
4389 *        radin            th         houtl         houtv         toutl
4390     3.6830e-01    6.3500e-02    0.0000e+00    0.0000e+00    3.0000e+02
4391 *        toutv         powin        powoff        rpowmx        powscl
4392     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4393 *         qp3in        qp3off        rqp3mx        qp3scl
4394     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4395 *
```

```
4396 * dx     * r04 1.2090e+00     5.9250e-01     1.1970e+00e
4397 * vol    * r04 5.1520e-01     2.5250e-01     5.1007e-01e
4398 * fa     * r06 4.2614e-01     4.8695e-01e
4399 * kfac   *     3.0000e-01r05 0.0000e+00     5.0000e-01e
4400 * rkfac  *     6.0000e-01r05 0.0000e+00     2.0000e-01e
4401 * grav   * r06 0.0000e+00     7.6600e-01e
4402 * hd     * r06 7.3660e-01     7.8740e-01e
4403 * icflg  * f             0e
4404 * nff    * f             1e
4405 * alp    * f    0.0000e+00e
4406 * vl     * f    0.0000e+00e
4407 * vv     * f    0.0000e+00e
4408 * tl     * f    5.9110e+02e
4409 * tv     * f    5.9110e+02e
4410 * p      * f    1.5500e+07e
4411 * pa     * f    0.0000e+00e
4412 * qppp   * f    0.0000e+00e
4413 * matid  *              7e
4414 * tw     * f    5.9110e+02e
4415 * conc   * f    0.0000e+00e
4416 *
4417 ************************************************************************
4418 *******   type           num            id        ctitle                  95
4419 tee                      22            22 $22$ steam-gen primary 2
4420 *        jcell         nodes          ichf          cost          epsw
4421               7             0             1    0.0000e+00    0.0000e+00
4422 *       iconc1        ncell1          jun1          jun2          ipow1
4423               1            18            22            24              0
4424 *       radin1           th1        houtl1        houtv1        toutl1
4425     9.8400e-03    1.2700e-03    0.0000e+00    0.0000e+00    3.0000e+02
4426 *       toutv1          pwin1        pwoff1        rpwmx1        pwscl1
4427     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4428 *       iconc2        ncell2          jun3          ipow2
4429               1             1           201             0
4430 *       radin2           th2        houtl2        houtv2        toutl2
4431     9.8400e-03    1.2700e-03    0.0000e+00    0.0000e+00    3.0000e+02
4432 *       toutv2          pwin2        pwoff2        rpwmx2        pwscl2
4433     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4434 *
4435 * main-cell arrays
4436 * dx     *     1.0668e+00    1.2192e+00r14 1.3320e+00    1.2192e+00    1.0668e+00
4437 * dx     * e
4438 * vol    *     1.4640e+00    2.8320e+00r14 1.2573e+00    2.8320e+00    1.4640e+00
4439 * vol    * e
4440 * fa     *     4.8695e-01    2.3226e+00r15 9.4392e-01    2.3226e+00    4.8695e-01
4441 * fa     * e
4442 * kfac   *     5.0000e-01    0.0000e+00    3.0000e-01r13 1.3530e-02    0.5000e+00
4443 * kfac   *     0.0000e+00    2.0000e-01e
4444 * rkfac  *     2.0000e-01    0.0000e+00    3.0000e-01r13 1.3530e-02    0.5000e+00
4445 * rkfac  *     0.0000e+00    5.0000e-01e
```

```
4446 * grav  *     7.6600e-01r08 1.0000e+00    0.0000e+00r08-1.0000e+00   -7.6600e-01
4447 * grav  * e
4448 * hd    *     7.8740e-01    1.4844e+00r15 1.9685e-02    1.4844e+00    7.8740e-01
4449 * hd    * e
4450 * icflg * f            0e
4451 * nff   * f            1e
4452 * alp   * f   0.0000e+00e
4453 * vl    * f   0.0000e+00e
4454 * vv    * f   0.0000e+00e
4455 * tl    * r09 5.9110e+02r09 5.5910e+02e
4456 * tv    * r09 5.9110e+02r09 5.5910e+02e
4457 * p     * f   1.5500e+07e
4458 * pa    * f   0.0000e+00e
4459 * conc  * f   0.0000e+00e
4460 *
4461 * side-cell arrays (for sgtr)
4462 * dx    *     5.0000e-01e
4463 * vol   *     6.0868e-04e
4464 * fa    * f   1.21736e-3e
4465 * kfac  *     1.0000e-10    0.0000e+00e
4466 * rkfac *     1.0000e-10    0.0000e+00e
4467 * grav  * f   0.0000e+00e
4468 * hd    * f   1.9685e-02e
4469 * icflg * f            0e
4470 * nff   * 1           -1e
4471 * alp   *     0.0000e+00e
4472 * vl    * f   0.0000e+00e
4473 * vv    * f   0.0000e+00e
4474 * tl    *     5.8000e+02e
4475 * tv    *     5.8000e+02e
4476 * p     *     1.5500e+07e
4477 * pa    *     0.0000e+00e
4478 * conc  *     0.0000e+00e
4479 *
4480 ************************************************************************
4481 *******   type           num            id        ctitle
4482 pipe                     24            24 $24$ loop seal 2
4483 *       ncells         nodes          jun1          jun2          epsw
4484              6             1            24            26    0.0000e+00
4485 *         ichf         iconc          iacc          ipow
4486              1             1             0             0
4487 *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
4488              0             0             0             0             0
4489 *        radin            th         houtl         houtv         toutl
4490     3.9370e-01    6.6680e-02    0.0000e+00    0.0000e+00    3.0000e+02
4491 *        toutv         powin        powoff        rpowmx        powscl
4492     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4493 *         qp3in        qp3off        rqp3mx        qp3scl
4494     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4495 *
```

```
4496 * dx    *     9.5768e-01    8.3972e-01    1.1484e+00r02 1.6961e+00    1.1484e+00
4497 * dx    * e
4498 * vol   *     4.6634e-01    4.0890e-01    5.5921e-01r02 8.2589e-01    5.5921e-01
4499 * vol   * e
4500 * fa    * f   4.8695e-01e
4501 * kfac  *     2.0000e-01r06 0.0000e+00e
4502 * rkfac *     5.0000e-01r06 0.0000e+00e
4503 * grav  *    -7.6600e-01r02-1.0000e+00   -5.6067e-01    0.0000e+00    5.6067e-01
4504 * grav  *     1.0000e+00e
4505 * hd    * f   7.8740e-01e
4506 * icflg * f            0e
4507 * nff   * f            1e
4508 * alp   * f   0.0000e+00e
4509 * vl    * f   0.0000e+00e
4510 * vv    * f   0.0000e+00e
4511 * tl    * f   5.5910e+02e
4512 * tv    * f   5.5910e+02e
4513 * p     * f   1.5500e+07e
4514 * pa    * f   0.0000e+00e
4515 * qppp  * f   0.0000e+00e
4516 * matid *             7e
4517 * tw    * f   5.5910e+02e
4518 * conc  * f   0.0000e+00e
4519 *
4520 ********************************************************************************
4521 *******   type          num           id        ctitle
4522 pump                    26           26 $26$ reactor-coolant pump 2
4523 *       ncells         nodes         jun1          jun2          epsw
4524              3             5           26            27    0.0000e+00
4525 *         ichf         iconc       ipmpty           irp          ipm
4526              1             1            2             0            1
4527 *       ipmptr        ipmpsv       npmptb        npmpsv       npmprf
4528             22             0            0             0            0
4529 *       iqp3tr        iqp3sv       nqp3tb        nqp3sv       nqp3rf
4530              0             0            0             0            0
4531 *        radin            th        houtl         houtv        toutl
4532     1.7052e-01    4.6656e-01    0.0000e+00    0.0000e+00    3.0000e+02
4533 *        toutv         effmi
4534     3.0000e+02    2.9500e+03
4535 *         tfr0          tfr1          tfr2          tfr3          tfrb
4536     6.4800e+01    0.0000e+00    1.5554e+03    0.0000e+00    0.0000e+00
4537 *        tfr10         tfr11         tfr12         tfr13
4538     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4539 *        rhead         rtork         rflow         rrho         romega
4540     7.8000e+02    3.2404e+04    5.5835e+00    7.5575e+02    1.2360e+02
4541 *       omegan        omgoff        romgmx        omgscl        npmpsd
4542     1.2360e+02    0.0000e+00    5.0000e+01    1.0000e+00             0
4543 *        qp3in         qp3off        rqp3mx        qp3scl
4544     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
```

```
4545 *       option
4546              2
4547 *
4548 * dx     *      2.4640e+00    4.5000e+00    9.8640e-01e
4549 * vol    *      1.6850e+00    3.3738e+00    3.7799e-01e
4550 * fa     *      4.8695e-01r02 6.8384e-01    3.8320e-01e
4551 * kfac   * f    0.0000e+00
4552 * rkfac  * f    0.0000e+00
4553 * grav   *      1.0000e+00r03 0.0000e+00
4554 * hd     *      7.8740e-01r02 9.3311e-01    6.9850e-01e
4555 * icflg  * f             0e
4556 * nff    * f             1e
4557 * alp    * f    0.0000e+00
4558 * ml     *      0.0000e+00    4.2590e+03r02 0.0000e+00e
4559 * vl     x f    0.0000e+00
4560 * vv     * f    0.0000e+00
4561 * tl     * f    5.5910e+02e
4562 * tv     * f    5.5910e+02e
4563 * p      * f    1.5500e+07e
4564 * pa     * f    0.0000e+00
4565 * qppp   * f    0.0000e+00
4566 * matid  * f             7e
4567 * tw     * f    5.5910e+02e
4568 * conc   * f    0.0000e+00
4569 *
4570 ********************************************************************************
4571 *******   type            num             id        ctitle
4572 tee                       27             27 $27$ cold leg section 2a
4573 *         jcell         nodes          ichf          cost          epsw
4574               1             1             1    0.0000e+00    0.0000e+00
4575 *        iconc1        ncell1          jun1          jun2          ipow1
4576               1             1            27            28              1
4577 *        ipwtr1        ipwsv1        npwtb1        npwsv1        npwrf1
4578              22             1            -2             0             0
4579 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
4580               0             0             0             0             0
4581 *        radin1          th1         houtl1        houtv1        toutl1
4582     3.4925e-01    6.6680e-02    0.0000e+00    0.0000e+00    3.0000e+02
4583 *        toutv1         pwin1        pwoff1        rpwmx1        pwscl1
4584     3.0000e+02    2.6670e+06    2.6670e+06    1.0000e+10    1.0000e+00
4585 *         qpin1        qpoff1        rqpmx1        qpscl1
4586     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4587 *        iconc2        ncell2          jun3          ipow2
4588               1             1            68             0
4589 *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
4590               0             0             0             0             0
4591 *        radin2          th2         houtl2        houtv2        toutl2
4592     1.1113e-01    2.5400e-02    0.0000e+00    0.0000e+00    3.0000e+02
4593 *        toutv2         pwin2        pwoff2        rpwmx2        pwscl2
4594     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
```



```
4595 *        qpin2        qpoff2        rqpmx2        qpscl2
4596      0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4597 *
4598 * main-cell arrays
4599 * dx     *     1.1686e+00e
4600 * vol    *     4.4781e-01e
4601 * fa     * f   3.8320e-01e
4602 * kfac   * f   0.0000e+00e
4603 * rkfac  * f   0.0000e+00e
4604 * grav   * f   0.0000e+00e
4605 * hd     * f   6.9850e-01e
4606 * icflg  * f            0e
4607 * nff    * f            1e
4608 * alp    *     0.0000e+00e
4609 * vl     * f   0.0000e+00e
4610 * vv     * f   0.0000e+00e
4611 * tl     *     5.5910e+02e
4612 * tv     *     5.5910e+02e
4613 * p      *     1.5500e+07e
4614 * pa     *     0.0000e+00e
4615 * qppp   *     0.0000e+00e
4616 * matid  *            7e
4617 * tw     *     5.5910e+02e
4618 * conc   *     0.0000e+00e
4619 * powtbl*     0.0000e+00    2.6670e+06    1.0000e+00    0.0000e+00e
4620 *
4621 * side-cell arrays (eccs junction)
4622 * dx     *     0.762e+00e
4623 * vol    *     2.9489e-02e
4624 * fa     * f   3.8700e-02e
4625 * kfac   *     1.0000e-10    0.0000e+00e
4626 * rkfac  *     1.0000e-10    0.0000e+00e
4627 * grav   *     1.0000e+00    0.0000e+00e
4628 * hd     * f   2.2225e-01e
4629 * icflg  * f            0e
4630 * nff    *            1          1e
4631 * alp    *     0.0000e+00e
4632 * vl     * f   0.0000e+00e
4633 * vv     * f   0.0000e+00e
4634 * tl     *     5.5910e+02e
4635 * tv     *     5.5910e+02e
4636 * p      *     1.5500e+07e
4637 * pa     *     0.0000e+00e
4638 * qppp   *     0.0000e+00e
4639 * matid  *            7e
4640 * tw     *     5.5910e+02e
4641 * conc   *     0.0000e+00e
4642 *
4643 ************************************************************************
```

```
4644 *******   type            num             id        ctitle
4645 tee                      28             28 $28$ cold leg section 2b
4646 *        jcell         nodes           ichf          cost           epsw
4647              1             1              1    0.0000e+00    0.0000e+00
4648 *       iconc1        ncell1           jun1          jun2          ipow1
4649              1             4             28            29              0
4650 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
4651              0             0              0             0              0
4652 *       radin1           th1        houtl1        houtv1        toutl1
4653    3.4925e-01    6.6680e-02    0.0000e+00    0.0000e+00    3.0000e+02
4654 *       toutv1         pwin1        pwoff1        rpwmx1        pwscl1
4655    3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4656 *        qpin1         qpoff1        rqpmx1        qpscl1
4657    0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4658 *       iconc2        ncell2          jun3          ipow2
4659              1             1             92              0
4660 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
4661              0             0              0             0              0
4662 *       radin2           th2        houtl2        houtv2        toutl2
4663    3.3400e-02    1.1100e-02    0.0000e+00    0.0000e+00    3.0000e+02
4664 *       toutv2         pwin2        pwoff2        rpwmx2        pwscl2
4665    3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4666 *        qpin2         qpoff2        rqpmx2        qpscl2
4667    0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4668 *
4669 * main-cell arrays
4670 * dx    * f   1.1033e+00e
4671 * vol   * r03 4.2278e-01    4.9953e-01e
4672 * fa    * r04 3.8320e-01    5.7717e-01e
4673 * kfac  * r04 0.0000e+00    3.0000e-01e
4674 * rkfac * r04 0.0000e+00    3.0000e-01e
4675 * grav  * f   0.0000e+00e
4676 * hd    * r04 6.9850e-01    8.5725e-01e
4677 * icflg * f             0e
4678 * nff   * f             1e
4679 * alp   * f   0.0000e+00e
4680 * vl    * f   0.0000e+00e
4681 * vv    * f   0.0000e+00e
4682 * tl    * f   5.5910e+02e
4683 * tv    * f   5.5910e+02e
4684 * p     * f   1.5500e+07e
4685 * pa    * f   0.0000e+00e
4686 * qppp  * f   0.0000e+00e
4687 * matid *             7e
4688 * tw    * f   5.5910e+02e
4689 * conc  * f   0.0000e+00e
4690 *
4691 * side-cell arrays (cvcs junction)
4692 * dx    *     3.0480e+00e
4693 * vol   *     1.0640e-02e
```

```
4694 * fa     * f   3.4900e-03e
4695 * kfac   *     1.0000e-10    0.0000e+00e
4696 * rkfac  *     1.0000e-10    0.0000e+00e
4697 * grav   * f   0.0000e+00e
4698 * hd     * f   6.6700e-02e
4699 * icflg  * f            0e
4700 * nff    * f            1e
4701 * alp    *     0.0000e+00e
4702 * vl     * f   0.0000e+00e
4703 * vv     * f   0.0000e+00e
4704 * tl     *     5.5910e+02e
4705 * tv     *     5.5910e+02e
4706 * p      *     1.5500e+07e
4707 * pa     *     0.0000e+00e
4708 * qppp   *     0.0000e+00e
4709 * matid  *            7e
4710 * tw     *     5.5910e+02e
4711 * conc   *     0.0000e+00e
4712 *
4713 ************************************************************************
4714 *******   type          num           id        ctitle
4715 tee                     30           30 $30$ hot leg 3
4716 *        jcell        nodes         ichf         cost         epsw
4717               5            1            1   0.0000e+00   0.0000e+00
4718 *       iconc1       ncell1         jun1         jun2         ipow1
4719               1            6           30           32            0
4720 *       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
4721               0            0            0            0            0
4722 *       radin1          th1       hout11       houtv1       tout11
4723    3.6830e-01   6.3500e-02   0.0000e+00   0.0000e+00   3.0000e+02
4724 *       toutv1         pwin1        pwoff1        rpwmx1       pwscl1
4725    3.0000e+02   0.0000e+00   0.0000e+00   0.0000e+00   0.0000e+00
4726 *        qpin1        qpoff1        rqpmx1        qpscl1
4727    0.0000e+00   0.0000e+00   0.0000e+00   1.0000e+00
4728 *       iconc2       ncell2         jun3         ipow2
4729               1            4           40            0
4730 *       iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
4731               0            0            0            0            0
4732 *       radin2          th2       hout12       houtv2       tout12
4733    1.3335e-01   2.8580e-02   0.0000e+00   0.0000e+00   3.0000e+02
4734 *       toutv2         pwin2        pwoff2        rpwmx2       pwscl2
4735    3.0000e+02   0.0000e+00   0.0000e+00   0.0000e+00   0.0000e+00
4736 *        qpin2        qpoff2        rqpmx2        qpscl2
4737    0.0000e+00   0.0000e+00   0.0000e+00   1.0000e+00
4738 *
4739 * main-cell arrays
4740 * dx     * r04 1.2090e+00    5.9250e-01    1.1970e+00e
4741 * vol    * r04 5.1520e-01    2.5250e-01    5.1007e-01e
4742 * fa     * r06 4.2614e-01    4.8695e-01e
4743 * kfac   *     3.0000e-01r05 0.0000e+00    5.0000e-01e
```

```
4744 * rkfac *     6.0000e-01r05 0.0000e+00    2.0000e-01e
4745 * grav  * r06 0.0000e+00    7.6600e-01e
4746 * hd    * r06 7.3660e-01    7.8740e-01e
4747 * icflg * f            0e
4748 * nff   * f            1e
4749 * alp   * f   0.0000e+00e
4750 * vl    * f   0.0000e+00e
4751 * vv    * f   0.0000e+00e
4752 * tl    * f   5.9110e+02e
4753 * tv    * f   5.9110e+02e
4754 * p     * f   1.5500e+07e
4755 * pa    * f   0.0000e+00e
4756 * qppp  * f   0.0000e+00e
4757 * matid *              7e
4758 * tw    * f   5.9110e+02e
4759 * conc  * f   0.0000e+00e
4760 *
4761 * side-cell arrays (pressurizer surge line)
4762 * dx    * r03 3.6189e+00    4.6878e+00e
4763 * vol   * r03 2.0217e-01    2.6786e-01e
4764 * fa    * r04 5.5860e-02    6.7000e-02e
4765 * kfac  *     1.0000e-10r04 0.0000e+00
4766 * rkfac *     1.0000e-10r04 0.0000e+00
4767 * grav  * r04 0.0000e+00    1.0000e+00e
4768 * hd    * r04 2.6670e-01    2.9210e-01e
4769 * icflg * f            0e
4770 * nff   * r04          1           -1e
4771 * alp   * f   0.0000e+00e
4772 * vl    * f   0.0000e+00e
4773 * vv    * f   0.0000e+00e
4774 * tl    * f   5.9110e+02e
4775 * tv    * f   5.9110e+02e
4776 * p     * f   1.5500e+07e
4777 * pa    * f   0.0000e+00e
4778 * qppp  * f   0.0000e+00e
4779 * matid *              7e
4780 * tw    * f   5.9110e+02e
4781 * conc  * f   0.0000e+00e
4782 *
4783 ************************************************************************
4784 *******   type           num            id        ctitle
4785 pipe                     32            32 $32$ steam-gen primary 3
4786 *       ncells         nodes          jun1          jun2          epsw
4787             18             0            32            34    0.0000e+00
4788 *         ichf         iconc          iacc          ipow
4789             1              1             0             0
4790 *        radin            th         houtl         houtv         toutl
4791     9.8400e-03    1.2700e-03    0.0000e+00    0.0000e+00    3.0000e+02
4792 *        toutv         powin        powoff        rpowmx        powscl
4793     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
```

```
4794 *
4795 * dx    *     1.0668e+00    1.2192e+00r14 1.3320e+00    1.2192e+00    1.0668e+00
4796 * dx    * e
4797 * vol   *     1.4640e+00    2.8320e+00r14 1.2573e+00    2.8320e+00    1.4640e+00
4798 * vol   * e
4799 * fa    *     4.8695e-01    2.3226e+00r15 9.4392e-01    2.3226e+00    4.8695e-01
4800 * fa    * e
4801 * kfac  *     5.0000e-01    0.0000e+00    3.0000e-01r13 1.3530e-02    0.5000e+00
4802 * kfac  *     0.0000e+00    2.0000e-01e
4803 * rkfac *     2.0000e-01    0.0000e+00    3.0000e-01r13 1.3530e-02    0.5000e+00
4804 * rkfac *     0.0000e+00    5.0000e-01e
4805 * grav  *     7.6600e-01r08 1.0000e+00    0.0000e+00r08-1.0000e+00   -7.6600e-01
4806 * grav  * e
4807 * hd    *     7.8740e-01    1.4844e+00r15 1.9685e-02    1.4844e+00    7.8740e-01
4808 * hd    * e
4809 * icflg * f           0e
4810 * nff   * f           1e
4811 * alp   * f   0.0000e+00e
4812 * vl    * f   0.0000e+00e
4813 * vv    * f   0.0000e+00e
4814 * tl    * r09 5.9110e+02r09 5.5910e+02e
4815 * tv    * r09 5.9110e+02r09 5.5910e+02e
4816 * p     * f   1.5500e+07e
4817 * pa    * f   0.0000e+00e
4818 * conc  * f   0.0000e+00e
4819 *
4820 ************************************************************************
4821 *******   type          num           id        ctitle
4822 pipe                    34           34 $34$ loop seal 3
4823 *       ncells         nodes         jun1          jun2          epsw
4824              6             1           34            36    0.0000e+00
4825 *         ichf         iconc         iacc          ipow
4826              1             1            0             0
4827 *       iqp3tr        iqp3sv       nqp3tb        nqp3sv        nqp3rf
4828              0             0            0             0             0
4829 *        radin            th        houtl         houtv         toutl
4830     3.9370e-01    6.6680e-02    0.0000e+00    0.0000e+00    3.0000e+02
4831 *        toutv         powin        powoff        rpowmx        powscl
4832     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4833 *        qp3in        qp3off        rqp3mx        qp3scl
4834     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4835 *
4836 * dx    *     9.5768e-01    8.3972e-01    1.1484e+00r02 1.6961e+00    1.1484e+00
4837 * dx    * e
4838 * vol   *     4.6634e-01    4.0890e-01    5.5921e-01r02 8.2589e-01    5.5921e-01
4839 * vol   * e
4840 * fa    * f   4.8695e-01e
4841 * kfac  *     2.0000e-01r06 0.0000e+00e
4842 * rkfac *     5.0000e-01r06 0.0000e+00e
```

```
4843 * grav  *    -7.6600e-01r02-1.0000e+00   -5.6067e-01    0.0000e+00    5.6067e-01
4844 * grav  *     1.0000e+00e
4845 * hd    * f   7.8740e-01e
4846 * icflg * f            0e
4847 * nff   * f            1e
4848 * alp   * f   0.0000e+00e
4849 * vl    * f   0.0000e+00e
4850 * vv    * f   0.0000e+00e
4851 * tl    * f   5.5910e+02e
4852 * tv    * f   5.5910e+02e
4853 * p     * f   1.5500e+07e
4854 * pa    * f   0.0000e+00e
4855 * qppp  * f   0.0000e+00e
4856 * matid *            7e
4857 * tw    * f   5.5910e+02e
4858 * conc  * f   0.0000e+00e
4859 *
4860 ************************************************************************
4861 *******   type          num           id        ctitle
4862 pump                    36           36 $36$ reactor-coolant pump 3
4863 *       ncells        nodes         jun1          jun2          epsw
4864              3            5           36            37    0.0000e+00
4865 *         ichf        iconc       ipmpty           irp           ipm
4866              1            1            2             0             1
4867 *       ipmptr       ipmpsv       npmptb       npmpsv       npmprf
4868             22            0            0             0             0
4869 *       iqp3tr       iqp3sv       nqp3tb       nqp3sv       nqp3rf
4870              0            0            0             0             0
4871 *        radin           th        houtl        houtv        toutl
4872     1.7052e-01   4.6656e-01   0.0000e+00   0.0000e+00   3.0000e+02
4873 *        toutv        effmi
4874     3.0000e+02   2.9500e+03
4875 *         tfr0         tfr1         tfr2         tfr3         tfrb
4876     6.4800e+01   0.0000e+00   1.5554e+03   0.0000e+00   0.0000e+00
4877 *        tfrl0        tfrl1        tfrl2        tfrl3
4878     0.0000e+00   0.0000e+00   0.0000e+00   0.0000e+00
4879 *        rhead        rtork        rflow         rrho       romega
4880     7.8000e+02   3.2404e+04   5.5835e+00   7.5575e+02   1.2360e+02
4881 *       omegan       omgoff       romgmx       omgscl       npmpsd
4882     1.2360e+02   0.0000e+00   5.0000e+01   1.0000e+00            0
4883 *        qp3in        qp3off       rqp3mx       qp3scl
4884     0.0000e+00   0.0000e+00   0.0000e+00   1.0000e+00
4885 *       option
4886              2
4887 *
4888 * dx    *     2.4640e+00    4.5000e+00    9.8640e-01e
4889 * vol   *     1.6850e+00    3.3738e+00    3.7799e-01e
4890 * fa    *     4.8695e-01r02 6.8384e-01    3.8320e-01e
4891 * kfac  * f   0.0000e+00e
4892 * rkfac * f   0.0000e+00e
```

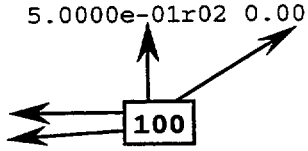
```
4893 * grav   *      1.0000e+00r03 0.0000e+00e
4894 * hd     *      7.8740e-01r02 9.3311e-01    6.9850e-01e
4895 * icflg * f            0e
4896 * nff    * f            1e
4897 * alp    * f    0.0000e+00e
4898 * ml     *      0.0000e+00    4.2590e+03r02 0.0000e+00e
4899 * vl     x f    0.0000e+00e
4900 * vv     * f    0.0000e+00e
4901 * tl     * f    5.5910e+02e
4902 * tv     * f    5.5910e+02e
4903 * p      * f    1.5500e+07e
4904 * pa     * f    0.0000e+00e
4905 * qppp   * f    0.0000e+00e
4906 * matid  * f            7e
4907 * tw     * f    5.5910e+02e
4908 * conc   * f    0.0000e+00e
4909 *
4910 ********************************************************************************
4911 *******   type           num            id        ctitle
4912 tee                      37            37 $37$ cold leg section 3a
4913 *        jcell          nodes          ichf          cost          epsw
4914              1              1             1    0.0000e+00    0.0000e+00
4915 *       iconc1         ncell1          jun1          jun2          ipow1
4916              1              1            37            38              1
4917 *       ipwtr1         ipwsv1        npwtb1        npwsv1        npwrf1
4918             22              1            -2             0             0
4919 *       iqptr1         iqpsv1        nqptb1        nqpsv1        nqprf1
4920              0              0             0             0             0
4921 *       radin1            th1        houtl1        houtv1        toutl1
4922     3.4925e-01    6.6680e-02    0.0000e+00    0.0000e+00    3.0000e+02
4923 *       toutv1          pwin1         pwoff1        rpwmx1        pwscl1
4924     3.0000e+02    2.6670e+06    2.6670e+06    1.0000e+10    1.0000e+00
4925 *        qpin1         qpoff1        rqpmx1        qpscl1
4926     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4927 *       iconc2         ncell2          jun3          ipow2
4928              1              1            78             0
4929 *       iqptr2         iqpsv2        nqptb2        nqpsv2        nqprf2
4930              0              0             0             0             0
4931 *       radin2            th2        houtl2        houtv2        toutl2
4932     1.1113e-01    2.5400e-02    0.0000e+00    0.0000e+00    3.0000e+02
4933 *       toutv2          pwin2         pwoff2        rpwmx2        pwscl2
4934     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4935 *        qpin2         qpoff2        rqpmx2        qpscl2
4936     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4937 *
4938 * main-cell arrays
4939 * dx     *      1.1686e+00e
4940 * vol    *      4.4781e-01e
4941 * fa     * f    3.8320e-01e
4942 * kfac   * f    0.0000e+00e
```

