APPENDIX F

ANNOTATED TRACIN-FILE INPUT DATA FOR THE W3LOOP TRANSIENT CALCULATION

An annotated listing of the TRACIN-file input data for a Westinghouse three-loop, full-plant model, steady-state calculation is provided in Appendix E. An annotated listing of the TRACIN-file input data for its transient calculation, that restarts from the steady-state calculation's last data dump, is provided in this appendix. This document was originally developed for TRAC-P, but it is also valid for TRAC-M. As recommended in Section 5.0., the full-plant model has been defined by the TRACIN-file input data for the steady-state calculation. This transient-calculation TRACIN file does not specify control-parameter data, but it does replace the data of a few hydraulic components. The remaining input data will be obtained from the restart-data TRCRST file.

The TRAC–M user may specify a replacement for or modification of an existing hydraulic component for a restart calculation by assigning it the same ID number in the transient-calculation TRACIN-file input data. FILL components 91 and 92 are reinput in this transient calculation with their VLSCL liquid-velocity table scaling factor set to zero to turn off their steady-state calculation defined letdown and makeup flows during the transient calculation. A hydraulic component can be added to or deleted from the transient calculation by adding its new component number to the IORDER array and inputting its component data or deleting its component number from the IORDER array. The steam-generator single-tube rupture is initiated in this transient calculation by replacing the two no-flow FILL components 202 and 203 connected to junctions 201 and 203 with a new PIPE component 202 connected to junctions 201 and 203. The PIPE provides the single-tube rupture flow path between the steam-generator primary and secondary sides of TEE components 22 and 200. Component number 203 is deleted from the IORDER array to make this change. The NCOMP (Word 3 on Main-Data Card 5) total number of components is decreased by 1 to reflect this change in the number of components.

The TRAC–M user can specify a replacement for or modification to an existing control parameter (signal variable, control block, or trip) or specify a new control parameter; however, the user cannot delete a control parameter in the control procedure (see exception is last sentence). If the NTSV, NTCB, or NTRP number of a control-parameter type increases, its value will need to be changed on Main-Data Card 7. For example, the user could decide to change or extend a control procedure after having evaluated the steady-state calculation. Changing the control parameters of already defined ID numbers or defining new ID number control parameters allows the user to make such changes without having to reevaluate the steady-state calculation. However, it is not possible to delete control parameters unless the deleted items are at the end of their respective lists by having the largest magnitude ID numbers.

F.1. Notes on the TRACIN-File Input Data for the Transient Calculation

In the following notes, reference is made to the input-data file listing in Setion. F.2. by callouts that are marked on the listing; for example, · is note 1. Items already discussed in Appendix E for the steady-state calculation TRACIN-file input data will not be discussed here.

1. The following changes were made to the steady-state calculation input-data NAMELIST variables.

   a. DTSTRT = 0.001 s defines the initial timestep size for the transient calculation; if DTSTRT were not specified, the steady-state calculation 0.2 s timestep size from the last restart-data dump would be used as the initial timestep size for the transient calculation.

   b. IPOWR and TPOWR are no longer defined because they are only used during the steady-state calculation to specify when the reactor-core power is set ON.

2. DSTEP = –1 specifies that the last data dump on the TRCRST file (the TRCDMP file from the steady-state calculation) is to be used to restart the transient calculation. Because DSTEP is less than zero, the initial problem time is defined from the last data dump (0.0 s) rather than by TIMET = 0.0000E+00 s.

3. A transient calculation is to be performed when STDYST = 0 and TRANSI = 1.

4. The NCOMP number of components is decreased by 1 and the NJUN number of junctions is not changed from the steady-state calculation because one component was deleted and three components were changed by this transient-calculation TRACIN-file input data.

5. Because this is a transient calculation, no CSS controllers (NCONTR = 0) are defined in this TRACIN-file input data.

6. The number of signal variables is increased by 1 and the number of control blocks, values of control-block tabular data, and trips are not changed from the steady-state calculation.

7. One new signal variable is defined by this TRACIN file for the new PIPE component 202. The subsequent record of five integer 0s indicates that the remaining NTSV–1 = 65 signal variables are to be defined by the TRCRST-file restart data from the steady-state calculation.

8. The NAMELIST variable IUNLAB = 8 number of user-defined units-name labels need to be reinput because they were not output as part of the TRCDMP-file data dump.

9. One control block is reinput by this TRACIN file. Its defined form is the same as in the steady-state calculation; therefore, inputting it again only demonstrates that a control block can be modified by reinputting it. The subsequent record of five integer 0s indicates that the remaining NTCB–1 = 237 control blocks are to be defined by the TRCRST-file restart data from the steady-state calculation.

10. This record provides values needed for dimensioning array storage for the NTRP = 72 trips.

11. No trips are defined by this TRACIN file. The record of five integer 0s indicates that the remaining NTRP = 72 trips are to be defined by the TRCRST-file restart data.

12. FILL components 91 and 92 are reinput with VMSCL = 0.0000E+00 to turn off their FILL-table defined letdown and makeup flows, respectively, during the transient calculation.

13. PIPE component 202 is input to replace FILL component 202 and provide fluid flow between junctions 201 and 203 to model a loop 2 steam-generator single-tube rupture during the transient calculation.

14. The "END" record indicates the end of the component data. Because the data for three components are specified before it, the remaining NCOMP–3 = 128 components are to be defined by the TRCRST-file restart data. The last data dump to the TRCDMP file defines the remaining components with the steady-state calculation's evaluated thermal-hydraulic steady-state condition of the modeled system.

15. One set of timestep data is specified. The transient calculation will be evaluated for TEND = 6.0000E+02 s of problem time starting with a DTSTRT = 0.001 s timestep size (see note 1) rather than a DTMIN = 1.0000E-05 s timestep size. Thereafter the timestep size is constrained to be no less than DTMIN = 1.0000E-05 s and no greater than DTMAX = 5.0000E-01 s. A small and large TRCOUT edit is to be generated every SEDINT = EDINT = 1.0000E+02 s, a graphics edit is to be generated every GFINT = 5.0000E+00 s, and a data dump edit is to be generated every DMPINT = 2.0000E+02 s. When problem time reaches 600.0 s, the next timestep data set reads in a DTMIN = –1.0000e+00 < 0.0, which terminates the TRAC-M transient calculation

F.2. Input-Data Listing of the TRACIN File for the Transient Calculation

Annotation for the callouts that are marked on the following input-data listing is provided by the referenced note of the same number in Section F.1. of this appendix.

```
free format
*
*************
* main data *
*************
*
*       numtcr          ieos         inopt          nmat          id2o
            28             0             1             0             0
this is a h.b.robinson-2 steam-generator one-tube-rupture transient.
hbr-2 is a 2300 mwt, three-loop westinghouse nuclear plant located
in hartsville, s.c., that is owned and operated by the carolina
power and light company (cp&l).  this plant model was developed for
reactor-coolant pump (rcp) trip analysis by james lime for trac-pf1
/mod1 on 7/84.  it was converted for trac-pf1/mod2 by robert steinke
and james lime on 5/96.  the trac-pf1/mod2 steady-state calculation
plant model has been modified to handle the following loss-of-coolant
accidents, through transient input-data tracin-file changes, allowing
the same steady-state restart data-dump file to be used:
  1) cold-leg small break without pump trip,
  2) cold-leg small break with pump trip,
  3) one-tube steam generator tube rupture,
  4) two-tube steam generator tube rupture, and
  5) 100% cold-leg degb large break.
this input-data model contains the following components and subsystems:
  1) three-dimensional (r=2,t=6,z=12) reactor vessel;
  2) vessel upper-plenum guide tubes;
  3) powered-rod and unpowered-slab heat structures in the vessel;
  4) three primary- and secondary-coolant loops modeled individually;
  5) makeup, letdown, and pressurizer-sprayer cvcs flows;
  6) accumulator and hpsi fills in each primary-coolant loop;
  7) pressurizer and pressurizer porv and srv;
  8) pressurizer, steam generator, and steam-dump control systems;
  9) single-tube degb leakage path in loop 2 steam generator;
 10) main-steam and steam-dump lines;
 11) high-pressure feedwater system after hp heaters; and
 12) auxiliary-feedwater fills (motor and steam driven).
*
*****************
* namelist data *
*****************
*                                                          1
 &inopts
  dtstrt=0.001, fdfhl=0.0, iadded=10, icflow=2, ikfac=1, imfr=3,
  iolab=1, iunlab=8, newrfd=1, nfrcl=2, nhtstr=21, noair=0
 &end
*
*         dstep         timet
             -1    0.0000e+00      2
```

```
*        stdyst        transi  [3]  ncomp         njun     [4]  ipak
              0             1       131           123           1
*          epso          epss
     1.0000e-04    1.0000e-04
*        oitmax        sitmax        isolut        ncontr   [5]  nccfl
             10            10             1             0           0
*          ntsv          ntcb          ntcf          ntrp   [6]  ntcp
             66           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 s    * steam-generator degb single tube
*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 l1,r1&2 l2,r1 l2-7,r2
*iorder*    904   905   906 s   * vessel structure l3-6,r1 l7-11,r1 l8,r2
*iorder*    907   908   909 s   * vessel structure l9,r2 l10&11,r2 l12,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 *
**************************
*
* signal variables
*
*    steam generator tube rupture mass flow
*        idsv         isvn         ilcn         icn1         icn2
         2020           69          202            1            0
*                                                                       7
*        idsv         isvn         ilcn         icn1         icn2
            0            0            0            0            0
*
* user defined unit labels
*                                                                       8
*     lulabel      lunitsi     luniteng      ufactor       ushift
     lusqrden lusqrt(kg/m3) lusqr(lb/ft3)  2.4986e-01   0.0000e+00
      ludtpdp       luk/pa     luf/psid    1.2411e+04   0.0000e+00
     lurpress       lu1/pa     lu1/psia    6.8948e+03   0.0000e+00
     lupresst       lupaxs     lupsidxs    1.4504e-04   0.0000e+00
      lurtime        lu1/s        lu1/s    1.0000e+00   0.0000e+00
     luasqrtp lum2xsqrt(pa) luft2sq(psid)  1.2963e-01   0.0000e+00
     lusqrtml  lusqrt(kgxm) lusqr(lbmxft)  2.6894e+00   0.0000e+00
     lurmflow       lus/kg     luhr/lbm    1.2600e-04   0.0000e+00
*
* control blocks
*
*    weighted sum for pi controller                                     9
*        idcb         icbn         icb1         icb2         icb3
         -414           59         -410         -412            0
*      lugain       luxmin       luxmax       lucon1       lucon2
     lunounit     lunounit     lunounit     lunounit     lunounit
```

```
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
     5.0000e+01   -1.0000e+00    1.0000e+00    8.0000e-01    2.0000e-01
*
*          idcb          icbn          icb1          icb2          icb3
              0             0             0             0             0
*
* trips
*
*    trip-dimension variables data
*          ntse          ntct          ntsf          ntdp          ntsd
              3            20             0             0             0        10
*
*          idtp          isrt          iset          itst          idsg
              0             0             0             0             0        11
*
*****************
* component data *
*****************
*
*************************************************************************
*******     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
     0.0000e+00    0.0000e+00
*                      12
* 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
*          dxin         volin         alpin          vlin          tlin
     1.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00    5.2900e+02
*           pin          pain        flowin          vvin          tvin
     1.5500e+07    0.0000e+00    0.0000e+00    0.0000e+00    5.2900e+02
```

```
*         vmscl          vvscl
     0.0000e+00     0.0000e+00    12
*
* vmtb   *    -1.0000e+00    1.1289e+01r02 0.0000e+00e
*
*********************************************************************
*******     type              num            id        ctitle
pipe                13        202            202 $202$ sgtr (single-tube)
*          ncells           nodes          jun1          jun2          epsw
               10               0           201           203    0.0000e+00
*            ichf           iconc          iacc          ipow
                1               1             0             0
*           radin              th         houtl         houtv         toutl
       1.0000e-02      1.3000e-03    0.0000e+00    0.0000e+00    3.0000e+02
*           toutv           powin        powoff        rpowmx        powscl
       3.0000e+02      0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
* dx     *      5.0000e-01r08 1.0000e+00     5.0000e-01e
* vol    *      3.0434e-04r08 6.0868e-04     3.0434e-04e
* fa     *      1.21736e-3r09 6.0868e-04     1.21736e-3e
* kfac   * f    0.0000e+00e
* rkfac  * f    0.0000e+00e
* grav   * f    0.0000e+00e
* hd     * f    1.9685e-02e
* icflg  * r09            0              1              0e
* nff    * f             -1e
* alp    * f    0.0000e+00e
* vl     * f    0.0000e+00e
* vv     * f    0.0000e+00e
* tl     * f    5.6600e+02e
* tv     * f    5.6600e+02e
* p      * f    1.5400e+07e
* pa     * f    0.0000e+00e
* conc   * f    0.0000e+00e
*
end                 14
*
*****************
* time-step data *
*****************
*                                                                              15
*          dtmin           dtmax          tend         rtwfp       rpowerc
      1.0000e-05      5.0000e-01    6.0000e+02    1.0000e+00    1.0000e+20
*         edint           gfint        dmpint        sedint
      1.0000e+02      5.0000e+00    2.0000e+02    1.0000e+02
*
*       endflag
    -1.0000e+00
```

APPENDIX G

ANNOTATED TRCMSG FILES FROM THE W3LOOP STEADY-STATE AND TRANSIENT CALCULATIONS

TRAC-P Version 5.4.19 has been executed on the steady-state and transient input-data files in Apps. E and F. Except where noted, the following commentary on these uses is still valid for TRAC-M. The TRCMSG file from each of these calculations is discussed and annotated in this appendix with Section G.1. discussing the steady-state calculation TRCMSG file output in Section G.2. and Section G.3. discusses the restart transient calculation TRCMSG file output in Section G.4. The purpose of this discussion is not to dwell on the physical nature of the solution, but to focus on the type and form of the information provided by the TRCMSG file. These TRCMSG-file examples provide representative information. Only eight of several hundred different warning error messages were generated by TRAC-P during these two calculations because of the nature of their numerical solutions.

G.1. Notes on the TRCMSG File From the Steady-State Calculation

The output from the steady-state calculation to the TRCMSG file is reviewed in this section to provide a description of its contents. Notes in this section are referenced in the TRCMSG file by callouts that are marked on the output listing in Section G.2. For example, $\boxed{1}$ is note 1.

1. The TRAC-P logo is on the initial printout page. Most of the TRCMSG-file information also is sent to the ITTY or terminal I/O channel (which for most terminals needs to be less than 80-columns to prevent longer line clipping or wrap-around that is hard to read).

   Note: The code logo has not been reimplemented in TRAC-M.

2. Quality-control identification of the current version of TRAC-P, the date the TRAC-P executable was created, the history of TRAC-P versions since version 5.4, and a list of each version's updates is provided for the purpose of verification and traceability.

   Note: This identification information has been modified in TRAC-M.

3. TRAC-P internally defines the coolant with H_2O or D_2O properties. The coolant-type properties to be used in the TRAC-P calculation are specified by ID2O (Word 5 on Main-Data Card 2) and identified by this output line.

4. An echo output of the 27 problem title cards from the input-data TRACIN file is shown here.

5. The input-specified IORDER-array component numbers are reordered by TRAC-P into subgroupings of hydraulic components that connect to each other sequentially with each subgroup forming a flow channel called a "loop." The equations of the components in each subgroup loop are

evaluated simultaneously by TRAC with coupling of TEE side tubes to other loops or across a PLENUM cell to other loops evaluated by the network matrix-equation solution. The list of component numbers shown here has the reordered hydraulic component numbers (in the order they will be processed by TRAC-P and their large-edit parameter information output to the TRCOUT file) followed by the heat-structure component numbers (ordered as input). Note that the TRAC-P short-edit debug and timestep control information is presented in the same order as this edit of the IORDER array. For example, the timestep-size control edit in the short edit, which lists the number of times a hydraulic component was the last component to converge in the outer iteration, is presented in the same order as in this listing of the IORDER array.

Note: Item 6 is not written by TRAC-M.

6. When the plant system model has one or more VESSEL components, this message gives the size of the VESSEL coefficient matrix solved as a VESSEL-matrix equation by TRAC-M for all VESSEL components in one matrix equation. In this problem, the VESSEL coefficient matrix has 12 diagonal rows above and below the main diagonal with elements that potentially can be nonzero valued. This defines the banded-matrix portion of the VESSEL coefficient matrix as having a bandwidth of 12 + 1 + 12 = 25 diagonal rows. The output message indicates that 12 of the VESSEL-matrix rows have 1 or more nonzero elements outside the matrix bandwidth. These nonzero elements represent the source-connection junction coupling of nonadjacent VESSEL mesh cells to 1D component loops. These nonzero elements outside the matrix bandwidth are coupled to the banded portion of the VESSEL coefficient matrix by a capacitance-matrix solution.

Note: Item 7 is not written by TRAC-M.

7. Problem-size specifications define the computer memory required under various categories. This problem was executed on a SUN Sparc II workstation computer with 1.475256 MWords of RAM memory required. Small-core memory (SCM) and large-core memory (LCM) now are the same fast or RAM memory of the computer.