```
4943 * rkfac * f    0.0000e+00e
4944 * grav  * f    0.0000e+00e
4945 * hd    * f    6.9850e-01e
4946 * icflg * f             0e
4947 * nff   * f             1e
4948 * alp   *      0.0000e+00e
4949 * vl    * f    0.0000e+00e
4950 * vv    * f    0.0000e+00e
4951 * tl    *      5.5910e+02e
4952 * tv    *      5.5910e+02e
4953 * p     *      1.5500e+07e
4954 * pa    *      0.0000e+00e
4955 * qppp  *      0.0000e+00e
4956 * matid *              7e
4957 * tw    *      5.5910e+02e
4958 * conc  *      0.0000e+00e
4959 * powtb1*      0.0000e+00    2.6670e+06    1.0000e+00    0.0000e+00e
4960 *
4961 * side-cell arrays (eccs junction)
4962 * dx    *      0.762e+00e
4963 * vol   *      2.9489e-02e
4964 * fa    * f    3.8700e-02e
4965 * kfac  *      1.0000e-10    0.0000e+00e
4966 * rkfac *      1.0000e-10    0.0000e+00e
4967 * grav  *      1.0000e+00    0.0000e+00e
4968 * hd    * f    2.2225e-01e
4969 * icflg * f             0e
4970 * nff   *               1            1e
4971 * alp   *      0.0000e+00e
4972 * vl    * f    0.0000e+00e
4973 * vv    * f    0.0000e+00e
4974 * tl    *      5.5910e+02e
4975 * tv    *      5.5910e+02e
4976 * p     *      1.5500e+07e
4977 * pa    *      0.0000e+00e
4978 * qppp  *      0.0000e+00e
4979 * matid *              7e
4980 * tw    *      5.5910e+02e
4981 * conc  *      0.0000e+00e
4982 *
4983 ********************************************************************************
4984 *******   type          num           id        ctitle
4985 tee                     38           38 $38$ cold leg section 3b
4986 *        jcell        nodes         ichf          cost          epsw
4987              1            1            1    0.0000e+00    0.0000e+00
4988 *       iconc1       ncell1         jun1          jun2          ipow1
4989              1            4           38            39              0
4990 *       iqptr1       iqpsv1       nqptb1        nqpsv1        nqprf1
4991              0            0            0             0              0
```

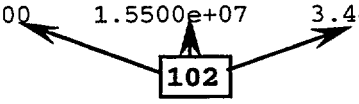
```
4992 *       radin1           th1        houtl1        houtv1        toutl1
4993     3.4925e-01    6.6680e-02    0.0000e+00    0.0000e+00    3.0000e+02
4994 *       toutv1          pwin1        pwoff1        rpwmx1        pwscl1
4995     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
4996 *        qpin1         qpoff1        rqpmx1        qpscl1
4997     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
4998 *       iconc2         ncell2          jun3          ipow2
4999             1              1            93             0
5000 *       iqptr2         iqpsv2        nqptb2        nqpsv2        nqprf2
5001             0              0             0             0             0
5002 *       radin2           th2        houtl2        houtv2        toutl2
5003     3.3400e-02    1.1100e-02    0.0000e+00    0.0000e+00    3.0000e+02
5004 *       toutv2          pwin2        pwoff2        rpwmx2        pwscl2
5005     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5006 *        qpin2         qpoff2        rqpmx2        qpscl2
5007     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
5008 *
5009 * main-cell arrays
5010 * dx     * f   1.1033e+00e
5011 * vol    * r03 4.2278e-01    4.9953e-01e
5012 * fa     * r04 3.8320e-01    5.7717e-01e
5013 * kfac   * r04 0.0000e+00    3.0000e-01e
5014 * rkfac  * r04 0.0000e+00    3.0000e-01e
5015 * grav   * f   0.0000e+00e
5016 * hd     * r04 6.9850e-01    8.5725e-01e
5017 * icflg  * f             0e
5018 * nff    * f             1e
5019 * alp    * f   0.0000e+00e
5020 * vl     * f   0.0000e+00e
5021 * vv     * f   0.0000e+00e
5022 * tl     * f   5.5910e+02e
5023 * tv     * f   5.5910e+02e
5024 * p      * f   1.5500e+07e
5025 * pa     * f   0.0000e+00e
5026 * qppp   * f   0.0000e+00e
5027 * matid  *             7e
5028 * tw     * f   5.5910e+02e
5029 * conc   * f   0.0000e+00e
5030 *
5031 * side-cell arrays (cvcs junction)
5032 * dx     *     3.0480e+00e
5033 * vol    *     1.0640e-02e
5034 * fa     * f   3.4900e-03e
5035 * kfac   *     1.0000e-10    0.0000e+00e
5036 * rkfac  *     1.0000e-10    0.0000e+00e
5037 * grav   * f   0.0000e+00e
5038 * hd     * f   6.6700e-02e
5039 * icflg  * f             0e
5040 * nff    * f             1e
5041 * alp    *     0.0000e+00e
```

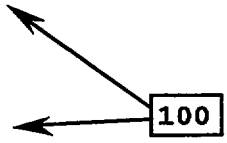
```
5042 * vl     * f    0.0000e+00
5043 * vv     * f    0.0000e+00
5044 * tl     *      5.5910e+02e
5045 * tv     *      5.5910e+02e
5046 * p      *      1.5500e+07e
5047 * pa     *      0.0000e+00e
5048 * qppp   *      0.0000e+00e
5049 * matid  *               7e
5050 * tw     *      5.5910e+02e
5051 * conc   *      0.0000e+00e
5052 *
5053 ************************************************************************
5054 *******   type            num             id        ctitle
5055 pipe                       40             40 $40$ prizer heater section
5056 *       ncells          nodes           jun1          jun2           epsw
5057              3              5             41            40    0.0000e+00
5058 *         ichf          iconc           iacc          ipow
5059              1              1              0             1
5060 *       ipowtr         ipowsv         npowtb        npowsv         npowrf
5061            -407           -450              0             0              0
5062 *       iqp3tr         iqp3sv         nqp3tb        nqp3sv         nqp3rf
5063              0              0              0             0              0
5064 *        radin             th          houtl         houtv          outl
5065     1.0855e+00     1.0922e-01     0.0000e+00    4.0000e+01    3.0000e+02
5066 *        toutv          powin         powoff         rpowmx         powscl
5067     3.1000e+02     2.0000e+05     0.0000e+00    1.0000e+10    1.0000e+00
5068 *        qp3in          qp3off         rqp3mx         qp3scl
5069     0.0000e+00     0.0000e+00     1.0000e+10    1.0000e+00
5070 *
5071 * dx     *      1.1400e+00r02 5.3100e-01e
5072 * vol    *      3.9519e+00    1.6871e+00    7.6739e-01e
5073 * fa     * r02  3.5434e+00    2.6570e+00    6.7000e-02e
5074 * kfac   * r02  0.0000e+00    1.0000e-02    0.0000e+00e
5075 * rkfac  * r02  0.0000e+00    2.0000e-02    0.0000e+00e
5076 * grav   * f   -1.0000e+00e
5077 * hd     * r02  2.1240e+00    1.8393e+00    2.9210e-01e
5078 * icflg  * f             0e
5079 * nff    * r03           1             -1e
5080 * alp    * f    0.0000e+00e
5081 * vl     * f    0.0000e+00e
5082 * vv     * f    0.0000e+00e
5083 * tl     * f    6.1800e+02e
5084 * tv     * f    6.1800e+02e
5085 * p      * f    1.5500e+07e
5086 * pa     * f    0.0000e+00e
5087 * qppp   * f    0.0000e+00e
5088 * matid  * f             9e
5089 * tw     * f    6.1800e+02e
5090 * conc   * f    0.0000e+00e
5091 *
```

```
5092 ************************************************************************
5093 *******   type            num             id        ctitle
5094 tee                       41             41 $41$ prizer middle section
5095 *        jcell          nodes           ichf          cost          epsw
5096               2              5              1    0.0000e+00    0.0000e+00
5097 *       iconc1         ncell1           jun1          jun2          ipow1
5098               1             10             42            41             0
5099 *       iqptr1         iqpsv1         nqptb1        nqpsv1        nqprf1
5100               0              0              0             0             0
5101 *       radin1            th1         houtl1        houtv1        toutl1
5102     1.0620e+00    1.0922e-01    0.0000e+00    4.0000e+01    3.0000e+02
5103 *       toutv1          pwin1         pwoff1        rpwmx1        pwscl1
5104     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5105 *        qpin1         qpoff1         rqpmx1        qpscl1
5106     0.0000e+00    0.0000e+00    1.0000e+10    1.0000e+00
5107 *       iconc2         ncell2           jun3          ipow2
5108               1              1             44             0
5109 *       iqptr2         iqpsv2         nqptb2        nqpsv2        nqprf2
5110               0              0              0             0             0
5111 *       radin2            th2         houtl2        houtv2        toutl2
5112     1.0000e+00    1.0000e-02    0.0000e+00    0.0000e+00    3.0000e+02
5113 *       toutv2          pwin2         pwoff2        rpwmx2        pwscl2
5114     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5115 *        qpin2         qpoff2         rqpmx2        qpscl2
5116     0.0000e+00    0.0000e+00    1.0000e+10    1.0000e+00
5117 *
5118 * main-cell arrays
5119 * dx    * r03 1.7700e-01r07 1.1222e+00e
5120 * vol   * r03 5.7483e-01r07 3.9763e+00e
5121 * fa    *     2.6570e+00r02 3.2476e+00r08 3.5434e+00e
5122 * kfac  *     2.0000e-02r10 0.0000e+00e
5123 * rkfac *     1.0000e-02r10 0.0000e+00e
5124 * grav  * f  -1.0000e+00e
5125 * hd    *     1.8393e+00r10 2.1240e+00e
5126 * icflg * f            0e
5127 * nff   * f            1e
5128 * alp   * r07 1.0000e+00    5.0000e-01r02 0.0000e+00e
5129 * vl    * f   0.0000e+00e
5130 * vv    * f   0.0000e+00e
5131 * tl    * f   6.1800e+02e
5132 * tv    * f   6.1800e+02e
5133 * p     * f   1.5500e+07e
5134 * pa    * f   0.0000e+00e
5135 * qppp  * f   0.0000e+00e
5136 * matid * f            9e
5137 * tw    * f   6.1800e+02e
5138 * conc  * f   0.0000e+00e
5139 *
5140 * side-cell arrays
5141 * dx    *     1.0000e+00e
```



```
5142 * vol    *      5.8000e-02e
5143 * fa     * f    5.8000e-02e
5144 * kfac   *      1.0000e-10     0.0000e+00e
5145 * rkfac  *      1.0000e-10     0.0000e+00e
5146 * grav   * f    0.0000e+00e
5147 * hd     * f    2.7200e-01e
5148 * icflg  * f             0e
5149 * nff    * f             1e
5150 * alp    *      1.0000e+00e
5151 * vl     * f    0.0000e+00e
5152 * vv     * f    0.0000e+00e
5153 * tl     *      6.1800e+02e
5154 * tv     *      6.1800e+02e
5155 * p      *      1.5500e+07e
5156 * pa     *      0.0000e+00e
5157 * qppp   * f    0.0000e+00e
5158 * matid  * f             9e
5159 * tw     * f    6.1800e+02e
5160 * conc   *      0.0000e+00e
5161 *
5162 ************************************************************************
5163 *******   type            num             id        ctitle
5164 prizer                     42             42 $42$ prizer sprayer section
5165 *       ncells          nodes           jun1          jun2
5166              1              5             43            42
5167 *         ichf          iconc         qp3in
5168              1              1    0.0000e+00
5169 *        radin             th         houtl         houtv         toutl
5170     1.0929e+00    1.0922e-01    0.0000e+00    4.0000e+01    3.0000e+02
5171 *        toutv          qheat          pset          dpmax          zhtr
5172     3.1000e+02    0.0000e+00    1.5500e+07    3.4400e+05    0.0000e+00
5173 *
5174 * dx     *      5.3100e-01e
5175 * vol    *      7.8438e-01e
5176 * fa     *      6.3200e-03     2.6570e+00e
5177 * kfac   *      0.0000e+00     2.0000e-02e
5178 * rkfac  *      0.0000e+00     1.0000e-02e
5179 * grav   * f   -1.0000e+00e
5180 * hd     *      8.9610e-02     1.8393e+00e
5181 * icflg  * f             0e
5182 * nff    * f             1e
5183 * alp    *      1.0000e+00e
5184 * vl     * f    0.0000e+00e
5185 * vv     * f    0.0000e+00e
5186 * tl     *      6.1800e+02e
5187 * tv     *      6.1800e+02e
5188 * p      *      1.5500e+07e
5189 * pa     *      0.0000e+00e
5190 * qppp   * f    0.0000e+00e
5191 * matid  * f             9e
```





```
5192 * tw     * f    6.1800e+02e
5193 * conc   *      0.0000e+00
5194 *
5195 ************************************************************************
5196 *******   type           num            id        ctitle
5197 fill                      43            43 $43$ prizer spray fill
5198 *          jun1          ifty          ioff
5199               43             5             0
5200 *          iftr          ifsv          nftb          nfsv          nfrf
5201               1          -434   <-103  2             0             0
5202 *        twtold          rfmx         concin         felv
5203     0.0000e+00    2.8000e+00    0.0000e+00    0.0000e+00
5204 *          dxin          volin         alpin         vlin          tlin
5205     1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    5.5910e+02
5206 *           pin          pain         flowin         vvin          tvin
5207     1.5500e+07    0.0000e+00    0.0000e+00    0.0000e+00    5.5910e+02
5208 *         vmscl         vvscl
5209     1.0000e+00    1.0000e+00
5210 *
5211 * vmtb   *      1.7237e+05    5.0000e-02    5.1711e+05    2.8260e+01e  <-103
5212 *
5213 ************************************************************************
5214 *******   type           num            id        ctitle
5215 tee                       44            44 $44$ prizer porv/srv header
5216 *         jcell         nodes          ichf          cost          epsw
5217               2             1             1    0.0000e+00    0.0000e+00
5218 *        iconc1        ncell1          jun1          jun2          ipow1
5219               1             3            44            45             0
5220 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
5221               0             0             0             0             0
5222 *        radin1           th1         houtl1         houtv1         toutl1
5223     1.0000e-01    1.0000e-02    0.0000e+00    0.0000e+00    3.0000e+02
5224 *        toutv1         pwin1         pwoff1         rpwmx1         pwscl1
5225     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5226 *         qpin1         qpoff1         rqpmx1         qpscl1
5227     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
5228 *        iconc2        ncell2          jun3          ipow2
5229               1             1            46             0
5230 *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
5231               0             0             0             0             0
5232 *        radin2           th2         houtl2         houtv2         toutl2
5233     1.0000e-01    1.0000e-02    0.0000e+00    0.0000e+00    3.0000e+02
5234 *        toutv2         pwin2         pwoff2         rpwmx2         pwscl2
5235     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5236 *         qpin2         qpoff2         rqpmx2         qpscl2
5237     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
5238 *
5239 * main-cell arrays
5240 * dx     * f    3.3333e-01e
5241 * vol    * f    1.3000e-02e
```

```
5242 * fa    *     5.8000e-02r02 3.9000e-02    1.9000e-02e
5243 * kfac  * f   0.0000e+00
5244 * rkfac * f   0.0000e+00
5245 * grav  * f   0.0000e+00
5246 * hd    *     2.7200e-01r02 2.1400e-01    1.5600e-01e
5247 * icflg * f           0e
5248 * nff   * r03         1            -1e
5249 * alp   * f   1.0000e+00
5250 * vl    * f   0.0000e+00
5251 * vv    * f   0.0000e+00
5252 * tl    * f   6.1800e+02e
5253 * tv    * f   6.1800e+02e
5254 * p     * f   1.5500e+07e
5255 * pa    * f   0.0000e+00
5256 * qppp  * f   0.0000e+00
5257 * matid *             9e
5258 * tw    * f   6.1800e+02e
5259 * conc  * f   0.0000e+00
5260 *
5261 * side-cell arrays
5262 * dx    *     1.0000e+00
5263 * vol   *     3.9000e-02
5264 * fa    * f   3.9000e-02
5265 * kfac  *     1.0000e-10    0.0000e+00
5266 * rkfac *     1.0000e-10    0.0000e+00
5267 * grav  * f   0.0000e+00
5268 * hd    * f   2.2300e-01e
5269 * icflg * f           0e
5270 * nff   * f           1e
5271 * alp   *     1.0000e+00
5272 * vl    * f   0.0000e+00
5273 * vv    * f   0.0000e+00
5274 * tl    *     6.1800e+02e
5275 * tv    *     6.1800e+02e
5276 * p     *     1.5500e+07e
5277 * pa    *     0.0000e+00
5278 * qppp  *     0.0000e+00
5279 * matid *             9e
5280 * tw    *     6.1800e+02e
5281 * conc  *     0.0000e+00
5282 *
5283 ********************************************************************
5284 *******   type          num           id        ctitle
5285 valve                   45           45 $45$ prizer porv
5286 *       ncells         nodes         jun1         jun2          epsw
5287             1             1           45           47    0.0000e+00
5288 *         ichf         iconc         ivty         ivps          nvtb2
5289             1             1            3            2    104   0
5290 *         ivtr          ivsv        nvtb1         nvsv          nvrf
5291           450    104    1            -2            0           0
                                                              105
```

```
5292 *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
5293              0             0             0             0             0
5294 *       ivtrov        ivtyov
5295              0             0
5296 *         rvmx          rvov        fminov        fmaxov
5297     2.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
5298 *        radin            th         houtl         houtv         toutl
5299     1.0000e-01    1.0000e-02    0.0000e+00    0.0000e+00    3.0000e+02
5300 *        toutv         avlve         avlve        favlve          xpos
5301     3.0000e+02    2.0400e-03    5.1000e-02    0.0000e+00    0.0000e+00
5302 *        qp3in         qp3off        rqp3mx        qp3scl
5303     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
5304 *
5305 * dx     *      1.0000e+00e
5306 * vol    *      1.9000e-02e
5307 * fa     * f    1.9000e-02e
5308 * kfac   * f    0.0000e+00e
5309 * rkfac  * f    0.0000e+00e
5310 * grav   * f    0.0000e+00e
5311 * hd     *      1.5600e-01    5.1000e-02e
5312 * icflg  *               0            1e
5313 * nff    *              -1            1e
5314 * alp    *      1.0000e+00
5315 * vl     * f    0.0000e+00
5316 * vv     * f    0.0000e+00
5317 * tl     *      6.1800e+02
5318 * tv     *      6.1800e+02
5319 * p      *      1.5500e+07e
5320 * pa     *      0.0000e+00e
5321 * qppp   *      0.0000e+00e
5322 * matid  *               9e
5323 * tw     *      6.1800e+02e
5324 * conc   *      0.0000e+00e
5325 * vtb1   * r02  0.0000e+00    2.0000e+00    1.0000e+00e
5326 *
5327 ************************************************************************
5328 *******   type            num            id        ctitle
5329 valve                    46            46 $46$ prizer srv
5330 *       ncells         nodes          jun1          jun2          epsw
5331              1             1            46            48    0.0000e+00
5332 *         ichf         iconc          ivty          ivps          nvtb2
5333              1             1             3             2             0
5334 *         ivtr          ivsv         nvtb1          nvsv          nvrf
5335              460           1            -2             0             0
5336 *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
5337              0             0             0             0             0
5338 *       ivtrov        ivtyov
5339              0             0
5340 *         rvmx          rvov        fminov        fmaxov
5341     5.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
```

104 108 108 105 108 106 4c 104

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5342 *        radin             th          houtl          houtv          toutl
5343     1.0000e-01    1.0000e-02    0.0000e+00    0.0000e+00    3.0000e+02
5344 *        toutv          avlve          hvlve          favlve          xpos
5345     3.0000e+02    3.6800e-03    6.8500e-02    0.0000e+00    0.0000e+00
5346 *         qp3in         qp3off         rqp3mx         qp3scl
5347     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
5348 *
5349 * dx     *      1.0000e+00e
5350 * vol    *      3.9000e-02e
5351 * fa     *      3.9000e-02    3.6800e-03e
5352 * kfac   * f    0.0000e+00e
5353 * rkfac  * f    0.0000e+00e
5354 * grav   * f    0.0000e+00e
5355 * hd     *      2.2300e-01    6.8500e-02e
5356 * icflg  *               0             1e
5357 * nff    * f             1e
5358 * alp    *      1.0000e+00e
5359 * vl     * f    0.0000e+00e
5360 * vv     * f    0.0000e+00e
5361 * tl     *      6.1800e+02e
5362 * tv     *      6.1800e+02e
5363 * p      *      1.5500e+07e
5364 * pa     *      0.0000e+00e
5365 * qppp   *      0.0000e+00e
5366 * matid  *               9e
5367 * tw     *      6.1800e+02e
5368 * conc   *      0.0000e+00e
5369 * vtb1   * r02 0.0000e+00r02 1.0000e+00e
5370 *
5371 ********************************************************************************
5372 *******   type            num             id        ctitle
5373 break                      47             47 $47$ prizer porv boundary
5374 *          jun1          ibty           isat           ioff
5375               47             0              0              1
5376 *          dxin          volin          alpin           tin            pin
5377     1.0000e+00    2.9210e-01    1.0000e+00    3.7316e+02    1.0135e+05
5378 *          pain          concin          rbmx          poff          belv
5379     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5380 *
5381 ********************************************************************************
5382 *******   type            num             id        ctitle
5383 break                      48             48 $48$ prizer srv boundary
5384 *          jun1          ibty           isat           ioff
5385               48             0              0              1
5386 *          dxin          volin          alpin           tin            pin
5387     1.0000e+00    2.9210e-01    1.0000e+00    3.7316e+02    1.0135e+05
5388 *          pain          concin          rbmx          poff          belv
5389     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5390 *
```

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```
5391 ************************************************************************
5392 *******   type            num             id        ctitle
5393 fill                      49             49 $49$ acc-1 bc
5394 *          jun1          ifty          ioff
5395               49             2           109      0
5396 *        twtold          rfmx         concin          felv
5397     0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
5398 *          dxin          volin          alpin          vlin          tlin
5399     1.0000e+00    5.0870e-02    0.0000e+00    0.0000e+00    5.4800e+02
5400 *           pin          pain         flowin          vvin          tvin
5401     5.0000e+06    0.0000e+00    0.0000e+00    0.0000e+00    5.4800e+02
5402 *
5403 ************************************************************************
5404 *******   type            num             id        ctitle
5405 pipe                      50             50 $50$ accumulator 1
5406 *        ncells         nodes          jun1          jun2          epsw
5407                5             1           111 49          52    1.0000e-04
5408 *          ichf         iconc          iacc          ipow
5409               0             1             1           110  0
5410 *        iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
5411               0             0             0             0             0
5412 *          radin   111     th          houtl          houtv   111   outl
5413     1.4890e+00    3.4900e-02    0.0000e+00    5.0000e+00    3.0000e+02
5414 *          toutv         powin         powoff         rpowmx         powscl
5415     3.2200e+02    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
5416 *          qp3in         qp3off         rqp3mx         qp3scl
5417     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
5418 *
5419 * dx     *      1.48907e+0r02 1.4478e+00r02 7.44535e-1e
5420 * vol    *      6.90931e00r02 1.00808e10    4.79015e00    2.15916e00e
5421 * fa     *      5.0870e-02r03 6.96594e00    5.22446e00    5.0870e-02e
5422 * kfac   * f    0.0000e+00e
5423 * rkfac  * f    0.0000e+00e
5424 * grav   * f   -1.0000e+00e
5425 * hd     *      2.5451e-01r03 2.97814e00    2.57947e00    2.5451e-01e
5426 * icflg  * f             0e
5427 * nff    * f            -1e
5428 * alp    *      1.0000e+00    5.0843e-01r03 0.0000e+00e
5429 * vl     * f    0.0000e+00e
5430 * vv     * f    0.0000e+00e
5431 * tl     * f    3.2200e+02e
5432 * tv     * f    3.2200e+02e
5433 * p      * f    4.4471e+06e
5434 * pa     * r02  4.43542e06r03 0.0000e+00e
5435 * qppp   * f    0.0000e+00e
5436 * matid  * f             7e          111
5437 * tw     * f    3.2200e+02e
5438 * conc   * f    0.0000e+00e
5439 *
```

```
5440 ***************************************************************************
5441 *******   type            num             id        ctitle
5442 valve                     52             52 $52$ acc-1 check valve
5443 *       ncells          nodes           jun1          jun2          epsw
5444              7              1             52            54    1.0000e-05
5445 *         ichf          iconc           ivty          ivps          nvtb2
5446              0              1              3             3              0
5447 *         ivtr            ivsv         nvtb1          nvsv          nvrf
5448            520              1             -2             0              0
5449 *       iqp3tr          iqp3sv        nqp3tb        nqp3sv        nqp3rf
5450              0              0              0             0              0
5451 *       ivtrov          ivtyov
5452              0              0
5453 *         rvmx            rvov         fminov        fmaxov
5454    1.0000e+10     1.0000e+10     0.0000e+00    1.0000e+00
5455 *        radin              th         houtl         houtv         toutl
5456    8.6500e-02     2.3000e-02     0.0000e+00    0.0000e+00    3.0000e+02
5457 *        toutv           avlve          hvlve         favlve          xpos
5458    3.0000e+02     5.0870e-02     2.5451e-01    0.0000e+00    0.0000e+00
5459 *         qp3in          qp3off         rqp3mx        qp3scl
5460    0.0000e+00     0.0000e+00     1.0000e+20    1.0000e+00
5461 *
5462 * dx    *     1.04242e00    1.96901e00r02 3.1090e+00r03 4.6390e+00e
5463 * vol   *     5.3030e-02    1.0016e-01r02 1.2033e-01r03 1.7953e-01e
5464 * fa    * r03 5.0870e-02r05 3.8700e-02e
5465 * kfac  * f   0.0000e+00e
5466 * rkfac * r02 0.0000e+00    1.0000e+20r05 0.0000e+00e
5467 * grav  * r02-1.0000e+00    0.0000e+00    1.0000e+00r04 0.0000e+00e
5468 * hd    * r03 2.5451e-01r05 2.2225e-01e
5469 * icflg * f           0e
5470 * nff   * r07        -1            1e
5471 * alp   * f   0.0000e+00e
5472 * vl    * f   0.0000e+00e
5473 * vv    * f   0.0000e+00e
5474 * tl    * r03 3.2200e+02    3.5000e+02    3.7900e+02    4.3600e+02    4.9300e+02
5475 * tl    * e
5476 * tv    * r03 3.2200e+02    3.5000e+02    3.7900e+02    4.3600e+02    4.9300e+02
5477 * tv    * e
5478 * p     * r02 4.4471e+06r05 1.5500e+07e
5479 * pa    * f   0.0000e+00e
5480 * qppp  * f   0.0000e+00e
5481 * matid * f           7e
5482 * tw    * r03 3.2200e+02    3.5000e+02    3.7900e+02    4.3600e+02    4.9300e+02
5483 * tw    * e
5484 * conc  * f   0.0000e+00e
5485 * vtb1  * r02 0.0000e+00    1.0000e-01    1.0000e+00
5486 *
5487 ***************************************************************************
```

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```
5488 *******   type           num            id        ctitle
5489 tee                      54            54 $54$ accum/hpsi tee 1
5490 *        jcell         nodes          ichf          cost          epsw
5491              1             1             1    0.0000e+00    0.0000e+00
5492 *       iconc1        ncell1          jun1          jun2          ipow1
5493              1             1            54            58              0
5494 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
5495              0             0             0             0              0
5496 *       radin1           th1        houtl1        houtv1        toutl1
5497    1.1113e-01    2.5400e-02    0.0000e+00    0.0000e+00    0.0000e+00
5498 *       toutv1
5499    0.0000e+00
5500 *         qpin1         qpoff1        rqpmx1        qpscl1
5501    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5502 *       iconc2        ncell2          jun3          ipow2
5503              1             1            56              0
5504 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
5505              0             0             0             0              0
5506 *       radin2           th2        houtl2        houtv2        toutl2
5507    2.1450e-02    8.7100e-03    0.0000e+00    0.0000e+00    0.0000e+00
5508 *       toutv2
5509    0.0000e+00
5510 *         qpin2         qpoff2        rqpmx2        qpscl2
5511    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5512 *
5513 * dx     *      2.2860e+00e
5514 * vol    *      8.8468e-02e
5515 * fa     * f    3.8700e-02e
5516 * kfac   * f    0.0000e+00e
5517 * rkfac  * f    0.0000e+00e
5518 * grav   * f    0.0000e+00e
5519 * hd     * f    2.2225e-01e
5520 * icflg  * f             0e
5521 * nff    *               1             1e
5522 * alp    *      0.0000e+00e
5523 * vl     * f    0.0000e+00e
5524 * vv     * f    0.0000e+00e
5525 * tl     *      5.5000e+02e
5526 * tv     *      5.5000e+02e
5527 * p      *      1.5500e+07e
5528 * pa     *      0.0000e+00e
5529 * qppp   *      0.0000e+00e
5530 * matid  *               7e
5531 * tw     *      5.5000e+02e
5532 * conc   *      0.0000e+00e
5533 *
5534 * dx     *      6.1889e+00e
5535 * vol    *      8.9464e-03e
5536 * fa     * f    1.4456e-03e
```

```
5537 * kfac   *      5.0000e-01     0.0000e+00e
5538 * rkfac  *      5.0000e-01     0.0000e+00e
5539 * grav   * f    0.0000e+00
5540 * hd     * f    4.2900e-02e
5541 * icflg  * f             0e
5542 * nff    * f             1e
5543 * alp    *      0.0000e+00e
5544 * vl     * f    0.0000e+00e
5545 * vv     * f    0.0000e+00e
5546 * tl     *      5.5000e+02e
5547 * tv     *      5.5000e+02e
5548 * p      *      1.5500e+07e
5549 * pa     *      0.0000e+00e
5550 * qppp   *      0.0000e+00e
5551 * matid  *              7e
5552 * tw     *      5.5000e+02e
5553 * conc   *      0.0000e+00e
5554 *
5555 ************************************************************************
5556 *******   type           num            id        ctitle
5557 fill                      56            56 $56$ hpsi fill 1
5558 *          jun1          ifty          ioff
5559               56             8             2
5560 *          iftr          ifsv          nftb          nfsv          nfrf
5561               21           171            11             0             0
5562 *        twtold          rfmx        concin          felv
5563      0.0000e+00    1.0000e+10    0.0000e+00    0.0000e+00
5564 *          dxin          volin          alpin          vlin          tlin
5565      1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
5566 *           pin           pain         flowin          vvin          tvin
5567      7.0000e+06    0.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
5568 *        flwoff          vloff          vvoff         alpoff
5569      0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5570 *         vmscl          vvscl
5571      2.4700e-01    2.4700e-01
5572 *
5573 * vmtb   *      1.0100e+05    6.6000e+01    1.4800e+06    6.1000e+01    2.8590e+06
5574 * vmtb   *      5.5800e+01    4.2380e+06    5.0100e+01    5.6170e+06    4.3500e+01
5575 * vmtb   *      6.9960e+06    3.6100e+01    7.6860e+06    3.1800e+01    8.3750e+06
5576 * vmtb   *      2.6500e+01    9.0650e+06    2.0400e+01    9.7540e+06    1.1300e+01
5577 * vmtb   *      1.0168e+07    0.0000e+00e
5578 *
5579 ************************************************************************
5580 *******   type           num            id        ctitle
5581 fill                      59            59 $59$ acc-2 bc
5582 *          jun1          ifty          ioff
5583               59             2             0
5584 *        twtold          rfmx        concin          felv
5585      0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
```

```
5586 *          dxin          volin          alpin          vlin          tlin
5587      1.0000e+00     5.0870e-02     0.0000e+00     0.0000e+00     5.4800e+02
5588 *           pin           pain         flowin           vvin           tvin
5589      5.0000e+06     0.0000e+00     0.0000e+00     0.0000e+00     5.4800e+02
5590 *
5591 ************************************************************************
5592 *******   type            num             id        ctitle
5593 pipe                       60             60 $60$ accumulator 2
5594 *        ncells          nodes           jun1           jun2           epsw
5595                5              1             59             62     1.0000e-04
5596 *          ichf          iconc          iacc          ipow
5597                0              1              1             0
5598 *        iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
5599                0              0             0             0             0
5600 *          radin             th         houtl         houtv         toutl
5601      1.4890e+00     3.4900e-02     0.0000e+00     5.0000e+00     3.0000e+02
5602 *          toutv          powin         powoff         rpowmx         powscl
5603      3.2200e+02     0.0000e+00     0.0000e+00     1.0000e+20     1.0000e+00
5604 *          qp3in         qp3off         rqp3mx         qp3scl
5605      0.0000e+00     0.0000e+00     1.0000e+20     1.0000e+00
5606 *
5607 * dx     *      1.48907e+0r02 1.4478e+00r02 7.44535e-1e
5608 * vol    *      6.90931e00r02 1.00808e10    4.79015e00    2.15916e00e
5609 * fa     *      5.0870e-02r03 6.96594e00    5.22446e00    5.0870e-02e
5610 * kfac   * f    0.0000e+00e
5611 * rkfac  * f    0.0000e+00e
5612 * grav   * f   -1.0000e+00e
5613 * hd     *      2.5451e-01r03 2.97814e00    2.57947e00    2.5451e-01e
5614 * icflg  * f             0e
5615 * nff    * f            -1e
5616 * alp    *      1.0000e+00    5.0843e-01r03 0.0000e+00e
5617 * vl     * f    0.0000e+00e
5618 * vv     * f    0.0000e+00e
5619 * tl     * f    3.2200e+02e
5620 * tv     * f    3.2200e+02e
5621 * p      * f    4.4471e+06e
5622 * pa     * r02 4.43542e06r03 0.0000e+00e
5623 * qppp   * f    0.0000e+00e
5624 * matid  * f             7e
5625 * tw     * f    3.2200e+02e
5626 * conc   * f    0.0000e+00e
5627 *
5628 ************************************************************************
5629 *******   type            num             id        ctitle
5630 valve                      62             62 $62$ acc-2 check valve
5631 *        ncells          nodes           jun1           jun2           epsw
5632                7              1             62             64     1.0000e-05
5633 *          ichf          iconc          ivty          ivps          nvtb2
5634                0              1              3             3             0
```