8. A data dump is generated at the start of every TRAC-M calculation (after the input data are processed and all other parameters are initialized but before the first timestep is evaluated). Restarting from this data dump would produce results identical to that of starting with the TRACIN input-data file for the initial calculation of this problem example.

9. The first set of timestep data that is input is echoed to output. The minimum and maximum timestep sizes, heat-transfer to hydraulic calculation timestep ratio, convective energy-error controller level, and the various output time intervals will be used from the start of the calculation at 0.0 s to the time domain end at TEND = 10.0 s.

10. During the first and second timesteps, water packing occurred in the steam-generator downcomers of TEE components 190, 290, and 390. The liquid is at rest initially and packs under a pressure spike because of feedwater flow and establishing a hydraulic head in the vertical portion of the downcomer. Starting the steady-state calculation with a timestep size smaller than 0.001 s could have avoided these warning error messages during the first and second outer iterations. TRAC-M gives warning messages when it is having a numerical-solution difficulty, and gets around the difficulty with internal logic (such as for water packing or stretching, backup calculation, timestep size control, etc.) in almost all situations and is able to converge the timestep solution.

11. The liquid-level trip signal of the pressurizer's low-level trip –407 rises above the S_2 = 1.5000E-01 m setpoint causing TRAC-P to change the trip set status from OFF to $ON_{Forward}$ with no setpoint delay time. Trip –407 is the only trip with a negative ID number that is evaluated during the steady-state calculation. A trip must be evaluated and its trip signal must reach or cross a setpoint value to change the trip's set status. Such a trip message is generated when the trip's ITST input parameter has a positive value.

12. Status information about the numerical solution is printed in table form with column heading labels. The first five columns show the timestep number, problem time, timestep size, number of outer iterations required for convergence of the pressure-matrix solution, and the accumulated CPU execution time. This information is printed every 100 timesteps and when a large edit is output to the TRCOUT file. Those 5 columns and the last 5 columns, defining the 1D and 3D hydraulic-component material-Courant numbers, the VESSEL's SETS3D evaluation flag, and the component and cell number where the maximum of the 2 Courant numbers is located, are printed every NAMELIST-variable defined IADDED = 10 timesteps. Interspersed between groups of those one-line edits are other information and messages generated during the calculation.

13. The reactor-core power is set to its RPOWRI = 2.3×10^9 W (7.8479×10^9 Btu h^{-1}) steady-state power level at or after NAMELIST variable TPOWR = 2.0 s problem time because NAMELIST variable IPOWR = –1. This power is generated in the powered fuel ROD elements of HTSTR component 900. The actual problem time was 2.071103 s rather than 2.0 s because the previous timestep size was >0.071103 s and the problem time at the beginning of the previous timestep was <2.0 s.

14. During a steady-state calculation, TRAC-M tests for steady-state solution convergence every 5 timesteps and for every timestep when a large edit is output to the TRCOUT file. That information in the following table is sent to the TRCMSG file every 100 timesteps and for every timestep when a large edit is output to the TRCOUT file. The steady-state solution convergence test is based on comparing the maximum fractional change

per second of seven hydraulic parameters (pressure, liquid velocity, gas velocity, gas volume fraction, liquid temperature, gas temperature, and noncondensable-gas pressure) everywhere in the modeled system with the user input EPSS convergence criterion. All the maximum fractional-change per second values must be less than EPSS for steady-state solution convergence to be satisfied and for TRAC-M to end the calculation before the time domains of all timestep data have been evaluated. We see in this table at timestep number 100 that the maximum fractional-change per second values are large compared with EPSS = 1.0000E-04 that was input. At problem time 2.234650 s, the input specified state of the plant model is still undergoing a rapid transient to get to steady-state conditions. Testing the maximum fractional change per second rather than per timestep provides a better test of steady-state conditions because it does not depend on the timestep size that is being used. A similar steady-state convergence test and output edit can be generated during a transient calculation that evaluates the asymptotic steady-state condition by setting NAMELIST variable ISSCVT = 1.

15. When the steady-state calculation is a CSS calculation, a table showing the current status of all CSS controllers is printed after the steady-state convergence-test table discussed in note 14. The columns denoting the component type and number, the minimum and maximum values of the adjusted parameter, and the desired value for the monitored parameter are input specified values for each of the controllers. The current status of the controller action is seen in the values of the adjusted parameter and the monitored parameter. By making changes in the adjusted parameter, the controller is trying to affect the solution state of the plant model in a way that causes the monitored parameter value to change to the desired value. Adjustment is not allowed outside the minimum to maximum value range. When the adjusted parameter reaches either limit, the controller has no further ability to affect the system model until the controller adjustment changes direction. Constraining an adjusted parameter to a reasonable adjustment range keeps inappropriate conditions of a rapidly changing solution from causing a controller to make inappropriate adjustments that may hinder or prevent a steady-state solution from being determined. Before steady-state convergence-test conditions can be satisfied, CSS controller adjustments must become very small. Because local conditions of the monitored parameter can change somewhat irregularly at times as the solution approaches steady-state conditions, constraining the rate of change of the component actions controlled by the CSS controllers is sometimes necessary to achieve steady-state convergence. That is done with the component-action maximum rate of change input parameter that is part of the component data (for example, ROMGMX for a PUMP component).

16. Five backup calculations that reevaluate the timestep with a smaller timestep size were performed between 7.8 and 15.8 s problem time. All 5 backups were from subroutine POST during the post stage of the

calculation. All were affected by numerical-solution difficulties encountered on the secondary sides of the steam generators in their steam dome and downcomer sections.

17. The second set of timestep data that is input for problem time 10.0 to 100.0 s is echoed to output. The maximum timestep size, output time intervals, and heat-transfer to hydraulic calculation timestep ratio have changed from the first set of timestep data.

18. After 20.0 s problem time, the TRAC-P CSS calculation executes with its maximum 0.2 s timestep size and generally requires only 2 outer iterations to converge the outer-stage pressure-matrix solution. The dynamics of the solution appear to have settled down in that the maximum fractional change per second in the parameters tested for steady-state convergence continue to get smaller with each table edit until 65.773748 s problem time. Thereafter their maximum fractional change per second values increase and decrease with each table printout but don't appear as a whole to decrease further to satisfy the EPSS steady-state convergence-test criterion.

19. The third and final set of timestep data that is input for problem time 100.0 to 200.0 s is echoed to output. The maximum timestep size, output time intervals, and heat-transfer to hydraulic calculation timestep ratio have changed. At TEND = 2.0000E+02 s, TRAC-P ends the CSS calculation without having satisfied the EPSS = 1.0000E-04 steady-state convergence test criterion. Maximum fractional-change per second values in the pressure of the feedwater control valves and in the phasic velocities and temperatures and the gas volume fraction on the secondary sides of the steam generators indicate the secondary-side solution is not settling down. It is felt that the nature of the secondary-side model has created oscillatory behavior. To diagnose the cause and introduce appropriate modeling changes to converge the steady-state solution, the secondary-side solution behavior would need to be examined and the source of its oscillatory behavior would need to be understood. This can be done most effectively with graphics output.

20. A final large edit is output to the TRCOUT file and a final data dump is sent to the TRCDMP file at 200.069335 s by TRAC-M automatically at the end of the steady-state calculation. The short, large, and dump output time intervals were defined so that they generated no output. Our interest is in the final end-of-calculation output of the hopefully converged steady-state solution. After 20 s problem time, the material Courant limit ranged from 10 to 20. The total CPU run time of 18,418 s (5.16 h) for the steady-state calculation was on a SUN Sparc 2 workstation.