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```
5635 *          ivtr          ivsv         nvtb1          nvsv          nvrf
5636             620             1            -2             0             0
5637 *        iqp3tr        iqp3sv       nqp3tb       nqp3sv       nqp3rf
5638                0             0            0            0             0
5639 *        ivtrov        ivtyov
5640                0             0
5641 *          rvmx          rvov        fminov        fmaxov
5642     1.0000e+10    1.0000e+10    0.0000e+00    1.0000e+00
5643 *          radin            th         houtl         houtv         toutl
5644     8.6500e-02    2.3000e-02    0.0000e+00    0.0000e+00    3.0000e+02
5645 *          toutv         avlve         hvlve         favlve          xpos
5646     3.0000e+02    5.0870e-02    2.5451e-01    0.0000e+00    0.0000e+00
5647 *          qp3in         qp3off        rqp3mx        qp3scl
5648     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
5649 *
5650 * dx     *      1.04242e00    1.96901e00r02 3.1090e+00r03 3.3500e+00e
5651 * vol    *      5.3030e-02    1.0016e-01r02 1.2033e-01r03 1.2964e-01e
5652 * fa     * r03 5.0870e-02r05 3.8700e-02e
5653 * kfac   * f   0.0000e+00e
5654 * rkfac  * r02 0.0000e+00    1.0000e+20r05 0.0000e+00e
5655 * grav   * r02-1.0000e+00    0.0000e+00    1.0000e+00r04 0.0000e+00e
5656 * hd     * r03 2.5451e-01r05 2.2225e-01e
5657 * icflg  * f             0e
5658 * nff    * r07          -1             1e
5659 * alp    * f   0.0000e+00e
5660 * vl     * f   0.0000e+00e
5661 * vv     * f   0.0000e+00e
5662 * tl     * r03 3.2200e+02    3.5000e+02    3.7900e+02    4.3600e+02    4.9300e+02
5663 * tl     * e
5664 * tv     * r03 3.2200e+02    3.5000e+02    3.7900e+02    4.3600e+02    4.9300e+02
5665 * tv     * e
5666 * p      * r02 4.4471e+06r05 1.5500e+07e
5667 * pa     * f   0.0000e+00e
5668 * qppp   * f   0.0000e+00e
5669 * matid  * f             7e
5670 * tw     * r03 3.2200e+02    3.5000e+02    3.7900e+02    4.3600e+02    4.9300e+02
5671 * tw     * e
5672 * conc   * f   0.0000e+00e
5673 * vtb1   * r02 0.0000e+00    1.0000e-01    1.0000e+00e
5674 *
5675 ************************************************************************
5676 *******   type           num            id        ctitle
5677 tee                       64            64 $64$ accum/hpsi tee 2
5678 *         jcell         nodes         ichf         cost          epsw
5679                1             1            1    0.0000e+00    0.0000e+00
5680 *        iconc1        ncell1         jun1         jun2         ipow1
5681                1             1           64           68             0
5682 *        iqptr1        iqpsv1       nqptb1       nqpsv1       nqprf1
5683                0             0            0            0             0
```

```
5684 *       radin1           th1        houtl1        houtv1        toutl1
5685     1.1113e-01    2.5400e-02    0.0000e+00    0.0000e+00    0.0000e+00
5686 *       toutv1
5687     0.0000e+00
5688 *        qpin1        qpoff1        rqpmx1        qpscl1
5689     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5690 *       iconc2        ncell2          jun3         ipow2
5691              1             1            66             0
5692 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
5693              0             0             0             0             0
5694 *       radin2           th2        houtl2        houtv2        toutl2
5695     2.1450e-02    8.7100e-03    0.0000e+00    0.0000e+00    0.0000e+00
5696 *       toutv2
5697     0.0000e+00
5698 *        qpin2        qpoff2        rqpmx2        qpscl2
5699     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5700 *
5701 * dx     *      2.2860e+00e
5702 * vol    *      8.8468e-02e
5703 * fa     * f    3.8700e-02e
5704 * kfac   * f    0.0000e+00e
5705 * rkfac  * f    0.0000e+00e
5706 * grav   * f    0.0000e+00e
5707 * hd     * f    2.2225e-01e
5708 * icflg  * f             0e
5709 * nff    *               1             1e
5710 * alp    *      0.0000e+00e
5711 * vl     * f    0.0000e+00e
5712 * vv     * f    0.0000e+00e
5713 * tl     *      5.5000e+02e
5714 * tv     *      5.5000e+02e
5715 * p      *      1.5500e+07e
5716 * pa     *      0.0000e+00e
5717 * qppp   *      0.0000e+00e
5718 * matid  *               7e
5719 * tw     *      5.5000e+02e
5720 * conc   *      0.0000e+00e
5721 *
5722 * dx     *      6.1889e+00e
5723 * vol    *      8.9464e-03e
5724 * fa     * f    1.4456e-03e
5725 * kfac   *      5.0000e-01    0.0000e+00e
5726 * rkfac  *      5.0000e-01    0.0000e+00e
5727 * grav   * f    0.0000e+00e
5728 * hd     * f    4.2900e-02e
5729 * icflg  * f             0e
5730 * nff    * f             1e
5731 * alp    *      0.0000e+00e
5732 * vl     * f    0.0000e+00e
5733 * vv     * f    0.0000e+00e
```

```
5734 * tl     *      5.5000e+02e
5735 * tv     *      5.5000e+02e
5736 * p      *      1.5500e+07e
5737 * pa     *      0.0000e+00e
5738 * qppp   *      0.0000e+00e
5739 * matid  *              7e
5740 * tw     *      5.5000e+02e
5741 * conc   *      0.0000e+00e
5742 *
5743 ************************************************************************
5744 *******   type           num            id        ctitle
5745 fill                     66            66 $66$ hpsi fill 2
5746 *          jun1          ifty          ioff
5747               66             8             2
5748 *          iftr          ifsv          nftb          nfsv          nfrf
5749               21           271            11             0             0
5750 *        twtold          rfmx        concin          felv
5751     0.0000e+00    1.0000e+10    0.0000e+00    0.0000e+00
5752 *          dxin          volin          alpin          vlin          tlin
5753     1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
5754 *           pin          pain         flowin          vvin          tvin
5755     7.0000e+06    0.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
5756 *        flwoff          vloff          vvoff         alpoff
5757     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
5758 *         vmscl          vvscl
5759     3.1600e-01    3.1600e-01
5760 *
5761 * vmtb  *      1.0100e+05    6.6000e+01    1.4800e+06    6.1000e+01    2.8590e+06
5762 * vmtb  *      5.5800e+01    4.2380e+06    5.0100e+01    5.6170e+06    4.3500e+01
5763 * vmtb  *      6.9960e+06    3.6100e+01    7.6860e+06    3.1800e+01    8.3750e+06
5764 * vmtb  *      2.6500e+01    9.0650e+06    2.0400e+01    9.7540e+06    1.1300e+01
5765 * vmtb  *      1.0168e+07    0.0000e+00e
5766 *
5767 ************************************************************************
5768 *******   type           num            id        ctitle
5769 fill                     69            69 $69$ acc-3 bc
5770 *          jun1          ifty          ioff
5771               69             2             0
5772 *        twtold          rfmx        concin          felv
5773     0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
5774 *          dxin          volin          alpin          vlin          tlin
5775     1.0000e+00    5.0870e-02    0.0000e+00    0.0000e+00    5.4800e+02
5776 *           pin          pain         flowin          vvin          tvin
5777     5.0000e+06    0.0000e+00    0.0000e+00    0.0000e+00    5.4800e+02
5778 *
5779 ************************************************************************
5780 *******   type           num            id        ctitle
5781 pipe                     70            70 $70$ accumulator 3
5782 *        ncells         nodes          jun1          jun2          epsw
5783               5             1            69            72    1.0000e-04
```

```
5784 *          ichf          iconc           iacc           ipow
5785               0              1              1              0
5786 *         iqp3tr         iqp3sv         nqp3tb         nqp3sv         nqp3rf
5787               0              0              0              0              0
5788 *          radin             th          houtl          houtv          toutl
5789      1.4890e+00     3.4900e-02     0.0000e+00     5.0000e+00     3.0000e+02
5790 *          toutv          powin         powoff         rpowmx         powscl
5791      3.2200e+02     0.0000e+00     0.0000e+00     1.0000e+20     1.0000e+00
5792 *          qp3in         qp3off         rqp3mx         qp3scl
5793      0.0000e+00     0.0000e+00     1.0000e+20     1.0000e+00
5794 *
5795 * dx    *      1.48907e+0r02 1.4478e+00r02 7.44535e-1e
5796 * vol   *      6.90931e00r02 1.00808e10     4.79015e00     2.15916e00e
5797 * fa    *      5.0870e-02r03 6.96594e00     5.22446e00     5.0870e-02e
5798 * kfac  * f    0.0000e+00e
5799 * rkfac * f    0.0000e+00e
5800 * grav  * f   -1.0000e+00e
5801 * hd    *      2.5451e-01r03 2.97814e00     2.57947e00     2.5451e-01e
5802 * icflg * f             0e
5803 * nff   * f            -1e
5804 * alp   *      1.0000e+00     5.0843e-01r03 0.0000e+00e
5805 * vl    * f    0.0000e+00e
5806 * vv    * f    0.0000e+00e
5807 * tl    * f    3.2200e+02e
5808 * tv    * f    3.2200e+02e
5809 * p     * f    4.4471e+06e
5810 * pa    * r02  4.43542e06r03 0.0000e+00e
5811 * qppp  * f    0.0000e+00e
5812 * matid * f             7e
5813 * tw    * f    3.2200e+02e
5814 * conc  * f    0.0000e+00e
5815 *
5816 ********************************************************************************
5817 *******   type            num             id        ctitle                      <-- 112
5818 valve                     72             72 $72$ acc-3 check valve
5819 *         ncells         nodes           jun1           jun2           epsw
5820               7              1             72             74     1.0000e-05
5821 *          ichf          iconc          ivty           ivps          nvtb2
5822               0              1              3              3              0
5823 *          ivtr          ivsv         nvtb1          nvsv           nvrf
5824             720              1             -2              0              0
5825 *         iqp3tr         iqp3sv         nqp3tb         nqp3sv         nqp3rf
5826               0              0              0              0              0
5827 *         ivtrov         ivtyov
5828               0              0
5829 *           rvmx           rvov         fminov         fmaxov
5830      1.0000e+10     1.0000e+10     0.0000e+00     1.0000e+00
5831 *          radin             th          houtl          houtv          toutl
5832      8.6500e-02     2.3000e-02     0.0000e+00     0.0000e+00     3.0000e+02
```

```
5833 *        toutv          avlve          hvlve         favlve          xpos
5834     3.0000e+02     5.0870e-02     2.5451e-01     0.0000e+00     0.0000e+00
5835 *         qp3in         qp3off          rqp3mx         qp3scl
5836     0.0000e+00     0.0000e+00     1.0000e+20     1.0000e+00
5837 *
5838 * dx     *      1.04242e00     1.96901e00r02 3.1090e+00r03 4.0630e+00e
5839 * vol    *      5.3030e-02     1.0016e-01r02 1.2033e-01r03 1.5725e-01e
5840 * fa     * r03 5.0870e-02r05 3.8700e-02e
5841 * kfac   * f   0.0000e+00e
5842 * rkfac  * r02 0.0000e+00     1.0000e+20r05 0.0000e+00e
5843 * grav   * r02-1.0000e+00     0.0000e+00     1.0000e+00r04 0.0000e+00e
5844 * hd     * r03 2.5451e-01r05 2.2225e-01e
5845 * icflg  * f             0e
5846 * nff    * r07          -1              1e
5847 * alp    * f   0.0000e+00e
5848 * vl     * f   0.0000e+00e
5849 * vv     * f   0.0000e+00e
5850 * tl     * r03 3.2200e+02     3.5000e+02     3.7900e+02     4.3600e+02     4.9300e+02
5851 * tl     * e
5852 * tv     * r03 3.2200e+02     3.5000e+02     3.7900e+02     4.3600e+02     4.9300e+02
5853 * tv     * e
5854 * p      * r02 4.4471e+06r05 1.5500e+07e
5855 * pa     * f   0.0000e+00e
5856 * qppp   * f   0.0000e+00e
5857 * matid  * f             7e
5858 * tw     * r03 3.2200e+02     3.5000e+02     3.7900e+02     4.3600e+02     4.9300e+02
5859 * tw     * e
5860 * conc   * f   0.0000e+00e
5861 * vtbl   * r02 0.0000e+00     1.0000e-01     1.0000e+00e
5862 *
5863 ************************************************************************
5864 *******   type           num            id        ctitle
5865 tee                      74            74 $74$ accum/hpsi tee 3
5866 *         jcell         nodes          ichf          cost          epsw
5867                1             1             1     0.0000e+00     0.0000e+00
5868 *        iconc1        ncell1          jun1          jun2          ipow1
5869                1             1            74            78              0
5870 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
5871                0             0             0             0              0
5872 *        radin1           th1        houtl1        houtv1        toutl1
5873     1.1113e-01     2.5400e-02     0.0000e+00     0.0000e+00     0.0000e+00
5874 *        toutv1
5875     0.0000e+00
5876 *         qpin1         qpoff1         rqpmx1         qpscl1
5877     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
5878 *        iconc2        ncell2          jun3          ipow2
5879                1             1            76              0
5880 *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
5881                0             0             0             0              0
```

```
5882 *       radin2           th2        hout12        houtv2        tout12
5883     2.1450e-02     8.7100e-03     0.0000e+00     0.0000e+00     0.0000e+00
5884 *       toutv2
5885     0.0000e+00
5886 *        qpin2        qpoff2        rqpmx2        qpscl2
5887     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
5888 *
5889 * dx     *     2.2860e+00e
5890 * vol    *     8.8468e-02e
5891 * fa     * f   3.8700e-02e
5892 * kfac   * f   0.0000e+00e
5893 * rkfac  * f   0.0000e+00e
5894 * grav   * f   0.0000e+00e
5895 * hd     * f   2.2225e-01e
5896 * icflg  * f            0e
5897 * nff    *              1              1e
5898 * alp    *     0.0000e+00e
5899 * vl     * f   0.0000e+00e
5900 * vv     * f   0.0000e+00e
5901 * tl     *     5.5000e+02e
5902 * tv     *     5.5000e+02e
5903 * p      *     1.5500e+07e
5904 * pa     *     0.0000e+00e
5905 * qppp   *     0.0000e+00e
5906 * matid  *             7e
5907 * tw     *     5.5000e+02e
5908 * conc   *     0.0000e+00e
5909 *
5910 * dx     *     6.1889e+00e
5911 * vol    *     8.9464e-03e
5912 * fa     * f   1.4456e-03e
5913 * kfac   *     5.0000e-01    0.0000e+00e
5914 * rkfac  *     5.0000e-01    0.0000e+00e
5915 * grav   * f   0.0000e+00e
5916 * hd     * f   4.2900e-02e
5917 * icflg  * f            0e
5918 * nff    * f            1e
5919 * alp    *     0.0000e+00e
5920 * vl     * f   0.0000e+00e
5921 * vv     * f   0.0000e+00e
5922 * tl     *     5.5000e+02e
5923 * tv     *     5.5000e+02e
5924 * p      *     1.5500e+07e
5925 * pa     *     0.0000e+00e
5926 * qppp   *     0.0000e+00e
5927 * matid  *             7e
5928 * tw     *     5.5000e+02e
5929 * conc   *     0.0000e+00e
5930 *
5931 ************************************************************************
```

```
******   type            num             id        ctitle
fill                      76             76 $76$ hpsi fill 3
*         jun1          ifty          ioff
            76             8             2
*         iftr          ifsv          nftb          nfsv          nfrf
            21           371            11             0             0
*       twtold          rfmx        concin          felv
    0.0000e+00    1.0000e+10    0.0000e+00    0.0000e+00
*         dxin          volin          alpin          vlin          tlin
    1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
*          pin          pain         flowin          vvin          tvin
    7.0000e+06    0.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
*        flwoff         vloff         vvoff        alpoff
    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*         vmscl         vvscl
    4.3700e-01    4.3700e-01
*
* vmtb  *     1.0100e+05    6.6000e+01    1.4800e+06    6.1000e+01    2.8590e+06
* vmtb  *     5.5800e+01    4.2380e+06    5.0100e+01    5.6170e+06    4.3500e+01
* vmtb  *     6.9960e+06    3.6100e+01    7.6860e+06    3.1800e+01    8.3750e+06
* vmtb  *     2.6500e+01    9.0650e+06    2.0400e+01    9.7540e+06    1.1300e+01
* vmtb  *     1.0168e+07    0.0000e+00e
*
**********************************************************************
******   type            num             id        ctitle
fill                      91             91 $91$ cvcs 1 (letdown flow)
*         jun1          ifty          ioff
            91             5             0
*         iftr          ifsv          nftb          nfsv          nfrf
             1          -414             2             0             0
*       twtold          rfmx        concin          felv
    0.0000e+00    2.5750e+00    0.0000e+00    0.0000e+00
*         dxin          volin          alpin          vlin          tlin
    1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    5.5900e+02
*          pin          pain         flowin          vvin          tvin
    1.5500e+07    0.0000e+00    0.0000e+00    0.0000e+00    5.5900e+02
*         vmscl         vvscl
    5.0000e+00    1.0000e+00
*
* vmtb  * r02 0.0000e+00    1.0000e+00   -2.5750e+00e
*
**********************************************************************
******   type            num             id        ctitle
fill                      92             92 $92$ cvcs 2 (makeup flow)
*         jun1          ifty          ioff
            92             5             0
*         iftr          ifsv          nftb          nfsv          nfrf
             1          -414             2             0             0
*       twtold          rfmx        concin          felv
    0.0000e+00    1.1289e+00    0.0000e+00    0.0000e+00
```

```
5982 *          dxin          volin          alpin          vlin          tlin
5983      1.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00     5.2900e+02
5984 *           pin           pain         flowin          vvin          tvin
5985      1.5500e+07     0.0000e+00     0.0000e+00     0.0000e+00     5.2900e+02
5986 *         vmscl         vvscl
5987      2.0000e+00     1.0000e+00
5988 *
5989 * vmtb  *     -1.0000e+00     1.1289e+01r02 0.0000e+00e
5990 *
5991 ************************************************************************
5992 *******   type            num            id        ctitle
5993 fill                      93            93 $93$ cvcs 3 (prizer sprayer)
5994 *          jun1          ifty          ioff
5995               93             5             0
5996 *          iftr          ifsv          nftb          nfsv          nfrf
5997                1          -434 <-103-   2             0             0
5998 *        twtold          rfmx         concin          felv
5999      0.0000e+00     2.8000e+00     0.0000e+00     0.0000e+00
6000 *          dxin          volin          alpin          vlin          tlin
6001      1.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00     5.5900e+02
6002 *           pin           pain         flowin          vvin          tvin
6003      1.5500e+07     0.0000e+00     0.0000e+00     0.0000e+00     5.5900e+02
6004 *         vmscl         vvscl
6005      1.0000e+00     1.0000e+00
6006 *
6007 * vmtb  *      1.7237e+05    -5.0000e-02     5.1711e+05    -2.8260e+01e <-103-
6008 *
6009 ************************************************************************
6010 *******   type            num            id        ctitle
6011 pipe                      100           100 $100$ steam-gen boiler 1 <-114-
6012 *        ncells         nodes          jun1          jun2          epsw
6013                7             0           100           105     0.0000e+00
6014 *          ichf         iconc          iacc          ipow
6015                1             1             0             0
6016 *         radin            th         houtl         houtv         toutl
6017      1.4821e+00     9.5250e-03     0.0000e+00     0.0000e+00     3.0000e+02
6018 *         toutv         powin         powoff         rpowmx         powscl
6019      3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6020 *
6021 * dx    * f   1.3320e+00e
6022 * vol   * r06 5.8490e+00     6.7440e+00e
6023 * fa    *     2.8456e+00r06 4.3911e+00     4.2500e+00e
6024 * kfac  *     2.1500e+02r07 0.0000e+00e
6025 * rkfac *     1.0000e+03r07 0.0000e+00e
6026 * grav  *     0.0000e+00r07 1.0000e+00e
6027 * hd    * r07 9.1200e-03    3.2410e+00e
6028 * icflg * f           0e
6029 * nff   * f           1e
6030 * alp   * r05 0.0000e+00    5.0000e-01    1.0000e+00e
6031 * vl    * f   0.0000e+00e
```

```
6032 * vv     * f   0.0000e+00
6033 * tl     * f   5.4211e+02
6034 * tv     * f   5.4212e+02
6035 * p      * f   5.4158e+06
6036 * pa     * f   0.0000e+00
6037 * conc   * f   0.0000e+00
6038 *
6039 ************************************************************************
6040 *******   type            num             id        ctitle
6041 tee                      105            105 $105$ separator & dome 1
6042 *         jcell          nodes           ichf          cost          epsw
6043                6          115              0             1    0.0000e+00    0.0000e+00
6044 *        iconc1         ncell1          jun1          jun2          ipow1
6045                1              8           105           190              0
6046 *        radin1           th1         houtl1        houtv1         toutl1
6047     6.5380e-01    9.5250e-03    0.0000e+00    0.0000e+00    3.0000e+02
6048 *        toutv1          pwin1         pwoff1        rpwmx1         pwscl1
6049     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6050 *        iconc2         ncell2          jun3          ipow2
6051                1              4           110             0
6052 *        radin2           th2         houtl2        houtv2         toutl2
6053     2.0193e+00    8.8900e-02    0.0000e+00    0.0000e+00    3.0000e+02
6054 *        toutv2          pwin2         pwoff2        rpwmx2         pwscl2
6055     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6056 *
6057 * main-cell arrays (separator region)
6058 * dx     *      1.2440e+00    1.1670e+00    1.0910e+00    1.0000e+00r03 3.3333e-01
6059 * dx     *      1.0000e+00e
6060 * vol    *      7.6460e+00r02 4.5570e+00    5.6630e+00r03 2.4353e+00    8.9610e+00
6061 * vol    * e
6062 * fa     *      4.2500e+00r03 4.0320e+00    5.5740e+00r02 7.3060e+00    6.9880e+00
6063 * fa     *      8.5590e+00e
6064 * kfac   * f    0.0000e+00e
6065 * rkfac  * f    0.0000e+00e
6066 * grav   * r04  1.0000e+00r04 0.0000e+00   -1.0000e+00e
6067 * hd     *      3.2410e+00r03 1.3080e+00    2.6640e+00r02 2.8210e+00    2.9780e+00
6068 * hd     *      1.2070e+00e
6069 * icflg  * f             0e
6070 * nff    * f             1e
6071 * alp    * f    1.0000e+00e
6072 * vl     * f    0.0000e+00e
6073 * vv     * f    0.0000e+00e
6074 * tl     * f    5.4211e+02e
6075 * tv     * f    5.4212e+02e
6076 * p      * f    5.4158e+06e
6077 * pa     * f    0.0000e+00e
6078 * conc   * f    0.0000e+00e
6079 *
6080 * side-cell arrays (steam dome)
6081 * dx     *      1.0150e+00    9.3900e-01    7.0000e-01    2.3900e-01e
```

```
6082 * vol    * r02 5.1080e+00    7.0000e+00    1.6220e+00e
6083 * fa     * r02 5.0325e+00    6.0000e+00    6.7866e+00    1.2897e-01e
6084 * kfac   * r02 1.0000e-10r03 0.0000e+00e
6085 * rkfac  * r02 1.0000e-10r03 0.0000e+00e
6086 * grav   * f   1.0000e+00e
6087 * hd     *     4.3220e+00    3.4380e+00    2.0480e+00    1.0000e+00    6.0985e-01
6088 * hd     * e
6089 * icflg  * r04          0             1e
6090 * nff    * r04          1            -1e
6091 * alp    * f   1.0000e+00e
6092 * vl     * f   0.0000e+00e
6093 * vv     * f   0.0000e+00e
6094 * tl     * f   5.4211e+02e
6095 * tv     * f   5.4212e+02e
6096 * p      * f   5.4158e+06e
6097 * pa     * f   0.0000e+00e
6098 * conc   * f   0.0000e+00e
6099 *
6100 ************************************************************************
6101 *******   type           num            id        ctitle
6102 tee                      110           110 $110$ main steam line 1
6103 *        jcell         nodes          ichf          cost          epsw
6104              16             1             1    0.0000e+00    0.0000e+00
6105 *       iconc1        ncell1          jun1          jun2          ipow1
6106              1             16           110           120             0
6107 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
6108              0              0             0             0             0
6109 *       radin1           th1        houtl1        houtv1        toutl1
6110     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
6111 *       toutv1         pwin1        pwoff1        rpwmx1        pwscl1
6112     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6113 *        qpin1         qpoff1        rqpmx1        qpscl1
6114     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6115 *       iconc2        ncell2          jun3          ipow2
6116              1             1           112             0
6117 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
6118              0              0             0             0             0
6119 *       radin2           th2        houtl2        houtv2        toutl2
6120     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
6121 *       toutv2         pwin2        pwoff2        rpwmx2        pwscl2
6122     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6123 *        qpin2         qpoff2        rqpmx2        qpscl2
6124     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6125 *
6126 * main-cell arrays (26-inch main steam line)
6127 * dx     *     2.2860e+00    5.0292e+00r03 4.4806e+00r10 4.5126e+00    2.2860e+00
6128 * dx     * e
6129 * vol    *     6.6775e-01    1.4733e+00r03 1.3088e+00r10 1.3181e+00    6.6775e-01
6130 * vol    * e
```

```
6131 * fa    *     1.2897e-01    2.1054e-01    2.9210e-01    2.1091e-01    1.2972e-01
6132 * fa    *     2.1091e-01r11 2.9210e-01e
6133 * kfac  * f   0.0000e+00
6134 * rkfac * f   0.0000e+00
6135 * grav  *     1.0000e+00    0.0000e+00r03-1.0000e+00r12 0.0000e+00e
6136 * hd    * f   6.0985e-01e
6137 * icflg *              1r03          0             1r12          0e
6138 * nff   * r02         -1             1r03          1r11          1e
6139 * alp   * f   1.0000e+00e
6140 * vl    * f   0.0000e+00e
6141 * vv    * f   0.0000e+00e
6142 * tl    * f   5.4211e+02e
6143 * tv    * f   5.4212e+02e
6144 * p     * f   5.4158e+06e
6145 * pa    * f   0.0000e+00e
6146 * qppp  * f   0.0000e+00e
6147 * matid *              9e
6148 * tw    * f   5.4211e+02e
6149 * conc  * f   0.0000e+00e
6150 *
6151 * side-cell arrays (relief-valves header)
6152 * dx    *     1.0000e+00e
6153 * vol   *     2.9210e-01e
6154 * fa    * f   2.9210e-01e
6155 * kfac  *     1.0000e-10    0.0000e+00e
6156 * rkfac *     1.0000e-10    0.0000e+00e
6157 * grav  * f   1.0000e+00e
6158 * hd    * f   6.0985e-01e
6159 * icflg * f            0e
6160 * nff   * f            1e
6161 * alp   *     1.0000e+00e
6162 * vl    * f   0.0000e+00e
6163 * vv    * f   0.0000e+00e
6164 * tl    *     5.4211e+02e
6165 * tv    *     5.4212e+02e
6166 * p     *     5.4158e+06e
6167 * pa    *     0.0000e+00e
6168 * qppp  *     0.0000e+00e
6169 * matid *              9e
6170 * tw    *     5.4211e+02e
6171 * conc  *     0.0000e+00e
6172 *
6173 ************************************************************************
6174 *******   type          num           id        ctitle
6175 tee                     112           112 $112$ msl 1 porv/srv header
6176 *        jcell         nodes          ichf          cost          epsw
6177              1             1             1    0.0000e+00    0.0000e+00
6178 *       iconc1        ncell1          jun1          jun2          ipow1
6179              1             1           112           114             0
```

```
6180 *       iqptr1         iqpsv1         nqptb1         nqpsv1         nqprf1
6181              0              0              0              0              0
6182 *       radin1           th1         houtl1         houtv1         toutl1
6183     3.0493e-01     2.5270e-02     0.0000e+00     0.0000e+00     3.0000e+02
6184 *       toutv1          pwin1         pwoff1         rpwmx1         pwscl1
6185     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6186 *        qpin1         qpoff1         rqpmx1         qpscl1
6187     0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
6188 *       iconc2         ncell2           jun3          ipow2
6189              1              1            116              0
6190 *       iqptr2         iqpsv2         nqptb2         nqpsv2         nqprf2
6191              0              0              0              0              0
6192 *       radin2           th2         houtl2         houtv2         toutl2
6193     3.0493e-01     2.5270e-02     0.0000e+00     0.0000e+00     3.0000e+02
6194 *       toutv2          pwin2         pwoff2         rpwmx2         pwscl2
6195     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6196 *        qpin2         qpoff2         rqpmx2         qpscl2
6197     0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
6198 *
6199 * main-cell arrays (header inlet to srv outlet)
6200 * dx     *     1.0000e+00e
6201 * vol    *     2.9210e-01e
6202 * fa     * f   2.9210e-01e
6203 * kfac   * f   0.0000e+00e
6204 * rkfac  * f   0.0000e+00e
6205 * grav   * f   1.0000e+00e
6206 * hd     * f   6.0985e-01e
6207 * icflg  * f            0e
6208 * nff    * f            1e
6209 * alp    *     1.0000e+00e
6210 * vl     * f   0.0000e+00e
6211 * vv     * f   0.0000e+00e
6212 * tl     *     5.4211e+02e
6213 * tv     *     5.4212e+02e
6214 * p      *     5.4158e+06e
6215 * pa     *     0.0000e+00e
6216 * qppp   *     0.0000e+00e
6217 * matid  *            9e
6218 * tw     *     5.4211e+02e
6219 * conc   *     0.0000e+00e
6220 *
6221 * side-cell arrays (header outlet to porv)
6222 * dx     *     1.0000e+00e
6223 * vol    *     2.9210e-01e
6224 * fa     * f   2.9210e-01e
6225 * kfac   *     1.0000e-10    0.0000e+00e
6226 * rkfac  *     1.0000e-10    0.0000e+00e
6227 * grav   * f   0.0000e+00e
6228 * hd     * f   6.0985e-01e
6229 * icflg  * f         0e
```

```
6230 * nff    * f            1e
6231 * alp    *      1.0000e+00e
6232 * vl     * f    0.0000e+00e
6233 * vv     * f    0.0000e+00e
6234 * tl     *      5.4211e+02e
6235 * tv     *      5.4212e+02e
6236 * p      *      5.4158e+06e
6237 * pa     *      0.0000e+00e
6238 * qppp   *      0.0000e+00e
6239 * matid  *               9e
6240 * tw     *      5.4211e+02e
6241 * conc   *      0.0000e+00e
6242 *
6243 ************************************************************************
6244 *******   type            num             id        ctitle
6245 fill                      114            114 $114$ msl 1 srv
6246 *          jun1          ifty           ioff
6247             114             5              0
6248 *          iftr          ifsv           nftb           nfsv           nfrf
6249                0          1121              9              0              0
6250 *        twtold           rfmx         concin          felv
6251     0.0000e+00     1.0000e+10     0.0000e+00     0.0000e+00
6252 *          dxin          volin          alpin          vlin           tlin
6253     1.0000e+00     2.9210e-01     1.0000e+00     0.0000e+00     5.4211e+02
6254 *           pin           pain         flowin          vvin           tvin
6255     5.4158e+06     0.0000e+00     0.0000e+00     0.0000e+00     5.4212e+02
6256 *         vmscl          vvscl
6257     1.0000e+00     1.0000e+00
6258 *
6259 * vmtb  *      7.5500e+06     0.0000e+00     7.5800e+06    -5.8300e+01     7.6900e+06
6260 * vmtb  *     -6.3000e+01     7.7200e+06    -1.2490e+02     7.8200e+06    -1.4730e+02
6261 * vmtb  *      7.8600e+06    -2.3920e+02     7.9200e+06    -2.4550e+02     7.9600e+06
6262 * vmtb  *     -3.5610e+02     8.2000e+06    -4.3200e+02e
6263 *
6264 ************************************************************************
6265 *******   type            num             id        ctitle
6266 valve                     116            116 $116$ msl 1 porv
6267 *        ncells          nodes           jun1           jun2           epsw
6268                1              1            116            118     0.0000e+00
6269 *          ichf          iconc          ivty           ivps          nvtb2
6270                1              1              1                            0
6271 *          ivtr          ivsv          nvtb1           nvsv           nvrf
6272                0          -1162                             0              0
6273 *        iqp3tr        iqp3sv         nqp3tb         nqp3sv         nqp3rf
6274                0              0              0              0              0
6275 *        ivtrov        ivtyov
6276                0              0
6277 *          rvmx          rvov          fminov         fmaxov
6278     5.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
```

```
6279 *         radin              th          houtl          houtv          toutl
6280      3.0493e-01     2.5270e-02     0.0000e+00     0.0000e+00     3.0000e+02
6281 *         toutv           avlve          hvlve          favlve           xpos
6282      3.0000e+02     4.1484e-03     1.5240e-01     0.0000e+00     0.0000e+00
6283 *          qp3in          qp3off         rqp3mx         qp3scl
6284      0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
6285 *
6286 * dx     *      1.0000e+00e
6287 * vol    *      2.9210e-01e
6288 * fa     * f    2.9210e-01e
6289 * kfac   * f    0.0000e+00e
6290 * rkfac  * f    0.0000e+00e
6291 * grav   * f    0.0000e+00e
6292 * hd     * f    6.0985e-01e
6293 * icflg  *               0              1e
6294 * nff    * f             1e
6295 * alp    *      1.0000e+00e
6296 * vl     * f    0.0000e+00e
6297 * vv     * f    0.0000e+00e
6298 * tl     *      5.4211e+02e
6299 * tv     *      5.4212e+02e
6300 * p      *      5.4158e+06e
6301 * pa     *      0.0000e+00e
6302 * qppp   *      0.0000e+00e
6303 * matid  *               9e
6304 * tw     *      5.4211e+02e
6305 * conc   *      0.0000e+00e
6306 *
6307 ********************************************************************************
6308 *******   type           num            id        ctitle
6309 break                    118           118 $118$ msl 1 porv boundary
6310 *          jun1          ibty          isat          ioff
6311              118             0             0             1
6312 *          dxin          volin         alpin           tin           pin
6313      1.0000e+00     2.9210e-01     1.0000e+00     3.7316e+02     1.0135e+05
6314 *          pain         concin          rbmx          poff          belv
6315      0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6316 *
6317 ********************************************************************************
6318 *******   type           num            id        ctitle
6319 valve                    120           120 $120$ msiv line 1
6320 *        ncells         nodes          jun1          jun2          epsw
6321                5             1           120           122     0.0000e+00
6322 *          ichf          iconc         ivty          ivps          nvtb2
6323                1             1            3             2              0
6324 *          ivtr          ivsv         nvtb1          nvsv          nvrf
6325              24              1           -2             0              0
6326 *        iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
6327                0             0             0             0              0
```

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123

```
6328 *       ivtrov        ivtyov
6329              0             0
6330 *         rvmx          rvov        fminov        fmaxov
6331     1.0000e-01    0.0000e+00    0.0000e+00    1.0000e+00
6332 *        radin            th         houtl         houtv         toutl
6333     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
6334 *        toutv          avlve         hvlve        favlve          xpos
6335     3.0000e+02    2.9210e-01    6.0985e-01    4.0000e-01    4.0000e-01
6336 *         qp3in        qp3off        rqp3mx        qp3scl
6337     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6338 *
6339 *     cell arrays (26-inch main steam line)
6340 * dx     *      2.2860e+00r04 4.5994e+00e
6341 * vol    *      6.6775e-01r04 1.3409e+00e
6342 * fa     * f    2.9210e-01e
6343 * kfac   * r05  0.0000e+00    2.0000e-02e
6344 * rkfac  * r05  0.0000e+00    2.0000e-02e
6345 * grav   * f    0.0000e+00e
6346 * hd     * f    6.0985e-01e
6347 * icflg  *               0             1r04          0e
6348 * nff    * f             1e
6349 * alp    * f    1.0000e+00e
6350 * vl     * f    0.0000e+00e
6351 * vv     * f    0.0000e+00e
6352 * tl     * f    5.4211e+02e
6353 * tv     * f    5.4212e+02e
6354 * p      * f    5.4158e+06e
6355 * pa     * f    0.0000e+00e
6356 * qppp   * f    0.0000e+00e
6357 * matid  *               9e
6358 * tw     * f    5.4211e+02e
6359 * conc   * f    0.0000e+00e
6360 * vtbl   *     -6.0000e+00    1.0000e+00    4.0000e+00    0.0000e+00e
6361 *
6362 ************************************************************************
6363 *******   type           num            id        ctitle
6364 tee                      150           150 $150$ hp heater discharge line
6365 *         jcell         nodes          ichf          cost          epsw
6366               2             5             1    0.0000e+00    0.0000e+00
6367 *        iconc1        ncell1          jun1          jun2          ipow1
6368               1             2           150           151              0
6369 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
6370               0             0             0             0              0
6371 *        radin1           th1        houtl1        houtv1        toutl1
6372     2.2150e-01    3.2540e-02    0.0000e+00    0.0000e+00    3.0000e+02
6373 *        toutv1         pwin1        pwoff1        rpwmx1        pwscl1
6374     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6375 *         qpin1         qpoff1        rqpmx1        qpscl1
6376     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
```

```
6377 *       iconc2        ncell2          jun3         ipow2
6378              1             1           154             0
6379 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
6380              0             0             0             0             0
6381 *       radin2           th2        houtl2        houtv2        toutl2
6382    2.6590e-01    3.8900e-02    0.0000e+00    0.0000e+00    3.0000e+02
6383 *       toutv2         pwin2        pwoff2        rpwmx2        pwscl2
6384    3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6385 *         qpin2         qpoff2         rqpmx2         qpscl2
6386    0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6387 *
6388 * main-cell arrays
6389 * dx     *     4.0180e+00    1.1369e+00e
6390 * vol    *     8.9255e-01    2.5255e-01e
6391 * fa     *     1.5408e-01r02 2.2214e-01e
6392 * kfac   * f   3.0000e-01e
6393 * rkfac  * f   3.0000e-01e
6394 * grav   * f   0.0000e+00e
6395 * hd     *     4.4300e-01r02 5.3180e-01e
6396 * icflg  * f             0e
6397 * nff    * f             1e
6398 * alp    * f   0.0000e+00e
6399 * vl     * f   0.0000e+00e
6400 * vv     * f   0.0000e+00e
6401 * tl     * f   4.8870e+02e
6402 * tv     * f   4.8870e+02e
6403 * p      * f   5.4158e+06e
6404 * pa     * f   0.0000e+00e
6405 * qppp   * f   0.0000e+00e
6406 * matid  * f             9e
6407 * tw     * f   4.8870e+02e
6408 * conc   * f   0.0000e+00e
6409 *
6410 * side-cell arrays
6411 * dx     *     3.0479e+00e
6412 * vol    *     3.0000e-01e
6413 * fa     * f   9.8430e-02e
6414 * kfac   * f   3.0000e-01e
6415 * rkfac  * f   3.0000e-01e
6416 * grav   * f   0.0000e+00e
6417 * hd     * f   3.5400e-01e
6418 * icflg  * f             0e
6419 * nff    * f             1e
6420 * alp    *     0.0000e+00e
6421 * vl     * f   0.0000e+00e
6422 * vv     * f   0.0000e+00e
6423 * tl     *     4.8870e+02e
6424 * tv     *     4.8870e+02e
6425 * p      *     5.4158e+06e
6426 * pa     *     0.0000e+00e
```

```
6427 * qppp   * f    0.0000e+00
6428 * matid * f             9e
6429 * tw     * f    4.8870e+02
6430 * conc   *      0.0000e+00
6431 *
6432 ************************************************************************
6433 *******    type            num            id         ctitle
6434 valve                      154           154 $154$ mfwcv-1 regulating valve
6435 *        ncells         nodes          jun1          jun2          epsw
6436                2             5           154           158    0.0000e+00
6437 *          ichf         iconc         ivty          ivps          nvtb2
6438                1             1            3             2              0
6439 *          ivtr          ivsv         nvtb1          nvsv          nvrf
6440                1         -1014             0             0              0
6441 *        iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
6442                0             0             0             0              0
6443 *        ivtrov          ivtyov
6444             422             0
6445 *          rvmx          rvov         fminov        fmaxov
6446     1.0000e-02    5.0000e-02    0.0000e+00    1.0000e+00
6447 *         radin            th         houtl         houtv         toutl
6448     1.7700e-01    2.6200e-02    0.0000e+00    0.0000e+00    3.0000e+02
6449 *         toutv          avlve         hvlve         favlve          xpos
6450     3.0000e+02    8.0000e-02    3.1900e-01    4.0000e-01    4.0000e-01
6451 *         qp3in         qp3off        rqp3mx        qp3scl
6452     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6453 *
6454 * dx     * f    1.5239e+00e
6455 * vol    * f    1.5000e-01e
6456 * fa     * f    9.8430e-02e
6457 * kfac   * f    3.0000e-01e
6458 * rkfac  * f    3.0000e-01e
6459 * grav   * f    0.0000e+00e
6460 * hd     * f    3.5400e-01e
6461 * icflg  * f             0e
6462 * nff    * f             1e
6463 * alp    * f    0.0000e+00e
6464 * vl     * f    0.0000e+00e
6465 * vv     * f    0.0000e+00e
6466 * tl     * f    4.8870e+02e
6467 * tv     * f    4.8870e+02e
6468 * p      * f    5.4158e+06e
6469 * pa     * f    0.0000e+00e
6470 * qppp   * f    0.0000e+00e
6471 * matid  * f             9e
6472 * tw     * f    4.8870e+02e
6473 * conc   * f    0.0000e+00e
6474 *
6475 ************************************************************************
```

```
6476 *******   type            num             id        ctitle
6477 fill                      169            169 $169$ sdafw fill 1
6478 *          jun1          ifty           ioff
6479             170             8              2
6480 *          iftr          ifsv           nftb           nfsv           nfrf
6481               28         -1005              2              0              0
6482 *        twtold          rfmx         concin           felv
6483      0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
6484 *          dxin          volin          alpin           vlin           tlin
6485      1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
6486 *           pin          pain          flowin          vvin           tvin
6487      5.4158e+06    0.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
6488 *        flwoff          vloff          vvoff         alpoff
6489      0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6490 *          vmscl          vvscl
6491      1.0000e+00    1.0000e+00
6492 *
6493 * vmtb  *      7.4000e-01    9.4635e+00    7.6000e-01    0.0000e+00e
6494 *
6495 ************************************************************************
6496 *******   type            num             id        ctitle
6497 tee                       170            170 $170$ mfwcv-1 discharge line
6498 *          jcell         nodes          ichf          cost          epsw
6499               1             5             1    0.0000e+00    0.0000e+00
6500 *         iconc1        ncell1          jun1          jun2          ipow1
6501               1             6           158           180              0
6502 *         iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
6503               0             0             0             0              0
6504 *         radin1           th1        houtl1        houtv1        toutl1
6505      1.7700e-01    2.6200e-02    0.0000e+00    0.0000e+00    3.0000e+02
6506 *         toutv1         pwin1         pwoff1         rpwmx1         pwscl1
6507      3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6508 *          qpin1         qpoff1        rqpmx1         qpscl1
6509      0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6510 *         iconc2        ncell2          jun3          ipow2
6511               1             1           170              0
6512 *         iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
6513               0             0             0             0              0
6514 *         radin2           th2        houtl2        houtv2        toutl2
6515      4.8600e-02    8.5600e-03    0.0000e+00    0.0000e+00    3.0000e+02
6516 *         toutv2         pwin2         pwoff2         rpwmx2         pwscl2
6517      3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6518 *          qpin2         qpoff2        rqpmx2         qpscl2
6519      0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6520 *
6521 * main-cell arrays
6522 * dx    * f   6.0957e+00e
6523 * vol   * f   6.0000e-01e
6524 * fa    * r02 9.8430e-02    7.3830e-02    4.9220e-02    7.3830e-02r02 9.8430e-02
6525 e
```

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```
6526 * kfac   * f   3.0000e-01e
6527 * rkfac  * f   3.0000e-01e
6528 * grav   *     0.0000e+00    1.0000e+00r05 0.0000e+00e
6529 * hd     * f   3.5400e-01e
6530 * icflg  * f            0e
6531 * nff    * f            1e
6532 * alp    * f   0.0000e+00e
6533 * vl     * f   0.0000e+00e
6534 * vv     * f   0.0000e+00e
6535 * tl     * f   4.8870e+02e
6536 * tv     * f   4.8870e+02e
6537 * p      * f   5.4158e+06e
6538 * pa     * f   0.0000e+00e
6539 * qppp   * f   0.0000e+00e
6540 * matid  * f            9e
6541 * tw     * f   4.8870e+02e
6542 * conc   * f   0.0000e+00e
6543 *
6544 * side-cell arrays
6545 * dx     *     1.5240e+00e
6546 * vol    *     1.1300e-02e
6547 * fa     * f   7.4200e-03e
6548 * kfac   * f   3.0000e-01e
6549 * rkfac  * f   3.0000e-01e
6550 * grav   * f   0.0000e+00e
6551 * hd     * f   9.7200e-02e
6552 * icflg  * f            0e
6553 * nff    * f            1e
6554 * alp    *     0.0000e+00e
6555 * vl     * f   0.0000e+00e
6556 * vv     * f   0.0000e+00e
6557 * tl     *     4.8870e+02e
6558 * tv     *     4.8870e+02e
6559 * p      *     5.4158e+06e
6560 * pa     *     0.0000e+00e
6561 * qppp   * f   0.0000e+00e
6562 * matid  * f            9e
6563 * tw     * f   4.8870e+02e
6564 * conc   *     0.0000e+00e
6565 *
6566 ************************************************************************
6567 *******   type          num           id        ctitle
6568 fill                    179          179 $179$ mdafw fill 1
6569 *         jun1          ifty         ioff
6570             179             8            2
6571 *         iftr          ifsv         nftb          nfsv          nfrf
6572              26         -1005            2             0             0
6573 *       twtold          rfmx       concin          felv
6574     0.0000e+00    2.0000e+00    0.0000e+00    0.0000e+00
```

```
6575 *          dxin          volin          alpin          vlin          tlin
6576      1.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00     3.0000e+02
6577 *           pin           pain         flowin           vvin          tvin
6578      5.4158e+06     0.0000e+00     0.0000e+00     0.0000e+00     3.0000e+02
6579 *        flwoff          vloff          vvoff         alpoff
6580      0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6581 *          vmscl          vvscl
6582      1.0000e+00     1.0000e+00
6583 *
6584 * vmtb  *      7.4000e-01     9.4635e+00     7.6000e-01     0.0000e+00e
6585 *
6586 ************************************************************************
6587 *******    type             num             id          ctitle
6588 tee                         180            180 $180$ mfw line 1
6589 *         jcell           nodes           ichf           cost           epsw
6590                1               5              1     0.0000e+00     0.0000e+00
6591 *        iconc1          ncell1           jun1           jun2          ipow1
6592                1               8            180            185              0
6593 *        iqptr1          iqpsv1         nqptb1         nqpsv1         nqprf1
6594                0               0              0              0              0
6595 *        radin1            th1         houtl1         houtv1         toutl1
6596      1.7700e-01     2.6200e-02     0.0000e+00     0.0000e+00     3.0000e+02
6597 *        toutv1           pwin1          pwoff1          rpwmx1          pwscl1
6598      3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6599 *         qpin1          qpoff1         rqpmx1          qpscl1
6600      0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
6601 *        iconc2          ncell2           jun3          ipow2
6602                1               1            179              0
6603 *        iqptr2          iqpsv2         nqptb2         nqpsv2         nqprf2
6604                0               0              0              0              0
6605 *        radin2            th2         houtl2         houtv2         toutl2
6606      4.8600e-02     8.5600e-03     0.0000e+00     0.0000e+00     3.0000e+02
6607 *        toutv2           pwin2          pwoff2          rpwmx2          pwscl2
6608      3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6609 *         qpin2          qpoff2         rqpmx2          qpscl2
6610      0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
6611 *
6612 * main-cell arrays
6613 * dx    * r06 6.0957e+00r02 5.3033e+00e
6614 * vol   * r06 6.0000e-01r02 5.2200e-01e
6615 * fa    * f   9.8430e-02e
6616 * kfac  * f   3.0000e-01e
6617 * rkfac * f   3.0000e-01e
6618 * grav  * r07 0.0000e+00r02 1.0000e+00e
6619 * hd    * f   3.5400e-01e
6620 * icflg * f             0e
6621 * nff   * f             1e
6622 * alp   * f   0.0000e+00e
6623 * vl    * f   0.0000e+00e
6624 * vv    * f   0.0000e+00e
```

```
6625 * tl     * f   4.8870e+02e
6626 * tv     * f   4.8870e+02e
6627 * p      * f   5.4158e+06e
6628 * pa     * f   0.0000e+00e
6629 * qppp   * f   0.0000e+00e
6630 * matid  * f            9e
6631 * tw     * f   4.8870e+02e
6632 * conc   * f   0.0000e+00e
6633 *
6634 * side-cell arrays
6635 * dx     *     8.8390e+00e
6636 * vol    *     6.5560e-02e
6637 * fa     * f   7.4200e-03e
6638 * kfac   * f   3.0000e-01e
6639 * rkfac  * f   3.0000e-01e
6640 * grav   * f   0.0000e+00e
6641 * hd     * f   9.7200e-02e
6642 * icflg  * f            0e
6643 * nff    * f            1e
6644 * alp    *     0.0000e+00e
6645 * vl     * f   0.0000e+00e
6646 * vv     * f   0.0000e+00e
6647 * tl     *     4.8870e+02e
6648 * tv     *     4.8870e+02e
6649 * p      *     5.4158e+06e
6650 * pa     *     0.0000e+00e
6651 * qppp   * f   0.0000e+00e
6652 * matid  * f            9e
6653 * tw     * f   4.8870e+02e
6654 * conc   *     0.0000e+00e
6655 *
6656 ************************************************************************
6657 *******   type           num            id        ctitle
6658 tee                      190           190 $190$ steam-gen downcomer 1
6659 * .       jcell         nodes          ichf          cost          epsw
6660                3             0             1    0.0000e+00    0.0000e+00
6661 *         iconc1        ncell1          jun1          jun2          ipow1
6662                1            12           190           100              0
6663 *         radin1           th1        houtl1        houtv1        toutl1
6664      1.0920e-01    3.8040e-02    0.0000e+00    0.0000e+00    3.0000e+02
6665 *         toutv1         pwin1        pwoff1        rpwmx1        pwscl1
6666      3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6667 *         iconc2        ncell2          jun3          ipow2
6668                1             1           185              0
6669 *         radin2           th2        houtl2        houtv2        toutl2
6670      1.7700e-01    2.6200e-02    0.0000e+00    0.0000e+00    3.0000e+02
6671 *         toutv2         pwin2        pwoff2        rpwmx2        pwscl2
6672      3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6673 *
```

```
6674 * main-cell arrays (downcomer annulus)
6675 * dx     *      1.0910e+00r03 3.8900e-01    1.2440e+00r07 1.3320e+00e
6676 * vol    *      9.7890e+00r03 3.2630e+00    7.5320e+00    2.7290e+00    8.0750e-01
6677 * vol    * r05 7.0000e-01e
6678 * fa     *      8.5590e+00    8.6600e+00r02 8.3882e+00    8.6600e+00    3.3610e+00
6679 * fa     *      1.2350e+00r05 5.2120e-01    2.8456e+00e
6680 * kfac   * r04 0.0000e+00    1.0000e-01r02 3.0000e-01r05 0.0000e+00    2.1500e+02
6681 * kfac   * e
6682 * rkfac  * r04 0.0000e+00    2.0000e-01r02 6.0000e-01r05 0.0000e+00    1.0000e+03
6683 * rkfac  * e
6684 * grav   * r12-1.0000e+00    0.0000e+00e
6685 * hd     *      1.2070e+00r04 1.3750e+00    6.0000e-01    2.5280e-01r05 1.0912e-01
6686 * hd     *      9.1200e-03e
6687 * icflg  * f             0e
6688 * nff    * f             1e
6689 * alp    * r04 1.0000e+00    7.2195e-01r07 0.0000e+00e
6690 * vl     * f   0.0000e+00e
6691 * vv     * f   0.0000e+00e
6692 * tl     * f   4.9330e+02e
6693 * tv     * f   4.9330e+02e
6694 * p      * f   5.4158e+06e
6695 * pa     * f   0.0000e+00e
6696 * conc   * f   0.0000e+00e
6697 *
6698 * side-cell arrays (feedwater inlet)
6699 * dx     *      1.4569e+00e
6700 * vol    *      1.4340e-01e
6701 * fa     * f   9.8430e-02e
6702 * kfac   *      5.0000e-01    3.0000e-01e
6703 * rkfac  *      1.0000e+00    3.0000e-01e
6704 * grav   *      0.0000e+00   -1.0000e+00e
6705 * hd     * f   3.5400e-01e
6706 * icflg  * f             0e
6707 * nff    * f             1e
6708 * alp    *     0.0000e+00e
6709 * vl     * f   0.0000e+00e
6710 * vv     * f   0.0000e+00e
6711 * tl     *     4.8870e+02e
6712 * tv     *     4.8870e+02e
6713 * p      *     5.4158e+06e
6714 * pa     *     0.0000e+00e
6715 * conc   *     0.0000e+00e
6716 *
6717 ************************************************************************
6718 *******   type           num            id        ctitle
6719 tee                      200           200 $200$ steam-gen boiler 2
6720 *        jcell          nodes          ichf          cost          epsw
6721               5              0             1    0.0000e+00    0.0000e+00
6722 *       iconc1         ncell1          jun1          jun2          ipow1
6723               1              7           200           205              0
```

```
6724 *       radin1           th1         houtl1         houtv1         toutl1
6725     1.4821e+00     9.5250e-03     0.0000e+00     0.0000e+00     3.0000e+02
6726 *       toutv1          pwin1         pwoff1         rpwmx1         pwscl1
6727     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6728 *       iconc2          ncell2           jun3          ipow2
6729             1               1            203              0
6730 *       radin2           th2         houtl2         houtv2         toutl2
6731     9.8400e-03     1.2700e-03     0.0000e+00     0.0000e+00     3.0000e+02
6732 *       toutv2          pwin2         pwoff2         rpwmx2         pwscl2
6733     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
6734 *
6735 * main-cell arrays (boiler region)
6736 * dx     * f   1.3320e+00e
6737 * vol    * r06 5.8490e+00     6.7440e+00e
6738 * fa     *     2.8456e+00r06 4.3911e+00     4.2500e+00e
6739 * kfac   *     2.1500e+02r07 0.0000e+00e
6740 * rkfac  *     1.0000e+03r07 0.0000e+00e
6741 * grav   *     0.0000e+00r07 1.0000e+00e
6742 * hd     * r07 9.1200e-03     3.2410e+00e
6743 * icflg * f            0e
6744 * nff    * f            1e
6745 * alp    * r05 0.0000e+00     5.0000e-01     1.0000e+00e
6746 * vl     * f   0.0000e+00e
6747 * vv     * f   0.0000e+00e
6748 * tl     * f   5.4211e+02e
6749 * tv     * f   5.4212e+02e
6750 * p      * f   5.4158e+06e
6751 * pa     * f   0.0000e+00e
6752 * conc   * f   0.0000e+00e
6753 *
6754 * side-cell arrays (for sgtr)
6755 * dx     *     5.0000e-01e
6756 * vol    *     6.0868e-04e
6757 * fa     * f   1.21736e-3e
6758 * kfac   *     1.0000e-10     0.0000e+00e
6759 * rkfac  *     1.0000e-10     0.0000e+00e
6760 * grav   * f   0.0000e+00e
6761 * hd     * f   1.9685e-02e
6762 * icflg *              0             0e
6763 * nff    *              1            -1e
6764 * alp    *     0.0000e+00e
6765 * vl     * f   0.0000e+00e
6766 * vv     * f   0.0000e+00e
6767 * tl     *     5.4211e+02e
6768 * tv     *     5.4212e+02e
6769 * p      *     5.4158e+06e
6770 * pa     *     0.0000e+00e
6771 * conc   *     0.0000e+00e
6772 *
6773 ************************************************************************
```

```
******   type            num             id        ctitle
fill                     202            202 $202$ sgtr bc during s/s
*          jun1          ifty           ioff
            201             2              0
*        twtold          rfmx         concin          felv
     0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
*          dxin          volin         alpin          vlin          tlin
     1.0000e+00    5.0870e-02    0.0000e+00    0.0000e+00    5.4800e+02
*           pin          pain         flowin          vvin          tvin
     5.0000e+06    0.0000e+00    0.0000e+00    0.0000e+00    5.4800e+02
*
**********************************************************************
******   type            num             id        ctitle
fill                     203            203 $203$ sgtr bc during s/s
*          jun1          ifty           ioff
            203             2              0
*        twtold          rfmx         concin          felv
     0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
*          dxin          volin         alpin          vlin          tlin
     1.0000e+00    5.0870e-02    0.0000e+00    0.0000e+00    5.4800e+02
*           pin          pain         flowin          vvin          tvin
     5.0000e+06    0.0000e+00    0.0000e+00    0.0000e+00    5.4800e+02
*
**********************************************************************
******   type            num             id        ctitle
tee                      205            205 $205$ separator & dome 2
*         jcell         nodes          ichf          cost          epsw
              6             0             1    0.0000e+00    0.0000e+00
*        iconc1         ncell1         jun1          jun2          ipow1
              1             8           205           290              0
*        radin1           th1        houtl1        houtv1        toutl1
     6.5380e-01    9.5250e-03    0.0000e+00    0.0000e+00    3.0000e+02
*        toutv1          pwin1         pwoff1        rpwmx1        pwscl1
     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*        iconc2         ncell2         jun3          ipow2
              1             4           210              0
*        radin2           th2        houtl2        houtv2        toutl2
     2.0193e+00    8.8900e-02    0.0000e+00    0.0000e+00    3.0000e+02
*        toutv2          pwin2         pwoff2        rpwmx2        pwscl2
     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
* main-cell arrays (separator region)
* dx    *     1.2440e+00    1.1670e+00    1.0910e+00    1.0000e+00r03 3.3333e-01
* dx    *     1.0000e+00e
* vol   *     7.6460e+00r02 4.5570e+00    5.6630e+00r03 2.4353e+00    8.9610e+00
* vol   * e
* fa    *     4.2500e+00r03 4.0320e+00    5.5740e+00r02 7.3060e+00    6.9880e+00
* fa    *     8.5590e+00e
* kfac  * f   0.0000e+00e
* rkfac * f   0.0000e+00e
```