G.2. Listing of the TRCMSG File From the Steady-State Calculation

```
                                          transient  reactor  analysis  code

              tttt                   cccc                     pppppppppppp
            ttt  t                  cc  cc                  pp            pp
          ttt                      cc                     pp   ppp            pp
 t      tttt                aa    cc          c          p     pp            pp
tt   ttt tt               aaaaa   cc        cc           p     pp             pp
ttttt   tt               aa  aa   ccc    ccc              p p  pp             pp
        tt        rrr   aa   aa  cc ccccc                  p   pp            pp
        tt      rrrrr   aa   aaaaa                             pp          pp
        tt     rr  rr   aa  aa aa                             pppp      ppp
       tt      rr  rr   aaaaa                     ****        pp  pppppp        1
       tt      rr  rr  aa aa                                  pp
       tt     rrr  rrrrr                                      pp
       tt     rr    rr                                       pp
      tt     rr                                              pp
      tt    rr                                               pp
t    tt                                                 p    pp
tt  ttt                                                 pp  ppp
 ttttt                                                   ppppp

          *****************
          **   warning   **
          *****************

 *trac* this executable has memory preset to zero

 current overlays in memory: cbmain
     real variables preset to zero
     integer variables preset to zero
     ***code may not function in the same manner as***
     ***lanl internal version which presets memory ***
     ***to negative indefinites                    ***
 *** Official TRAC-P Version 5.4.19    ***
Program library created Thu May 2 14:50:51 MDT 1996          2
```

```
 ---------------------------------------------------------------------------
                   Change History
 ---------------------------------------------------------------------------
  5.4      Date Stamp Fri Apr 2 14:46:00  MDT 1993 **date not automated**
  5.4.01   Date Stamp Thu Jun 9 11:23:55 MDT 1994
  5.4.02   Date Stamp Mon. Oct. 3 1994          **date not automated**
  5.4.03   Date Stamp Thu. Oct 13 1994          **date not automated**
  5.4.04   Date Stamp Thu. Dec 08 1994          **date not automated**
  5.4.05   Date Stamp Tue. Dec 20 1994          **date not automated**
  5.4.06   Date Stamp Tue. Mar 14 1995          **date not automated**
  5.4.07   Date Stamp Mon June 19 1995          **date not automated**
  5.4.08   Date Stamp Thu June 22 1995          **date not automated**
  5.4.09   Date Stamp Fri July 14 1995          **date not automated**
  5.4.10   Date Stamp Fri. Aug 18 1995          **date revised in 5.4.11**
  5.4.11   Date Stamp Fri Aug. 25 1995          **date not automated**
  5.4.12   Date Stamp Wed Sep 13 13:53:12 MDT 1995
  5.4.13   Date Stamp Fri Oct 27 11:17:11 MDT 1995
  5.4.14   Date Stamp Wed Nov 29 09:26:17 MST 1995
  5.4.15   Date Stamp Mon Dec 4 14:28:15 MST 1995
  5.4.16   Date Stamp Fri Jan 19 10:50:18 MST 1996
  5.4.17   Date Stamp Mon Jan 29 15:45:39 MST 1996
  5.4.18   Date Stamp Wed Apr 17 12:08:23 MDT 1996
  5.4.19   Date Stamp Thu May 2 14:50:51 MDT 1996
 Version 5.4.01   created from version 5.4       using the following updates:
     fxchfit     pltvar      fxrfdz      fsurflx     vector2
     upnljf      fans792     fxibf       fxcidc      fxwpkxx
     fixml3      fxmfg       fxbktr1     fxtss       upnvp1
     fxcvm       fxmrod      fxb1b2      upxtvp2     fxbit
     morml3      fxsmvt      v5p4p01
 Version 5.4.02   created from version 5.4.01    using the following updates:
     uphtmlb     fxlptre     no360       dcomer      fxnffz2
     fxtee       fxltfcb3    fxincb      fxtkf       uphep
     uphsrd2     ieeeg       upm1d       brksat      genbrk
     fxlabc      v5p4p02
 Version 5.4.03   created from version 5.4.02    using the following updates:
     upm1d2      modig       upjf1       fxisrb      fxfxtkf
     hpconv      v5p4p03
 Version 5.4.04   created from version 5.4.03    using the following updates:
     updmfc      fxsave      fixcpu      realfix     fxigmod
     fhtbdc      fxetime     cifblas     v5p4p04
 Version 5.4.05   created from version 5.4.04    using the following updates:
     fixcdeq     fixsg       v5p4p05
```

```
Version 5.4.06   created from version 5.4.05   using the following updates:
    fixtype    units      v5p4p06
Version 5.4.07   created from version 5.4.06   using the following updates:
    cpuprt     v5p4p07
Version 5.4.08   created from version 5.4.07   using the following updates:
    fixbr      fxfachk    fxudid     rstub      v5p4p08
Version 5.4.09   created from version 5.4.08   using the following updates:
    uphsbu     upldpt     fxrgs      upnouc     fixhsft
    hsflip2    cnlist     xtvi3e     fxgbit     fixbul
    gnwkst2    fxnul      ssavg      aenergy    upenwrt
    labout09   upencyl    upenhts    fixb21     v5p4p09
Version 5.4.10   created from version 5.4.09   using the following updates:
    fxnstl     uprad3n    radhyd     radhts     fxshstr
    radrd      radi       gamht1     gamht2     upfind5
    fprad      vmatrix    raddmp3    uplinalg   csst5c
    fxuphts    v5p4p10
Version 5.4.11   created from version 5.4.10   using the following updates:
    fxivsl     fxdef      fxuc2      fixfr      fxifdf
    labout11   fxvstp     v5p4p11
Version 5.4.12   created from version 5.4.11   using the following updates:
    fxvadj2    hpssi      labout12   fxdsln2    fxsct
    fxsahsl    xtvl2b     fixfr2     upenwrt2   fxcnlist
    fxsedit    fxradln    upfxrad    upenrad    ngenwks2
    v5p4p12
Version 5.4.13   created from version 5.4.12   using the following updates:
    fxencyl    rmcom      xtvibm     fxency2    smatsol
    fxname     v5p4p13
Version 5.4.14   created from version 5.4.13   using the following updates:
    newlogo    fxunits    faxbugs    v5p4p14
Version 5.4.15   created from version 5.4.14   using the following updates:
    fxflowin   fxrsudul   fxwhtstr   v5p4p15
Version 5.4.16   created from version 5.4.15   using the following updates:
    ifrd       hp9kdef    rs6kdef    sundef     unixdef
    v5p4p16
Version 5.4.17   created from version 5.4.16   using the following updates:
    prgast     v5p4p17
Version 5.4.18   created from version 5.4.17   using the following updates:
    d2o        fxface2    chdefs     tsdiag2    labout18
    v5p4p18
Version 5.4.19   created from version 5.4.18   using the following updates:
    vectrz     unixdef    v5p4p19
--------------------------------------------------------------------------


                        input data is being processed

                           h2o properties are used                3

number of title cards is:   27
this is a sample problem for the trac-p users guide manual.  it models      4
a westinghouse 2308-mwt powered nuclear-core, three-loop pressurized
water reactor with constrained steady-state and transient calculations.
this full-plant model evaluates a steam-generator single-tube double-
ended-guillotine break transient with primary-coolant pumps operating.
this input-data model contains the following components and subsystems:
  1) three-dimensional (r=2,t=6,z=12) reactor vessel;
  2) vessel upper-plenum guide tubes;
  3) powered-rod and unpowered-slab heat structures in the vessel;
  4) three primary- and secondary-coolant loops modeled individually;
  5) makeup, letdown, and pressurizer-sprayer cvcs flows;
  6) accumulator and hpsi fills in each primary-coolant loop;
  7) pressurizer and pressurizer porv and srv;
  8) pressurizer, steam generator, and steam-dump control systems;
  9) single-tube degb leakage path in loop 2 steam generator;
 10) main-steam and steam-dump lines;
 11) high-pressure feedwater system after hp heaters; and
 12) auxiliary-feedwater fills (motor and steam driven).
the w3loop input-data model has the following developmental history:
  james lime created the trac-pf1/mod1 input-data model on 7/84.
  robert steinke converted the trac-pf1/mod1 input-data model with
  gocnvt to a trac-pf1/mod2 input-data model and added component-
  network diagrams on 9/90. marvin salazar added units labels to
  the control blocks and trips for si/english units i/o on 10/93.
  robert steinke replaced stgen components with htstr, pipe, and tee
  components on 2/96.  James lime upgraded the w3loop input-data model
  to be consistent with the current h.b.robinson plant model on 5/96.

graphics data is defined in si units
```

```
input data is defined in si units

output data is defined in si units                                                                          5

system components 10  12  14  16  17  18  54  52  50  49  91  56  20  22  24  26  27  28  64  62  60 202  59  92  66
                  30  32  34  36  37  38  40  41  42  74  72  70  44  45  46  43  69  93  47  76  48   2   3   4   5
                   6   7 100 105 190 110 120 400 410 420 422 180 170 154 150 250 350 112 220 210 205 290 200 320 310
                 305 390 300 430 432 254 270 280 354 370 380 116 212 312 436 216 316 424 578 114 434 179 169 576 118
                 214 203 314 438 269 279 369 379 218 318   1 900 901 902 903 904 905 906 907 908 909 910 920 930 931
                 932 933 934 935 936 937 938


the vessel-matrix array storage is dimensioned for 12 diagonals
above and below the main diagonal defining the matrix bandwidth         6
with 12 matrix rows of nonzero elements outside the bandwidth


problem size specifications

  fixed scm data size is      0
  maximum 1d component scm size is   4095          7
  maximum 1 level/rod scm size is 146729
  maximum 3 level scm size is ******
  direct matrix scm size is   9528
 last lcm space used is   1475256


restart dump generated at problem time     0.000000 s after     0 time steps          8

                         time domain data to be used
   minimum    maximum    time       long     graphics     dump       short
    time       time     domain      edit      edit        edit        edit
  step (s)   step (s)   end (s)   step (s)   step (s)   step (s)   step (s)
  1.000E-03 1.000E-01 1.000E+01 1.010E+01 5.000E-01 1.010E+01 1.010E+01

steady-state calculation heat-transfer/hydraulic time-step ratio is 1.0000E+01         9
convective energy-error controller is  1.0000E+20   w

at time     0.0000 s in component number 931 at cell   7, the maximum stanton number is 1.759790E+03
at time     0.0000 s in component number 900 at cell   1, the minimum tld is 6.179053E+02 k
              where tld is the liquid temperature at bubble detachment from a heated surface
*tf1ds3* pack-stretch  nstep=     0 oitno=    2 num=190 cell= 14
         etime= 0.0000E+00  delt= 1.0000E-03 alp= 0.0000E+00 pspike= 5.9112E+06
          vlnj= 2.2460E-01 vlnjp= 6.1552E-02    p= 5.4158E+06     pn= 5.5779E+06
*tf1ds3* pack-stretch  nstep=     0 oitno=    2 num=190 cell=  6
         etime= 0.0000E+00  delt= 1.0000E-03 alp= 0.0000E+00 pspike= 5.9419E+06
          vlnj= 1.9888E-01 vlnjp= 1.1266E-01    p= 5.4158E+06     pn= 5.6869E+06
*tf1ds3* pack-stretch  nstep=     0 oitno=    2 num=290 cell= 14
         etime= 0.0000E+00  delt= 1.0000E-03 alp= 0.0000E+00 pspike= 5.9112E+06
          vlnj= 2.2460E-01 vlnjp= 6.1548E-02    p= 5.4158E+06     pn= 5.5779E+06
*tf1ds3* pack-stretch  nstep=     0 oitno=    2 num=290 cell=  6
         etime= 0.0000E+00  delt= 1.0000E-03 alp= 0.0000E+00 pspike= 5.9419E+06
          vlnj= 1.9888E-01 vlnjp= 1.1266E-01    p= 5.4158E+06     pn= 5.6869E+06
*tf1ds3* pack-stretch  nstep=     0 oitno=    2 num=390 cell= 14
         etime= 0.0000E+00  delt= 1.0000E-03 alp= 0.0000E+00 pspike= 5.9112E+06
          vlnj= 2.2460E-01 vlnjp= 6.1552E-02    p= 5.4158E+06     pn= 5.5779E+06       10
*tf1ds3* pack-stretch  nstep=     0 oitno=    2 num=390 cell=  6
         etime= 0.0000E+00  delt= 1.0000E-03 alp= 0.0000E+00 pspike= 5.9419E+06
          vlnj= 1.9888E-01 vlnjp= 1.1266E-01    p= 5.4158E+06     pn= 5.6869E+06

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number   time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
    0      0.000000  0.001000    4      98.017   0.0003    0.0000   1  150    1
*tf1ds3* pack-stretch  nstep=     1 oitno=    1 num=190 cell= 14
         etime= 1.0000E-03  delt= 1.0000E-03 alp= 7.1270E-06 pspike= 6.3141E+06
          vlnj= 4.1015E-01 vlnjp= 1.9527E-02    p= 5.4158E+06     pn= 5.4158E+06
*tf1ds3* alpha increase turns packer off  nstep=     1 oitno=    1
         num=190 cell= 14 etime= 1.00000E-03 delt= 1.00000E-03
*tf1ds3* pack-stretch  nstep=     1 oitno=    1 num=290 cell= 14
         etime= 1.0000E-03  delt= 1.0000E-03 alp= 7.1272E-06 pspike= 6.3143E+06
          vlnj= 4.1015E-01 vlnjp= 1.9527E-02    p= 5.4158E+06     pn= 5.4158E+06
*tf1ds3* alpha increase turns packer off  nstep=     1 oitno=    1
         num=290 cell= 14 etime= 1.00000E-03 delt= 1.00000E-03
*tf1ds3* pack-stretch  nstep=     1 oitno=    1 num=390 cell= 14
         etime= 1.0000E-03  delt= 1.0000E-03 alp= 7.1269E-06 pspike= 6.3144E+06
          vlnj= 4.1015E-01 vlnjp= 1.9526E-02    p= 5.4158E+06     pn= 5.4158E+06
*tf1ds3* alpha increase turns packer off  nstep=     1 oitno=    1
         num=390 cell= 14 etime= 1.00000E-03 delt= 1.00000E-03

at     0.001659 s, the trip -407 signal crossed setpoint s2 =  1.500000E-01 -      11
at     0.002000 s, the trip -407 signal is  1.801346E-01 -

at     0.002000 s, trip -407 is reset from  0 to  1 with a set status of on-forward
```

```
time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
 number    time (s)  size (s)  number  time (s)   1-d      3-d   flag cmp cell
   10     0.012027  0.001551     3     251.117   0.1358   0.0011   1  305    7
   20     0.031539  0.002527     3     399.217   0.1189   0.0031   1  305    7
   30     0.063323  0.004116     3     548.067   0.1378   0.0086   1  210    1
   40     0.115095  0.006705     4     697.167   0.2035   0.0245   1  210    1      12
   50     0.195730  0.010401     2     830.150   0.3368   0.0639   1  310    1
   60     0.326556  0.016943     3     971.300   1.0143   0.1662   1  210    1
   70     0.536079  0.026283     3    1137.500   1.9111   0.3590   1  210    1
   80     0.866670  0.042813     3    1298.367   3.7543   0.6870   1  210    1
   90     1.405168  0.069738     3    1462.400   6.4132   1.1670   1  310    1

*htstr1*  heat structure 900 is set to a steady-state power of 2.30000E+09    w
          problem time is      2.071103 s and the time-step number is     98    13

               generalized steady-state convergence-test results

      problem time is      2.234650 s and time-step size is    0.081774 s      14
        time-step number is    100 and number of outer iterations is  3

     parameters tested    max.fr.change per second    component       cell
      for convergence         over last time step       number        number
         pressure                  0.110635              200             2
      liquid velocity             10.105591              205             4
        gas velocity               4.222451              200             7
       void fraction              -1.147031              205             3
     liquid temperature           -0.022811                1            90
       gas temperature             0.020845              200             3
      ncd-gas pressure            -0.000041               50             1

             constrained steady-state calculation parameters

  component      minimum       adjusted       maximum      monitored      desired
  and number      value        parameter       value       parameter       value
  pump    16  0.00000E+00  1.30287E+02  2.00000E+02  4.58485E+03  4.25900E+03    15
                    rad/s        rad/s        rad/s         kg/s         kg/s
  pump    26  0.00000E+00  1.30300E+02  2.00000E+02  4.58456E+03  4.25900E+03
                    rad/s        rad/s        rad/s         kg/s         kg/s
  pump    36  0.00000E+00  1.30045E+02  2.00000E+02  4.55714E+03  4.25900E+03
                    rad/s        rad/s        rad/s         kg/s         kg/s


time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
 number    time (s)  size (s)  number  time (s)   1-d      3-d   flag cmp cell
  100     2.234650  0.085862     6    1651.717   8.0544   1.3696   1  310    1
  110     3.103088  0.100000     3    1816.184   9.3750   1.5636   1  310    1
  120     4.103088  0.100000     3    1983.417   9.1050   1.5404   1  310    1
  130     5.103088  0.100000     3    2155.833   8.1547   1.5381   1  310    1
  140     6.103088  0.100000     2    2315.067   7.1516   1.5344   1  310    1
  150     7.103088  0.100000     2    2455.250   6.2484   1.5335   1  310    1
back up forced in post by component 310, cell    1, time step   157.           16

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
 number    time (s)  size (s)  number  time (s)   1-d      3-d   flag cmp cell
  160     7.960713  0.057881     2    2616.450   3.2516   0.8856   1  310    1
  170     8.688737  0.094282     2    2761.817   5.4584   1.4394   1  310    1
  180     9.682016  0.100000     2    2915.900   5.1963   1.5189   1  210    1

                      time domain data to be used
   minimum    maximum     time       long    graphics     dump       short
    time       time      domain      edit      edit       edit       edit
  step (s)   step (s)   end (s)   step (s)   step (s)   step (s)   step (s)       17
  1.000E-03 2.000E-01 1.000E+02 9.020E+01 1.000E+00 9.020E+01 9.020E+01

steady-state calculation heat-transfer/hydraulic time-step ratio is 3.0000E+00
convective energy-error controller is  1.0000E+20   w

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
 number    time (s)  size (s)  number  time (s)   1-d      3-d   flag cmp cell
  190    10.796217  0.140710     2    3058.350   8.8709   2.1289   1  210    1

               generalized steady-state convergence-test results

      problem time is     12.539873 s and time-step size is    0.200000 s      14
        time-step number is    200 and number of outer iterations is  3

     parameters tested    max.fr.change per second    component       cell
      for convergence         over last time step       number        number
         pressure                 -0.009036              290             3
      liquid velocity             -0.880862              190             3
        gas velocity               0.853617              205             8
       void fraction              -0.442276              290             4
     liquid temperature            0.022910              290             4
       gas temperature            -0.003021              205             4
      ncd-gas pressure            -0.000024               50             1
```

```
              constrained steady-state calculation parameters

 component    minimum     adjusted     maximum     monitored     desired
 and number    value      parameter     value      parameter      value
 pump   16  0.00000E+00  1.23069E+02  2.00000E+02  4.27555E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s
 pump   26  0.00000E+00  1.23105E+02  2.00000E+02  4.27527E+03  4.25900E+03      15
                  rad/s        rad/s        rad/s         kg/s         kg/s
 pump   36  0.00000E+00  1.23310E+02  2.00000E+02  4.28473E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)    1-d      3-d   flag cmp cell
   200    12.539873  0.200000     4   3225.150  14.1282   3.0155   1  105    5
back up forced in post by component 390, cell   4, time step  204.
back up forced in post by component 390, cell   4, time step  204.              16
back up forced in post by component 390, cell   4, time step  204.

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)    1-d      3-d   flag cmp cell
   210    13.509920  0.033502     2   3425.217   2.3955   0.5055   1  105    5
   220    13.931310  0.054572     2   3558.100   4.0397   0.8236   1  105    5
   230    14.617709  0.088892     2   3693.800   6.9233   1.3424   1  105    5
   240    15.735781  0.144795     3   3835.450  11.6158   2.1879   1  105    5
back up forced in post by component 290, cell   3, time step  240.

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)    1-d      3-d   flag cmp cell
   240    15.735781  0.072398     2   3848.550   5.8077   1.0940   1  105    5
   250    16.646391  0.117928     2   3990.300   9.6033   1.7831   1  310    1
   260    18.129680  0.192093     2   4126.617  15.8056   2.9062   1  310    1      18
   270    20.121772  0.200000     2   4265.567  16.3982   3.0270   1  105    5
   280    22.121772  0.200000     2   4404.700  16.3272   3.0259   1  105    5
   290    24.121772  0.200000     2   4543.733  16.2922   3.0256   1  105    5

             generalized steady-state convergence-test results

      problem time is      26.121772 s and time-step size is    0.200000 s        14
        time-step number is    300 and number of outer iterations is  2

    parameters tested     max.fr.change per second    component       cell
     for convergence          over last time step        number        number
        pressure                   -0.013218              354             2
     liquid velocity                0.200403              205             9
       gas velocity                -0.055897              205             9
      void fraction                -0.046856              305             1
    liquid temperature              0.001671              290             4
      gas temperature              -0.000419              105             7
     ncd-gas pressure              -0.000024               50             1

              constrained steady-state calculation parameters

 component    minimum     adjusted     maximum     monitored     desired
 and number    value      parameter     value      parameter      value
 pump   16  0.00000E+00  1.23306E+02  2.00000E+02  4.25898E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s      15
 pump   26  0.00000E+00  1.23336E+02  2.00000E+02  4.25843E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s
 pump   36  0.00000E+00  1.23378E+02  2.00000E+02  4.26102E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)    1-d      3-d   flag cmp cell
   300    26.121772  0.200000     2   4683.050  16.2701   3.0259   1  105    5
   310    28.121772  0.200000     2   4821.967  16.2640   3.0264   1  105    5
   320    30.121772  0.200000     2   4963.784  16.2863   3.0270   1  105    5
   330    32.121772  0.200000     2   5102.950  16.3606   3.0275   1  105    5
   340    34.121772  0.200000     2   5250.450  16.5013   3.0280   1  105    5
   350    36.121772  0.200000     2   5395.100  16.6645   3.0285   1  105    5
   360    38.121772  0.200000     2   5536.950  16.9025   3.0290   1  105    5
   370    40.121772  0.200000     2   5676.250  16.9934   3.0297   1  210    1
   380    42.121772  0.200000     2   5815.567  17.1050   3.0306   1  210    1
   390    44.121772  0.200000     2   5957.617  17.6353   3.0309   1  210    1

             generalized steady-state convergence-test results

      problem time is      46.121772 s and time-step size is    0.200000 s        14
        time-step number is    400 and number of outer iterations is  2

    parameters tested     max.fr.change per second    component       cell
     for convergence          over last time step        number        number
        pressure                    0.005767              154             2
     liquid velocity                0.138618              105             9
       gas velocity                -0.061429              105             9
```

```
        gas velocity                 -0.061429          105          9
       void fraction                  0.033206          290          1
    liquid temperature               -0.001569          390          4
       gas temperature                0.000642          305          4
      ncd-gas pressure               -0.000024           50          1

              constrained steady-state calculation parameters

  component    minimum     adjusted     maximum     monitored     desired
  and number    value      parameter     value      parameter      value
  pump   16  0.00000E+00  1.23491E+02  2.00000E+02  4.25701E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s      15
  pump   26  0.00000E+00  1.23581E+02  2.00000E+02  4.25626E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
  pump   36  0.00000E+00  1.23605E+02  2.00000E+02  4.25402E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number   time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
   400    46.121772  0.200000    2    6097.233  18.0810    3.0321   1  210    1
   410    48.121772  0.200000    2    6236.417  18.2248    3.0333   1  210    1
   420    50.121772  0.200000    2    6378.250  18.4032    3.0343   1  210    1
   430    52.121772  0.200000    2    6520.284  18.6601    3.0352   1  210    1
   440    54.121772  0.200000    2    6659.467  18.7562    3.0362   1  210    1
   450    56.121772  0.200000    2    6817.784  18.8197    3.0371   1  210    1
   460    58.121772  0.200000    2    6956.800  19.0520    3.0379   1  210    1
   470    60.121772  0.200000    2    7098.784  19.0026    3.0385   1  210    1
   480    61.785213  0.189529    2    7246.500  17.9935    2.8799   1  210    1
   490    63.773748  0.200000    2    7388.583  19.1627    3.0396   1  210    1

               generalized steady-state convergence-test results

      problem time is      65.773748 s and time-step size is    0.200000 s
        time-step number is    500 and number of outer iterations is  2       14

     parameters tested      max.fr.change per second    component       cell
      for convergence          over last time step        number        number
          pressure                    0.009779              154            2
      liquid velocity                 0.885266              290            5
        gas velocity                 -0.320182              290            1
       void fraction                  0.328091         18   290            4
    liquid temperature               -0.036486              290            1
       gas temperature               -0.001815              205            4
      ncd-gas pressure               -0.000024               50            1

              constrained steady-state calculation parameters

  component    minimum     adjusted     maximum     monitored     desired
  and number    value      parameter     value      parameter      value
  pump   16  0.00000E+00  1.23737E+02  2.00000E+02  4.25768E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s      15
  pump   26  0.00000E+00  1.23909E+02  2.00000E+02  4.25756E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
  pump   36  0.00000E+00  1.23994E+02  2.00000E+02  4.25834E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number   time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
   500    65.773748  0.200000    2    7530.400  19.1247    3.0400   1  210    1
   510    67.773748  0.200000    3    7680.800  19.1730    3.0405   1  210    1
   520    69.773748  0.200000    2    7820.217  19.2880    3.0408   1  210    1
   530    71.773748  0.200000    2    7965.217  19.2485    3.0411   1  210    1
   540    73.773748  0.200000    2    8110.400  19.0296    3.0414   1  210    1
   550    75.773748  0.200000    2    8249.650  18.8896    3.0415   1  210    1
   560    77.773748  0.200000    2    8388.850  18.7338    3.0415   1  210    1
   570    79.773748  0.200000    2    8539.450  18.4046    3.0421   1  210    1
   580    81.773748  0.200000    2    8681.667  18.7602    3.0411   1  210    1
   590    83.773748  0.200000    2    8821.367  18.3481    3.0413   1  210    1

               generalized steady-state convergence-test results

      problem time is      85.773748 s and time-step size is    0.200000 s
        time-step number is    600 and number of outer iterations is  2       14

     parameters tested      max.fr.change per second    component       cell
      for convergence          over last time step        number        number
          pressure                    0.020327              154            2
      liquid velocity                 0.156745              400            4
        gas velocity                 -0.069365              105            9
       void fraction                  0.042481         18   205            2
    liquid temperature               -0.002164              290           12
       gas temperature               -0.000511              205            4
      ncd-gas pressure               -0.000024               50            1
```

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23803E+02 rad/s	2.00000E+02 rad/s	4.25876E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23991E+02 rad/s	2.00000E+02 rad/s	4.25917E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23970E+02 rad/s	2.00000E+02 rad/s	4.25860E+03 kg/s	4.25900E+03 kg/s

15

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
600	85.773748	0.200000	2	8964.017	18.1704	3.0414	1	210	1
610	87.773748	0.200000	2	9106.533	17.6015	3.0413	1	105	5
620	89.773748	0.200000	2	9248.717	17.5018	3.0394	1	105	5
630	91.772208	0.200000	2	9390.934	17.5847	3.0375	1	105	5
640	93.772208	0.200000	2	9530.467	17.5735	3.0361	1	105	5
650	95.772208	0.200000	2	9669.817	17.5511	3.0340	1	105	5
660	97.772208	0.200000	2	9812.100	17.5887	3.0319	1	105	5
670	99.772208	0.200000	2	9951.667	17.6697	3.0300	1	105	5

time domain data to be used

minimum time step (s)	maximum time step (s)	time domain end (s)	long edit step (s)	graphics edit step (s)	dump edit step (s)	short edit step (s)
1.000E-03	3.000E-01	2.000E+02	1.003E+02	2.000E+00	1.003E+02	1.003E+02

19

steady-state calculation heat-transfer/hydraulic time-step ratio is 1.0000E+00
convective energy-error controller is 1.0000E+20 w

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
680	102.177521	0.300000	2	10088.300	26.3059	4.5435	1	105	5
690	104.281917	0.161170	2	10238.434	14.2357	2.4413	1	210	1

generalized steady-state convergence-test results

problem time is 106.309090 s and time-step size is 0.250027 s
time-step number is 700 and number of outer iterations is 3

14

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	0.008198	154	2
liquid velocity	2.547990	305	7
gas velocity	-1.628743	305	7
void fraction	0.785299	305	6
liquid temperature	0.002992	290	3
gas temperature	-0.017311	305	7
ncd-gas pressure	-0.000020	50	1

18

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23762E+02 rad/s	2.00000E+02 rad/s	4.25961E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23709E+02 rad/s	2.00000E+02 rad/s	4.25991E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23934E+02 rad/s	2.00000E+02 rad/s	4.25978E+03 kg/s	4.25900E+03 kg/s

15

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
700	106.309090	0.112046	3	10385.934	10.1146	1.6973	1	210	1
710	107.499093	0.148581	2	10527.950	13.3980	2.2508	1	210	1
720	109.367927	0.242023	2	10664.217	21.6144	3.6661	1	210	1
730	111.106022	0.176152	2	10814.367	15.6660	2.6683	1	210	1
740	113.030087	0.100826	3	10964.450	8.9898	1.5273	1	210	1
750	114.209567	0.150511	2	11103.850	13.4386	2.2799	1	210	1
760	116.102681	0.245167	2	11240.134	21.8582	3.7136	1	210	1
770	117.511191	0.121425	2	11387.717	10.7522	1.8393	1	210	1
780	119.038467	0.197789	2	11524.250	17.4433	2.9961	1	105	5
790	120.980361	0.117208	2	11677.184	10.3276	1.7755	1	105	5

generalized steady-state convergence-test results

problem time is 122.454592 s and time-step size is 0.181828 s
time-step number is 800 and number of outer iterations is 2

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	-0.011721	254	2

liquid velocity	0.178387	205	3
gas velocity	-0.111389	290	5
void fraction	0.050457	305	6
liquid temperature	-0.001100	290	4
gas temperature	0.001691	290	4
ncd-gas pressure	-0.000026	50	1

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23730E+02 rad/s	2.00000E+02 rad/s	4.25900E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23722E+02 rad/s	2.00000E+02 rad/s	4.25938E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23911E+02 rad/s	2.00000E+02 rad/s	4.25875E+03 kg/s	4.25900E+03 kg/s

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
800	122.454592	0.190920	2	11810.684	16.8943	2.8921	1	210	1
810	124.542595	0.105298	3	11958.017	9.3898	1.5952	1	210	1
820	125.722653	0.149182	2	12094.350	13.3419	2.2600	1	210	1
830	127.599053	0.243002	2	12230.667	21.7379	3.6814	1	210	1
840	128.992560	0.106386	2	12378.000	9.4864	1.6118	1	210	1
850	130.330668	0.173291	2	12514.517	15.3884	2.6254	1	210	1
860	132.510304	0.211880	4	12659.300	18.7214	3.2101	1	105	5
870	134.216726	0.210267	2	12801.467	18.5982	3.1857	1	105	5
880	136.041761	0.186500	2	12949.117	16.4966	2.8256	1	105	5
890	137.946190	0.160739	2	13101.934	14.2166	2.4353	1	105	5

generalized steady-state convergence-test results

problem time is 139.896958 s and time-step size is 0.178364 s
time-step number is 900 and number of outer iterations is 3

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	-0.025155	154	2
liquid velocity	-2.935348	305	7
gas velocity	1.930202	305	7
void fraction	-0.701062	305	6
liquid temperature	0.001246	305	6
gas temperature	-0.032385	305	6
ncd-gas pressure	-0.000027	50	1

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23751E+02 rad/s	2.00000E+02 rad/s	4.25876E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23726E+02 rad/s	2.00000E+02 rad/s	4.25937E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23937E+02 rad/s	2.00000E+02 rad/s	4.25873E+03 kg/s	4.25900E+03 kg/s

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
900	139.896958	0.143603	3	13249.533	12.6904	2.1757	1	105	5
910	141.703181	0.233914	3	13385.867	20.7444	3.5440	1	210	1
920	143.031086	0.117537	2	13535.867	10.4812	1.7808	1	210	1
930	144.509457	0.191456	2	13672.267	17.1106	2.9008	1	210	1
940	146.596550	0.123795	3	13822.750	11.0447	1.8757	1	210	1
950	148.153634	0.201650	2	13958.700	17.9362	3.0552	1	210	1
960	150.055219	0.166624	3	14108.550	14.7564	2.5245	1	210	1
970	152.002367	0.128659	2	14258.800	11.3724	1.9494	1	105	5
980	153.620630	0.209572	2	14395.400	18.5209	3.1752	1	105	5
990	155.295306	0.098290	2	14545.700	8.6886	1.4892	1	105	5

generalized steady-state convergence-test results

problem time is 156.531585 s and time-step size is 0.152480 s
time-step number is 1000 and number of outer iterations is 3

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	0.010948	154	2
liquid velocity	-2.801336	290	5
gas velocity	1.117346	290	5
void fraction	-0.170374	290	4
liquid temperature	-0.000871	290	4
gas temperature	0.000768	290	5
ncd-gas pressure	-0.000029	50	1

constrained steady-state calculation parameters

component and number		minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump	16	0.00000E+00 rad/s	1.23800E+02 rad/s	2.00000E+02 rad/s	4.25867E+03 kg/s	4.25900E+03 kg/s
pump	26	0.00000E+00 rad/s	1.23767E+02 rad/s	2.00000E+02 rad/s	4.25868E+03 kg/s	4.25900E+03 kg/s
pump	36	0.00000E+00 rad/s	1.23966E+02 rad/s	2.00000E+02 rad/s	4.25867E+03 kg/s	4.25900E+03 kg/s

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
1000	156.531585	0.160104	2	14685.384	14.1574	2.4257	1	105	5
1010	158.545353	0.260792	3	14824.900	23.0371	3.9510	1	105	5
1020	159.846084	0.121668	2	14966.800	10.7403	1.8433	1	105	5
1030	161.376412	0.198184	2	15103.367	17.6006	3.0024	1	210	1
1040	163.752047	0.071483	3	15253.384	6.3847	1.0831	1	210	1
1050	164.651154	0.116439	2	15397.983	10.4041	1.7645	1	210	1
1060	166.115707	0.189666	2	15534.400	16.9034	2.8749	1	210	1
1070	168.200000	0.109113	3	15684.450	9.6816	1.6542	1	210	1
1080	169.437891	0.158808	2	15823.967	14.0443	2.4079	1	210	1
1090	171.435359	0.258681	3	15963.250	22.8431	3.9223	1	105	5

generalized steady-state convergence-test results

problem time is 172.672565 s and time-step size is 0.116133 s
time-step number is 1100 and number of outer iterations is 2

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	0.019037	254	2
liquid velocity	-1.240295	305	7
gas velocity	0.472313	305	7
void fraction	-0.306315	305	6
liquid temperature	0.004046	290	4
gas temperature	-0.006893	305	6
ncd-gas pressure	-0.000035	50	1

18

constrained steady-state calculation parameters

component and number		minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump	16	0.00000E+00 rad/s	1.23828E+02 rad/s	2.00000E+02 rad/s	4.25893E+03 kg/s	4.25900E+03 kg/s
pump	26	0.00000E+00 rad/s	1.23841E+02 rad/s	2.00000E+02 rad/s	4.25888E+03 kg/s	4.25900E+03 kg/s
pump	36	0.00000E+00 rad/s	1.24010E+02 rad/s	2.00000E+02 rad/s	4.25897E+03 kg/s	4.25900E+03 kg/s

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
1100	172.672565	0.121940	2	16105.017	10.7687	1.8488	1	105	5
1110	174.206312	0.198627	2	16242.050	17.5550	3.0113	1	105	5
1120	176.277983	0.083551	2	16397.867	7.3828	1.2665	1	105	5
1130	177.328879	0.136096	2	16534.367	12.0182	2.0627	1	105	5
1140	179.040678	0.221686	2	16668.051	19.5954	3.3591	1	210	1
1150	181.049076	0.108277	3	16818.184	9.6371	1.6405	1	210	1
1160	182.410972	0.176372	2	16960.267	15.7260	2.6723	1	210	1
1170	184.552240	0.124807	3	17110.517	11.1058	1.8911	1	210	1
1180	186.122055	0.203298	2	17252.566	18.0389	3.0804	1	210	1
1190	188.025773	0.171916	3	17402.701	15.1900	2.6049	1	105	5

generalized steady-state convergence-test results

problem time is 189.860423 s and time-step size is 0.108199 s
time-step number is 1200 and number of outer iterations is 3

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	0.033624	154	2
liquid velocity	-3.315537	305	7
gas velocity	-1.849876	305	6
void fraction	-0.696953	305	6
liquid temperature	-0.001120	290	3
gas temperature	-0.005255	305	6
ncd-gas pressure	-0.000041	50	1

18

```
                 constrained steady-state calculation parameters

 component     minimum      adjusted       maximum      monitored      desired
 and number     value       parameter       value       parameter       value
 pump   16  0.00000E+00  1.23809E+02  2.00000E+02  4.25925E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s
 pump   26  0.00000E+00  1.23778E+02  2.00000E+02  4.25974E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s
 pump   36  0.00000E+00  1.23967E+02  2.00000E+02  4.25957E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s


time-step  problem   time-step outer-it.  cpu      courant  numbers sets location
 number    time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
 1200    189.860423  0.101278     2  17547.267   8.9495    1.5345   1  105    5
 1210    191.134281  0.164970     2  17689.400  14.5841    2.4996   1  105    5
 1220    193.209261  0.187904     4  17836.934  16.6205    2.8470   1  105    5
 1230    194.742635  0.189294     2  17979.017  16.7405    2.8681   1  105    5
 1240    197.038298  0.078718     3  18126.451   6.9571    1.1927   1  105    5
 1250    198.028399  0.128223     2  18265.451  11.3380    1.9427   1  210    1
 1260    199.641170  0.208861     2  18401.801  18.5014    3.1645   1  210    1
 1262      0.000000  0.219304     2  18417.684  <------------------------------ 20

at time      0.0000 s in component number 931 at cell    7, the maximum stanton number is 1.759790E+03
at time      3.1031 s in component number 906 at cell    1, the minimum tld is 6.220945E+02 k
              where tld is the liquid temperature at bubble detachment from a heated surface

                 constrained steady-state calculation parameters

 component     minimum      adjusted       maximum      monitored      desired
 and number     value       parameter       value       parameter       value
 pump   16  0.00000E+00  1.23787E+02  2.00000E+02  4.25923E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s
 pump   26  0.00000E+00  1.23750E+02  2.00000E+02  4.25911E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s
 pump   36  0.00000E+00  1.23952E+02  2.00000E+02  4.25908E+03  4.25900E+03
                  rad/s        rad/s        rad/s         kg/s         kg/s

restart dump generated with time of      0.000000 s after  1262 time steps   <-------- 20


         *****************
         **   warning   **
         *****************

*steady* steady-state solution not converged

current overlays in memory: cbmain

problem time is      0.000000 s, time-step size is    0.219304 s, time-step number is  1262,
outer-iteration number is   2, component number is  938, and component type is a rod


                            end of problem
```

G.3. Notes on the TRCMSG File From the Transient Calculation

The printout from the transient calculation TRCMSG file is reviewed in this section to provide a description of its contents. Items already discussed in Section G.1. for the steady-state calculation TRCMSG file will not be discussed here unless additional comments are needed on that item. Notes in this section are referenced in the TRCMSG file by callouts that are marked on the printout in Section G.4. For example, 1 is note 1.

1. This is a restart transient calculation from the last data dump of the steady-state calculation. After the title cards, the number of signal variables, control blocks, and trips that the TRCRST file defines are noted. The IORDER-array component numbers, excluding the component numbers whose component data are input-specified in the TRACIN file, are listed in their input order. These are the component numbers whose component data are defined by the TRCRST file. Then all the component numbers, reordered for their evaluation, are listed. The TRACIN file for this transient calculation in Appendix F inputs the redefined FILL components 91 and 92 and a new PIPE component 202 to replace FILL component 202 from the

restart-data components. FILL component 203 is deleted by no longer being defined in the IORDER array. The restart data comes from the steady-state calculation data dump at timestep number 1262 where the 200.069335 s problem time has been reset to 0.0 s.

2. The transient calculation is evaluated for TEND = 600.0 s of problem time with one timestep data set. A steam-generator single-tube rupture, initiated at 0.0 s problem time, causes a mild loss-of-primary-coolant transient. NAMELIST variable DTSTRT = 1.0000E-03 s starts the transient calculation at a timestep size of 0.001 s rather than at the 0.2 s timestep size from the data dump.

3. All trips are evaluated at the start of each timestep in a transient calculation. During the first three timesteps, trip ID numbers 34, 26, 10, 16, and 18 have their ITST = 3 trip-controlled-trip signals changed from 0.0 to 1.0 (because one of their controlling trips was set ON and their controlling-trip set status are summed to define their trip signal). Being ISRT = 2 trips, when their trip signal crosses setpoint S2 = 0.9, a pending set status change from OFF to ON after the T2 delay time is set up. That delay time is 0.0 s for Trip ID numbers 34, 10, 16, and 18, so their set status is changed to ON ($ON_{forward}$). The set status of trip ID 26 will not be changed until 30.0019 s because its T2 delay time is 30.0 s. Other trips that were input with a negative value for their ITST parameter may also have changed their set status, but messages to that effect are not printed to the TRCMSG file. That is the case for the controlling trips that affected the set status change of these trip-controlled trips. Only trips of interest that control component actions should have their change of set status messages output to the TRCMSG (and TRCOUT) file.

4. At 6.7 s problem time, steam-dump VALVE component 432 begins to open under the control of control blocks –4342 and –4336 (and other control blocks that have not yet been activated in the control network). Depressurization of the secondary-side coolant of all three steam generators that are hydraulically coupled initially causes numerical-solution difficulty in TEE component 430 that is connected to opening VALVE component 432. The TEE's linearly projected pressure is a poor timestep-solution estimate because the ~0.18 s timestep size is too large. Backups and timestep-size control reduce the timestep size to 0.0026 s in the last *TF1DS3* warning message before this initial secondary-side depressurization phase of the transient can be numerically evaluated. By 11.0 s, the timestep size has recovered to ~0.1 s.

5. Depressurization of the primary-side coolant occurs because of the single-tube rupture in the loop 2 steam generator. At 14.95 s, trip ID number 54 is set ON because of a low pressure signal in the pressurizer that activates its power-deposited-in-the-liquid-coolant heater. At 25.59 s, trip ID number –407 is set OFF because of a low liquid level in the pressurizer that turns off

the power-deposited-in-the-liquid-coolant heater in pressurizer PIPE component 40 because of POWOFF = 0.0 W.

6. Depressurization effects and velocity reversals that oscillate on the secondary-side of the loop 1 steam generator require two outer-iteration backups at 25.95 s that reduce the timestep size from 0.1122 to 0.02805 s. TRAC-P recovers from numerical-solution difficulty be performing backups that reduce the timestep size until the linearly projected numerical solution is able to converge to a solution state that is simultaneously satisfied among all state equations.

7. From 30.8 to 30.9 s, six trip signals cross their setpoints for change of set status. Four of the trips change their set status because their setpoint delay time is 0.0 s; trip ID numbers 21 and 28 have setpoint delay times of 20.0 s and 30.0 s, respectively, that delay the change of their set status.

8. Velocity reversal oscillations at ~42, ~46, and ~72 s and extremely low liquid-temperature estimates at ~63 s in the steam dome of the loop 3 steam generator periodically require backups to reduce the timestep size to obtain a converged numerical solution.

9. After 75 s, the numerical solution evaluated more robustly with the timestep size increasing to between 0.2 and 0.4 s for the remainder of the 600 s problem-time calculation. Material Courant limits of 10 to 40 were evaluated. A DTMAX maximum timestep size of 0.3 s rather than 0.5 s would have been more appropriate for this transient calculation because timesteps of 0.4 s required a smaller timestep size. Short and large edits were output to the TRCOUT file every 100 s and data dumps were output every 200 s to the TRCDMP file.