127

127

```
6824 * grav   * r04 1.0000e+00r04 0.0000e+00   -1.0000e+00e
6825 * hd     *     3.2410e+00r03 1.3080e+00    2.6640e+00r02 2.8210e+00    2.9780e+00
6826 * hd     *     1.2070e+00e
6827 * icflg * f           0e
6828 * nff    * f           1e
6829 * alp    * f   1.0000e+00e
6830 * vl     * f   0.0000e+00e
6831 * vv     * f   0.0000e+00e
6832 * tl     * f   5.4211e+02e
6833 * tv     * f   5.4212e+02e
6834 * p      * f   5.4158e+06e
6835 * pa     * f   0.0000e+00e
6836 * conc   * f   0.0000e+00e
6837 *
6838 * side-cell arrays (steam dome)
6839 * dx     *     1.0150e+00    9.3900e-01    7.0000e-01    2.3900e-01e
6840 * vol    * r02 5.1080e+00    7.0000e+00    1.6220e+00e
6841 * fa     * r02 5.0325e+00    6.0000e+00    6.7866e+00    1.2897e-01e
6842 * kfac   * r02 1.0000e-10r03 0.0000e+00e
6843 * rkfac  * r02 1.0000e-10r03 0.0000e+00e
6844 * grav   * f   1.0000e+00e
6845 * hd     *     4.3220e+00    3.4380e+00    2.0480e+00    1.0000e+00    6.0985e-01
6846 * hd     * e
6847 * icflg * r04         0            1e
6848 * nff    * r04         1           -1e
6849 * alp    * f   1.0000e+00e
6850 * vl     * f   0.0000e+00e
6851 * vv     * f   0.0000e+00e
6852 * tl     * f   5.4211e+02e
6853 * tv     * f   5.4212e+02e
6854 * p      * f   5.4158e+06e
6855 * pa     * f   0.0000e+00e
6856 * conc   * f   0.0000e+00e
6857 *
6858 ************************************************************************
6859 *******   type          num           id        ctitle
6860 tee                     210          210 $210$ main steam line 2
6861 *        jcell        nodes         ichf          cost          epsw
6862              9            1            1    0.0000e+00    0.0000e+00
6863 *       iconc1       ncell1         jun1          jun2         ipow1
6864              1            9          210           220             0
6865 *       iqptr1       iqpsv1       nqptb1        nqpsv1        nqprf1
6866              0            0            0             0             0
6867 *       radin1         th1        houtl1        houtv1        toutl1
6868    3.0493e-01   2.5270e-02   0.0000e+00    0.0000e+00    3.0000e+02
6869 *       toutv1        pwin1        pwoff1        rpwmx1        pwscl1
6870    3.0000e+02   0.0000e+00   0.0000e+00    0.0000e+00    0.0000e+00
6871 *        qpin1        qpoff1        rqpmx1        qpscl1
6872    0.0000e+00   0.0000e+00   0.0000e+00    1.0000e+00
```

```
6873 *       iconc2        ncell2          jun3          ipow2
6874              1             1           212              0
6875 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
6876              0             0             0             0             0
6877 *       radin2           th2        houtl2        houtv2        toutl2
6878     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
6879 *       toutv2         pwin2        pwoff2        rpwmx2        pwscl2
6880     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6881 *         qpin2         qpoff2        rqpmx2        qpscl2
6882     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6883 *
6884 * main-cell arrays (26-inch main steam line)
6885 * dx     *     2.2860e+00    5.0292e+00r03 4.4806e+00r03 4.5363e+00    2.2860e+00
6886 * dx     * e
6887 * vol    *     6.6775e-01    1.4733e+00r03 1.3088e+00r03 1.3251e+00    6.6775e-01
6888 * vol    * e
6889 * fa     *     1.2897e-01    2.1054e-01    2.9210e-01    2.1091e-01    1.2972e-01
6890 * fa     *     2.1091e-01r04 2.9210e-01e
6891 * kfac   * f   0.0000e+00e
6892 * rkfac  * f   0.0000e+00e
6893 * grav   *     1.0000e+00    0.0000e+00r03-1.0000e+00r05 0.0000e+00e
6894 * hd     * f   6.0985e-01e
6895 * icflg *              1r03          0             1r05          0e
6896 * nff    * r02         -1            1r03          -1r04         1e
6897 * alp    * f   1.0000e+00e
6898 * vl     * f   0.0000e+00e
6899 * vv     * f   0.0000e+00e
6900 * tl     * f   5.4211e+02e
6901 * tv     * f   5.4212e+02e
6902 * p      * f   5.4158e+06e
6903 * pa     * f   0.0000e+00e
6904 * qppp   * f   0.0000e+00e
6905 * matid *              9e
6906 * tw     * f   5.4211e+02e
6907 * conc   * f   0.0000e+00e
6908 *
6909 * side-cell arrays (relief-valves header)
6910 * dx     *     1.0000e+00e
6911 * vol    *     2.9210e-01e
6912 * fa     * f   2.9210e-01e
6913 * kfac   *     1.0000e-10    0.0000e+00e
6914 * rkfac  *     1.0000e-10    0.0000e+00e
6915 * grav   * f   1.0000e+00e
6916 * hd     * f   6.0985e-01e
6917 * icflg * f            0e
6918 * nff    * f            1e
6919 * alp    *     1.0000e+00e
6920 * vl     * f   0.0000e+00e
6921 * vv     * f   0.0000e+00e
6922 * tl     *     5.4211e+02e
```

```
6923 * tv    *      5.4212e+02e
6924 * p     *      5.4158e+06e
6925 * pa    *      0.0000e+00e
6926 * qppp  *      0.0000e+00e
6927 * matid *               9e
6928 * tw    *      5.4211e+02e
6929 * conc  *      0.0000e+00e
6930 *
6931 ************************************************************************
6932 *******   type            num             id        ctitle
6933 tee                       212            212 $212$ msl 2 porv/srv header
6934 *         jcell         nodes           ichf          cost           epsw
6935                 1             1              1    0.0000e+00    0.0000e+00
6936 *        iconc1        ncell1          jun1          jun2          ipow1
6937                 1             1            212           214              0
6938 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
6939                 0             0              0             0              0
6940 *        radin1           th1        houtl1        houtv1        toutl1
6941     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
6942 *        toutv1          pwin1         pwoff1        rpwmx1        pwscl1
6943     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6944 *         qpin1         qpoff1        rqpmx1        qpscl1
6945     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6946 *        iconc2        ncell2          jun3          ipow2
6947                 1             1            216              0
6948 *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
6949                 0             0              0             0              0
6950 *        radin2           th2        houtl2        houtv2        toutl2
6951     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
6952 *        toutv2          pwin2         pwoff2        rpwmx2        pwscl2
6953     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
6954 *         qpin2         qpoff2        rqpmx2        qpscl2
6955     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
6956 *
6957 * main-cell arrays (header inlet to srv outlet)
6958 * dx    *      1.0000e+00e
6959 * vol   *      2.9210e-01e
6960 * fa    * f    2.9210e-01e
6961 * kfac  * f    0.0000e+00e
6962 * rkfac * f    0.0000e+00e
6963 * grav  * f    1.0000e+00e
6964 * hd    * f    6.0985e-01e
6965 * icflg * f             0e
6966 * nff   * f             1e
6967 * alp   *      1.0000e+00e
6968 * vl    * f    0.0000e+00e
6969 * vv    * f    0.0000e+00e
6970 * tl    *      5.4211e+02e
6971 * tv    *      5.4212e+02e
6972 * p     *      5.4158e+06e
```

```
6973 * pa     *      0.0000e+00
6974 * qppp   *      0.0000e+00
6975 * matid  *              9e
6976 * tw     *      5.4211e+02e
6977 * conc   *      0.0000e+00
6978 *
6979 * side-cell arrays (header outlet to porv)
6980 * dx     *      1.0000e+00
6981 * vol    *      2.9210e-01e
6982 * fa     * f    2.9210e-01e
6983 * kfac   *      1.0000e-10     0.0000e+00e
6984 * rkfac  *      1.0000e-10     0.0000e+00e
6985 * grav   * f    0.0000e+00e
6986 * hd     * f    6.0985e-01e
6987 * icflg  * f             0e
6988 * nff    * f             1e
6989 * alp    *      1.0000e+00e
6990 * vl     * f    0.0000e+00e
6991 * vv     * f    0.0000e+00e
6992 * tl     *      5.4211e+02e
6993 * tv     *      5.4212e+02e
6994 * p      *      5.4158e+06e
6995 * pa     *      0.0000e+00e
6996 * qppp   *      0.0000e+00e
6997 * matid  *              9e
6998 * tw     *      5.4211e+02e
6999 * conc   *      0.0000e+00e
7000 *
7001 ************************************************************************
7002 *******   type            num             id        ctitle
7003 fill                      214            214 $214$ msl 2 srv
7004 *          jun1          ifty           ioff
7005              214             5              0
7006 *          iftr          ifsv           nftb           nfsv           nfrf
7007                0          2121              9              0              0
7008 *        twtold           rfmx         concin          felv
7009     0.0000e+00    1.0000e+10    0.0000e+00    0.0000e+00
7010 *          dxin          volin          alpin          vlin           tlin
7011     1.0000e+00    2.9210e-01    1.0000e+00    0.0000e+00    5.4211e+02
7012 *           pin           pain         flowin          vvin           tvin
7013     5.4158e+06    0.0000e+00    0.0000e+00    0.0000e+00    5.4212e+02
7014 *         vmscl          vvscl
7015     1.0000e+00    1.0000e+00
7016 *
7017 * vmtb  *     7.5500e+06    0.0000e+00    7.5800e+06   -5.8300e+01    7.6900e+06
7018 * vmtb  *    -6.3000e+01    7.7200e+06   -1.2490e+02    7.8200e+06   -1.4730e+02
7019 * vmtb  *     7.8600e+06   -2.3920e+02    7.9200e+06   -2.4550e+02    7.9600e+06
7020 * vmtb  *    -3.5610e+02    8.2000e+06   -4.3200e+02e
7021 *
7022 ************************************************************************
```

```
7023 *******   type            num             id        ctitle
7024 valve                     216            216 $216$ msl 2 porv
7025 *       ncells          nodes           junl          jun2          epsw
7026               1              1            216           218  0.0000e+00
7027 *         ichf          iconc          ivty          ivps         nvtb2
7028               1              1             1             2             0
7029 *         ivtr           ivsv         nvtb1          nvsv          nvrf
7030               0          -2162             0             0             0
7031 *       iqp3tr         iqp3sv        nqp3tb        nqp3sv        nqp3rf
7032               0              0             0             0             0
7033 *       ivtrov         ivtyov
7034               0              0
7035 *         rvmx           rvov         fminov        fmaxov
7036     5.0000e+00     0.0000e+00     0.0000e+00    1.0000e+00
7037 *         radin             th         houtl         houtv         toutl
7038     3.0493e-01     2.5270e-02     0.0000e+00    0.0000e+00    3.0000e+02
7039 *         toutv          avlve          hvlve         favlve          xpos
7040     3.0000e+02     4.1484e-03     1.5240e-01    0.0000e+00    0.0000e+00
7041 *         qp3in         qp3off         rqp3mx        qp3scl
7042     0.0000e+00     0.0000e+00     0.0000e+00    1.0000e+00
7043 *
7044 * dx     *      1.0000e+00e
7045 * vol    *      2.9210e-01e
7046 * fa     * f    2.9210e-01e
7047 * kfac   * f    0.0000e+00e
7048 * rkfac  * f    0.0000e+00e
7049 * grav   * f    0.0000e+00e
7050 * hd     * f    6.0985e-01e
7051 * icflg  *               0              1e
7052 * nff    * f             1e
7053 * alp    *      1.0000e+00e
7054 * vl     * f    0.0000e+00e
7055 * vv     * f    0.0000e+00e
7056 * tl     *      5.4211e+02e
7057 * tv     *      5.4212e+02e
7058 * p      *      5.4158e+06e
7059 * pa     *      0.0000e+00e
7060 * qppp   *      0.0000e+00e
7061 * matid  *              9e
7062 * tw     *      5.4211e+02e
7063 * conc   *      0.0000e+00e
7064 *
7065 ********************************************************************************
7066 *******   type            num             id        ctitle
7067 break                     218            218 $218$ msl 2 porv boundary
7068 *         junl          ibty          isat          ioff
7069             218             0             0             1
7070 *         dxin         volin         alpin           tin           pin
7071     1.0000e+00     2.9210e-01     1.0000e+00    3.7316e+02    1.0135e+05
```

```
7072 *          pain          concin           rbmx          poff          belv
7073     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7074 *
7075 ********************************************************************************
7076 *******   type           num            id        ctitle
7077 valve                   220           220 $220$ msiv line 2
7078 *        ncells         nodes          jun1          jun2          epsw
7079              6             1           220           222    0.0000e+00
7080 *          ichf         iconc          ivty          ivps          nvtb2
7081              1             1             3             2              0
7082 *          ivtr          ivsv         nvtb1          nvsv          nvrf
7083             24             1            -2             0              0
7084 *        iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
7085              0             0             0             0              0
7086 *        ivtrov        ivtyov
7087              0             0
7088 *          rvmx          rvov        fminov        fmaxov
7089     1.0000e-01    0.0000e+00    0.0000e+00    1.0000e+00
7090 *         radin            th         houtl         houtv         toutl
7091     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
7092 *         toutv          avlve         hvlve         favlve          xpos
7093     3.0000e+02    2.9210e-01    6.0985e-01    4.0000e-01    4.0000e-01
7094 *         qp3in         qp3off        rqp3mx        qp3scl
7095     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7096 *
7097 * dx     *      2.2860e+00r05 4.2428e+00e
7098 * vol    *      6.6775e-01r05 1.2394e+00e
7099 * fa     * f    2.9210e-01e
7100 * kfac   * r06  0.0000e+00    2.0000e-02e
7101 * rkfac  * r06  0.0000e+00    2.0000e-02e
7102 * grav   * f    0.0000e+00e
7103 * hd     * f    6.0985e-01e
7104 * icflg  *               0             1r05          0e
7105 * nff    * f             1e
7106 * alp    * f    1.0000e+00e
7107 * vl     * f    0.0000e+00e
7108 * vv     * f    0.0000e+00e
7109 * tl     * f    5.4211e+02e
7110 * tv     * f    5.4212e+02e
7111 * p      * f    5.4158e+06e
7112 * pa     * f    0.0000e+00e
7113 * qppp   * f    0.0000e+00e
7114 * matid  *              9e
7115 * tw     * f    5.4211e+02e
7116 * conc   * f    0.0000e+00e
7117 * vtb1   *    -6.0000e+00    1.0000e+00    4.0000e+00    0.0000e+00e
7118 *
7119 ********************************************************************************
7120 *******   type           num            id        ctitle
7121 tee                     250           250 $250$ hp heater discharge line
```

```
7122 *        jcell          nodes           ichf          cost          epsw
7123              1              5              1  0.0000e+00  0.0000e+00
7124 *       iconc1         ncell1           jun1          jun2          ipow1
7125              1              1            151           351              0
7126 *       iqptr1         iqpsv1         nqptb1        nqpsv1        nqprf1
7127              0              0              0             0              0
7128 *       radin1            th1         hout11        houtv1        tout11
7129    2.6590e-01     3.8900e-02     0.0000e+00    0.0000e+00    3.0000e+02
7130 *       toutv1          pwin1         pwoff1        rpwmx1        pwscl1
7131    3.0000e+02     0.0000e+00     0.0000e+00    0.0000e+00    0.0000e+00
7132 *        qpin1         qpoff1         rqpmx1        qpscl1
7133    0.0000e+00     0.0000e+00     0.0000e+00    1.0000e+00
7134 *       iconc2         ncell2           jun3          ipow2
7135              1              1            254             0
7136 *       iqptr2         iqpsv2         nqptb2        nqpsv2        nqprf2
7137              0              0              0             0              0
7138 *       radin2            th2         hout12        houtv2        tout12
7139    1.7700e-01     2.6200e-02     0.0000e+00    0.0000e+00    3.0000e+02
7140 *       toutv2          pwin2         pwoff2        rpwmx2        pwscl2
7141    3.0000e+02     0.0000e+00     0.0000e+00    0.0000e+00    0.0000e+00
7142 *        qpin2         qpoff2         rqpmx2        qpscl2
7143    0.0000e+00     0.0000e+00     0.0000e+00    1.0000e+00
7144 *
7145 * main-cell arrays
7146 * dx     *      1.1369e+00e
7147 * vol    *      2.5255e-01e
7148 * fa     * f    2.2214e-01e
7149 * kfac   * f    3.0000e-01e
7150 * rkfac  * f    3.0000e-01e
7151 * grav   * f    0.0000e+00e
7152 * hd     * f    5.3180e-01e
7153 * icflg  * f             0e
7154 * nff    * f             1e
7155 * alp    *      0.0000e+00e
7156 * vl     * f    0.0000e+00e
7157 * vv     * f    0.0000e+00e
7158 * tl     *      4.8870e+02e
7159 * tv     *      4.8870e+02e
7160 * p      *      5.4158e+06e
7161 * pa     *      0.0000e+00e
7162 * qppp   * f    0.0000e+00e
7163 * matid  * f             9e
7164 * tw     * f    4.8870e+02e
7165 * conc   *      0.0000e+00e
7166 *
7167 * side-cell arrays
7168 * dx     *      3.0479e+00e
7169 * vol    *      3.0000e-01e
7170 * fa     *      2.2214e-01    9.8430e-02e
7171 * kfac   * f    3.0000e-01e
```

```
7172 * rkfac * f   3.0000e-01e
7173 * grav  * f   0.0000e+00e
7174 * hd    *     5.3180e-01    3.5400e-01e
7175 * icflg * f           0e
7176 * nff   * f           1e
7177 * alp   *     0.0000e+00e
7178 * vl    * f   0.0000e+00e
7179 * vv    * f   0.0000e+00e
7180 * tl    *     4.8870e+02e
7181 * tv    *     4.8870e+02e
7182 * p     *     5.4158e+06e
7183 * pa    *     0.0000e+00e
7184 * qppp  * f   0.0000e+00e
7185 * matid * f           9e
7186 * tw    * f   4.8870e+02e
7187 * conc  *     0.0000e+00e
7188 *
7189 ************************************************************************
7190 *******   type          num           id        ctitle
7191 valve                   254          254 $254$ mfwcv-2 regulating valve
7192 *       ncells        nodes         jun1         jun2          epsw
7193             2            5          254          258    0.0000e+00
7194 *         ichf        iconc         ivty         ivps          nvtb2
7195             1            1            3            2              0
7196 *         ivtr         ivsv        nvtb1         nvsv          nvrf
7197             1        -2014            0            0             0
7198 *       iqp3tr       iqp3sv       nqp3tb       nqp3sv        nqp3rf
7199             0            0            0            0             0
7200 *       ivtrov       ivtyov
7201          422            0
7202 *         rvmx         rvov       fminov       fmaxov
7203    1.0000e-02   5.0000e-02   0.0000e+00   1.0000e+00
7204 *        radin           th        houtl        houtv         toutl
7205    1.7700e-01   2.6200e-02   0.0000e+00   0.0000e+00   3.0000e+02
7206 *        toutv         avlve        hvlve        favlve         xpos
7207    3.0000e+02   8.0000e-02   3.1900e-01   4.0000e-01   4.0000e-01
7208 *        qp3in        qp3off       rqp3mx       qp3scl
7209    0.0000e+00   0.0000e+00   0.0000e+00   1.0000e+00
7210 *
7211 * dx    * f   1.5239e+00e
7212 * vol   * f   1.5000e-01e
7213 * fa    * f   9.8430e-02e
7214 * kfac  * f   3.0000e-01e
7215 * rkfac * f   3.0000e-01e
7216 * grav  * f   0.0000e+00e
7217 * hd    * f   3.5400e-01e
7218 * icflg * f           0e
7219 * nff   * f           1e
7220 * alp   * f   0.0000e+00e
7221 * vl    * f   0.0000e+00e
```

```
7222 * vv     * f    0.0000e+00e
7223 * tl     * f    4.8870e+02e
7224 * tv     * f    4.8870e+02e
7225 * p      * f    5.4158e+06e
7226 * pa     * f    0.0000e+00e
7227 * qppp   * f    0.0000e+00e
7228 * matid  * f             9e
7229 * tw     * f    4.8870e+02e
7230 * conc   * f    0.0000e+00e
7231 *
7232 ************************************************************************
7233 *******   type           num            id        ctitle
7234 fill                     269           269 $269$ sdafw fill 2
7235 *          jun1          ifty          ioff
7236              270             8             2
7237 *          iftr          ifsv          nftb          nfsv          nfrf
7238               28         -2005             2             0             0
7239 *        twtold          rfmx        concin          felv
7240     0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
7241 *          dxin          volin          alpin          vlin          tlin
7242     1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
7243 *           pin           pain        flowin          vvin          tvin
7244     5.4158e+06    0.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
7245 *        flwoff          vloff          vvoff         alpoff
7246     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7247 *         vmscl          vvscl
7248     1.0000e+00    1.0000e+00
7249 *
7250 * vmtb  *      7.4000e-01    9.4635e+00    7.6000e-01    0.0000e+00e
7251 *
7252 ************************************************************************
7253 *******   type           num            id        ctitle
7254 tee                      270           270 $270$ mfwcv-2 discharge line
7255 *         jcell         nodes          ichf          cost          epsw
7256               1             5             1    0.0000e+00    0.0000e+00
7257 *        iconc1        ncell1          jun1          jun2          ipow1
7258               1             6           258           280              0
7259 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7260               0             0             0             0              0
7261 *        radin1           th1        houtl1        houtv1        toutl1
7262     1.7700e-01    2.6200e-02    0.0000e+00    0.0000e+00    3.0000e+02
7263 *        toutv1         pwin1        pwoff1        rpwmx1        pwscl1
7264     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7265 *         qpin1        qpoff1        rqpmx1        qpscl1
7266     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7267 *        iconc2        ncell2          jun3         ipow2
7268               1             1           270             0
7269 *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7270               0             0             0             0              0
```

```
7271 *       radin2           th2        hout12        houtv2        tout12
7272     4.8600e-02    8.5600e-03    0.0000e+00    0.0000e+00    3.0000e+02
7273 *       toutv2         pwin2        pwoff2        rpwmx2        pwsc12
7274     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7275 *         qpin2        qpoff2        rqpmx2        qpsc12
7276     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7277 *
7278 * main-cell arrays
7279 * dx     * f   6.0957e+00e
7280 * vol    * f   6.0000e-01e
7281 * fa     * r02 9.8430e-02    7.3830e-02    4.9220e-02    7.3830e-02r02 9.8430e-02
7282 e
7283 * kfac   * f   3.0000e-01e
7284 * rkfac  * f   3.0000e-01e
7285 * grav   *     0.0000e+00    1.0000e+00r05 0.0000e+00e
7286 * hd     * f   3.5400e-01e
7287 * icflg  * f            0e
7288 * nff    * f            1e
7289 * alp    * f   0.0000e+00e
7290 * vl     * f   0.0000e+00e
7291 * vv     * f   0.0000e+00e
7292 * tl     * f   4.8870e+02e
7293 * tv     * f   4.8870e+02e
7294 * p      * f   5.4158e+06e
7295 * pa     * f   0.0000e+00e
7296 * qppp   * f   0.0000e+00e
7297 * matid  * f            9e
7298 * tw     * f   4.8870e+02e
7299 * conc   * f   0.0000e+00e
7300 *
7301 * side-cell arrays
7302 * dx     *     1.5240e+00e
7303 * vol    *     1.1300e-02e
7304 * fa     * f   7.4200e-03e
7305 * kfac   * f   3.0000e-01e
7306 * rkfac  * f   3.0000e-01e
7307 * grav   * f   0.0000e+00e
7308 * hd     * f   9.7200e-02e
7309 * icflg  * f            0e
7310 * nff    * f            1e
7311 * alp    *     0.0000e+00e
7312 * vl     * f   0.0000e+00e
7313 * vv     * f   0.0000e+00e
7314 * tl     *     4.8870e+02e
7315 * tv     *     4.8870e+02e
7316 * p      *     5.4158e+06e
7317 * pa     *     0.0000e+00e
7318 * qppp   * f   0.0000e+00e
7319 * matid  * f            9e
7320 * tw     * f   4.8870e+02e
```

```
7321 * conc  *     0.0000e+00e
7322 *
7323 ********************************************************************************
7324 *******   type           num            id        ctitle
7325 fill                    279           279 $279$ mdafw fill 2
7326 *         jun1          ifty          ioff
7327             279             8             2
7328 *         iftr          ifsv          nftb          nfsv          nfrf
7329              26         -2005             2             0             0
7330 *       twtold          rfmx        concin          felv
7331     0.0000e+00    2.0000e+00    0.0000e+00    0.0000e+00
7332 *         dxin          volin          alpin          vlin          tlin
7333     1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
7334 *          pin          pain        flowin          vvin          tvin
7335     5.4158e+06    0.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
7336 *       flwoff          vloff          vvoff         alpoff
7337     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7338 *         vmscl          vvscl
7339     1.0000e+00    1.0000e+00
7340 *
7341 * vmtb  *     7.4000e-01    9.4635e+00    7.6000e-01    0.0000e+00e
7342 *
7343 ********************************************************************************
7344 *******   type           num            id        ctitle
7345 tee                     280           280 $280$ mfw line 2
7346 *        jcell         nodes          ichf          cost          epsw
7347              1             5             1    0.0000e+00    0.0000e+00
7348 *       iconc1        ncell1          jun1          jun2          ipow1
7349              1             4           280           285             0
7350 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7351              0             0             0             0             0
7352 *       radin1           th1        houtl1        houtv1        toutl1
7353     1.7700e-01    2.6200e-02    0.0000e+00    0.0000e+00    3.0000e+02
7354 *       toutv1         pwin1        pwoff1        rpwmx1        pwscl1
7355     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7356 *        qpin1        qpoff1        rqpmx1        qpscl1
7357     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7358 *       iconc2        ncell2          jun3          ipow2
7359              1             1           279             0
7360 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7361              0             0             0             0             0
7362 *       radin2           th2        houtl2        houtv2        toutl2
7363     4.8600e-02    8.5600e-03    0.0000e+00    0.0000e+00    3.0000e+02
7364 *       toutv2         pwin2        pwoff2        rpwmx2        pwscl2
7365     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7366 *        qpin2        qpoff2        rqpmx2        qpscl2
7367     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7368 *
7369 * main-cell arrays
7370 * dx    * r02 4.9680e+00r02 5.3040e+00e
```

```
7371 * vol    * r02 4.8900e-01r02 5.2200e-01e
7372 * fa     * f   9.8430e-02e
7373 * kfac   * f   3.0000e-01e
7374 * rkfac  * f   3.0000e-01e
7375 * grav   * r03 0.0000e+00r02 1.0000e+00e
7376 * hd     * f   3.5400e-01e
7377 * icflg  * f            0e
7378 * nff    * f            1e
7379 * alp    * f   0.0000e+00e
7380 * vl     * f   0.0000e+00e
7381 * vv     * f   0.0000e+00e
7382 * tl     * f   4.8870e+02e
7383 * tv     * f   4.8870e+02e
7384 * p      * f   5.4158e+06e
7385 * pa     * f   0.0000e+00e
7386 * qppp   * f   0.0000e+00e
7387 * matid  * f            9e
7388 * tw     * f   4.8870e+02e
7389 * conc   * f   0.0000e+00e
7390 *
7391 * side-cell arrays
7392 * dx     *     8.8390e+00e
7393 * vol    *     6.5560e-02e
7394 * fa     * f   7.4200e-03e
7395 * kfac   * f   3.0000e-01e
7396 * rkfac  * f   3.0000e-01e
7397 * grav   * f   0.0000e+00e
7398 * hd     * f   9.7200e-02e
7399 * icflg  * f            0e
7400 * nff    * f            1e
7401 * alp    *     0.0000e+00e
7402 * vl     * f   0.0000e+00e
7403 * vv     * f   0.0000e+00e
7404 * tl     *     4.8870e+02e
7405 * tv     *     4.8870e+02e
7406 * p      *     5.4158e+06e
7407 * pa     *     0.0000e+00e
7408 * qppp   * f   0.0000e+00e
7409 * matid  * f            9e
7410 * tw     * f   4.8870e+02e
7411 * conc   *     0.0000e+00e
7412 *
7413 ************************************************************************
7414 *******   type          num           id        ctitle
7415 tee                     290          290 $290$ steam-gen downcomer 2
7416 *        jcell        nodes         ichf         cost          epsw
7417              3            0            1  0.0000e+00  0.0000e+00
7418 *       iconc1       ncell1         jun1         jun2         ipow1
7419              1           12          290          200             0
```

```
7420 *       radin1           th1         houtl1         houtv1         toutl1
7421     1.0920e-01     3.8040e-02     0.0000e+00     0.0000e+00     3.0000e+02
7422 *       toutv1          pwin1         pwoff1         rpwmx1         pwscl1
7423     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
7424 *       iconc2          ncell2           jun3          ipow2
7425             1               1            285              0
7426 *       radin2           th2         houtl2         houtv2         toutl2
7427     1.7700e-01     2.6200e-02     0.0000e+00     0.0000e+00     3.0000e+02
7428 *       toutv2          pwin2         pwoff2         rpwmx2         pwscl2
7429     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
7430 *
7431 * main-cell arrays (downcomer annulus)
7432 * dx     *      1.0910e+00r03 3.8900e-01     1.2440e+00r07 1.3320e+00e
7433 * vol    *      9.7890e+00r03 3.2630e+00     7.5320e+00     2.7290e+00     8.0750e-01
7434 * vol    * r05 7.0000e-01e
7435 * fa     *      8.5590e+00     8.6600e+00r02 8.3882e+00     8.6600e+00     3.3610e+00
7436 * fa     *      1.2350e+00r05 5.2120e-01     2.8456e+00e
7437 * kfac   * r04 0.0000e+00     1.0000e-01r02 3.0000e-01r05 0.0000e+00     2.1500e+02
7438 * kfac   * e
7439 * rkfac  * r04 0.0000e+00     2.0000e-01r02 6.0000e-01r05 0.0000e+00     1.0000e+03
7440 * rkfac  * e
7441 * grav   * r12-1.0000e+00     0.0000e+00e
7442 * hd     *      1.2070e+00r04 1.3750e+00     6.0000e-01     2.5280e-01r05 1.0912e-01
7443 * hd     *      9.1200e-03e
7444 * icflg  * f             0e
7445 * nff    * f             1e
7446 * alp    * r04 1.0000e+00     7.2195e-01r07 0.0000e+00e
7447 * vl     * f    0.0000e+00e
7448 * vv     * f    0.0000e+00e
7449 * tl     * f    4.9330e+02e
7450 * tv     * f    4.9330e+02e
7451 * p      * f    5.4158e+06e
7452 * pa     * f    0.0000e+00e
7453 * conc   * f    0.0000e+00e
7454 *
7455 * side-cell arrays (feedwater inlet)
7456 * dx     *      1.4569e+00e
7457 * vol    *      1.4340e-01e
7458 * fa     * f    9.8430e-02e
7459 * kfac   *      5.0000e-01     3.0000e-01e
7460 * rkfac  *      1.0000e+00     3.0000e-01e
7461 * grav   *      0.0000e+00    -1.0000e+00e
7462 * hd     * f    3.5400e-01e
7463 * icflg  * f             0e
7464 * nff    * f             1e
7465 * alp    *      0.0000e+00e
7466 * vl     * f    0.0000e+00e
7467 * vv     * f    0.0000e+00e
7468 * tl     *      4.8870e+02e
7469 * tv     *      4.8870e+02e
```

```
7470 * p      *      5.4158e+06e
7471 * pa     *      0.0000e+00e
7472 * conc   *      0.0000e+00e
7473 *
7474 ***********************************************************************
7475 *******   type           num            id        ctitle
7476 pipe                     300           300 $300$ steam-gen boiler 3
7477 *        ncells         nodes          jun1          jun2          epsw
7478              7             0           300           305    0.0000e+00
7479 *          ichf         iconc          iacc          ipow
7480              1             1             0             0
7481 *         radin            th         houtl         houtv         toutl
7482     1.4821e+00    9.5250e-03    0.0000e+00    0.0000e+00    3.0000e+02
7483 *         toutv         powin        powoff        rpowmx        powscl
7484     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7485 *
7486 * dx     * f   1.3320e+00e
7487 * vol    * r06 5.8490e+00    6.7440e+00e
7488 * fa     *     2.8456e+00r06 4.3911e+00    4.2500e+00e
7489 * kfac   *     2.1500e+02r07 0.0000e+00e
7490 * rkfac  *     1.0000e+03r07 0.0000e+00e
7491 * grav   *     0.0000e+00r07 1.0000e+00e
7492 * hd     * r07 9.1200e-03    3.2410e+00e
7493 * icflg  * f            0e
7494 * nff    * f            1e
7495 * alp    * r05 0.0000e+00    5.0000e-01    1.0000e+00e
7496 * vl     * f   0.0000e+00e
7497 * vv     * f   0.0000e+00e
7498 * tl     * f   5.4211e+02e
7499 * tv     * f   5.4212e+02e
7500 * p      * f   5.4158e+06e
7501 * pa     * f   0.0000e+00e
7502 * conc   * f   0.0000e+00e
7503 *
7504 ***********************************************************************
7505 *******   type           num            id        ctitle
7506 tee                      305           305 $305$ separator & dome 3
7507 *         jcell         nodes          ichf          cost          epsw
7508              6             0             1    0.0000e+00    0.0000e+00
7509 *        iconc1        ncell1          jun1          jun2         ipow1
7510              1             8           305           390             0
7511 *        radin1           th1        houtl1        houtv1        toutl1
7512     6.5380e-01    9.5250e-03    0.0000e+00    0.0000e+00    3.0000e+02
7513 *        toutv1        pwin1        pwoff1        rpwmx1        pwscl1
7514     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7515 *        iconc2        ncell2          jun3          ipow2
7516              1             4           310             0
7517 *        radin2           th2        houtl2        houtv2        toutl2
7518     2.0193e+00    8.8900e-02    0.0000e+00    0.0000e+00    3.0000e+02
```

```
7519 *       toutv2          pwin2          pwoff2         rpwmx2         pwscl2
7520     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
7521 *
7522 * main-cell arrays (separator region)
7523 * dx     *      1.2440e+00     1.1670e+00     1.0910e+00     1.0000e+00r03 3.3333e-01
7524 * dx     *      1.0000e+00e
7525 * vol    *      7.6460e+00r02 4.5570e+00     5.6630e+00r03 2.4353e+00     8.9610e+00
7526 * vol    * e
7527 * fa     *      4.2500e+00r03 4.0320e+00     5.5740e+00r02 7.3060e+00     6.9880e+00
7528 * fa     *      8.5590e+00e
7529 * kfac   * f    0.0000e+00e
7530 * rkfac  * f    0.0000e+00e
7531 * grav   * r04  1.0000e+00r04 0.0000e+00    -1.0000e+00e
7532 * hd     *      3.2410e+00r03 1.3080e+00     2.6640e+00r02 2.8210e+00     2.9780e+00
7533 * hd     *      1.2070e+00e
7534 * icflg  * f             0e
7535 * nff    * f             1e
7536 * alp    * f    1.0000e+00e
7537 * vl     * f    0.0000e+00e
7538 * vv     * f    0.0000e+00e
7539 * tl     * f    5.4211e+02e
7540 * tv     * f    5.4212e+02e
7541 * p      * f    5.4158e+06e
7542 * pa     * f    0.0000e+00e
7543 * conc   * f    0.0000e+00e
7544 *
7545 * side-cell arrays (steam dome)
7546 * dx     *      1.0150e+00     9.3900e-01     7.0000e-01     2.3900e-01e
7547 * vol    * r02  5.1080e+00     7.0000e+00     1.6220e+00e
7548 * fa     * r02  5.0325e+00     6.0000e+00     6.7866e+00     1.2897e-01e
7549 * kfac   * r02  1.0000e-10r03 0.0000e+00e
7550 * rkfac  * r02  1.0000e-10r03 0.0000e+00e
7551 * grav   * f    1.0000e+00e
7552 * hd     *      4.3220e+00     3.4380e+00     2.0480e+00     1.0000e+00     6.0985e-01
7553 * hd     * e
7554 * icflg  * r04           0             1e
7555 * nff    * r04           1            -1e
7556 * alp    * f    1.0000e+00e
7557 * vl     * f    0.0000e+00e
7558 * vv     * f    0.0000e+00e
7559 * tl     * f    5.4211e+02e
7560 * tv     * f    5.4212e+02e
7561 * p      * f    5.4158e+06e
7562 * pa     * f    0.0000e+00e
7563 * conc   * f    0.0000e+00e
7564 *
7565 ************************************************************************
7566 *******   type            num             id        ctitle
7567 tee                       310            310 $310$ main steam line 3
```

```
7568 *        jcell          nodes           ichf          cost          epsw
7569             14              1              1    0.0000e+00    0.0000e+00
7570 *       iconc1         ncell1           jun1          jun2          ipow1
7571              1             14            310           320              0
7572 *       iqptr1         iqpsv1         nqptb1        nqpsv1        nqprf1
7573              0              0              0             0              0
7574 *       radin1            th1        hout11        houtv1        tout11
7575    3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
7576 *       toutv1          pwin1         pwoff1        rpwmx1        pwscl1
7577    3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7578 *         qpin1         qpoff1         rqpmx1        qpscl1
7579    0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7580 *       iconc2         ncell2           jun3          ipow2
7581              1              1            312             0
7582 *       iqptr2         iqpsv2         nqptb2        nqpsv2        nqprf2
7583              0              0              0             0              0
7584 *       radin2            th2        hout12        houtv2        tout12
7585    3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
7586 *       toutv2          pwin2         pwoff2        rpwmx2        pwscl2
7587    3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7588 *         qpin2         qpoff2         rqpmx2        qpscl2
7589    0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7590 *
7591 * main-cell arrays (26-inch main steam line)
7592 * dx     *     2.2860e+00    5.0292e+00r03 4.4806e+00r08 4.2573e+00    2.2860e+00
7593 * dx     * e
7594 * vol    *     6.6775e-01    1.4733e+00r03 1.3088e+00r08 1.2436e+00    6.6775e-01
7595 * vol    * e
7596 * fa     *     1.2897e-01    2.1054e-01    2.9210e-01    2.1091e-01    1.2972e-01
7597 * fa     *     2.1091e-01r09 2.9210e-01e
7598 * kfac   * f   0.0000e+00e
7599 * rkfac  * f   0.0000e+00e
7600 * grav   *     1.0000e+00    0.0000e+00r03-1.0000e+00r10 0.0000e+00e
7601 * hd     * f   6.0985e-01e
7602 * icflg *              1r03          0             1r10          0e
7603 * nff    * r02         -1            1r03         -1r09          1e
7604 * alp    * f   1.0000e+00e
7605 * vl     * f   0.0000e+00e
7606 * vv     * f   0.0000e+00e
7607 * tl     * f   5.4211e+02e
7608 * tv     * f   5.4212e+02e
7609 * p      * f   5.4158e+06e
7610 * pa     * f   0.0000e+00e
7611 * qppp   * f   0.0000e+00e
7612 * matid *              9e
7613 * tw     * f   5.4211e+02e
7614 * conc   * f   0.0000e+00e
7615 *
7616 * side-cell arrays (relief-valves header)
7617 * dx     *     1.0000e+00e
```

```
7618 * vol    *      2.9210e-01e
7619 * fa     * f    2.9210e-01e
7620 * kfac   *      1.0000e-10     0.0000e+00e
7621 * rkfac  *      1.0000e-10     0.0000e+00e
7622 * grav   * f    1.0000e+00
7623 * hd     * f    6.0985e-01e
7624 * icflg  * f             0e
7625 * nff    * f             1e
7626 * alp    *      1.0000e+00e
7627 * vl     * f    0.0000e+00e
7628 * vv     * f    0.0000e+00e
7629 * tl     *      5.4211e+02e
7630 * tv     *      5.4212e+02e
7631 * p      *      5.4158e+06e
7632 * pa     *      0.0000e+00e
7633 * qppp   *      0.0000e+00e
7634 * matid  *             9e
7635 * tw     *      5.4211e+02e
7636 * conc   *      0.0000e+00e
7637 *
7638 ************************************************************************
7639 *******   type           num            id        ctitle
7640 tee                     312           312 $312$ msl 3 porv/srv header
7641 *         jcell         nodes          ichf          cost          epsw
7642               1             1             1    0.0000e+00    0.0000e+00
7643 *        iconc1        ncell1          jun1          jun2          ipow1
7644               1             1           312           314              0
7645 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7646               0             0             0             0              0
7647 *        radin1          th1         houtl1        houtv1        toutl1
7648     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
7649 *        toutv1         pwin1         pwoff1        rpwmx1        pwscl1
7650     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7651 *         qpin1         qpoff1        rqpmx1        qpscl1
7652     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7653 *        iconc2        ncell2          jun3          ipow2
7654               1             1           316              0
7655 *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7656               0             0             0             0              0
7657 *        radin2          th2         houtl2        houtv2        toutl2
7658     3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
7659 *        toutv2         pwin2         pwoff2        rpwmx2        pwscl2
7660     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7661 *         qpin2         qpoff2        rqpmx2        qpscl2
7662     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7663 *
7664 * main-cell arrays (header inlet to srv outlet)
7665 * dx     *      1.0000e+00e
7666 * vol    *      2.9210e-01e
7667 * fa     * f    2.9210e-01e
```

```
7668 * kfac   * f   0.0000e+00
7669 * rkfac  * f   0.0000e+00
7670 * grav   * f   1.0000e+00
7671 * hd     * f   6.0985e-01e
7672 * icflg  * f            0e
7673 * nff    * f            1e
7674 * alp    *     1.0000e+00
7675 * vl     * f   0.0000e+00
7676 * vv     * f   0.0000e+00
7677 * tl     *     5.4211e+02e
7678 * tv     *     5.4212e+02e
7679 * p      *     5.4158e+06e
7680 * pa     *     0.0000e+00
7681 * qppp   *     0.0000e+00
7682 * matid  *            9e
7683 * tw     *     5.4211e+02e
7684 * conc   *     0.0000e+00
7685 *
7686 * side-cell arrays (header outlet to porv)
7687 * dx     *     1.0000e+00e
7688 * vol    *     2.9210e-01e
7689 * fa     * f   2.9210e-01e
7690 * kfac   *     1.0000e-10    0.0000e+00e