10. The total CPU run time of 42,924 s (11.92 h) for the transient calculation involved an overnight evaluation on a SUN Sparc 2 workstation. A faster workstation could reduce that run time to a few hours. That is an acceptable calculation time for a rather elaborate system model of 131 components with a complex control procedure of 66 signal variables, 238 control blocks, and 72 trips.

G.4. Listing of the TRCMSG File From the Transient Calculation

```
                                     transient  reactor  analysis  code

             tttt                 cccc                   ppppppppppp
           ttt  t                cc  cc                pp           pp
         ttt                    cc                    pp  ppp           pp
 t     tttt               aa    cc         c         p    pp           pp
tt   ttt tt             aaaaa   cc       cc          p    pp            pp
ttttt  tt              aa  aa   ccc   ccc            p p  pp            pp
       tt        rrr  aa   aa  cc ccccc                p  pp           pp
       tt      rrrrr  aa   aaaaa                          pp          pp
       tt     rr  rr  aa  aa aa                          pppp      ppp
      tt      rr  rr  aaaaa                   ****       pp  pppppp
      tt      rr  rr aa aa                               pp
      tt     rrr  rrrrr                                  pp
      tt     rr    rr                                   pp
      tt    rr                                          pp
      tt   rr                                           pp
t    tt                                             p   pp
tt  ttt                                             pp ppp
 ttttt                                               ppppp

        *****************
        **   warning   **
        *****************

 *trac* this executable has memory preset to zero

 current overlays in memory: cbmain
     real variables preset to zero
     integer variables preset to zero
     ***code may not function in the same manner as***
     ***lanl internal version which presets memory ***
     ***to negative indefinites                    ***
 *** Official TRAC-P Version 5.4.19   ***
Program library created Thu May 2 14:50:51 MDT 1996



 ---------------------------------------------------------------------------
                    Change History
 ---------------------------------------------------------------------------
  5.4      Date Stamp Fri Apr 2 14:46:00  MDT 1993 **date not automated**
  5.4.01   Date Stamp Thu Jun 9 11:23:55 MDT 1994
  5.4.02   Date Stamp Mon. Oct. 3 1994            **date not automated**
  5.4.03   Date Stamp Thu. Oct 13 1994            **date not automated**
  5.4.04   Date Stamp Thu. Dec 08 1994            **date not automated**
  5.4.05   Date Stamp Tue. Dec 20 1994            **date not automated**
  5.4.06   Date Stamp Tue. Mar 14 1995            **date not automated**
  5.4.07   Date Stamp Mon June 19 1995            **date not automated**
  5.4.08   Date Stamp Thu June 22 1995            **date not automated**
  5.4.09   Date Stamp Fri July 14 1995            **date not automated**
  5.4.10   Date Stamp Fri. Aug 18 1995            **date revised in 5.4.11**
  5.4.11   Date Stamp Fri Aug. 25 1995 .          **date not automated**
  5.4.12   Date Stamp Wed Sep 13 13:53:12 MDT 1995
  5.4.13   Date Stamp Fri Oct 27 11:17:11 MDT 1995
  5.4.14   Date Stamp Wed Nov 29 09:26:17 MST 1995
  5.4.15   Date Stamp Mon Dec 4 14:28:15 MST 1995
  5.4.16   Date Stamp Fri Jan 19 10:50:18 MST 1996
  5.4.17   Date Stamp Mon Jan 29 15:45:39 MST 1996
  5.4.18   Date Stamp Wed Apr 17 12:08:23 MDT 1996
  5.4.19   Date Stamp Thu May 2 14:50:51 MDT 1996
 Version 5.4.01    created from version 5.4      using the following updates:
     fxchfit    pltvar     fxrfdz     fsurflx    vector2
     upnljf     fans792    fxibf      fxcidc     fxwpkxx
     fixml3     fxmfg      fxbktrl    fxtss      upnvpl
     fxcvm      fxmrod     fxblb2     upxtvp2    fxbit
     morml3     fxsmvt     v5p4p01
 Version 5.4.02    created from version 5.4.01   using the following updates:
     uphtmlb    fxlptre    no360      dcomer     fxnffz2
     fxtee      fxltfcb3   fxincb     fxtkf      uphep
     uphsrd2    ieeeg      upmld      brksat     genbrk
     fxlabc     v5p4p02
 Version 5.4.03    created from version 5.4.02   using the following updates:
     upmld2     modig      upjfl      fxisrb     fxfxtkf
     hpconv     v5p4p03
 Version 5.4.04    created from version 5.4.03   using the following updates:
     updmfc     fxsave     fixcpu     realfix    fxigmod
     fhtbdc     fxetime    cifblas    v5p4p04
 Version 5.4.05    created from version 5.4.04   using the following updates:
     fixcdeq    fixsg      v5p4p05
```

```
Version 5.4.06   created from version 5.4.05   using the following updates:
    fixtype     units     v5p4p06
Version 5.4.07   created from version 5.4.06   using the following updates:
    cpuprt      v5p4p07
Version 5.4.08   created from version 5.4.07   using the following updates:
    fixbr       fxfachk   fxudid    rstub     v5p4p08
Version 5.4.09   created from version 5.4.08   using the following updates:
    uphsbu      up1dpt    fxrgs     upnouc    fixhsft
    hsflip2     cnlist    xtvi3e    fxgbit    fixbu1
    gnwkst2     fxmu1     ssavg     aenergy   upenwrt
    labout09    upencyl   upenhts   fixb21    v5p4p09
Version 5.4.10   created from version 5.4.09   using the following updates:
    fxnst1      uprad3n   radhyd    radhts    fxshstr
    radrd       radi      gamht1    gamht2    upfind5
    fprad       vmatrix   raddmp3   uplinalg  csst5c
    fxuphts     v5p4p10
Version 5.4.11   created from version 5.4.10   using the following updates:
    fxivsl      fxdef     fxuc2     fixfr     fxifdf
    labout11    fxvstp    v5p4p11
Version 5.4.12   created from version 5.4.11   using the following updates:
    fxvadj2     hpssi     labout12  fxdsln2   fxsct
    fxsahs1     xtv12b    fixfr2    upenwrt2  fxcnlist
    fxsedit     fxradln   upfxrad   upenrad   ngenwks2
    v5p4p12
Version 5.4.13   created from version 5.4.12   using the following updates:
    fxencyl     rmcom     xtvibm    fxency2   smatsol
    fxname      v5p4p13
Version 5.4.14   created from version 5.4.13   using the following updates:
    newlogo     fxunits   faxbugs   v5p4p14
Version 5.4.15   created from version 5.4.14   using the following updates:
    fxflowin    fxrsudul  fxwhtstr  v5p4p15
Version 5.4.16   created from version 5.4.15   using the following updates:
    ifrd        hp9kdef   rs6kdef   sundef    unixdef
    v5p4p16
Version 5.4.17   created from version 5.4.16   using the following updates:
    prgast      v5p4p17
Version 5.4.18   created from version 5.4.17   using the following updates:
    d2o         fxface2   chdefs    tsdiag2   labout18
    v5p4p18
Version 5.4.19   created from version 5.4.18   using the following updates:
    vectrz      unixdef   v5p4p19
--------------------------------------------------------------------------


                        input data is being processed

                          h2o properties are used

number of title cards is:   28
this is a h.b.robinson-2 steam-generator one-tube-rupture transient.        1
hbr-2 is a 2300 mwt, three-loop westinghouse nuclear plant located
in hartsville, s.c., that is owned and operated by the carolina
power and light company (cp&l).  this plant model was developed for
reactor-coolant pump (rcp) trip analysis by james lime for trac-pf1
/mod1 on 7/84.  it was converted for trac-pf1/mod2 by robert steinke
and james lime on 5/96.  the trac-pf1/mod2 steady-state calculation
plant model has been modified to handle the following loss-of-coolant
accidents, through transient input-data tracin-file changes, allowing
the same steady-state restart data-dump file to be used:
  1) cold-leg small break without pump trip,
  2) cold-leg small break with pump trip,
  3) one-tube steam generator tube rupture,
  4) two-tube steam generator tube rupture, and
  5) 100% cold-leg degb large break.
this input-data model contains the following components and subsystems:
  1) three-dimensional (r=2,t=6,z=12) reactor vessel;
  2) vessel upper-plenum guide tubes;
  3) powered-rod and unpowered-slab heat structures in the vessel;
  4) three primary- and secondary-coolant loops modeled individually;
  5) makeup, letdown, and pressurizer-sprayer cvcs flows;
  6) accumulator and hpsi fills in each primary-coolant loop;
  7) pressurizer and pressurizer porv and srv;
  8) pressurizer, steam generator, and steam-dump control systems;
  9) single-tube degb leakage path in loop 2 steam generator;
 10) main-steam and steam-dump lines;
 11) high-pressure feedwater system after hp heaters; and
 12) auxiliary-feedwater fills (motor and steam driven).

graphics data is defined in si units
```

```
input data is defined in si units

output data is defined in si units

the trcrst restart-data file will be searched for
signal variables  65
control blocks   237
trips             72                                                                                          1
component id #s  1   2   3   4   5   6   7  10  12  14  16  17  18  20  22  24  26  27  28  30  32  34  36  37  38
                40  41  42  43  44  45  46  47  48  49  50  52  54  56  59  60  62  64  66  69  70  72  74  76  93
               100 105 110 112 114 116 118 120 150 154 169 170 179 180 190 200 205 210 212 214 216 218 220 250 254
               269 270 279 280 290 300 305 310 312 314 316 318 320 350 354 369 370 379 380 390 400 410 420 422 424
               430 432 434 436 438 576 578 900 901 902 903 904 905 906 907 908 909 910 920 930 931 932 933 934 935
               936 937 938

restarting from final dump found at time-step number  1262 and time 0.00000E+00 s                            1

sys. component s10  12  14  16  17  18  54  52  50  49  91  56  20  22  24  26  27  28 202 200 205 290  64  62  60
               210 220 400 410 420 422 280 270 254 250 350 212 120 110 105 190 100 320 310 305 390 300 430 432 150
               354 370 380 216 112 180 170 154 312 436 116 316  59  92 424 578  66 214 434 279 269 576 218 114 314
               438 369 379 118 179 169 318  30  32  34  36  37  38  40  41  42  74  72  70  44  45  46  43  69  93
                47  76  48   2   3   4   5   6   7   1 900 901 902 903 904 905 906 907 908 909 910 920 930 931 932
               933 934 935 936 937 938


the vessel-matrix array storage is dimensioned for 12 diagonals
above and below the main diagonal defining the matrix bandwidth
with 12 matrix rows of nonzero elements outside the bandwidth


problem size specifications

  fixed scm data size is       0
  maximum 1d component scm size is    4095
  maximum 1 level/rod scm size is 146729
  maximum 3 level scm size is ******
  direct matrix scm size is    9528
 last lcm space used is   1482182


restart dump generated at problem time      0.000000 s after      0 time steps

                        time domain data to be used
   minimum   maximum     time      long    graphics    dump     short
    time      time      domain     edit      edit      edit      edit
  step (s)  step (s)   end (s)   step (s)  step (s)  step (s)  step (s)                 2
  1.000E-05 5.000E-01 6.000E+02 1.000E+02 5.000E+00 2.000E+02 1.000E+02
convective energy-error controller is  1.0000E+20   w

at time     0.0000 s in component number 920 at cell   2, the maximum stanton number is 2.681169E+01
at time     0.0000 s in component number 906 at cell   1, the minimum tld is 6.202981E+02 k
             where tld is the liquid temperature at bubble detachment from a heated surface

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number   time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
     0    0.000000  0.001000     4     49.333    0.0903    0.0152   1  202   11

at      0.000900 s, the trip   34 signal crossed setpoint s2 =  9.000000E-01 -                 3
at      0.001000 s, the trip   34 signal is  1.000000E+00 -

at      0.001000 s, trip   34 is reset from  0 to  1 with a set status of on-forward

at      0.001900 s, the trip   26 signal crossed setpoint s2 =  9.000000E-01 -
at      0.002000 s, the trip   26 signal is  1.000000E+00 -

at      0.002945 s, the trip   10 signal crossed setpoint s2 =  9.000000E-01 -
at      0.003050 s, the trip   10 signal is  1.000000E+00 -

at      0.003050 s, trip   10 is reset from  0 to  1 with a set status of on-forward

at      0.002945 s, the trip   16 signal crossed setpoint s2 =  9.000000E-01 -
at      0.003050 s, the trip   16 signal is  1.000000E+00 -

at      0.003050 s, trip   16 is reset from  0 to  1 with a set status of on-forward

at      0.002945 s, the trip   18 signal crossed setpoint s2 =  9.000000E-01 -
at      0.003050 s, the trip   18 signal is  1.000000E+00 -

at      0.003050 s, trip   18 is reset from  0 to  1 with a set status of on-forward
```

```
time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number   time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
    10     0.011295  0.001340     3     226.983   0.2454    0.0203   1  200    1
    20     0.028150  0.002183     3     379.150   0.6423    0.0331   1  200    1
    30     0.055445  0.003386     3     548.016   0.9289    0.0513   1  200    1
    40     0.098038  0.005253     4     708.733   1.6264    0.0796   1  200    1
    50     0.156571  0.007392     2     861.183   2.5034    0.1120   1  200    1
    60     0.249546  0.012041     2    1002.100   4.0652    0.1826   1  200    1
    70     0.399419  0.019392     2    1143.116   5.9431    0.2941   1  200    1
    80     0.643325  0.031462     3    1303.899   8.8132    0.4775   1  200    1
    90     0.928259  0.035661     3    1459.149  10.2360    0.5414   1  200    1
   100     1.376800  0.058088     3    1626.600  17.3101    0.8822   1  200    1
   110     2.107425  0.094619     3    1797.033  28.6844    1.4370   1  200    1
   120     3.277551  0.146786     3    1971.166  44.5636    2.2256   1  200    1
   130     4.931352  0.178419     4    2165.583  52.3882    2.7043   1  200    1
   140     6.733384  0.187340     4    2369.500  51.3485    2.8380   1  200    1

*trans*  backup forced by component 430 in cell   3 at time step  149 in post

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number   time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
   150     8.647295  0.103271     4    2597.416  25.8555    1.5663   1  200    1

*trans*  backup forced by component 430 in cell   3 at time step  151 in post
*tf1ds3* pack-stretch  nstep=   152 oitno=   1 num=430 cell=  3
         etime= 8.8022E+00  delt= 5.1636E-02 alp= 2.3766E-02 pspike= 4.3186E+06
          vlnj= 1.0645E+02 vlnjp=-2.8600E+01    p= 3.8863E+06      pn= 3.8863E+06

*tf1ds3* nstep=  152   etime= 8.80220E+00   oitno=   2  num=430   cell=  4
         delp= 4.75445E+05   delt= 5.16356E-02  alp= 9.99599E-01  alpn= 7.54754E-01
            p= 3.97710E+06     pn= 4.45602E+06   pa= 0.00000E+00   pan= 0.00000E+00
          pnm= 3.88629E+06    pnp= 4.39454E+06 tsat= 5.29901E+02
          tln= 1.25573E+03    tvn= 5.38504E+02 tsso= 5.23076E+02  tssn= 5.29901E+02
         chti= 5.50627E+04 chtia= 1.02506E+03  alv= 7.06330E+05  alve= 4.04354E+04
         vlnj= 2.58513E+01 vlnjp= 2.62070E+00 vvnj= 2.58513E+01 vvnjp= 2.02807E+01

*tf1ds3* nstep=  152   etime= 8.80220E+00   oitno=   4  num=430   cell=  4
         delp=-1.03108E+07   delt= 5.16356E-02  alp= 9.99599E-01  alpn= 8.25213E-01
            p= 3.97710E+06     pn= 1.97276E+07   pa= 0.00000E+00   pan= 0.00000E+00
          pnm= 3.88630E+06    pnp= 1.88607E+07 tsat= 6.37654E+02
          tln=-2.92291E+03    tvn= 8.81245E+02 tsso= 6.74424E+02  tssn= 6.37654E+02
         chti= 5.50627E+04 chtia= 1.02506E+03  alv= 7.06330E+05  alve= 4.04354E+04
         vlnj= 2.68180E+01 vlnjp= 1.30615E+01 vvnj= 2.68180E+01 vvnjp= 2.82079E+02

*hout*   outer iteration failed to converge at time     8.802202 s
         nstep is    152, oitno is    10, nmfail is  0, and delt is    0.051636 s          4

*hout*   varerm =  8.456037E-04,   num =  430,  j =    4

*hout*   pressure error by component
          6.854458E-14   7.806412E-14   4.591885E-14   3.325900E-14
          2.112484E-14   1.963835E-14   2.157268E-14   2.169839E-14
          2.253025E-15   0.000000E+00   0.000000E+00   0.000000E+00
          2.793394E-14   3.056392E-14   2.087426E-14   1.720120E-14
          1.361304E-14   1.343714E-14   2.936085E-14   4.831595E-15
          6.706493E-15   6.622985E-15   1.395064E-14   1.465749E-14
          2.253025E-15   4.071498E-13   1.550643E-12   1.738287E-12
          1.995051E-12   5.494012E-12   3.341295E-12   2.334020E-14
          8.011399E-14   7.524305E-14   3.423214E-15   2.760325E-15
          4.032208E-13   1.547242E-12   4.436728E-13   1.394868E-15
          1.227449E-15   7.995648E-16   1.442817E-12   1.073869E-13
          5.892283E-16   1.325735E-15   3.023664E-16   8.456037E-04
          6.721403E-04   3.155946E-15   4.067702E-15   5.451190E-14
          5.631896E-14   4.015643E-13   4.393981E-13   3.081186E-14
          3.255109E-14   2.346689E-14   1.058822E-13   1.387779E-10
          4.375932E-13   1.054473E-13   0.000000E+00   0.000000E+00
          0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
          0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
          0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
          0.000000E+00   0.000000E+00   0.000000E+00   0.000000E+00
          0.000000E+00   0.000000E+00   1.550558E-14   4.223684E-14
          2.418272E-14   1.286106E-14   2.174790E-15   9.967842E-15
          1.358071E-13   1.296120E-13   1.095426E-13   2.586745E-15
          3.270743E-15   2.253025E-15   1.082625E-13   1.078625E-13
          1.076322E-13   0.000000E+00   0.000000E+00   0.000000E+00
          0.000000E+00   0.000000E+00   0.000000E+00   6.077534E-14
          5.261651E-14   6.031331E-14   5.311869E-14   6.269641E-14
          5.144324E-14   5.144324E-14

*hout*   1-d failures =     2 at nstep =  152
         last failure on outer iteration     4 with oitno =    10
*tf1ds3* pack-stretch  nstep=    152 oitno=    2 num=430 cell=  3
         etime= 8.8022E+00  delt= 2.5818E-02 alp= 2.3766E-02 pspike= 4.3000E+06
          vlnj= 9.9334E+01 vlnjp=-2.1981E+01    p= 3.8863E+06      pn= 3.9820E+06
```

```
*tf1ds3* nstep=  152  etime= 8.80220E+00  oitno=    2  num=430  cell=  4
        delp= 2.76090E+05  delt= 2.58178E-02  alp= 9.99599E-01  alpn= 8.77210E-01
           p= 3.97710E+06    pn= 4.25372E+06   pa= 0.00000E+00   pan= 0.00000E+00
         pnm= 3.88629E+06   pnp= 4.17067E+06 tsat= 5.27070E+02
         tln= 1.06156E+03   tvn= 5.32834E+02 tsso= 5.23031E+02  tssn= 5.27070E+02
        chti= 6.58532E+04 chtia= 1.22593E+03  alv= 8.44748E+05  alve= 4.04354E+04
        vlnj= 2.55567E+01 vlnjp= 2.39236E+00 vvnj= 2.55567E+01 vvnjp= 1.66570E+01

*tf1ds3* nstep=  152  etime= 8.80220E+00  oitno=    4  num=430  cell=  4
        delp=-5.64562E+06  delt= 2.58178E-02  alp= 9.99599E-01  alpn= 8.99673E-01      4
           p= 3.97710E+06    pn= 7.59907E+06   pa= 0.00000E+00   pan= 0.00000E+00
         pnm= 3.88629E+06   pnp= 6.36480E+06 tsat= 5.64625E+02
         tln=-3.07195E+02   tvn= 5.98370E+02 tsso= 6.05436E+02  tssn= 5.64625E+02
        chti= 6.58532E+04 chtia= 1.22593E+03  alv= 8.44748E+05  alve= 4.04354E+04
        vlnj= 2.58082E+01 vlnjp= 9.73340E+00 vvnj= 2.58082E+01 vvnjp= 2.43903E+02

*hout*  1-d failures =     2 at nstep =  152
        last failure on outer iteration     4 with oitno =     9

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d        3-d   flag cmp cell
   160     8.876964  0.008281     3    2859.983   1.9485    0.1256   1  200    1
   170     8.979928  0.012235     3    3027.466   2.8660    0.1855   1  200    1
   180     9.133819  0.019930     3    3180.983   4.6447    0.3022   1  200    1
   190     9.384491  0.032463     3    3334.666   7.5763    0.4919   1  200    1
   200     9.792808  0.052879     3    3490.966  12.1776    0.8008   1  200    1
   210    10.457915  0.086134     3    3653.516  19.5588    1.3054   1  200    1
   220    11.534940  0.133623     4    3830.366  29.7882    2.0256   1  200    1
   230    13.011638  0.170540     4    4015.466  36.8262    2.5869   1  200    1
   240    14.666140  0.093865     3    4192.466  18.9866    1.4239   1  200    1

at   14.943443 s, the trip   54 signal crossed setpoint s1 =  1.280000E+07 pa      5
at   14.953837 s, the trip   54 signal is  1.279854E+07 pa

at   14.953837 s, trip   54 is reset from  0 to  1 with a set status of on-forward

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d        3-d   flag cmp cell
   250    15.768351  0.140764     3    4351.783  26.3186    2.1392   1  200    1
   260    17.258782  0.080648     2    4516.066  13.8777    1.2262   1  200    1
   270    18.234757  0.113480     3    4682.733  18.7260    1.7255   1  200    1
   280    19.662095  0.143645     2    4846.633  22.3289    2.1835   1  200    1
   290    20.906599  0.124862     2    4993.116  18.4665    1.8975   1  200    1
   300    22.289295  0.133284     2    5159.516  18.9058    2.0258   1  200    1
   310    23.742975  0.161870     3    5314.749  22.0617    2.4607   1  202   11
   320    24.467238  0.063376     2    5469.583   8.5184    0.9635   1  202   11
   330    25.170721  0.075941     2    5624.566  10.1287    1.1546   1  202   11

at   25.582519 s, the trip -407 signal crossed setpoint s1 =  1.440000E-01 -
at   25.590345 s, the trip -407 signal is  1.439803E-01 -

at   25.590345 s, trip -407 is reset from  1 to  0 with a set status of off

*tf1ds3* nstep=  338  etime= 2.58959E+01  oitno=    2  num=190  cell=  3
        delp=-2.68182E+04  delt= 1.12200E-01  alp= 9.56840E-01  alpn= 9.52908E-01
           p= 6.10680E+06    pn= 6.08288E+06   pa= 0.00000E+00   pan= 0.00000E+00
         pnm= 6.08280E+06   pnp= 6.08300E+06 tsat= 5.49643E+02
         tln=-9.25218E+02   tvn= 5.49372E+02 tsso= 5.49932E+02  tssn= 5.49643E+02
        chti= 3.80799E+06 chtia= 1.10655E+03  alv= 3.26300E+06  alve= 1.37415E+05
        vlnj= 6.75587E+00 vlnjp= 9.71859E-01 vvnj= 5.35729E-01 vvnjp= 1.66089E-01

*hout*  time-step calculation back up after   4 outer iterations
        due to velocity reversal at cell interface  2 in component 105      6

*hout*  time-step calculation back up after   4 outer iterations
        due to velocity reversal at cell interface  2 in component 105

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d        3-d   flag cmp cell
   340    25.953396  0.030925     2    5809.566   4.0761    0.4702   1  202   11
   350    26.342368  0.050374     2    5949.966   6.6281    0.7661   1  202   11
   360    26.975963  0.082053     2    6093.433  10.7211    1.2481   1  202   11
   370    27.980468  0.127292     3    6248.166  16.4766    1.9369   1  202   11
   380    28.857387  0.089920     3    6409.016  11.5534    1.3685   1  202   11
   390    29.885656  0.117497     2    6570.166  14.9870    1.7886   1  202   11

at   30.003153 s, trip   26 is reset from  0 to  1 with a set status of on-forward      3

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d        3-d   flag cmp cell
   400    30.737244  0.073778     3    6736.866   9.3631    1.1232   1  202   11

at   30.796267 s, the trip   46 signal crossed setpoint s2 =  1.800000E+00 -      7
at   30.811022 s, the trip   46 signal is  2.000000E+00 -
```

```
at    30.811022 s, trip   46 is reset from  0 to  1 with a set status of on-forward

at    30.758545 s, the trip   60 signal crossed setpoint s1 =  1.192800E+07 pa
at    30.811022 s, the trip   60 signal is  1.192671E+07 pa

at    30.811022 s, trip   60 is reset from  0 to  1 with a set status of on-forward

at    30.868151 s, the trip   20 signal crossed setpoint s2 =  9.000000E-01 -
at    30.874499 s, the trip   20 signal is  1.000000E+00 -

at    30.874499 s, trip   20 is reset from  0 to  1 with a set status of on-forward

at    30.868151 s, the trip   21 signal crossed setpoint s2 =  9.000000E-01 -        7
at    30.874499 s, the trip   21 signal is  1.000000E+00 -

at    30.868151 s, the trip   28 signal crossed setpoint s2 =  9.000000E-01 -
at    30.874499 s, the trip   28 signal is  1.000000E+00 -

at    30.817370 s, the trip  422 signal crossed setpoint s2 =  1.000000E-01 -
at    30.874499 s, the trip  422 signal is  1.000000E+00 -

at    30.874499 s, trip  422 is reset from  0 to -1 with a set status of on-reverse

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number   time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   410    31.480643  0.085821     3    6903.516  10.8337    1.3066   1  202   11
   420    32.349941  0.087775     2    7070.516  11.0201    1.3365   1  202   11
   430    33.259490  0.088964     3    7234.599  11.1125    1.3547   1  202   11

at    33.517740 s, the trip   32 signal crossed setpoint s2 =  9.000000E-01 -
at    33.526171 s, the trip   32 signal is  1.000000E+00 -

at    33.526171 s, trip   32 is reset from  0 to  1 with a set status of on-forward

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number   time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   440    34.191147  0.104753     2    7395.933  13.0224    1.5953   1  202   11
   450    35.197606  0.114736     3    7557.216  14.1863    1.7475   1  202   11
   460    36.046351  0.088794     2    7718.116  10.9277    1.3525   1  202   11
   470    36.921751  0.086162     2    7881.983  10.5470    1.3124   1  202   11
   480    37.957062  0.089498     3    8051.383  10.9134    1.3632   1  202   11
   490    38.537742  0.058231     3    8214.516   7.0933    0.8870   1  202   11
   500    39.211254  0.084827     3    8380.600  10.2987    1.2922   1  202   11
   510    40.100091  0.042387     3    8546.883   5.1528    0.6457   1  202   11
   520    40.591335  0.060790     3    8712.783   7.3616    0.9260   1  202   11
   530    41.328658  0.094305     3    8879.166  11.3972    1.4366   1  202   11

*hout*    time-step calculation back up after    4 outer iterations
          due to velocity reversal at cell interface 14 in component 305           8

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number   time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   540    42.297878  0.024831     4    9065.983   3.0180    0.3783   1  202   11
   550    42.596507  0.038521     3    9223.400   4.6555    0.5868   1  202   11
   560    43.081016  0.062746     3    9389.266   7.5751    0.9559   1  202   11
   570    43.870230  0.102207     3    9555.566  12.3092    1.5572   1  202   11
   580    44.806917  0.038864     2    9727.083   4.6892    0.5921   1  202   11
   590    45.295746  0.063306     3    9881.583   7.6066    0.9645   1  202   11
   600    46.091996  0.103118     2   10047.833  12.3813    1.5712   1  202   11

*hout*    time-step calculation back up after    4 outer iterations
          due to velocity reversal at cell interface 13 in component 305

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number   time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   610    46.942427  0.079985     2   10229.066   9.5855    1.2188   1  202   11
   620    47.864489  0.045730     5   10412.400   5.4908    0.6968   1  202   11
   630    48.408183  0.067564     3   10583.266   8.0769    1.0296   1  202   11
   640    49.257998  0.104814     4   10752.233  12.5032    1.5973   1  202   11
   650    49.948519  0.073614     3   10923.900   8.7687    1.1218   1  202   11

at    50.868995 s, trip   21 is reset from  0 to  1 with a set status of on-forward   7

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number   time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   660    50.868995  0.084689     4   11095.966  10.0818    1.2906   1  202   11
   670    51.812599  0.119166     4   11262.233  14.1433    1.8161   1  202   11
   680    52.612544  0.075997     3   11442.216   9.0116    1.1582   1  202   11
   690    53.568424  0.117896     5   11607.116  13.9521    1.7968   1  202   11
   700    54.180072  0.053045     3   11802.416   6.2774    0.8084   1  202   11
   710    54.847262  0.086404     2   11954.433  10.2133    1.3169   1  202   11
   720    55.934046  0.134041     4   12112.166  15.7722    2.0429   1  202   11
   730    56.587079  0.062642     2   12289.266   7.3722    0.9548   1  202   11
   740    57.374988  0.102038     2   12433.016  11.9832    1.5552   1  202   11
   750    58.614993  0.065062     4   12598.483   7.6350    0.9917   1  202   11
   760    59.152732  0.065579     3   12761.216   7.6612    0.9996   1  202   11
   770    59.977578  0.106821     2   12910.666  12.4645    1.6283   1  202   11
```

```
at   60.885077 s, trip  28 is reset from  0 to  1 with a set status of on-forward        7

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   780    60.947544  0.062467      4  13101.583   7.2865    0.9522   1  202    11
   790    61.698810  0.096907      2  13250.866  11.2773    1.4772   1  202    11
   800    62.917697  0.157851      4  13400.216  18.2857    2.4062   1  202    11

*tf1ds3* nstep=  802  etime= 6.32334E+01  oitno=   2  num=305  cell= 11
         delp=-3.29043E+04  delt= 8.95334E-02  alp= 9.97047E-01  alpn= 9.97177E-01
            p= 6.31961E+06     pn= 6.17874E+06    pa= 0.00000E+00   pan= 0.00000E+00
          pnm= 6.17864E+06   pnp= 6.17869E+06 tsat= 5.50672E+02
          tln= 5.28281E+01    tvn= 5.52164E+02 tsso= 5.51022E+02  tssn= 5.50672E+02   8
         chti= 5.09334E+03 chtia= 8.49605E+02  alv= 5.10800E+06  alve= 1.37236E+03
         vlnj=-8.09399E-01 vlnjp=-4.69099E-01 vvnj=-6.93191E-01 vvnjp=-4.25154E-01

*hout*   1-d failures =     1 at nstep =  802
         last failure on outer iteration     2 with oitno =     6

*trans*  backup forced by component 305 in cell   5 at time step  802 in post

*tf1ds3* nstep=  802  etime= 6.32334E+01  oitno=   2  num=305  cell= 11
         delp=-8.04825E+04  delt= 4.47667E-02  alp= 9.97047E-01  alpn= 9.97113E-01
            p= 6.31961E+06     pn= 6.13196E+06    pa= 0.00000E+00   pan= 0.00000E+00
          pnm= 6.12959E+06   pnp= 6.13246E+06 tsat= 5.50171E+02
          tln=-7.60699E+02    tvn= 5.51224E+02 tsso= 5.51030E+02  tssn= 5.50171E+02
         chti= 3.73458E+03 chtia= 8.49605E+02  alv= 5.10800E+06  alve= 1.07068E+03
         vlnj=-1.21883E+00 vlnjp=-7.62383E-01 vvnj=-1.70572E+00 vvnjp=-9.98371E-01

*hout*   1-d failures =     1 at nstep =  802
         last failure on outer iteration     2 with oitno =     6

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   810    63.470877  0.029970      3  13621.916   3.4896    0.4569   1  202    11
   820    63.847833  0.048817      2  13767.783   5.6613    0.7442   1  202    11
   830    64.461853  0.079518      2  13913.716   9.2070    1.2122   1  202    11
   840    65.462028  0.129527      2  14054.299  14.9386    1.9745   1  202    11
   850    66.500711  0.033105      3  14242.916   3.8370    0.5047   1  202    11
   860    66.900500  0.051356      2  14396.950   5.9159    0.7829   1  202    11
   870    67.546450  0.083653      2  14537.383   9.6294    1.2753   1  202    11
   880    68.598633  0.136263      2  14678.383  15.6185    2.0772   1  202    11

*trans*  backup forced by component 305 in cell   7 at time step  886 in post        8

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   890    69.704145  0.050320      3  14880.566   5.7792    0.7671   1  202    11
   900    70.337062  0.081966      2  15032.433   9.3773    1.2495   1  202    11
   910    71.368018  0.133513      2  15176.183  15.2211    2.0353   1  202    11

*hout*   time-step calculation back up after   4 outer iterations
         due to velocity reversal at cell interface 10 in component 305

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
   920    72.704445  0.035220      3  15379.566   4.0420    0.5369   1  202    11
   930    73.131626  0.054637      2  15536.683   6.2204    0.8329   1  202    11
   940    73.818847  0.088998      2  15677.383  10.1252    1.3568   1  202    11
   950    74.938258  0.144969      2  15818.116  16.4280    2.2099   1  202    11
   960    76.761659  0.236139      2  15961.616  26.6401    3.5996   1  202    11
   970    79.731788  0.384645      2  16105.083  43.1505    5.8629   1  202    11
   980    82.863007  0.129745      2  16256.966  14.5497    1.9778   1  202    11
   990    84.464061  0.200007      2  16397.383  22.3255    3.0488   1  202    11
  1000    86.808914  0.233924      2  16543.950  26.0335    3.5655   1  202    11
  1010    89.578787  0.317730      2  16690.149  35.2252    4.8426   1  202    11
  1020    92.683932  0.304961      2  16836.483  33.7181    4.6479   1  200     1
  1030    96.143337  0.212353      2  16979.883  23.4552    3.2362   1  200     1
  1040    98.632199  0.233267      2  17123.450  25.7088    3.5552   1  200     1    9
  1046   100.218864  0.297715      2  17196.600

at time     63.8013 s in component number 938 at cell   1, the maximum stanton number is 1.663668E+05
at time      0.0075 s in component number 906 at cell   1, the minimum tld is 6.203117E+02 k
             where tld is the liquid temperature at bubble detachment from a heated surface

time-step  problem  time-step outer-it.  cpu     courant  numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
  1050   101.566212  0.379968      2  17274.600  41.7649    5.7901   1  200     1
  1060   104.887317  0.299510      2  17415.200  32.8805    4.5641   1  200     1
  1070   108.417556  0.239055      2  17561.383  26.2110    3.6430   1  200     1
  1080   110.809109  0.249043      2  17701.682  27.2726    3.7949   1  200     1
  1090   113.749317  0.309463      2  17845.166  33.8338    4.7152   1  200     1
  1100   117.310801  0.394906      2  17988.866  43.0759    6.0170   1  200     1
  1110   120.162882  0.304589      2  18132.266  33.1870    4.6409   1  200     1
  1120   122.730618  0.290809      2  18275.783  31.6464    4.4304   1  200     1