7691 * rkfac  *     1.0000e-10    0.0000e+00e
7692 * grav   * f   0.0000e+00e
7693 * hd     * f   6.0985e-01e
7694 * icflg  * f            0e
7695 * nff    * f            1e
7696 * alp    *     1.0000e+00e
7697 * vl     * f   0.0000e+00e
7698 * vv     * f   0.0000e+00e
7699 * tl     *     5.4211e+02e
7700 * tv     *     5.4212e+02e
7701 * p      *     5.4158e+06e
7702 * pa     *     0.0000e+00e
7703 * qppp   *     0.0000e+00e
7704 * matid  *            9e
7705 * tw     *     5.4211e+02e
7706 * conc   *     0.0000e+00e
7707 *
7708 ************************************************************************
7709 *******   type          num           id        ctitle
7710 fill                    314          314 $314$ msl 3 srv
7711 *         jun1          ifty         ioff
7712             314             5            0
7713 *         iftr          ifsv         nftb          nfsv          nfrf
7714               0          3121            9             0             0
7715 *       twtold          rfmx       concin         felv
7716     0.0000e+00    1.0000e+10    0.0000e+00    0.0000e+00
```

```
7717 *          dxin          volin          alpin          vlin          tlin
7718      1.0000e+00     2.9210e-01     1.0000e+00     0.0000e+00     5.4211e+02
7719 *           pin           pain         flowin           vvin          tvin
7720      5.4158e+06     0.0000e+00     0.0000e+00     0.0000e+00     5.4212e+02
7721 *         vmscl         vvscl
7722      1.0000e+00     1.0000e+00
7723 *
7724 * vmtb  *      7.5500e+06     0.0000e+00     7.5800e+06    -5.8300e+01     7.6900e+06
7725 * vmtb  *     -6.3000e+01     7.7200e+06    -1.2490e+02     7.8200e+06    -1.4730e+02
7726 * vmtb  *      7.8600e+06    -2.3920e+02     7.9200e+06    -2.4550e+02     7.9600e+06
7727 * vmtb  *     -3.5610e+02     8.2000e+06    -4.3200e+02e
7728 *
7729 ************************************************************************
7730 *******   type            num             id        ctitle
7731 valve                     316            316 $316$ msl 3 porv
7732 *        ncells         nodes           jun1          jun2          epsw
7733                1             1            316           318     0.0000e+00
7734 *          ichf         iconc           ivty          ivps          nvtb2
7735                1             1              1             2              0
7736 *          ivtr          ivsv         nvtb1          nvsv          nvrf
7737                0         -3162              0             0              0
7738 *        iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
7739                0             0              0             0              0
7740 *        ivtrov        ivtyov
7741                0             0
7742 *          rvmx          rvov         fminov        fmaxov
7743      5.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
7744 *         radin            th          houtl         houtv         toutl
7745      3.0493e-01     2.5270e-02     0.0000e+00     0.0000e+00     3.0000e+02
7746 *         toutv          avlve          hvlve         favlve          xpos
7747      3.0000e+02     4.1484e-03     1.5240e-01     0.0000e+00     0.0000e+00
7748 *         qp3in         qp3off         rqp3mx         qp3scl
7749      0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
7750 *
7751 * dx    *      1.0000e+00e
7752 * vol   *      2.9210e-01e
7753 * fa    * f    2.9210e-01e
7754 * kfac  * f    0.0000e+00e
7755 * rkfac * f    0.0000e+00e
7756 * grav  * f    0.0000e+00e
7757 * hd    * f    6.0985e-01e
7758 * icflg *              0              1e
7759 * nff   * f            1e
7760 * alp   *      1.0000e+00e
7761 * vl    * f    0.0000e+00e
7762 * vv    * f    0.0000e+00e
7763 * tl    *      5.4211e+02e
7764 * tv    *      5.4212e+02e
7765 * p     *      5.4158e+06e
7766 * pa    *      0.0000e+00e
```

```
7767 * qppp   *      0.0000e+00
7768 * matid *               9e
7769 * tw     *      5.4211e+02
7770 * conc   *      0.0000e+00
7771 *
7772 ************************************************************************
7773 *******   type           num            id        ctitle
7774 break                    318           318 $318$ msl 3 porv boundary
7775 *          jun1          ibty          isat          ioff
7776              318             0             0             1
7777 *          dxin          volin         alpin           tin           pin
7778      1.0000e+00    2.9210e-01    1.0000e+00    3.7316e+02    1.0135e+05
7779 *          pain         concin          rbmx          poff          belv
7780      0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7781 *
7782 ************************************************************************
7783 *******   type           num            id        ctitle
7784 valve                    320           320 $320$ msiv line 3
7785 *        ncells         nodes          jun1          jun2          epsw
7786              7             1           320           322    0.0000e+00
7787 *          ichf          iconc         ivty          ivps          nvtb2
7788              1             1            3             2              0
7789 *          ivtr           ivsv        nvtb1          nvsv          nvrf
7790             24             1           -2             0              0
7791 *        iqp3tr         iqp3sv       nqp3tb        nqp3sv        nqp3rf
7792              0             0            0             0              0
7793 *        ivtrov         ivtyov
7794              0             0
7795 *          rvmx          rvov         fminov        fmaxov
7796      1.0000e-01    0.0000e+00    0.0000e+00    1.0000e+00
7797 *         radin            th         houtl         houtv         toutl
7798      3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
7799 *         toutv          avlve         hvlve         favlve          xpos
7800      3.0000e+02    2.9210e-01    6.0985e-01    4.0000e-01    4.0000e-01
7801 *         qp3in         qp3off        rqp3mx        qp3scl
7802      0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7803 *
7804 * main-cell arrays (26-inch main steam line)
7805 * dx     *      2.2860e+00r06 4.1078e+00e
7806 * vol    *      6.6775e-01r06 1.1999e+00e
7807 * fa     * f    2.9210e-01e
7808 * kfac   * r07  0.0000e+00    2.0000e-02e
7809 * rkfac  * r07  0.0000e+00    2.0000e-02e
7810 * grav   * f    0.0000e+00e
7811 * hd     * f    6.0985e-01e
7812 * icflg  *               0            1r06          0e
7813 * nff    * f             1e
7814 * alp    * f    1.0000e+00e
7815 * vl     * f    0.0000e+00e
7816 * vv     * f    0.0000e+00e
```

```
7817 * tl     * f   5.4211e+02e
7818 * tv     * f   5.4212e+02e
7819 * p      * f   5.4158e+06e
7820 * pa     * f   0.0000e+00e
7821 * qppp   * f   0.0000e+00e
7822 * matid *              9e
7823 * tw     * f   5.4211e+02e
7824 * conc   * f   0.0000e+00e
7825 * vtbl   *    -6.0000e+00    1.0000e+00    4.0000e+00    0.0000e+00e
7826 *
7827 ************************************************************************
7828 *******   type           num            id        ctitle
7829 tee                      350           350 $350$ hp heater discharge line
7830 *         jcell         nodes          ichf          cost          epsw
7831               2             5             1    0.0000e+00    0.0000e+00
7832 *        iconc1        ncell1          jun1          jun2          ipow1
7833               1             2           350           351              0
7834 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7835               0             0             0             0              0
7836 *        radin1           th1        houtl1        houtv1        toutl1
7837     2.2150e-01    3.2540e-02    0.0000e+00    0.0000e+00    3.0000e+02
7838 *        toutv1         pwin1         pwoff1        rpwmx1        pwscl1
7839     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7840 *         qpin1         qpoff1        rqpmx1        qpscl1
7841     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7842 *        iconc2        ncell2          jun3          ipow2
7843               1             1           354              0
7844 *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7845               0             0             0             0              0
7846 *        radin2           th2        houtl2        houtv2        toutl2
7847     2.6590e-01    3.8900e-02    0.0000e+00    0.0000e+00    3.0000e+02
7848 *        toutv2         pwin2         pwoff2        rpwmx2        pwscl2
7849     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7850 *         qpin2         qpoff2        rqpmx2        qpscl2
7851     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7852 *
7853 * main-cell arrays
7854 * dx     *     4.9122e+00    1.1369e+00e
7855 * vol    *     1.0912e+00    2.5255e-01e
7856 * fa     *     1.5408e-01r02 2.2214e-01e
7857 * kfac   * f   3.0000e-01e
7858 * rkfac  * f   3.0000e-01e
7859 * grav   * f   0.0000e+00e
7860 * hd     *     4.4300e-01r02 5.3180e-01e
7861 * icflg  * f            0e
7862 * nff    * f            1e
7863 * alp    * f   0.0000e+00e
7864 * vl     * f   0.0000e+00e
7865 * vv     * f   0.0000e+00e
7866 * tl     * f   4.8870e+02e
```

```
7867 * tv     * f   4.8870e+02e
7868 * p      * f   5.4158e+06e
7869 * pa     * f   0.0000e+00e
7870 * qppp   * f   0.0000e+00e
7871 * matid  * f            9e
7872 * tw     * f   4.8870e+02e
7873 * conc   * f   0.0000e+00e
7874 *
7875 * side-cell arrays
7876 * dx     *     3.0479e+00e
7877 * vol    *     3.0000e-01e
7878 * fa     * f   9.8430e-02e
7879 * kfac   * f   3.0000e-01e
7880 * rkfac  * f   3.0000e-01e
7881 * grav   * f   0.0000e+00e
7882 * hd     * f   3.5400e-01e
7883 * icflg  * f            0e
7884 * nff    * f            1e
7885 * alp    *     0.0000e+00e
7886 * vl     * f   0.0000e+00e
7887 * vv     * f   0.0000e+00e
7888 * tl     *     4.8870e+02e
7889 * tv     *     4.8870e+02e
7890 * p      *     5.4158e+06e
7891 * pa     *     0.0000e+00e
7892 * qppp   * f   0.0000e+00e
7893 * matid  * f            9e
7894 * tw     * f   4.8870e+02e
7895 * conc   *     0.0000e+00e
7896 *
7897 ************************************************************************
7898 *******   type          num           id        ctitle
7899 valve                   354          354 $354$ mfwcv-3 regulating valve
7900 *       ncells        nodes         jun1         jun2         epsw
7901             2            5          354          358   0.0000e+00
7902 *         ichf        iconc         ivty         ivps         nvtb2
7903             1            1            3            2             0
7904 *         ivtr         ivsv        nvtb1         nvsv         nvrf
7905             1        -3014            0            0             0
7906 *       iqp3tr       iqp3sv       nqp3tb       nqp3sv       nqp3rf
7907             0            0            0            0             0
7908 *       ivtrov       ivtyov
7909          422            0
7910 *         rvmx         rvov       fminov       fmaxov
7911   2.0000e-02   5.0000e-02   0.0000e+00   1.0000e+00
7912 *        radin           th        houtl        houtv        toutl
7913   1.7700e-01   2.6200e-02   0.0000e+00   0.0000e+00   3.0000e+02
7914 *        toutv         avlve        hvlve        favlve         xpos
7915   3.0000e+02   8.0000e-02   3.1900e-01   4.0000e-01   4.0000e-01
```

```
7916 *         qp3in         qp3off         rqp3mx         qp3scl
7917      0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
7918 *
7919 * dx     * f    1.5239e+00e
7920 * vol    * f    1.5000e-01e
7921 * fa     * f    9.8430e-02e
7922 * kfac   * f    3.0000e-01e
7923 * rkfac  * f    3.0000e-01e
7924 * grav   * f    0.0000e+00e
7925 * hd     * f    3.5400e-01e
7926 * icflg  * f            0e
7927 * nff    * f            1e
7928 * alp    * f    0.0000e+00e
7929 * vl     * f    0.0000e+00e
7930 * vv     * f    0.0000e+00e
7931 * tl     * f    4.8870e+02e
7932 * tv     * f    4.8870e+02e
7933 * p      * f    5.4158e+06e
7934 * pa     * f    0.0000e+00e
7935 * qppp   * f    0.0000e+00e
7936 * matid  * f            9e
7937 * tw     * f    4.8870e+02e
7938 * conc   * f    0.0000e+00e
7939 *
7940 ************************************************************************
7941 *******   type           num            id        ctitle
7942 fill                     369           369 $369$ sdafw fill 3
7943 *          jun1          ifty          ioff
7944              370             8             2
7945 *          iftr          ifsv          nftb          nfsv          nfrf
7946                28         -3005             2             0             0
7947 *        twtold          rfmx        concin          felv
7948      0.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00
7949 *          dxin          volin          alpin          vlin          tlin
7950      1.0000e+00     1.0000e+00     0.0000e+00     0.0000e+00     3.0000e+02
7951 *           pin          pain         flowin          vvin          tvin
7952      5.4158e+06     0.0000e+00     0.0000e+00     0.0000e+00     3.0000e+02
7953 *         flwoff          vloff          vvoff         alpoff
7954      0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
7955 *         vmscl          vvscl
7956      1.0000e+00     1.0000e+00
7957 *
7958 * vmtb   *      7.4000e-01     9.4635e+00     7.6000e-01     0.0000e+00e
7959 *
7960 ************************************************************************
7961 *******   type           num            id        ctitle
7962 tee                      370           370 $370$ mfwcv-3 discharge line
7963 *         jcell         nodes          ichf          cost          epsw
7964                1             5             1     0.0000e+00     0.0000e+00
```

```
7965 *       iconc1        ncell1          jun1          jun2          ipow1
7966              1             6           358           380              0
7967 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7968              0             0             0             0              0
7969 *       radin1           th1        hout11        houtv1        tout11
7970     1.7700e-01    2.6200e-02    0.0000e+00    0.0000e+00    3.0000e+02
7971 *       toutv1         pwin1         pwoff1        rpwmx1        pwscl1
7972     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7973 *        qpin1         qpoff1        rqpmx1        qpscl1
7974     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7975 *       iconc2        ncell2          jun3         ipow2
7976              1             1           370             0
7977 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7978              0             0             0             0              0
7979 *       radin2           th2        hout12        houtv2        tout12
7980     4.8600e-02    8.5600e-03    0.0000e+00    0.0000e+00    3.0000e+02
7981 *       toutv2         pwin2         pwoff2        rpwmx2        pwscl2
7982     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
7983 *        qpin2         qpoff2        rqpmx2        qpscl2
7984     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
7985 *
7986 * main-cell arrays
7987 * dx    * f   6.0957e+00e
7988 * vol   * f   6.0000e-01e
7989 * fa    * r02 9.8430e-02    7.3830e-02    4.9220e-02    7.3830e-02r02 9.8430e-02
7990 * fa    * e
7991 * kfac  * f   3.0000e-01e
7992 * rkfac * f   3.0000e-01e
7993 * grav  *     0.0000e+00    1.0000e+00r05 0.0000e+00e
7994 * hd    * f   3.5400e-01e
7995 * icflg * f             0e
7996 * nff   * f             1e
7997 * alp   * f   0.0000e+00e
7998 * vl    * f   0.0000e+00e
7999 * vv    * f   0.0000e+00e
8000 * tl    * f   4.8870e+02e
8001 * tv    * f   4.8870e+02e
8002 * p     * f   5.4158e+06e
8003 * pa    * f   0.0000e+00e
8004 * qppp  * f   0.0000e+00e
8005 * matid * f             9e
8006 * tw    * f   4.8870e+02e
8007 * conc  * f   0.0000e+00e
8008 *
8009 * side-cell arrays
8010 * dx    *     1.5240e+00e
8011 * vol   *     1.1300e-02e
8012 * fa    * f   7.4200e-03e
8013 * kfac  * f   3.0000e-01e
8014 * rkfac * f   3.0000e-01e
```

```
8015 * grav   * f   0.0000e+00e
8016 * hd     * f   9.7200e-02e
8017 * icflg * f            0e
8018 * nff    * f            1e
8019 * alp    *     0.0000e+00e
8020 * vl     * f   0.0000e+00e
8021 * vv     * f   0.0000e+00e
8022 * tl     *     4.8870e+02e
8023 * tv     *     4.8870e+02e
8024 * p      *     5.4158e+06e
8025 * pa     *     0.0000e+00e
8026 * qppp   * f   0.0000e+00e
8027 * matid * f            9e
8028 * tw     * f   4.8870e+02e
8029 * conc   *     0.0000e+00e
8030 *
8031 ************************************************************************
8032 *******   type           num            id        ctitle
8033 fill                     379           379 $379$ mdafw fill 3
8034 *         jun1          ifty          ioff
8035             379             8             2
8036 *         iftr          ifsv          nftb          nfsv          nfrf
8037               26         -3005             2             0             0
8038 *       twtold          rfmx        concin          felv
8039     0.0000e+00    2.0000e+00    0.0000e+00    0.0000e+00
8040 *         dxin          volin         alpin          vlin          tlin
8041     1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
8042 *          pin          pain         flowin          vvin          tvin
8043     5.4158e+06    0.0000e+00    0.0000e+00    0.0000e+00    3.0000e+02
8044 *        flwoff          vloff         vvoff         alpoff
8045     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8046 *         vmscl          vvscl
8047     1.0000e+00    1.0000e+00
8048 *
8049 * vmtb  *     7.4000e-01    9.4635e+00    7.6000e-01    0.0000e+00e
8050 *
8051 ************************************************************************
8052 *******   type           num            id        ctitle
8053 tee                      380           380 $380$ mfw line 3
8054 *         jcell         nodes          ichf          cost          epsw
8055               4             5             1    0.0000e+00    0.0000e+00
8056 *        iconc1        ncell1          jun1          jun2         ipow1
8057               1             6           380           385             0
8058 *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
8059               0             0             0             0             0
8060 *        radin1           th1        houtl1        houtv1        toutl1
8061     1.7700e-01    2.6200e-02    0.0000e+00    0.0000e+00    3.0000e+02
8062 *        toutv1         pwin1        pwoff1        rpwmx1        pwscl1
8063     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
```

```
8064 *        qpin1        qpoff1        rqpmx1        qpscl1
8065     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
8066 *       iconc2        ncell2          jun3         ipow2
8067              1             1           379             0
8068 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
8069              0             0             0             0             0
8070 *       radin2           th2        houtl2        houtv2        toutl2
8071     4.8600e-02    8.5600e-03    0.0000e+00    0.0000e+00    3.0000e+02
8072 *       toutv2         pwin2        pwoff2        rpwmx2        pwscl2
8073     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8074 *        qpin2        qpoff2        rqpmx2        qpscl2
8075     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
8076 *
8077 * main-cell arrays
8078 * dx     * r02 6.0957e+00    8.1886e+00    6.9186e+00r02 5.3033e+00e
8079 * vol    * r02 6.0000e-01    8.0600e-01    6.8100e-01r02 5.2200e-01e
8080 * fa     * f   9.8430e-02e
8081 * kfac   * f   3.0000e-01e
8082 * rkfac  * f   3.0000e-01e
8083 * grav   * r05 0.0000e+00r02 1.0000e+00e
8084 * hd     * f   3.5400e-01e
8085 * icflg  * f            0e
8086 * nff    * f            1e
8087 * alp    * f   0.0000e+00e
8088 * vl     * f   0.0000e+00e
8089 * vv     * f   0.0000e+00e
8090 * tl     * f   4.8870e+02e
8091 * tv     * f   4.8870e+02e
8092 * p      * f   5.4158e+06e
8093 * pa     * f   0.0000e+00e
8094 * qppp   * f   0.0000e+00e
8095 * matid  * f            9e
8096 * tw     * f   4.8870e+02e
8097 * conc   * f   0.0000e+00e
8098 *
8099 * side-cell arrays
8100 * dx     *     8.8390e+00e
8101 * vol    *     6.5560e-02e
8102 * fa     * f   7.4200e-03e
8103 * kfac   * f   3.0000e-01e
8104 * rkfac  * f   3.0000e-01e
8105 * grav   * f   0.0000e+00e
8106 * hd     * f   9.7200e-02e
8107 * icflg  * f            0e
8108 * nff    * f            1e
8109 * alp    *     0.0000e+00e
8110 * vl     * f   0.0000e+00e
8111 * vv     * f   0.0000e+00e
8112 * tl     *     4.8870e+02e
8113 * tv     *     4.8870e+02e
```

```
8114 * p      *      5.4158e+06e
8115 * pa     *      0.0000e+00e
8116 * qppp   * f    0.0000e+00e
8117 * matid  * f             9e
8118 * tw     * f    4.8870e+02e
8119 * conc   *      0.0000e+00e
8120 *
8121 ************************************************************************
8122 *******   type           num            id        ctitle
8123 tee                      390           390 $390$ steam-gen downcomer 3
8124 *         jcell         nodes          ichf          cost          epsw
8125               3             0             1    0.0000e+00    0.0000e+00
8126 *        iconc1        ncell1          jun1          jun2          ipow1
8127               1            12           390           300              0
8128 *        radin1           th1        houtl1        houtv1        toutl1
8129     1.0920e-01    3.8040e-02    0.0000e+00    0.0000e+00    3.0000e+02
8130 *        toutv1          pwin1         pwoff1         rpwmx1         pwscl1
8131     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8132 *        iconc2        ncell2          jun3          ipow2
8133               1             1           385              0
8134 *        radin2           th2        houtl2        houtv2        toutl2
8135     1.7700e-01    2.6200e-02    0.0000e+00    0.0000e+00    3.0000e+02
8136 *        toutv2          pwin2         pwoff2         rpwmx2         pwscl2
8137     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8138 *
8139 * main-cell arrays (downcomer annulus)
8140 * dx     *      1.0910e+00r03 3.8900e-01    1.2440e+00r07 1.3320e+00e
8141 * vol    *      9.7890e+00r03 3.2630e+00    7.5320e+00    2.7290e+00    8.0750e-01
8142 * vol    * r05 7.0000e-01e
8143 * fa     *      8.5590e+00    8.6600e+00r02 8.3882e+00    8.6600e+00    3.3610e+00
8144 * fa     *      1.2350e+00r05 5.2120e-01    2.8456e+00e
8145 * kfac   * r04 0.0000e+00    1.0000e-01r02 3.0000e-01r05 0.0000e+00    2.1500e+02
8146 * kfac   * e
8147 * rkfac  * r04 0.0000e+00    2.0000e-01r02 6.0000e-01r05 0.0000e+00    1.0000e+03
8148 * rkfac  * e
8149 * grav   * r12-1.0000e+00    0.0000e+00e
8150 * hd     *      1.2070e+00r04 1.3750e+00    6.0000e-01    2.5280e-01r05 1.0912e-01
8151 * hd     *      9.1200e-03e
8152 * icflg  * f             0e
8153 * nff    * f             1e
8154 * alp    * r04 1.0000e+00    7.2195e-01r07 0.0000e+00e
8155 * vl     * f    0.0000e+00e
8156 * vv     * f    0.0000e+00e
8157 * tl     * f    4.9330e+02e
8158 * tv     * f    4.9330e+02e
8159 * p      * f    5.4158e+06e
8160 * pa     * f    0.0000e+00e
8161 * conc   * f    0.0000e+00e
8162 *
```

```
8163 * side-cell arrays (feedwater inlet)
8164 * dx     *      1.4569e+00e
8165 * vol    *      1.4340e-01e
8166 * fa     * f    9.8430e-02e
8167 * kfac   *      5.0000e-01    3.0000e-01e
8168 * rkfac  *      1.0000e+00    3.0000e-01e
8169 * grav   *      0.0000e+00   -1.0000e+00e
8170 * hd     * f    3.5400e-01e
8171 * icflg  * f             0e
8172 * nff    * f             1e
8173 * alp    *      0.0000e+00e
8174 * vl     * f    0.0000e+00e
8175 * vv     * f    0.0000e+00e
8176 * tl     *      4.8870e+02e
8177 * tv     *      4.8870e+02e
8178 * p      *      5.4158e+06e
8179 * pa     *      0.0000e+00e
8180 * conc   *      0.0000e+00e
8181 *
8182 ************************************************************************
8183 *******   type            num             id        ctitle
8184 tee                       400            400 $400$ steam-line header inlet
8185 *         jcell           nodes          ichf          cost          epsw
8186                3               1             1    0.0000e+00    0.0000e+00
8187 *         iconc1          ncell1          jun1          jun2          ipow1
8188                1               3           122           410              0
8189 *         iqptr1          iqpsv1        nqptb1        nqpsv1        nqprf1
8190                0               0             0             0              0
8191 *         radin1             th1        houtl1        houtv1        toutl1
8192      8.4445e-01    7.0000e-02    0.0000e+00    0.0000e+00    3.0000e+02
8193 *         toutv1           pwin1         pwoff1        rpwmx1        pwscl1
8194      3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8195 *          qpin1          qpoff1        rqpmx1        qpscl1
8196      0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
8197 *         iconc2          ncell2          jun3          ipow2
8198                1               1           222              0
8199 *         iqptr2          iqpsv2        nqptb2        nqpsv2        nqprf2
8200                0               0             0             0              0
8201 *         radin2             th2        houtl2        houtv2        toutl2
8202      3.0493e-01    2.5270e-02    0.0000e+00    0.0000e+00    3.0000e+02
8203 *         toutv2           pwin2         pwoff2        rpwmx2        pwscl2
8204      3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8205 *          qpin2          qpoff2        rqpmx2        qpscl2
8206      0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
8207 *
8208 * main-cell arrays (main steam line 1 inlet to header)
8209 * dx     * f    9.1440e-01e
8210 * vol    *      1.0242e+00r02 2.0485e+00e
8211 * fa     *      2.9210e-01r03 2.2403e+00e
8212 * kfac   * r02  2.0000e-02r02 0.0000e+00e
```

```
8213 * rkfac * r02 2.0000e-02r02 0.0000e+00
8214 * grav  * f   0.0000e+00
8215 * hd    *     6.0985e-01r03 1.6889e+00
8216 * icflg * f           0e
8217 * nff   * f           1e
8218 * alp   * f   1.0000e+00
8219 * vl    * f   0.0000e+00
8220 * vv    * f   0.0000e+00
8221 * tl    * f   5.4211e+02
8222 * tv    * f   5.4212e+02
8223 * p     * f   5.4158e+06
8224 * pa    * f   0.0000e+00
8225 * qppp  * f   0.0000e+00
8226 * matid *             9e
8227 * tw    * f   5.4211e+02
8228 * conc  * f   0.0000e+00
8229 *
8230 * side-cell arrays
8231 * dx    *     9.1440e-01e
8232 * vol   *     1.0242e+00
8233 * fa    *     1.1200e+00    2.9210e-01e
8234 * kfac  * f   2.0000e-02e
8235 * rkfac * f   2.0000e-02e
8236 * grav  * f   0.0000e+00
8237 * hd    *     1.6889e+00    6.0985e-01e
8238 * icflg * f           0e
8239 * nff   * f           1e
8240 * alp   *     1.0000e+00
8241 * vl    * f   0.0000e+00
8242 * vv    * f   0.0000e+00
8243 * tl    *     5.4211e+02
8244 * tv    *     5.4212e+02
8245 * p     *     5.4158e+06
8246 * pa    *     0.0000e+00
8247 * qppp  *     0.0000e+00
8248 * matid *             9e
8249 * tw    *     5.4211e+02
8250 * conc  *     0.0000e+00
8251 *
8252 ************************************************************************
8253 *******   type          num           id        ctitle
8254 tee                     410          410 $410$ steam-line header outlet
8255 *        jcell        nodes         ichf         cost         epsw
8256              2            1            1    0.0000e+00    0.0000e+00
8257 *       iconc1       ncell1         jun1         jun2         ipow1
8258              1            3          322          420             0
8259 *       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
8260              0            0            0            0            0
8261 *       radin1         th1       houtl1       houtv1       toutl1
8262    3.0493e-01   2.5270e-02   0.0000e+00   0.0000e+00   3.0000e+02
```

```
8263 *       toutv1          pwin1         pwoff1         rpwmx1         pwscl1
8264     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
8265 *        qpin1         qpoff1         rqpmx1         qpscl1
8266     0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
8267 *       iconc2         ncell2           jun3          ipow2
8268             1              1            410              0
8269 *       iqptr2         iqpsv2         nqptb2         nqpsv2         nqprf2
8270             0              0              0              0              0
8271 *       radin2           th2         houtl2         houtv2         toutl2
8272     8.4445e-01     7.0000e-02     0.0000e+00     0.0000e+00     3.0000e+02
8273 *       toutv2          pwin2         pwoff2         rpwmx2         pwscl2
8274     3.0000e+02     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
8275 *        qpin2         qpoff2         rqpmx2         qpscl2
8276     0.0000e+00     0.0000e+00     0.0000e+00     1.0000e+00
8277 *
8278 * main-cell arrays (msl 3 inlet to header and header outlet)
8279 * dx     * f   6.0960e-01e
8280 * vol    * f   6.8283e-01e
8281 * fa     *     2.9210e-01r02 1.1201e+00    8.8491e-01e
8282 * kfac   *     2.0000e-02r03 0.0000e+00e
8283 * rkfac  *     2.0000e-02r03 0.0000e+00e
8284 * grav   * f   0.0000e+00e
8285 * hd     *     6.0985e-01r02 6.8021e-01    7.5057e-01e
8286 * icflg  * f           0e
8287 * nff    * f           1e
8288 * alp    * f   1.0000e+00e
8289 * vl     * f   0.0000e+00e
8290 * vv     * f   0.0000e+00e
8291 * tl     * f   5.4211e+02e
8292 * tv     * f   5.4212e+02e
8293 * p      * f   5.4158e+06e
8294 * pa     * f   0.0000e+00e
8295 * qppp   * f   0.0000e+00e
8296 * matid  *           9e
8297 * tw     * f   5.4211e+02e
8298 * conc   * f   0.0000e+00e
8299 *
8300 * side-cell arrays (msl 1 and 2 inlet to header)
8301 * dx     *     9.1440e-01e
8302 * vol    *     2.0485e+00e
8303 * fa     * f   2.2403e+00e
8304 * kfac   *     1.0000e-10    0.0000e+00e
8305 * rkfac  *     1.0000e-10    0.0000e+00e
8306 * grav   * f   0.0000e+00e
8307 * hd     * f   1.6889e+00e
8308 * icflg  * f           0e
8309 * nff    * f           1e
8310 * alp    *     1.0000e+00e
8311 * vl     * f   0.0000e+00e
8312 * vv     * f   0.0000e+00e
```

```
8313 * tl     *      5.4211e+02e
8314 * tv     *      5.4212e+02e
8315 * p      *      5.4158e+06e
8316 * pa     *      0.0000e+00e
8317 * qppp   *      0.0000e+00e
8318 * matid  *               9e
8319 * tw     *      5.4211e+02e
8320 * conc   *      0.0000e+00e
8321 *
8322 ************************************************************************
8323 *******   type           num            id        ctitle
8324 tee                      420           420 $420$ turbine/steam-dump line
8325 *         jcell        nodes          ichf          cost          epsw
8326               4            1             1    0.0000e+00    0.0000e+00
8327 *        iconc1       ncell1          jun1          jun2          ipow1
8328               1            8           420           422              0
8329 *        iqptr1       iqpsv1        nqptb1        nqpsv1        nqprf1
8330               0            0             0             0              0
8331 *        radin1          th1        houtl1        houtv1        toutl1
8332     3.7529e-01   3.1110e-02    0.0000e+00    0.0000e+00    3.0000e+02
8333 *        toutv1         pwin1        pwoff1        rpwmx1        pwscl1
8334     3.0000e+02   0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8335 *         qpin1        qpoff1        rqpmx1        qpscl1
8336     0.0000e+00   0.0000e+00    0.0000e+00    1.0000e+00
8337 *        iconc2       ncell2          jun3          ipow2
8338               1            6           430              0
8339 *        iqptr2       iqpsv2        nqptb2        nqpsv2        nqprf2
8340               0            0             0             0              0
8341 *        radin2          th2        houtl2        houtv2        toutl2
8342     1.8654e-01   1.6660e-02    0.0000e+00    0.0000e+00    3.0000e+02
8343 *        toutv2         pwin2        pwoff2        rpwmx2        pwscl2
8344     3.0000e+02   0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8345 *         qpin2        qpoff2        rqpmx2        qpscl2
8346     0.0000e+00   0.0000e+00    0.0000e+00    1.0000e+00
8347 *
8348 * main-cell arrays (combined 2 32-inch turbine steam lines
8349 * dx     * f    4.7833e+00e
8350 * vol    * f    4.2328e+00e
8351 * fa     * f    8.8491e-01e
8352 * kfac   * f    0.0000e+00e
8353 * rkfac  * f    0.0000e+00e
8354 * grav   * f    0.0000e+00e
8355 * hd     * f    7.5057e-01e
8356 * icflg  * f             0e
8357 * nff    * f             1e
8358 * alp    * f    1.0000e+00e
8359 * vl     * f    0.0000e+00e
8360 * vv     * f    0.0000e+00e
8361 * tl     * f    5.4211e+02e
8362 * tv     * f    5.4212e+02e
```

```
8363 * p      * f   5.4158e+06e
8364 * pa     * f   0.0000e+00e
8365 * qppp   * f   0.0000e+00e
8366 * matid *              9e
8367 * tw     * f   5.4211e+02e
8368 * conc   * f   0.0000e+00e
8369 *
8370 * side-cell arrays (combined 2 16-inch + 1 12-inch steam-dump lines)
8371 * dx     * f   4.8248e+00e
8372 * vol    * f   1.3858e+00e
8373 * fa     * f   2.8722e-01e
8374 * kfac   *     1.0000e-10r06 0.0000e+00e
8375 * rkfac  *     1.0000e-10r06 0.0000e+00e
8376 * grav   * f   0.0000e+00e
8377 * hd     * f   3.7308e-01e
8378 * icflg  * f            0e
8379 * nff    * f            1e
8380 * alp    * f   1.0000e+00e
8381 * vl     * f   0.0000e+00e
8382 * vv     * f   0.0000e+00e
8383 * tl     * f   5.4211e+02e
8384 * tv     * f   5.4212e+02e
8385 * p      * f   5.4158e+06e
8386 * pa     * f   0.0000e+00e
8387 * qppp   * f   0.0000e+00e
8388 * matid *              9e
8389 * tw     * f   5.4211e+02e
8390 * conc   * f   0.0000e+00e
8391 *
8392 ************************************************************************
8393 *******   type          num          id        ctitle
8394 valve                   422         422 $422$ turbine stop valve
8395 *       ncells        nodes        jun1        jun2        epsw
8396             1            1         422         424  0.0000e+00
8397 *         ichf        iconc        ivty        ivps       nvtb2
8398             1            1           3           2           0
8399 *         ivtr         ivsv       nvtb1        nvsv        nvrf
8400            18            1          -2           0           0
8401 *       iqp3tr       iqp3sv      nqp3tb      nqp3sv      nqp3rf
8402             0            0           0           0           0
8403 *       ivtrov       ivtyov
8404             0            0
8405 *         rvmx         rvov       fminov      fmaxov
8406     4.0000e+00   0.0000e+00  0.0000e+00  1.0000e+00
8407 *         radin          th        houtl       houtv       toutl
8408     3.7529e-01   3.1110e-02  0.0000e+00  0.0000e+00  3.0000e+02
8409 *         toutv        avlve       hvlve       favlve       xpos
8410     3.0000e+02   8.8491e-01  7.5057e-01  1.0000e+00  1.0000e+00
8411 *         qp3in        qp3off      rqp3mx      qp3scl
8412     0.0000e+00   0.0000e+00  0.0000e+00  1.0000e+00
```

```
8413 *
8414 * dx     *      4.7833e+00e
8415 * vol    *      4.2328e+00e
8416 * fa     * f    8.8491e-01e
8417 * kfac   * f    0.0000e+00e
8418 * rkfac  * f    0.0000e+00e
8419 * grav   * f    0.0000e+00e
8420 * hd     * f    7.5057e-01e
8421 * icflg  * f             0e
8422 * nff    *        1     -1e
8423 * alp    *      1.0000e+00e
8424 * vl     * f    0.0000e+00e
8425 * vv     * f    0.0000e+00e
8426 * tl     *      5.4211e+02e
8427 * tv     *      5.4212e+02e
8428 * p      *      5.4158e+06e
8429 * pa     *      0.0000e+00e
8430 * qppp   *      0.0000e+00e
8431 * matid  *              9e
8432 * tw     *      5.4211e+02e
8433 * conc   *      0.0000e+00e
8434 * vtb1   *      0.0000e+00    1.0000e+00    2.5000e-01    0.0000e+00e
8435 *
8436 ************************************************************************
8437 *******   type           num            id        ctitle
8438 break                    424           424 $424$ turbine pressure b.c.
8439 *          jun1          ibty          isat          ioff
8440             424             0             3             1
8441 *          dxin          volin         alpin          tin           pin
8442      4.7833e+00    4.2328e+01    1.0000e+00    5.4220e+02    5.3224e+06   <-- 124
8443 *          pain         concin          rbmx         poff          belv
8444      0.0000e+00    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
8445 *
8446 ************************************************************************
8447 *******   type           num            id        ctitle
8448 tee                      430           430 $430$ steam-dump line
8449 *         jcell         nodes          ichf          cost          epsw
8450               2             1             1    0.0000e+00    0.0000e+00
8451 *        iconc1        ncell1         jun1          jun2         ipow1
8452               1             6           430           432             0
8453 *        iqptr1        iqpsv1       nqptb1        nqpsv1        nqprf1
8454               0             0            0             0             0
8455 *        radin1          th1        houtl1        houtv1        toutl1
8456      1.8654e-01    1.6660e-02    0.0000e+00    0.0000e+00    3.0000e+02
8457 *        toutv1         pwin1        pwoff1        rpwmx1        pwscl1
8458      3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8459 *         qpin1        qpoff1        rqpmx1        qpscl1
8460      0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
8461 *        iconc2        ncell2         jun3         ipow2
8462               1             1           436             0
```

```
8463 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
8464              0             0             0             0             0
8465 *       radin2           th2        hout12        houtv2        tout12
8466     1.4765e-01    1.4270e-02    0.0000e+00    0.0000e+00    3.0000e+02
8467 *       toutv2         pwin2        pwoff2        rpwmx2        pwscl2
8468     3.0000e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8469 *         qpin2         qpoff2        rqpmx2        qpscl2
8470     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
8471 *
8472 * main-cell arrays
8473 * dx    * r03 1.6083e+00r02 5.1565e+00    4.2405e+00e
8474 * vol   * r03 3.3933e-01r02 7.0633e-01    5.8086e-01e
8475 * fa    *     2.8722e-01r02 2.1099e-01r04 1.3698e-01e
8476 * kfac  * f   0.0000e+00e
8477 * rkfac * f   0.0000e+00e
8478 * grav  * f   0.0000e+00e
8479 * hd    *     3.7308e-01r06 2.9530e-01e
8480 * icflg * f             0e
8481 * nff   * f             1e
8482 * alp   * f   1.0000e+00e
8483 * vl    * f   0.0000e+00e
8484 * vv    * f   0.0000e+00e
8485 * tl    * f   5.4211e+02e
8486 * tv    * f   5.4212e+02e
8487 * p     * f   5.4158e+06e
8488 * pa    * f   0.0000e+00e
8489 * qppp  * f   0.0000e+00e
8490 * matid *               9e
8491 * tw    * f   5.4211e+02e
8492 * conc  * f   0.0000e+00e
8493 *
8494 * side-cell arrays
8495 * dx    *     4.2405e+00e
8496 * vol   *     8.7129e-01e
8497 * fa    * f   2.0547e-01e
8498 * kfac  *     1.0000e-10    0.0000e+00e
8499 * rkfac *     1.0000e-10    0.0000e+00e
8500 * grav  * f   0.0000e+00e
8501 * hd    * f   2.9530e-01e
8502 * icflg * f             0e
8503 * nff   * f             1e
8504 * alp   *     1.0000e+00e
8505 * vl    * f   0.0000e+00e
8506 * vv    * f   0.0000e+00e
8507 * tl    *     5.4211e+02e
8508 * tv    *     5.4212e+02e
8509 * p     *     5.4158e+06e
8510 * pa    *     0.0000e+00e
8511 * qppp  *     0.0000e+00e
8512 * matid *               9e
```

```
8513 * tw    *     5.4211e+02e
8514 * conc  *     0.0000e+00e
8515 *
8516 ***************************************************************************
8517 *******   type            num             id        ctitle
8518 valve                     432            432 $432$ steam-dump valve a (bank
8519 *       ncells          nodes           jun1          jun2          epsw
8520              1              1            432           434    0.0000e+00
8521 *         ichf          iconc           ivty          ivps          nvtb2
8522              1              1              1             2              0
8523 *         ivtr           ivsv          nvtb1          nvsv          nvrf
8524              0          -4342              0             0              0
8525 *       iqp3tr         iqp3sv         nqp3tb        nqp3sv        nqp3rf
8526              0              0              0             0              0
8527 *       ivtrov         ivtyov
8528              0              0
8529 *         rvmx           rvov         fminov        fmaxov
8530    3.3330e-01    0.0000e+00    0.0000e+00    1.0000e+00
8531 *        radin             th          houtl         houtv         toutl
8532    1.4765e-01    1.4270e-02    0.0000e+00    0.0000e+00    3.0000e+02
8533 *        toutv          avlve          hvlve         favlve          xpos
8534    3.0000e+02    1.3698e-01    2.9530e-01    0.0000e+00    0.0000e+00
8535 *        qp3in         qp3off         rqp3mx         qp3scl
8536    0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
8537 *
8538 *   main-cell arrays (combined 2 12-inch lines)
8539 * dx    *     4.2405e+00e
8540 * vol   *     5.8086e-01e
8541 * fa    * f   1.3698e-01e
8542 * kfac  * f   0.0000e+00e
8543 * rkfac * f   0.0000e+00e
8544 * grav  * f   0.0000e+00e
8545 * hd    * f   2.9530e-01e
8546 * icflg * f            0e
8547 * nff   * f            1e
8548 * alp   *     1.0000e+00e
8549 * vl    * f   0.0000e+00e
8550 * vv    * f   0.0000e+00e
8551 * tl    *     5.4211e+02e
8552 * tv    *     5.4212e+02e
8553 * p     *     5.4158e+06e
8554 * pa    *     0.0000e+00e
8555 * qppp  *     0.0000e+00e
8556 * matid *             9e
8557 * tw    *     5.4211e+02e
8558 * conc  *     0.0000e+00e
8559 *
8560 ***************************************************************************
8561 *******   type            num             id        ctitle
8562 break                     434            434 $434$ condenser a boundary
```