  1130   126.133884  0.330137      3  18424.832  35.8627    5.0298   1  200     1
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  1140   130.274161  0.211280       3  18588.166  22.9144    3.2182   1  200     1
  1150   132.473953  0.238443       3  18751.467  25.8366    3.6316   1  200     1
  1160   135.449345  0.363493       2  18906.067  39.3379    5.5404   1  200     1
  1170   139.470801  0.166399       2  19055.016  18.0030    2.5352   1  200     1
  1180   141.267717  0.199012       2  19195.416  21.4778    3.0321   1  200     1
  1190   143.575787  0.293986       2  19338.866  31.6638    4.4789   1  200     1
  1200   147.273512  0.220157       2  19482.416  23.6854    3.3538   1  200     1
  1210   149.413479  0.204520       2  19631.533  21.9603    3.1159   1  200     1
  1220   151.985904  0.333141       2  19775.016  35.6490    5.0752   1  200     1
  1230   155.312502  0.312553       2  19926.967  33.3633    4.7616   1  200     1
  1240   158.612687  0.377005       2  20073.299  40.1263    5.7434   1  200     1
  1250   161.941741  0.322637       2  20219.483  34.3156    4.9152   1  202    11
  1260   165.059516  0.293729       2  20368.717  31.2186    4.4749   1  202    11
  1270   167.810949  0.250901       2  20509.432  26.5763    3.8224   1  202    11
  1280   170.398839  0.310544       3  20655.932  32.6887    4.7312   1  202    11
  1290   173.479732  0.202862       2  20802.133  21.2120    3.0908   1  202    11
  1300   175.436900  0.238473       2  20948.283  24.7526    3.6337   1  202    11
  1310   178.218104  0.308292       2  21091.682  31.6175    4.6968   1  202    11
  1320   181.180170  0.276814       2  21240.666  28.1870    4.2169   1  202    11
  1330   184.250016  0.342622       3  21386.883  34.7223    5.2192   1  202    11
  1340   187.123586  0.186430       2  21539.016  18.8452    2.8402   1  202    11
  1350   189.468481  0.303675       3  21685.033  30.3822    4.6264   1  202    11
  1360   192.826174  0.289807       2  21834.082  28.6005    4.4158   1  200     1
  1370   195.883107  0.250279       2  21980.383  24.3939    3.8131   1  200     1
  1380   199.031092  0.388265       3  22132.516  37.3436    5.9143   1  202    11

restart dump generated at problem time   200.068671 s after  1383 time steps        9

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
  1384   200.417875  0.349204       2  22182.116

at time     63.8013 s in component number 938 at cell    1, the maximum stanton number is 1.663668E+05
at time      0.0075 s in component number 906 at cell    1, the minimum tld is 6.203117E+02 k
                where tld is the liquid temperature at bubble detachment from a heated surface

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
  1390   202.130978  0.299371       2  22296.549  28.2195    4.5609   1  202    11
  1400   205.133054  0.283604       4  22468.116  26.5102    4.3207   1  200     1
  1410   207.950927  0.260374       3  22637.082  23.9325    3.9660   1  202    11
  1420   211.088887  0.385486       2  22794.633  35.1234    5.8729   1  202    11
  1430   214.519932  0.335054       2  22940.766  29.9072    5.1041   1  202    11
  1440   217.555235  0.363355       3  23098.133  31.9823    5.5360   1  202    11
  1450   220.444637  0.260867       2  23246.967  22.6815    3.9748   1  202    11
  1460   223.208752  0.299346       2  23398.766  25.7153    4.5603   1  202    11
  1470   226.419998  0.346068       2  23550.383  29.3828    5.2734   1  202    11
  1480   229.705265  0.283884       2  23696.266  23.7957    4.3252   1  202    11
  1490   233.056420  0.231931       2  23850.832  19.2257    3.5346   1  202    11
  1500   235.329654  0.266500       4  23999.717  21.9040    4.0607   1  202    11
  1510   238.177337  0.340448       2  24148.582  27.6817    5.1884   1  202    11
  1520   241.384791  0.289933       2  24303.149  23.3033    4.4186   1  202    11
  1530   244.524722  0.296627       2  24454.733  23.5585    4.5184   1  202    11
  1540   247.225626  0.227598       2  24609.366  17.9569    3.4687   1  202    11
  1550   249.895730  0.283166       2  24766.750  22.2137    4.3167   1  202    11
  1560   252.733527  0.283247       2  24909.832  22.2010    4.3165   1  202    11
  1570   256.025268  0.268001       2  25053.116  20.9884    4.0844   1  202    11
  1580   258.790391  0.252055       2  25196.450  19.6675    3.8413   1  202    11
  1590   261.759174  0.379389       2  25342.233  29.4451    5.7820   1  202    11
  1600   266.060833  0.279505       3  25488.332  21.5679    4.2597   1  202    11
  1610   269.146943  0.349238       2  25634.299  26.7427    5.3228   1  202    11

at  270.494125 s, the trip   58 signal crossed setpoint s1 =  9.066600E+06 pa
at  270.609003 s, the trip   58 signal is  9.064760E+06 pa

at  270.609003 s, trip   58 is reset from  0 to  1 with a set status of on-forward

at  270.950230 s, the trip   22 signal crossed setpoint s2 =  9.000000E-01 -
at  270.988144 s, the trip   22 signal is  1.000000E+00 -

time-step  problem  time-step outer-it.  cpu     courant   numbers sets location
  number    time (s)  size (s)  number  time (s)   1-d       3-d   flag cmp cell
  1620   272.671770  0.230514       4  25794.516  17.4661    3.5130   1  202    11
  1630   275.006397  0.272823       3  25951.600  20.5524    4.1569   1  202    11
  1640   277.758259  0.306230       2  26103.217  23.0723    4.6665   1  202    11
  1650   281.122616  0.303549       2  26243.432  22.9122    4.6257   1  202    11
  1660   284.373085  0.357447       2  26386.666  26.8671    5.4471   1  202    11
  1670   287.448183  0.181898       2  26529.783  13.5931    2.7724   1  202    11
  1680   289.736074  0.275391       2  26681.416  20.4867    4.1982   1  202    11
  1690   292.932442  0.390009       2  26847.116  29.0499    5.9448   1  202    11
  1700   296.420225  0.309211       2  26990.266  23.0467    4.7119   1  202    11
  1710   299.752877  0.282147       2  27136.182  21.0268    4.2996   1  202    11
  1713   300.642346  0.311067       2  27166.916                                      9
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at time     63.8013 s in component number 938 at cell    1, the maximum stanton number is 1.663668E+05
at time      0.0075 s in component number 906 at cell    1, the minimum tld is 6.203117E+02 k
              where tld is the liquid temperature at bubble detachment from a heated surface

time-step  problem  time-step outer-it.  cpu      courant  numbers sets location
 number    time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
  1720   302.891532  0.366716     2  27281.182  27.1867    5.5878   1  202   11
  1730   306.331496  0.370720     2  27432.832  27.4247    5.6512   1  202   11
  1740   309.525639  0.158856     2  27587.166  11.7970    2.4205   1  202   11
  1750   311.523709  0.258759     2  27727.317  19.2490    3.9431   1  202   11
  1760   314.329441  0.292922     2  27870.467  21.7812    4.4639   1  202   11
  1770   317.468870  0.352129     2  28010.766  26.1338    5.3660   1  202   11
  1780   320.361696  0.177015     2  28167.317  13.1142    2.6975   1  202   11
  1790   322.588167  0.288338     2  28307.416  21.3426    4.3940   1  202   11
  1800   325.419277  0.264458     2  28459.100  19.5999    4.0301   1  202   11
  1810   328.080051  0.315754     2  28599.200  23.4158    4.8117   1  202   11
  1820   331.321885  0.304888     3  28745.000  22.6231    4.6461   1  202   11
  1830   334.299935  0.282037     2  28890.883  20.9298    4.2979   1  202   11
  1840   337.516085  0.355578     2  29033.916  26.3861    5.4186   1  202   11
  1850   340.338531  0.323912     3  29179.567  24.0411    4.9360   1  202   11
  1860   343.705712  0.259369     2  29322.332  19.2702    3.9525   1  202   11
  1870   346.358710  0.302438     2  29465.350  22.4803    4.6088   1  202   11
  1880   349.342604  0.322255     2  29608.250  23.9774    4.9108   1  202   11
  1890   352.418714  0.325200     2  29751.250  24.2179    4.9557   1  202   11
  1900   355.421265  0.334491     3  29896.967  24.9245    5.0973   1  202   11
  1910   358.843615  0.256651     2  30039.733  19.1401    3.9110   1  202   11
  1920   361.179595  0.292541     2  30182.567  21.8271    4.4580   1  202   11
  1930   364.282672  0.377245     3  30328.217  28.1764    5.7488   1  202   11
  1940   367.234682  0.207599     2  30476.750  15.5173    3.1636   1  202   11
  1950   369.530621  0.276053     2  30616.633  20.6210    4.2067   1  202   11
  1960   372.868156  0.308297     2  30759.549  23.0201    4.6980   1  202   11
  1970   376.201892  0.209623     2  30905.317  15.6442    3.1943   1  202   11
  1980   378.124195  0.218006     2  31045.432  16.2758    3.3221   1  200    1
  1990   380.837174  0.324573     2  31188.250  24.2469    4.9461   1  200    1
  2000   383.802585  0.242410     2  31328.233  18.1200    3.6940   1  200    1
  2010   386.434117  0.312611     2  31471.082  23.3797    4.7639   1  200    1
  2020   389.641888  0.227059     2  31610.883  16.9900    3.4600   1  200    1
  2030   392.244301  0.326044     2  31753.717  24.4076    4.9685   1  200    1
  2040   395.710925  0.225724     2  31896.516  16.9116    3.4397   1  200    1
  2050   398.305184  0.288815     2  32036.483  21.6588    4.4012   1  200    1

restart dump generated at problem time   400.081136 s after  2056 time steps        9

time-step  problem  time-step outer-it.  cpu      courant  numbers sets location
 number    time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
  2058   400.715733  0.316792     2  32138.582

at time     63.8013 s in component number 938 at cell    1, the maximum stanton number is 1.663668E+05
at time      0.0075 s in component number 906 at cell    1, the minimum tld is 6.203117E+02 k
              where tld is the liquid temperature at bubble detachment from a heated surface

time-step  problem  time-step outer-it.  cpu      courant  numbers sets location
 number    time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
  2060   401.397627  0.269122     2  32185.283  20.1922    4.1011   1  200    1
  2070   404.188012  0.271263     2  32325.149  20.3806    4.1337   1  200    1
  2080   406.599838  0.277360     2  32467.799  20.8780    4.2267   1  200    1
  2090   409.635957  0.323335     2  32607.666  24.3782    4.9273   1  200    1
  2100   412.685676  0.258741     2  32750.649  19.5342    3.9430   1  200    1
  2110   415.445493  0.309694     2  32890.164  23.3977    4.7195   1  200    1
  2120   418.868792  0.176927     2  33038.598  13.3679    2.6962   1  200    1
  2130   420.761607  0.211384     2  33178.465  15.9822    3.2213   1  202   11
  2140   423.168465  0.273282     2  33321.184  20.6702    4.1646   1  202   11
  2150   426.605771  0.157023     2  33466.582  11.8870    2.3929   1  202   11
  2160   428.348110  0.190156     2  33606.465  14.4120    2.8978   1  202   11
  2170   430.739871  0.309744     2  33746.414  23.4773    4.7202   1  202   11
  2180   433.965837  0.258525     2  33892.133  19.6025    3.9397   1  202   11

*trans*  backup forced by component 190 in cell  14 at time step 2188 in post

*trans*  backup forced by component 190 in cell  14 at time step 2189 in post

time-step  problem  time-step outer-it.  cpu      courant  numbers sets location
 number    time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
  2190   436.042297  0.045927     2  34078.950   3.4846    0.6999   1  202   11

*trans*  backup forced by component 190 in cell  14 at time step 2190 in post

time-step  problem  time-step outer-it.  cpu      courant  numbers sets location
 number    time (s)  size (s)  number  time (s)    1-d       3-d   flag cmp cell
  2190   436.042297  0.022963     2  34092.465   1.7423    0.3499   1  202   11
  2200   436.331129  0.037405     2  34240.766   2.8394    0.5700   1  202   11
  2210   436.801605  0.060929     2  34380.782   4.6320    0.9285   1  202   11
  2220   437.567962  0.099247     1  34509.684   7.5508    1.5124   1  202   11
  2230   438.816277  0.161662     2  34638.617  12.2966    2.4636   1  202   11
  2240   440.849649  0.263331     2  34778.965  20.0361    4.0129   1  202   11
  2250   444.161799  0.428939     2  34922.133  32.6420    6.5365   1  202   11
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2260	447.190935	0.307971	2	35068.282	23.4482	4.6931	1	202	11
2270	450.660437	0.439126	3	35211.367	33.4153	6.6917	1	202	11
2280	452.793109	0.183555	2	35357.133	13.9694	2.7971	1	202	11
2290	455.039632	0.265536	2	35497.032	20.1814	4.0464	1	202	11
2300	458.189006	0.346971	2	35639.832	26.3369	5.2874	1	202	11
2310	461.057273	0.208741	2	35788.133	15.8306	3.1809	1	202	11
2320	463.258675	0.250714	2	35933.617	18.9918	3.8205	1	202	11
2330	466.412126	0.408386	3	36081.934	30.9024	6.2232	1	202	11
2340	468.875379	0.259391	2	36224.567	19.6286	3.9528	1	200	1
2350	471.725435	0.270197	2	36364.164	20.4496	4.1175	1	200	1
2360	474.411715	0.317035	2	36506.832	24.0055	4.8313	1	200	1
2370	477.465237	0.362590	2	36646.434	27.4631	5.5255	1	200	1
2380	480.500777	0.206600	2	36789.133	15.6520	3.1484	1	200	1
2390	482.905847	0.303085	2	36931.684	22.9646	4.6187	1	200	1
2400	486.216558	0.408925	2	37071.532	30.9900	6.2316	1	200	1
2410	489.679042	0.240591	2	37220.016	18.2028	3.6663	1	200	1
2420	492.252158	0.302646	2	37359.899	22.8792	4.6120	1	200	1
2430	495.485040	0.336741	2	37502.551	25.4432	5.1316	1	200	1
2440	498.942711	0.428170	3	37648.051	32.3262	6.5249	1	200	1 9
2449	500.727197	0.159738	2	37759.617					

at time 63.8013 s in component number 938 at cell 1, the maximum stanton number is 1.663668E+05
at time 0.0075 s in component number 906 at cell 1, the minimum tld is 6.203117E+02 k
where tld is the liquid temperature at bubble detachment from a heated surface

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
2450	500.894922	0.176111	2	37789.367	13.2926	2.6837	1	200	1
2460	503.095812	0.271938	2	37929.184	20.5244	4.1441	1	200	1
2470	505.828479	0.324103	2	38071.934	24.4503	4.9390	1	200	1
2480	508.620672	0.250696	2	38211.766	18.9066	3.8204	1	200	1
2490	511.441853	0.350973	2	38354.367	26.4621	5.3485	1	200	1
2500	514.817240	0.170820	2	38500.032	12.8767	2.6032	1	200	1
2510	516.965797	0.278248	2	38639.766	20.9729	4.2403	1	200	1
2520	519.656975	0.271183	2	38782.332	20.4355	4.1326	1	200	1
2530	522.892534	0.257614	2	38922.332	19.4078	3.9258	1	200	1
2540	525.455710	0.302616	2	39064.985	22.7931	4.6116	1	200	1
2550	528.387427	0.305447	2	39204.817	23.0005	4.6548	1	200	1
2560	531.433453	0.209752	2	39350.235	15.7914	3.1965	1	200	1
2570	533.834014	0.251709	2	39490.000	18.9473	3.8359	1	200	1
2580	536.999978	0.276553	2	39632.782	20.8089	4.2145	1	200	1
2590	539.890241	0.293442	2	39775.367	22.0755	4.4718	1	200	1

trans backup forced by component 290 in cell 14 at time step 2599 in post

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
2600	542.679331	0.075695	3	39934.164	5.7418	1.1536	1	200	1
2610	543.631408	0.123298	2	40071.215	9.2924	1.8790	1	200	1
2620	545.182242	0.200840	2	40205.582	15.1263	3.0607	1	200	1
2630	547.708387	0.327147	2	40345.465	24.6361	4.9855	1	200	1
2640	550.919436	0.298159	2	40488.133	22.4345	4.5438	1	200	1
2650	553.715275	0.334426	2	40627.965	25.1428	5.0964	1	200	1
2660	556.477896	0.291576	2	40770.516	21.9050	4.4434	1	200	1
2670	559.655870	0.295220	3	40915.965	22.1555	4.4990	1	200	1
2680	562.336598	0.283058	2	41058.617	21.2311	4.3136	1	200	1
2690	565.629469	0.278976	3	41221.098	20.9165	4.2514	1	200	1
2700	568.778163	0.392167	2	41363.649	29.3882	5.9764	1	200	1
2710	571.828154	0.259643	2	41506.149	19.4526	3.9568	1	200	1
2720	574.519814	0.240485	2	41651.582	18.0142	3.6648	1	200	1
2730	577.253255	0.313757	2	41794.149	23.4977	4.7815	1	200	1
2740	580.333054	0.308083	2	41933.985	23.0680	4.6950	1	200	1
2750	583.565565	0.334709	2	42076.598	25.0534	5.1008	1	200	1
2760	586.848414	0.228932	2	42222.184	17.1299	3.4888	1	200	1
2770	589.000860	0.239150	2	42362.082	17.8923	3.6445	1	200	1
2780	592.008860	0.389550	2	42504.766	29.1355	5.9365	1	200	1
2790	594.650873	0.221905	2	42647.200	16.5959	3.3817	1	200	1
2800	597.230930	0.220231	2	42789.750	16.4677	3.3562	1	200	1

restart dump generated at problem time 600.000977 s after 2810 time steps 9

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp	cell
2810	600.000977	0.341651	2	42919.766					

at time 63.8013 s in component number 938 at cell 1, the maximum stanton number is 1.663668E+05
at time 0.0075 s in component number 906 at cell 1, the minimum tld is 6.203117E+02 k
where tld is the liquid temperature at bubble detachment from a heated surface

end of problem

computative timing statistics 10
cpu time is 4.2924E+04 s

APPENDIX H

ANNOTATED TRCOUT-FILE SEGMENTS