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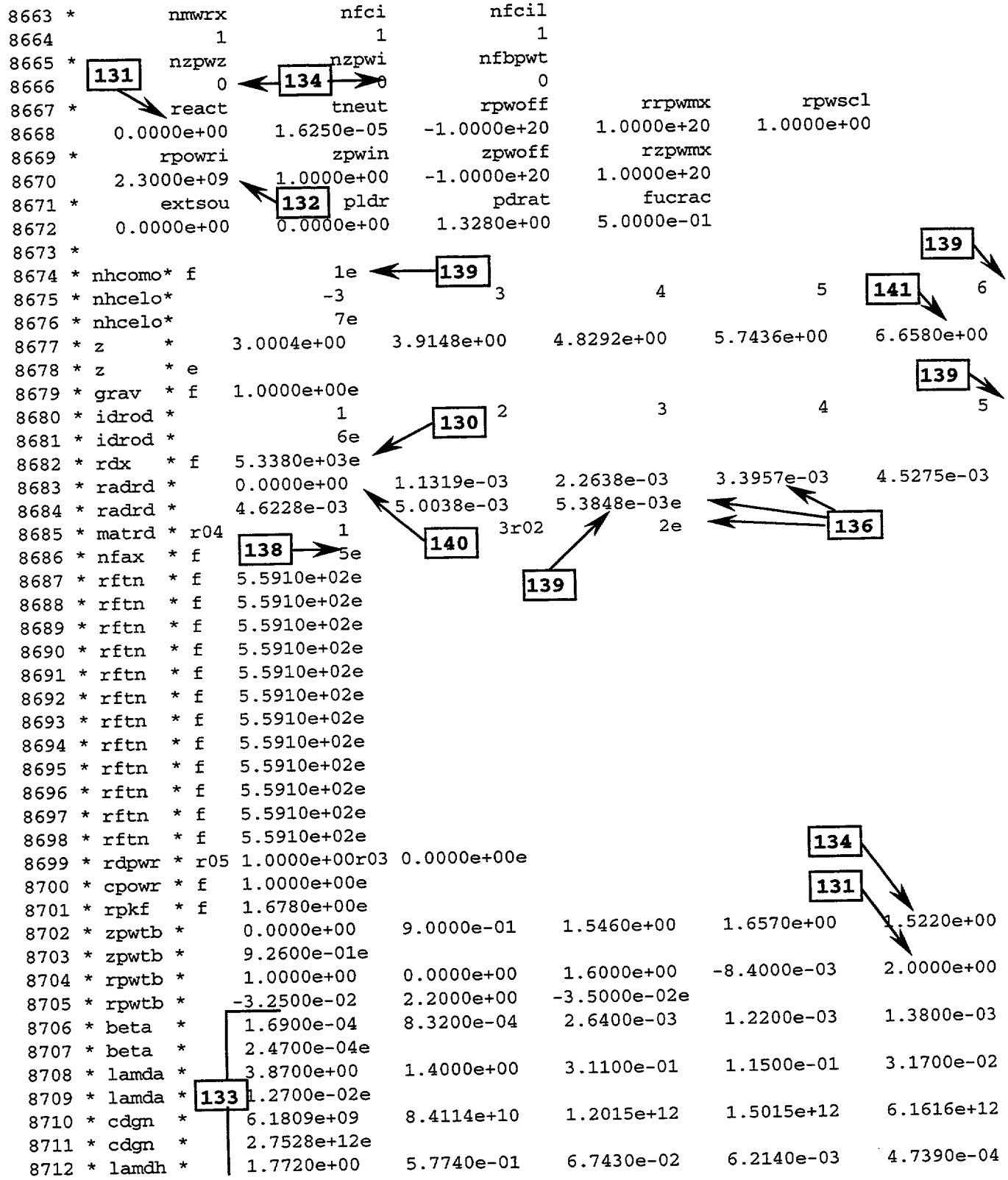
```
8563 *          jun1          ibty          isat          ioff
8564             434             0             3             1
8565 *          dxin          volin         alpin           tin           pin
8566     4.2405e+00    5.8086e-01    1.0000e+00    3.1106e+02    6.7731e+03
8567 *          pain         concin          rbmx          poff          belv
8568     0.0000e+00    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
8569 *
8570 ********************************************************************************
8571 *******    type           num            id         ctitle
8572 valve                     436           436 $436$ steam-dump valve b (bank
8573 *         ncells         nodes          jun1          jun2          epsw
8574               1             1           436           438    0.0000e+00
8575 *          ichf         iconc          ivty          ivps          nvtb2
8576               1             1             1             2             0
8577 *          ivtr          ivsv         nvtb1          nvsv          nvrf
8578               0         -4340             0             0             0
8579 *        iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
8580               0             0             0             0             0
8581 *        ivtrov        ivtyov
8582               0             0
8583 *          rvmx          rvov         fminov         fmaxov
8584     3.3330e-01    0.0000e+00    0.0000e+00    1.0000e+00
8585 *          radin            th         houtl          houtv         toutl
8586     1.4765e-01    1.4270e-02    0.0000e+00    0.0000e+00    3.0000e+02
8587 *          toutv         avlve         hvlve         favlve          xpos
8588     3.0000e+02    2.0547e-01    2.9530e-01    0.0000e+00    0.0000e+00
8589 *          qp3in        qp3off        rqp3mx        qp3scl
8590     0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
8591 *
8592 *   main-cell arrays (combined 3 12-inch lines)
8593 * dx     *      4.2405e+00e
8594 * vol    *      8.7129e-01e
8595 * fa     * f    2.0547e-01e
8596 * kfac   * f    0.0000e+00e
8597 * rkfac  * f    0.0000e+00e
8598 * grav   * f    0.0000e+00e
8599 * hd     * f    2.9530e-01e
8600 * icflg  * f             0e
8601 * nff    * f             1e
8602 * alp    *      1.0000e+00e
8603 * vl     * f    0.0000e+00e
8604 * vv     * f    0.0000e+00e
8605 * tl     *      5.4211e+02e
8606 * tv     *      5.4212e+02e
8607 * p      *      5.4158e+06e
8608 * pa     *      0.0000e+00e
8609 * qppp   *      0.0000e+00e
8610 * matid  *             9e
8611 * tw     *      5.4211e+02e
8612 * conc   *      0.0000e+00e
```

```
8613 *
8614 ***********************************************************************
8615 *******   type            num             id        ctitle
8616 break                     438            438 $438$ condenser b boundary
8617 *          jun1          ibty           isat          ioff
8618             438             0              3             1
8619 *          dxin          volin         alpin           tin           pin
8620     4.2405e+00    8.7129e-01    1.0000e+00    3.1106e+02    6.7731e+03
8621 *          pain         concin          rbmx         poff          belv
8622     0.0000e+00    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
8623 *
8624 ***********************************************************************
8625 *******   type            num             id        ctitle
8626 break                     576            576 $576$ mfw-1 pressure boundary
8627 *          jun1          ibty           isat          ioff
8628             150             0              0             0
8629 *          dxin          volin         alpin           tin           pin
8630     1.0000e+00    1.0000e+00    0.0000e+00    4.8870e+02    7.0000e+06
8631 *          pain         concin          rbmx         poff          belv
8632     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8633 *
8634 ***********************************************************************
8635 *******   type            num             id        ctitle
8636 break                     578            578 $578$ mfw-2 pressure boundary
8637 *          jun1          ibty           isat          ioff
8638             350             0              0             0
8639 *          dxin          volin         alpin           tin           pin
8640     1.0000e+00    1.0000e+00    0.0000e+00    4.8870e+02    7.0000e+06
8641 *          pain         concin          rbmx         poff          belv
8642     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
8643 *
8644 ***********************************************************************
8645 *******   type            num             id        ctitle
8646 rod                       900            900 $900$ reactor-core fuel rods
8647 *          ncrx          ncrz          ittc          iext           mld
8648             6             4             0             0             0
8649 *        nopowr         nridr         modez        liqlev        iaxcnd
8650             0             0             0             1             1
8651 *         idbci         idbco          hdri          hdro
8652             0             2    0.0000e+00    0.0000e+00
8653 *         nrods         nodes         irftr          zmax        irftr2
8654            12             8          9997           200            98
8655 *     dtxht(1)      dtxht(2)         dznht         gapo          shelv
8656     3.0000e+00    1.0000e+01    5.0000e-03    1.7000e+04    0.0000e+00
8657 *        irpwty         ndgx          ndhx          nrts          nhist
8658             4             6            11            10             0
8659 *        irpwtr        irpwsv        nrpwtb        nrpwsv        nrpwrf
8660            10             1            -4             0             0
8661 *        izpwtr        izpwsv        nzpwtb        nzpwsv        nzpwrf
8662             0             1             1             0             0
```


8663 * nmwrx nfci nfcil
8664 1 1 1
8665 * nzpwz nzpwi nfbpwt
8666 0 0 0
8667 * react tneut rpwoff rrpwmx rpwscl
8668 0.0000e+00 1.6250e-05 -1.0000e+20 1.0000e+20 1.0000e+00
8669 * rpowri zpwin zpwoff rzpwmx
8670 2.3000e+09 1.0000e+00 -1.0000e+20 1.0000e+20
8671 * extsou pldr pdrat fucrac
8672 0.0000e+00 0.0000e+00 1.3280e+00 5.0000e-01
8673 *
8674 * nhcomo* f 1e
8675 * nhcelo* -3 3 4 5 6
8676 * nhcelo* 7e
8677 * z * 3.0004e+00 3.9148e+00 4.8292e+00 5.7436e+00 6.6580e+00
8678 * z * e
8679 * grav * f 1.0000e+00e
8680 * idrod * 1 2 3 4 5
8681 * idrod * 6e
8682 * rdx * f 5.3380e+03e
8683 * radrd * 0.0000e+00 1.1319e-03 2.2638e-03 3.3957e-03 4.5275e-03
8684 * radrd * 4.6228e-03 5.0038e-03 5.3848e-03e
8685 * matrd * r04 1 3r02 2e
8686 * nfax * f 5e
8687 * rftn * f 5.5910e+02e
8688 * rftn * f 5.5910e+02e
8689 * rftn * f 5.5910e+02e
8690 * rftn * f 5.5910e+02e
8691 * rftn * f 5.5910e+02e
8692 * rftn * f 5.5910e+02e
8693 * rftn * f 5.5910e+02e
8694 * rftn * f 5.5910e+02e
8695 * rftn * f 5.5910e+02e
8696 * rftn * f 5.5910e+02e
8697 * rftn * f 5.5910e+02e
8698 * rftn * f 5.5910e+02e
8699 * rdpwr * r05 1.0000e+00r03 0.0000e+00e
8700 * cpowr * f 1.0000e+00e
8701 * rpkf * f 1.6780e+00e
8702 * zpwtb * 0.0000e+00 9.0000e-01 1.5460e+00 1.6570e+00 1.5220e+00
8703 * zpwtb * 9.2600e-01e
8704 * rpwtb * 1.0000e+00 0.0000e+00 1.6000e+00 -8.4000e-03 2.0000e+00
8705 * rpwtb * -3.2500e-02 2.2000e+00 -3.5000e-02e
8706 * beta * 1.6900e-04 8.3200e-04 2.6400e-03 1.2200e-03 1.3800e-03
8707 * beta * 2.4700e-04e
8708 * lamda * 3.8700e+00 1.4000e+00 3.1100e-01 1.1500e-01 3.1700e-02
8709 * lamda * 1.2700e-02e
8710 * cdgn * 6.1809e+09 8.4114e+10 1.2015e+12 1.5015e+12 6.1616e+12
8711 * cdgn * 2.7528e+12e
8712 * lamdh * 1.7720e+00 5.7740e-01 6.7430e-02 6.2140e-03 4.7390e-04
131
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133

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8713 * lamdh *     4.8100e-05    5.3440e-06    5.7260e-07    1.0360e-07    2.9590e-08
8714 * lamdh *     7.5850e-10e
8715 * edh   *     2.9900e-03    8.2500e-03    1.5500e-02    1.9350e-02    1.1650e-02
8716 * edh   * 133 6.4500e-03    2.3100e-03    1.6400e-03    8.5000e-04    4.3000e-04
8717 * edh   *     5.7000e-04e
8718 * cdhn  *     3.8809e+06    3.2863e+07    5.2870e+08    7.1621e+09    5.6541e+10
8719 * cdhn  *     3.0842e+11    9.9420e+11    6.5875e+12    1.8871e+13    3.3423e+13
8720 * cdhn  *     1.7284e+15e
8721 * fpuo2 * f   0.0000e+00e
8722 * ftd   * f   9.4000e-01e
8723 * gmix  *     1.0000e+00r06 0.0000e+00    1.0000e+00r06 0.0000e+00    1.0000e+00
8724 * gmix  * r06 0.0000e+00    1.0000e+00r06 0.0000e+00    1.0000e+00r06 0.0000e+00
8725 * gmix  *     1.0000e+00r06 0.0000e+00e
8726 * gmles * f   0.0000e+00e
8727 * pgapt * f   1.0000e+07e
8728 * plvol * f   0.0000e+00e
8729 * pslen * f   0.0000e+00e
8730 * clenn * f   0.0000e+00e
8731 * burn  * f   1.0127e+04e
8732 * burn  * f   1.0127e+04e
8733 * burn  * f   1.0127e+04e
8734 * burn  * f   1.0127e+04e
8735 * burn  * f   1.0127e+04e
8736 * burn  * f   1.0127e+04e
8737 * burn  * f   1.0127e+04e
8738 * burn  * f   1.0127e+04e
8739 * burn  * f   1.0127e+04e
8740 * burn  * f   1.0127e+04e
8741 * burn  * f   1.0127e+04e
8742 * burn  * f   1.0127e+04e
8743 *
8744 ************************************************************************
8745 *******   type            num             id        ctitle
8746 slab                      901            901 $901$ level 1, rings 1-2   <-- 142
8747 *          ncrx          ncrz           ittc          iext           m1d
8748               12 <-143       1              0             0             0
8749 *        nopowr         nridr         modez        liqlev        iaxcnd
8750                1 <-142       1              1             0             0
8751 *         idbci         idbco          hdri          hdro
8752                0 <-143       2    0.0000e+00    0.0000e+00
8753 *         width         ipatch
8754     1.3930e+01              0
8755 *         nrods         nodes         irftr         nzmax        irftr2
8756               12             5             0             5             0
8757 *      dtxht(1)      dtxht(2)        dznht         hgapo         shelv
8758     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
8759 *
8760 * nhcomo* f            1e
8761 * nhcelo*             -1              1             2e  <-- 143
8762 * dz    *     1.7526e+00e
```

```
8763 * grav  *     1.0000e+00e
8764 * idrod *              1              2              3              4              5
8765 * idrod *              6              7              8              9             10
8766 * idrod *             11             12e
8767 * rdx   * r06 9.5133e-02r06 7.1534e-02e
8768 * radrd *     0.0000e+00    9.2910e-02    1.8582e-01    2.7873e-01    3.6916e-01
8769 * radrd * e
8770 * matrd * f             9e
8771 * nfax  *              1e
8772 * rftn  * f   5.5910e+02e
8773 * rftn  * f   5.5910e+02e
8774 * rftn  * f   5.5910e+02e
8775 * rftn  * f   5.5910e+02e
8776 * rftn  * f   5.5910e+02e
8777 * rftn  * f   5.5910e+02e
8778 * rftn  * f   5.5910e+02e
8779 * rftn  * f   5.5910e+02e
8780 * rftn  * f   5.5910e+02e
8781 * rftn  * f   5.5910e+02e
8782 * rftn  * f   5.5910e+02e
8783 * rftn  * f   5.5910e+02e
8784 *
8785 ************************************************************************
8786 *******   type           num            id        ctitle
8787 slab                   902           902 $902$ level 2, ring 1
8788 *          ncrx          ncrz          ittc          iext           mld
8789                6             1             0             0             0
8790 *        nopowr         nridr         modez        liqlev        iaxcnd
8791                1             1             1             0             0
8792 *         idbci         idbco          hdri          hdro
8793                0             2    0.0000e+00    0.0000e+00
8794 *         width        ipatch
8795     2.4818e+00             0
8796 *         nrods         nodes         irftr         nzmax        irftr2
8797                6             5             0             5             0
8798 *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
8799     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
8800 *
8801 * nhcomo* f             1e
8802 * nhcelo*              -2             2             3e
8803 * dz    *     1.2478e+00e
8804 * grav  *     1.0000e+00e
8805 * idrod *              1              2              3              4              5
8806 * idrod *             6e
8807 * rdx   * f   1.0000e+00e
8808 * radrd *     0.0000e+00    2.9643e-02    5.9285e-02    8.8928e-02    1.1857e-01
8809 * radrd * e
8810 * matrd * f             6e
8811 * nfax  *              1e
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8812 * rftn  * f   5.5910e+02e
8813 * rftn  * f   5.5910e+02e
8814 * rftn  * f   5.5910e+02e
8815 * rftn  * f   5.5910e+02e
8816 * rftn  * f   5.5910e+02e
8817 * rftn  * f   5.5910e+02e
8818 *
8819 ************************************************************************
8820 *******   type           num            id        ctitle
8821 slab                     903           903 $903$ levels 2-7, ring 2
8822 *         ncrx          ncrz          ittc          iext           mld
8823               6             6             0             0             0
8824 *       nopowr         nridr         modez        liqlev        iaxcnd
8825               1             1             1             0             1
8826 *        idbci         idbco          hdri          hdro
8827               0             2   0.0000e+00    0.0000e+00
8828 *        width        ipatch
8829     3.1576e+00             0
8830 *        nrods         nodes         irftr         nzmax        irftr2
8831               6             5             0            13             0
8832 *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
8833     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
8834 *
8835 * nhcomo* f            1e
8836 * nhcelo*             -2             2             3             4             5
8837 * nhcelo*              6             7            8e
8838 * dz    *     8.1726e-01r04 9.1440e-01    6.6380e-01e
8839 * grav  *   f 1.0000e+00e
8840 * idrod *              7             8             9            10            11
8841 * idrod *             12e
8842 * rdx   * f   1.0000e+00e
8843 * radrd *     0.0000e+00    6.5570e-02    1.3114e-01    1.9671e-01    2.5260e-01
8844 * radrd * e
8845 * matrd * f            9e
8846 * nfax  * f            1e
8847 * rftn  * f   5.5910e+02e
8848 * rftn  * f   5.5910e+02e
8849 * rftn  * f   5.5910e+02e
8850 * rftn  * f   5.5910e+02e
8851 * rftn  * f   5.5910e+02e
8852 * rftn  * f   5.5910e+02e
8853 *
8854 ************************************************************************
8855 *******   type           num            id        ctitle
8856 slab                     904           904 $904$ levels 3-6, ring 1
8857 *         ncrx          ncrz          ittc          iext           mld
8858               6             4             0             0             0
8859 *       nopowr         nridr         modez        liqlev        iaxcnd
8860               1             1             1             0             0
```

```
8861 *        idbci         idbco          hdri          hdro
8862              0             2    0.0000e+00    0.0000e+00
8863 *        width        ipatch
8864     3.2240e+00             0
8865 *        nrods         nodes         irftr         nzmax        irftr2
8866              6             5             0            20             0
8867 *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
8868     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
8869 *
8870 * nhcomo* f            1e
8871 * nhcelo*            -3             3             4             5             6
8872 * nhcelo*             7e
8873 * dz    * f   9.1440e-01e
8874 * grav  * f   1.0000e+00e
8875 * idrod *             1             2             3             4             5
8876 * idrod *             6e
8877 * rdx   * f   1.0000e+00e
8878 * radrd *     0.0000e+00    7.6200e-03    1.5240e-02    2.2860e-02    3.0480e-02
8879 * radrd * e
8880 * matrd * f            6e
8881 * nfax  * f            1e
8882 * rftn  * f   5.5910e+02e
8883 * rftn  * f   5.5910e+02e
8884 * rftn  * f   5.5910e+02e
8885 * rftn  * f   5.5910e+02e
8886 * rftn  * f   5.5910e+02e
8887 * rftn  * f   5.5910e+02e
8888 *
8889 ************************************************************************
8890 *******   type          num           id        ctitle
8891 slab                  905          905 $905$ levels 7-11, ring 1
8892 *         ncrx         ncrz         ittc         iext          m1d
8893              6            5            0            0            0
8894 *       nopowr        nridr       modez       liqlev       iaxcnd
8895              1            1            1            0            1
8896 *        idbci         idbco         hdri         hdro
8897              0             2    0.0000e+00    0.0000e+00
8898 *        width        ipatch
8899     7.3000e+00             0
8900 *        nrods         nodes         irftr         nzmax        irftr2
8901              6             5             0            11             0
8902 *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
8903     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
8904 *
8905 * nhcomo* f            1e
8906 * nhcelo*            -7             7             8             9            10
8907 * nhcelo*            11           11e
8908 * dz    *     1.16022e00    8.5685e-01    8.3227e-01    8.3225e-01    2.5928e-01
8909 * dz    * e
8910 * grav  *   f 1.0000e+00e
```

```
8911 * idrod *              1             2             3             4             5
8912 * idrod *             6e
8913 * rdx   * f   1.0000e+00e
8914 * radrd *     0.0000e+00    7.6200e-03    1.5240e-02    2.2860e-02    3.0480e-02
8915 * radrd * e
8916 * matrd * f             6e
8917 * nfax  * f             1e
8918 * rftn  * f   5.5910e+02e
8919 * rftn  * f   5.5910e+02e
8920 * rftn  * f   5.5910e+02e
8921 * rftn  * f   5.5910e+02e
8922 * rftn  * f   5.5910e+02e
8923 * rftn  * f   5.5910e+02e
8924 *
8925 ************************************************************************
8926 *******   type           num            id        ctitle
8927 slab                    906           906 $906$ level 8, ring 2
8928 *         ncrx          ncrz          ittc          iext           m1d
8929               6             1             0             0             0
8930 *       nopowr         nridr         modez        liqlev        iaxcnd
8931               1             1             1             0             0
8932 *        idbci         idbco          hdri          hdro
8933               0             2    0.0000e+00    0.0000e+00
8934 *       width        ipatch
8935    1.46517e01             0
8936 *        nrods         nodes         irftr         nzmax        irftr2
8937               6             5             0             5             0
8938 *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
8939    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
8940 *
8941 * nhcomo* f             1e
8942 * nhcelo*              -8             8             9e
8943 * dz    *     8.5725e-01e
8944 * grav  *     1.0000e+00e
8945 * idrod *              7             8             9            10            11
8946 * idrod *             12e
8947 * rdx   *     1.4320e-01    1.9013e-01    1.4320e-01    1.9013e-01    1.4320e-01
8948 * rdx   *     1.9013e-01e
8949 * radrd *     0.0000e+00    7.6200e-02    1.5240e-01    2.2860e-01    3.0480e-01
8950 * radrd * e
8951 * matrd * f             9e
8952 * nfax  *              1e
8953 * rftn  * f   5.5910e+02e
8954 * rftn  * f   5.5910e+02e
8955 * rftn  * f   5.5910e+02e
8956 * rftn  * f   5.5910e+02e
8957 * rftn  * f   5.5910e+02e
8958 * rftn  * f   5.5910e+02e
8959 *
8960 ************************************************************************
```

```
8961 *******   type           num            id        ctitle
8962 slab                     907           907 $907$ level 9, ring 2
8963 *          ncrx          ncrz          ittc          iext          m1d
8964               6             1             0             0            0
8965 *        nopowr          nridr         modez        liqlev        iaxcnd
8966               1             1             1             0            0
8967 *         idbci         idbco          hdri          hdro
8968               0             2    0.0000e+00    0.0000e+00
8969 *         width        ipatch
8970     2.0681e+00             0
8971 *         nrods         nodes         irftr         nzmax        irftr2
8972               6             5             0             5            0
8973 *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
8974     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
8975 *
8976 * nhcomo* f            1e
8977 * nhcelo*             -9             9            10e
8978 * dz    *     8.3263e-01e
8979 * grav  *     1.0000e+00e
8980 * idrod *              7             8             9            10            11
8981 * idrod *             12e
8982 * rdx   * f   1.0000e+00e
8983 * radrd *     0.0000e+00    7.2237e-02    1.4447e-01    2.1671e-01    2.8895e-01
8984 * radrd * e
8985 * matrd * f            9e
8986 * nfax  *              1e
8987 * rftn  * f   5.5910e+02e
8988 * rftn  * f   5.5910e+02e
8989 * rftn  * f   5.5910e+02e
8990 * rftn  * f   5.5910e+02e
8991 * rftn  * f   5.5910e+02e
8992 * rftn  * f   5.5910e+02e
8993 *
8994 ************************************************************************
8995 *******   type           num            id        ctitle
8996 slab                     908           908 $908$ levels 10-11, ring 2
8997 *          ncrx          ncrz          ittc          iext          m1d
8998               6             2             0             0            0
8999 *        nopowr          nridr         modez        liqlev        iaxcnd
9000               1             1             1             0            1
9001 *         idbci         idbco          hdri          hdro
9002               0             2    0.0000e+00    0.0000e+00
9003 *         width        ipatch
9004     2.0681e+00             0
9005 *         nrods         nodes         irftr         nzmax        irftr2
9006               6             5             0             5            0
9007 *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
9008     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
9009 *
9010 * nhcomo* f            1e
```

```
9011 * nhcelo*            -10            10            11            12e
9012 * dz    *     8.3264e-01   8.0814e-01e
9013 * grav  *   f 1.0000e+00
9014 * idrod *             7             8             9            10            11
9015 * idrod *            12e
9016 * rdx   * f   1.0000e+00
9017 * radrd *     0.0000e+00    1.1255e-01    2.2509e-01    3.3764e-01    4.5019e-01
9018 * radrd * e
9019 * matrd * f           9e
9020 * nfax  * f           1e
9021 * rftn  * f   5.5910e+02
9022 * rftn  * f   5.5910e+02
9023 * rftn  * f   5.5910e+02
9024 * rftn  * f   5.5910e+02
9025 * rftn  * f   5.5910e+02
9026 * rftn  * f   5.5910e+02
9027 *
9028 ************************************************************************
9029 *******   type           num            id        ctitle
9030 slab                    909           909 $909$ level 12, ring 1
9031 *         ncrx          ncrz          ittc          iext          mld
9032               6             1             0             0             0   <-- 146
9033 *       nopowr         nridr         modez        liqlev        iaxcnd
9034               1             1             1             0             0
9035 *        idbci         idbco          hdri          hdro
9036               0             2    0.0000e+00    0.0000e+00
9037 *        width        ipatch
9038     1.8967e+00             0
9039 *        nrods         nodes         irftr         nzmax        irftr2
9040               6             5             0             5             0
9041 *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
9042     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
9043 *
9044 * nhcomo* f           1e
9045 * nhcelo*           -12           12           13e
9046 * dz    *     9.3345e-01e
9047 * grav  *     1.0000e+00e
9048 * idrod *             1             2             3             4             5
9049 * idrod *            6e
9050 * rdx   * f   1.0000e+00
9051 * radrd *     0.0000e+00    5.7857e-02    1.1571e-01    1.7357e-01    2.3143e-01
9052 * radrd * e
9053 * matrd * f           9e
9054 * nfax  *            1e
9055 * rftn  * f   5.5910e+02
9056 * rftn  * f   5.5910e+02
9057 * rftn  * f   5.5910e+02
9058 * rftn  * f   5.5910e+02
9059 * rftn  * f   5.5910e+02
9060 * rftn  * f   5.5910e+02
```

```
9061 *
9062 ***********************************************************************
9063 *******   type            num             id        ctitle
9064 rod                       910            910 $910$ st-gen-1 tube bundle
9065 *          ncrx          ncrz           ittc          iext          m1d
9066               1 <144>      14              0             0            0 <146>
9067 *        nopowr         nridr         modez        liqlev        iaxcnd
9068               1             0             1             0             1
9069 *         idbci         idbco          hdri          hdro
9070               2             2  1.9680e-02  2.2220e-02
9071 *         nrods         nodes         irftr         nzmax        irftr2
9072               1             3             0            15             0
9073 *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
9074     3.0000e+00    1.0000e+01  5.0000e-03  0.0000e+00  0.0000e+00
9075 *
9076 * nhcomi* f           12e
9077 * nhceli*             -3             3             4             5             6
9078 * nhceli*              7             8             9            10            11
9079 * nhceli*             12            13            14            15            16
9080 * nhceli*             17e
9081 * nhcomo* f          100e
9082 * nhcelo*             -1             1             2             3             4
9083 * nhcelo*              5             6             7            -7            -6
9084 * nhcelo*             -5            -4            -3            -2            -1
9085 * nhcelo*             -1e
9086 * dz     * f   1.3320e+00e
9087 * grav   * r07 1.0000e+00r07-1.0000e+00
9088 * rdx    *     3.1022e+03e
9089 * radrd *     9.8400e-03    1.0475e-02    1.1110e-02e
9090 * matrd * f           12e
9091 * nfax   * f            0e
9092 * rftn   * f   5.4211e+02e
9093 *
9094 ***********************************************************************
9095 *******   type            num             id        ctitle
9096 rod                       920            920 $920$ st-gen-2 tube bundle
9097 *          ncrx          ncrz           ittc          iext          m1d
9098               1 <144>      14              0             0            0 <146>
9099 *        nopowr         nridr         modez        liqlev        iaxcnd
9100               1             0             1             0             1
9101 *         idbci         idbco          hdri          hdro
9102               2             2  1.9680e-02  2.2220e-02
9103 *         nrods         nodes         irftr         nzmax        irftr2
9104               1             3             0            15             0
9105 *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
9106     3.0000e+00    1.0000e+01  5.0000e-03  0.0000e+00  0.0000e+00
9107 *
9108 * nhcomi* f           22e
9109 * nhceli*             -3             3             4             5             6
9110 * nhceli*              7             8             9            10            11
```

```
9111 * nhceli*             12             13             14             15             16
9112 * nhceli*             17e
9113 * nhcomo* f          200e
9114 * nhcelo*             -1              1              2              3              4
9115 * nhcelo*              5              6              7             -7             -6
9116 * nhcelo*             -5             -4             -3             -2             -1
9117 * nhcelo*             -1e
9118 * dz    * f   1.3320e+00e
9119 * grav  * r07 1.0000e+00r07-1.0000e+00e
9120 * rdx   *     3.1022e+03e
9121 * radrd *     9.8400e-03    1.0475e-02    1.1110e-02e
9122 * matrd * f           12e
9123 * nfax  * f            0e
9124 * rftn  * f   5.4211e+02e
9125 *
9126 ************************************************************************
9127 *******   type           num            id        ctitle
9128 rod                      930           930 $930$ st-gen-3 tube bundle
9129 *         ncrx           ncrz          ittc          iext           m1d
9130              1 <144>        14             0             0             0 <146>
9131 *       nopowr          nridr         modez        liqlev        iaxcnd
9132              1              0             1             0             1
9133 *        idbci          idbco          hdri          hdro
9134              2              2    1.9680e-02    2.2220e-02
9135 *        nrods          nodes         irftr         nzmax        irftr2
9136              1              3             0            15             0
9137 *     dtxht(1)       dtxht(2)        dznht         hgapo         shelv
9138     3.0000e+00     1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
9139 *
9140 * nhcomi* f           32e
9141 * nhceli*             -3              3              4              5              6
9142 * nhceli*              7              8              9             10             11
9143 * nhceli*             12             13             14             15             16
9144 * nhceli*             17e
9145 * nhcomo* f          300e
9146 * nhcelo*             -1              1              2              3              4
9147 * nhcelo*              5              6              7             -7             -6
9148 * nhcelo*             -5             -4             -3             -2             -1
9149 * nhcelo*             -1e
9150 * dz    * f   1.3320e+00e
9151 * grav  * r07 1.0000e+00r07-1.0000e+00e
9152 * rdx   *     3.1022e+03e
9153 * radrd *     9.8400e-03    1.0475e-02    1.1110e-02e
9154 * matrd * f           12e
9155 * nfax  * f            0e
9156 * rftn  * f   5.4211e+02e
9157 *
9158 ************************************************************************
9159 *******   type           num            id        ctitle
9160 slab                     931           931 $931$ st-gen-1,2,3 wrapper
```

```
9161 *         ncrx            ncrz            ittc            iext            m1d
9162              3 <-145-> 12                   0               0              1  <-146
9163 *       nopowr           nridr           modez           liqlev          iaxcnd
9164              1               0               1               0              1
9165 *        idbci           idbco           hdri            hdro
9166              2               2      2.9642e+00      2.9832e+00
9167 *       width           ipatch
9168     9.34215e00               0
9169 *        nrods           nodes           irftr           nzmax          irftr2
9170              3               3               0              25              0
9171 *     dtxht(1)        dtxht(2)        dznht           hgapo           shelv
9172     3.0000e+00      1.0000e+01      5.0000e-03      0.0000e+00      0.0000e+00
9173 *
9174 * nhcomi* r08          100r06          105e
9175 * nhceli*               -1               1               2               3               4
9176 * nhceli*                5               6               7               1               2
9177 * nhceli*                2               2               3              4e
9178 * nhcomo* f            190e
9179 * nhcelo*               12             -12             -11             -10              -9
9180 * nhcelo*               -8              -7              -6              -5              -4
9181 * nhcelo*               -3              -2              -1             -1e
9182 * nhcomi* r08          200r06          205e
9183 * nhceli*               -1               1               2               3               4
9184 * nhceli*                5               6               7               1               2
9185 * nhceli*                2               2               3              4e
9186 * nhcomo* f            290e
9187 * nhcelo*               12             -12             -11             -10              -9
9188 * nhcelo*               -8              -7              -6              -5              -4
9189 * nhcelo*               -3              -2              -1             -1e
9190 * nhcomi* r08          300r06          305e
9191 * nhceli*               -1               1               2               3               4
9192 * nhceli*                5               6               7               1               2
9193 * nhceli*                2               2               3              4e
9194 * nhcomo* f            390e
9195 * nhcelo*               12             -12             -11             -10              -9
9196 * nhcelo*               -8              -7              -6              -5              -4
9197 * nhcelo*               -3              -2              -1             -1e
9198 * dz     *      1.0272e+00r05 1.3320e+00      1.39399e00      1.46717e00r03 5.1689e-01
9199 * dz     *      1.44969e00e
9200 * grav   * f    1.0000e+00e
9201 * rdx    * f    1.0000e+00e
9202 * radrd  *      0.0000e+00     4.7625e-03      9.5250e-03e
9203 * matrd  * f             9e
9204 * nfax   * f             0e
9205 * rftn   * f    5.4211e+02e
9206 * rftn   * f    5.4211e+02e
9207 * rftn   * f    5.4211e+02e
9208 *
9209 ************************************************************************
```

```
9210 *******   type            num             id        ctitle
9211 rod                      932            932 $932$ st-gen-1,2,3 l.o.shell
9212 *          ncrx          ncrz           ittc          iext           mld
9213               3             6              0             0             2   <146>
9214 *        nopowr         nridr         modez        liqlev        iaxcnd
9215               1             0              1             0             1
9216 *         idbci         idbco          hdri          hdro
9217               2             1  3.0924e+00  0.0000e+00
9218 *           tlo           tvo           hlo           hvo
9219     3.0000e+02    3.0000e+02  0.0000e+00  0.0000e+00
9220 *         nrods         nodes         irftr         nzmax        irftr2
9221               3             3             0             8             0
9222 *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
9223     3.0000e+00    1.0000e+01  5.0000e-03  0.0000e+00  0.0000e+00
9224 *
9225 * nhcomi* f          190e
9226 * nhceli*             12          -12           -11           -10            -9
9227 * nhceli*             -8           -7            -7e
9228 * nhcomi* f          290e
9229 * nhceli*             12          -12           -11           -10            -9
9230 * nhceli*             -8           -7            -7e
9231 * nhcomi* f          390e
9232 * nhceli*             12          -12           -11           -10            -9
9233 * nhceli*             -8           -7            -7e
9234 * dz     * f   1.3320e+00e
9235 * grav   * f   1.0000e+00e
9236 * rdx    * f   1.0000e+00e
9237 * radrd *      1.5462e+00    1.5795e+00    1.6127e+00e
9238 * matrd * f           9e
9239 * nfax   * f           0e
9240 * rftn   * f   5.4211e+02e
9241 * rftn   * f   5.4211e+02e
9242 * rftn   * f   5.4211e+02e
9243 *
9244 ************************************************************************
9245 *******   type            num             id        ctitle
9246 rod                      933            933 $933$ st-gen-1,2,3 u.o.shell
9247 *          ncrx          ncrz           ittc          iext           mld
9248               3             8              0             0             3   <146>
9249 *        nopowr         nridr         modez        liqlev        iaxcnd
9250               1             0              1             0             1
9251 *         idbci         idbco          hdri          hdro
9252               2             1  4.0386e+00  0.0000e+00
9253 *           tlo           tvo           hlo           hvo
9254     3.0000e+02    3.0000e+02  0.0000e+00  0.0000e+00
9255 *         nrods         nodes         irftr         nzmax        irftr2
9256               3             3             0            17             0
9257 *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
9258     3.0000e+00    1.0000e+01  5.0000e-03  0.0000e+00  0.0000e+00
9259 *
```

```
9260 * nhcomi* r07        190r03        105e
9261 * nhceli*             6            -6            -5            -4            -3
9262 * nhceli*            -2            -1             8            12            12
9263 * nhceli* e
9264 * nhcomi* r07        290r03        205e
9265 * nhceli*             6            -6            -5            -4            -3
9266 * nhceli*            -2            -1             8            12            12
9267 * nhceli* e
9268 * nhcomi* r07        390r03        305e
9269 * nhceli*             6            -6            -5            -4            -3
9270 * nhceli*            -2            -1             8            12            12
9271 * nhceli* e
9272 * dz    *     1.17032e00    1.21665e00r03 3.8900e-01    1.0910e+00    1.2430e+00
9273 * dz    *     1.5763e+00e
9274 * grav  * f   1.0000e+00e
9275 * rdx   * f   1.0000e+00e
9276 * radrd *     2.0193e+00    2.0637e+00    2.1082e+00e
9277 * matrd * f           9e
9278 * nfax  * f           0e
9279 * rftn  * f   5.4211e+02e
9280 * rftn  * f   5.4211e+02e
9281 * rftn  * f   5.4211e+02e
9282 *
9283 ************************************************************************
9284 *******   type          num           id        ctitle
9285 rod                     934          934 $934$ st-gen-1,2,3 i.t.sheet
9286 *         ncrx          ncrz         ittc          iext          m1d
9287               3             1            0             0            4
9288 *       nopowr         nridr        modez        liqlev        iaxcnd
9289               1             0            1             0            0
9290 *        idbci         idbco         hdri          hdro
9291               2             2   3.9360e-02    5.2720e-02
9292 *        nrods         nodes        irftr         nzmax        irftr2
9293               3             3            0             8            0
9294 *     dtxht(1)      dtxht(2)       dznht         hgapo         shelv
9295    3.0000e+00    1.0000e+01   5.0000e-03    0.0000e+00    0.0000e+00
9296 *
9297 * nhcomi* f          12e
9298 * nhceli*            -3            3             3e
9299 * nhcomo* f          12e
9300 * nhcelo*            -2            2             2e
9301 * nhcomi* f          22e
9302 * nhceli*            -3            3             3e
9303 * nhcomo* f          22e
9304 * nhcelo*            -2            2             2e
9305 * nhcomi* f          32e
9306 * nhceli*            -3            3             3e
9307 * nhcomo* f          32e
9308 * nhcelo*            -2            2             2e
9309 * dz    * f   1.0000e+00e
```

```
9310 * grav   * f    0.0000e+00
9311 * rdx    * f    8.9767e+02
9312 * radrd *      1.9680e-02    2.3020e-02    2.6360e-02e
9313 * matrd * f             9e
9314 * nfax   * f             0e
9315 * rftn   * f    5.4211e+02e
9316 * rftn   * f    5.4211e+02e
9317 * rftn   * f    5.4211e+02e
9318 *
9319 ************************************************************************
9320 *******    type            num             id        ctitle
9321 rod                        935            935 $935$ st-gen-1,2,3 o.t.sheet
9322 *          ncrx           ncrz           ittc           iext           mld
9323                3              1              0              0             5
9324 *        nopowr          nridr          modez         liqlev         iaxcnd
9325                1              0              1              0             0
9326 *         idbci          idbco           hdri           hdro
9327                2              2     3.9360e-02     5.2720e-02
9328 *         nrods          nodes          irftr          nzmax         irftr2
9329                3              3              0              8             0
9330 *      dtxht(1)       dtxht(2)         dznht          hgapo          shelv
9331     3.0000e+00     1.0000e+01     5.0000e-03     0.0000e+00     0.0000e+00
9332 *
9333 * nhcomi* f            12e
9334 * nhceli*              16           -16           -16e
9335 * nhcomo* f            12e
9336 * nhcelo*              17           -17           -17e
9337 * nhcomi* f            22e
9338 * nhceli*              16           -16           -16e
9339 * nhcomo* f            22e
9340 * nhcelo*              17           -17           -17e
9341 * nhcomi* f            32e
9342 * nhceli*              16           -16           -16e
9343 * nhcomo* f            32e
9344 * nhcelo*              17           -17           -17e
9345 * dz     * f    1.0000e+00
9346 * grav   * f    0.0000e+00
9347 * rdx    * f    8.9767e+02
9348 * radrd *      1.9680e-02    2.3020e-02    2.6360e-02e
9349 * matrd * f             9e
9350 * nfax   * f             0e
9351 * rftn   * f    5.4211e+02e
9352 * rftn   * f    5.4211e+02e
9353 * rftn   * f    5.4211e+02e
9354 *
9355 ************************************************************************
9356 *******    type            num             id        ctitle
9357 rod                        936            936 $936$ st-gen-1,2,3 i.plenum
9358 *          ncrx           ncrz           ittc           iext           mld
9359                3              1              0              0             6
```

```
9360 *       nopowr          nridr          modez         liqlev         iaxcnd
9361              1              0              1              0              0
9362 *        idbci          idbco           hdri           hdro
9363              2              1    3.0090e+00    0.0000e+00
9364 *          tlo            tvo            hlo            hvo
9365     3.0000e+02     3.0000e+02    0.0000e+00    0.0000e+00
9366 *        nrods          nodes          irftr          nzmax         irftr2
9367              3              3              0              8              0
9368 *     dtxht(1)       dtxht(2)         dznht          hgapo          shelv
9369     3.0000e+00     1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
9370 *
9371 * nhcomi* f           12e
9372 * nhceli*             -1             1             1e
9373 * nhcomi* f           22e
9374 * nhceli*             -1             1             1e
9375 * nhcomi* f           32e
9376 * nhceli*             -1             1             1e
9377 * dz     * f    7.5182e-01e
9378 * grav   * f    1.0000e+00e
9379 * rdx    * f    1.0000e+00e
9380 * radrd *      1.5045e+00     1.6203e+00     1.7361e+00e
9381 * matrd * f           9e
9382 * nfax   * f           0e
9383 * rftn   * f    5.4211e+02e
9384 * rftn   * f    5.4211e+02e
9385 * rftn   * f    5.4211e+02e
9386 *
9387 ************************************************************************
9388 *******    type           num            id        ctitle
9389 rod                       937           937 $937$ st-gen-1,2,3 o.plenum
9390 *          ncrx          ncrz          ittc          iext           m1d
9391              3             1             0             0             7
9392 *        nopowr          nridr         modez         liqlev         iaxcnd
9393              1             0             1             0              0
9394 *         idbci          idbco          hdri          hdro
9395              2             1    3.0090e+00    0.0000e+00
9396 *           tlo           tvo            hlo           hvo
9397     3.0000e+02    3.0000e+02    0.0000e+00    0.0000e+00
9398 *         nrods         nodes          irftr         nzmax         irftr2
9399              3             3              0             3              0
9400 *      dtxht(1)      dtxht(2)         dznht         hgapo          shelv
9401     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
9402 *
9403 * nhcomi* f           12e
9404 * nhceli*             18           -18           -18e
9405 * nhcomi* f           22e
9406 * nhceli*             18           -18           -18e
9407 * nhcomi* f           32e
9408 * nhceli*             18           -18           -18e
9409 * dz     * f    7.5182e-01e
```

```
9410 * grav   * f    1.0000e+00
9411 * rdx    * f    1.0000e+00
9412 * radrd *      1.5045e+00     1.6203e+00     1.7361e+00e
9413 * matrd * f             9e
9414 * nfax   * f             0e
9415 * rftn   * f    5.4211e+02e
9416 * rftn   * f    5.4211e+02e
9417 * rftn   * f    5.4211e+02e
9418 *
9419 ************************************************************************
9420 *******    type            num             id        ctitle
9421 rod                         938            938 $938$ st-gen-1,2,3 sec.dryer
9422 *           ncrx           ncrz           ittc           iext           m1d
9423                3              2              0              0             8
9424 *         nopowr          nridr         modez         liqlev         iaxcnd
9425                1              0              1              0             1
9426 *          idbci          idbco          hdri          hdro
9427                2              2     6.0960e+00     6.1087e+00
9428 *          nrods          nodes          irftr          nzmax         irftr2
9429                3              3              0              8             0
9430 *      dtxht(1)       dtxht(2)         dznht          hgapo          shelv
9431      3.0000e+00     1.0000e+01     5.0000e-03     0.0000e+00     0.0000e+00
9432 *
9433 * nhcomi* f           105e
9434 * nhceli*              -9              9             10             10e
9435 * nhcomo* f           105e
9436 * nhcelo*              -6              6              6              6e
9437 * nhcomi* f           205e
9438 * nhceli*              -9              9             10             10e
9439 * nhcomo* f           205e
9440 * nhcelo*              -6              6              6              6e
9441 * nhcomi* f           305e
9442 * nhceli*              -9              9             10             10e
9443 * nhcomo* f           305e
9444 * nhcelo*              -6              6              6              6e
9445 * dz     * f    5.7542e+00e
9446 * grav   * f    0.0000e+00e
9447 * rdx    * f    1.0000e+00e
9448 * radrd *      3.0480e+00     3.0512e+00     3.0543e+00e
9449 * matrd * f             9e
9450 * nfax   * f             0e
9451 * rftn   * f    5.4211e+02e
9452 * rftn   * f    5.4211e+02e
9453 * rftn   * f    5.4211e+02e
9454 *
9455 end
9456 *
9457 ******************
```

```
* time-step data *
******************
*
*         dtmin         dtmax          tend          rtwfp         powerc
     1.0000e-03    1.0000e-01    1.0000e+01    1.0000e+01    1.0000e+20
*         edint         gfint         dmpint         sedint
     1.0100e+01    5.0000e-01    1.0100e+01    1.0100e+01
*
*         dtmin         dtmax          tend          rtwfp         powerc
     1.0000e-03    2.0000e-01    1.0000e+02    3.0000e+00    1.0000e+20
*         edint         gfint         dmpint         sedint
     9.0200e+01    1.0000e+00    9.0200e+01    9.0200e+01
*
*         dtmin         dtmax          tend          rtwfp         powerc
     1.0000e-03    3.0000e-01    2.0000e+02    1.0000e+00    1.0000e+20
*         edint         gfint         dmpint         sedint
     1.0030e+02    2.0000e+00    1.0030e+02    1.0030e+02
*
*       endflag
    -1.0000e+00
```