The steady-state and transient input-data TRACIN files in Appendices E and F were executed upon by TRAC-P Version 5.4.19. Except where noted, the following commentary is valid for TRAC-M. Their steady-state and transient calculation TRCOUT files have 145 double-sided pages (37 217 lines) and 338 double-sided pages (86 447 lines), respectively. Most of the output results are associated with an initial input-data output echo having variable-name labels and unit symbols, a initial short and large edit at problem time 0.0 s, and 1 steady-state and 6 transient calculation short and large edits that were user requested in the Timestep Data from each calculation. The large size of these TRCOUT files makes it impractical to present them in their entirety in this appendix. We have chosen instead to present segments of each file that have items of interest for annotation. The steady-state and transient calculation segmented TRCOUT files shown in this appendix have 4794 and 10 205 lines, respectively. The deleted portions of each TRCOUT file are marked by the inserted message

"########## xxxx lines deleted here ##########"

at locations in the output where xxxx lines from the original TRCOUT file were deleted and replaced by this comment. Section H.1. discusses the steady-state calculation segmented TRCOUT file output listing in Section H.2.; Section H.3. discusses the transient calculation segmented TRCOUT file output listing in Section H.4. The purpose of the discussion in this appendix is not to dwell on the physical nature of the solution, but to focus on the type and form of the information provided by the TRCOUT file.

H.1. Notes on the Steady-State Calculation TRCOUT-File Segments

The output segments from the steady-state calculation TRCOUT file are reviewed in this section to provide a description of their contents. Notes in this section are referenced by callouts that are marked on the TRCOUT-file output segments in Section H.2. For example, 1 corresponds to note 1.

Note: The logo has not been reimplemented in TRAC–M.

1. The TRAC-P logo is on the first output page.

Note: This identification information has been modified in TRAC-M.

2. Quality-control identification of the version of TRAC-P, the date the TRAC-P executable was created, and a list of updates included in TRAC-P since version 5.4 is printed here for the purpose of verification and traceability.

3. TRAC-P internally has H_2O or D_2O properties available to define the coolant. ID20 = 0 or 1 (Word 5 on Main-Data Card 2) selects H_2O or D_2O properties and identifies that choice on these output lines.

4. An output echo of the NUMTCR = 27 problem title cards from the input-data TRACIN file is shown here.
5. The values of all namelist variables are printed here. The values of FDFHL, IADDED, ICFLOW, IKFAC, IMFR, IOLAB, IPOWR, IUNLAB, NEWRFD, NFRC1, NHTSTR, NOAIR, and TPOWR were defined by the TRACIN file shown in Section E.7.; all other NAMELIST variables have their default values.
6. The metric SI units-name labels and their units symbols defined internally by TRAC-P are output as user information. Only SI units are shown because the input TRACIN file and output TRCMSG, TRCOUT, and TRCGRF files are in SI units based on the default values of NAMELIST variable IOINP = 0, IOOUT = 0, and IOGRF = 0. Had any one or more of their values been 1 or the INLAB file been output by NAMELIST variable INLAB = 3 with IOLAB = 1, the English units-name labels and their units symbols would have to be output here as well.
7. Namelist variable NFRC1 = 2 results in this output message that forward-flow and reverse-flow direction additive loss coefficients are to be input for all 1D hydraulic components.
8. This message states that the default solubility-parameter values shown are used to dissolve SN-array solute or to plate-out CONC-array solute that are defined because NAMELIST variable ISOLCN = 0 (default value).
9. The Main-Data card parameter values are output here with their FORTRAN variable-name in the order that they were input.
10. This message states that the boiling-curve minimum temperature for not rewetting a heated surface is based on homogeneous nucleation because ITMIN = 0 is initialized in subroutine BLKDAT. If TRAC-P were to be reprogrammed with ITMIN > 0, the maximum value of the boiling-curve minimum temperature based on the homogeneous nucleation model or the Iloeje model would be used instead.
11. This message indicates that the solute-tracking option is on because ISOLUT = 1 was input on Main-Data card 6. This requires the input specification of ICONC for each hydraulic component. ICONC = 0 requires no solute-parameter input, ICONC = 1 requires the dissolved-solute-to-liquid mass-ratio array CONC be input, and ICONC = 2 requires array CONC and the plated-out solute concentration array SN be input for the hydraulic component.
12. The IORDER-array hydraulic and heat-structure component numbers are shown in ascending numerical order. This order is different from the order they were input where their component numbers were grouped according to their similar components in the three coolant loops. The total number of component numbers shown is NCOMP = 132 (word 3 on Main-Data card 4). Refer to note 23 where these component numbers have been reordered and

printed in the order that TRAC-P evaluates them in their computational loops.

13. The input parameters defining the NCONTR = 3 constrained steady-state controllers have their values printed here. These input-parameter values (and for most of the other input-parameter values that follow) are printed in the order they were input and are labeled with their FORTRAN variable or array names (defined in the input-data format description of Section 6.0.).

14. All NTSV = 65 signal variables have their input-data parameter values shown on the output.

15. The NAMELIST variable IUNLAB = 8 user-defined units-name labels, in addition to TRAC-P's internally defined 50 units-name labels (see note 6), are shown here on the output.

16. There are 26 examples shown (of the 20 different function-operator-type control blocks defined) on the output from among the NTCB = 238 control blocks input. The output presents a schematic of each control block with the function-operator label in a starred box having zero to three input-signal positive signal-variable or negative control-block ID numbers on the left side of the box and the control block's output-signal negative control-block ID number on the right side of the box.

17. The trip-dimension variables card enables TRAC-P to reserve computer memory storage for NTSE = 3 signal-expression trip signals and NTCT = 20 trip-controlled-trip trip signals.

18. There are 9 of the NTRP = 72 trips shown with their input-data parameter values echoed to the output.

19. This message states that there are 48 signal-variable/control-block trip-signal trips, 3 signal-expression trip-signal trips, and 21 trip-controlled-trip trip-signal trips among the NTRP = 72 trips input. The later 2 trip-signal types require NTSE = 3 different signal-expression trip signals whose input-parameter values are output next and NTCT = 20 different trip-controlled-trip trip signals whose input-parameter values are printed thereafter (see note 17).

20. The Component Data input-data parameter values are echoed to the output in the order they were input. The first component is VESSEL component 1. Of its NASX = 12 axial-cell levels, all of the level 1 array data and parts of level 2, 3, 7, and 12 array data input are shown in the segmented output. Input data for levels 4, 5, and 6 repeat level 3 input data to define the reactor-core and downcomer region within the VESSEL component.

21. All or part of the input-data parameter values output echoed for hydraulic components PIPE 2, PIPE 12, PUMP 16, and FILL 93 for the primary-side coolant and PIPE 100, TEE 105, TEE 110, TEE 200, FILL 202, FILL 203, and TEE 205 for the secondary-side coolant are shown in the segmented output. This output provides a representative example of how the input-data

parameter values for these hydraulic components are echoed to the TRCOUT file.

22. All or part of the input-data parameter values output echoed for HTSTR (heat-structure) components ROD 900, SLAB 901, ROD 910, ROD 920, SLAB 931, and ROD 932 are shown in this segmented output. ROD 900 is a powered (NOPOWR = 0) HTSTR component that models the reactor-core fuel rods. It has the same input-data parameters as an unpowered HTSTR component plus additional scalar and array input-data parameters defining its power-generating option. The power generation of ROD 900 is defined by a point-reactor kinetics model (IRPWTY = 4) with no reactivity feedback modeled (IRPWTY < 11) and with the programmed reactivity of control-rod insertion defined by a trip IRPWTR = 10 controlled component-action RPWTBR table. See Appendix I for an example of modeling reactivity feedback in the input data of ROD 900. The remaining HTSTR components are unpowered (NOPOWR = 1). SLABs 901 to 909 model the internal structure of the reactor vessel; RODs 910, 920, and 930 model the tubes of the loop 1, 2, and 3 steam generators, respectively; and SLAB 931 plus RODs 932 to 938 model the internal structure of all three steam generators. TRAC-P requires that the heat-structure component data be input after the hydraulic component data, and that the heat-structure component ID numbers be numerically larger than the hydraulic component ID numbers.

23. This IORDER-array listing of the hydraulic and heat-structure component ID numbers has been reordered to reflect the order in which the hydraulic components are evaluated by TRAC-P in their computational loops and the order in which their component thermal-hydraulic state solution results are output to the TRCOUT file for each large edit.

24. When the system model has one or more VESSEL components, this message gives the size of the vessel coefficient matrix solved as a vessel-matrix equation by TRAC-P for all VESSEL components. For this problem the vessel coefficient matrix has 12 diagonal rows above and below the main diagonal with elements that potentially can be nonzero valued. This defines the banded-matrix portion of the vessel coefficient matrix as having a bandwidth of 12 + 1 + 12 = 25 diagonal rows. Twelve of the vessel-matrix rows have one or more nonzero elements outside the matrix bandwidth. These nonzero elements represent the source-connection junction coupling of VESSEL mesh cells in different axial levels by 1D hydraulic-component coolant-flow loops.

25. This output information is from the power initialization-stage calculation for powered HTSTR component ROD 900. The output shows the linear-power generation rate in W m^{-1} (Btu h^{-1} ft^{-1}) units for each of the five NZ node rows (radially integrated) of the first two powered average rods and the last powered supplemental rod that has a power-peaking factor of 1.678. The linear-power generation rate has been normalized to give a total power of 2.300000E+09 W (7.875223E+03 Btu h^{-1}) from the NCRX = 6 average-

power RODs wherein each average-power ROD element represents RDX = 5.33800E+03 fuel-rod elements.

26. The VOL, FAYT, FAZ, and FAXR values printed for VESSEL component 1 are the coolant mesh-cell volumes and interface flow areas determined during the initialization stage of the calculation from the geometric dimensions of the VESSEL component and the volume and flow-area fractions input. All of the level 1 and 12 output is shown along with the initial part of the level 2 output. The summed coolant volume of each level and of all levels up to and including that level is shown as well. We see from the level 12 output that the VESSEL component has a total coolant volume of 9.517555E+01 m^3 (3.361093E+03 ft^3).

27. This output shows the internally computed (during the initialization stage) vertical-height change across each 1D hydraulic component based on its DX and GRAV input data. Only the height changes across PIPE 10, PIPE 12, PIPE 14, PIPE 7, PIPE 100, TEE 105, TEE 110, TEE 190, and VALVE 316 are shown in the segmented output. The TRAC-P user can use this information from the full output to sum the vertical height changes around a computational loop to verify a net vertical height change equal and opposite to the height change between its interface-centered source-connection junctions to VESSEL component 1.

28. Because NAMELIST variable IKFAC = 1 and K-factors are input, the j interface $FRIC_j$ = K-$factor_j$ * HD_j / ($\Delta X_{j-1} + \Delta X_j$) values that were evaluated during the initialization stage of the calculation are output. This information is useful because it provides FRIC values based on the abrupt flow-area change irreversible flow-loss K-factors internally evaluated by TRAC-P for interfaces having NFF < 0 values. Inputting K-factor values is more physically intuitive to the user than inputting FRIC values.

29. A restart data dump is generated at the start of every TRAC-P calculation (after the input and restart data are processed and all other parameters initialized but before the first timestep is evaluated). Restarting a CSS calculation from this data dump would produce results identical to that of starting with the input-data TRACIN file shown in Section E.7.

30. The first set of Timestep Data is echoed from input. These minimum and maximum timestep sizes, heat-transfer calculation timestep ratio, convective energy-error limit, and the various output-edit time intervals will be used from the start of the CSS calculation at 0.0 s to the time domain end at TEND = 1.0000E+01 s.

31. This warning message indicates that the initial axial-power shape of powered HTSTR component ROD 900 at axial-power-shape table abscissa coordinate ZPWIN = 1.0000E+00 s is not consistent with the axial-power shape defined at the table's initial independent-variable value of 0.0 s problem time. The input-data preparer did not take care in defining the initial condition of these two input quantities (ZPWIN and TIMET = 0.0000E+00 s) consistently. ZPWIN = 0.0000E+00 s should have been input.

Because the axial-power-shape table has only one axial-power shape, the calculational results will not be affected by this, because there will not be an initial step change in axial-power shape because of this inconsistent input definition of the initial abscissa-coordinate value.

32. The first short and large (long) edit is generated by TRAC-P at time TIMET = 0.0000E+00 s (word 2 on Main-Data card 3) before starting its timestep calculation. The user does not have control through Timestep Data of not generating this initial short and large edit. Through Timestep Data, the user has selected that the next short and large edit will be at TIMET + EDINT or SEDINT = 0.0 s + 10.1 s = 10.1 s. With TEND = 1.0000E+01 s and DTMAX = 1.0000E-01 s, the problem time will not reach 10.1 s while this Timestep-Data set is in effect. As a result, the user has selected no short and large edit during this Timestep-Data set by defining EDINT or SEDINT ≥ TEND + DTMAX.

33. The short edit at problem time TIMET = 0.0000E+00 s contains information about the nature of the numerical solution. Because the timestep calculation has not been evaluated yet, this initial short edit has mostly default values. The problem time is 0.000000E+00 s and the timestep size is the value of DTMIN = 1.0000E–03 s, which is the default at the start of an initial (nonrestart) calculation (where the TRACIN file defines all input data). These undefined short-edit parameters will be discussed later in note 46 for the next short edit where the significance of these calculation-determined values can be discussed.

34. Output at the end of a short edit is the current CPU execution time of this calculation, current total CPU time of the initial and all restart calculations, and the number of timesteps thus far required by the TRAC-P calculation/s. The billing time at Los Alamos is based on the accumulated CPU execution time and computer-dependent fractions the I/O plus MEM usage times, which makes the billing time more than the CPU execution time. The number of timesteps includes the number of timesteps from prior calculations that TRAC-P may have restarted from. For an initial calculation, the number of timesteps is 0 in the initial short edit.

35. The first part of a large edit contains the values of the control-parameter signal variables, control blocks, trip set status, and trip signals at the start of the previous timestep when they were last evaluated. For this initial large edit, the values correspond to the start of the present timestep based on the input-data for the modeled system. Note that in the signal-variable and control-block outputs, the values for signal variable ID numbers 9901, 9902, and 9903 and control-block ID numbers –9901, –9902, and –9903 are shown even though these control parameters were not user specified through input. These signal variables and control blocks were generated internally by TRAC-P for the NCONTR = 3 (word 4 on Main-Data card 6) CSS controllers that the user selected for the STDYST = 2 (word 1 on Main-Data card 4) CSS calculation. For system models to be evaluated by a CSS calculation, signal variable IDs 9901 to 9900+2*NCONTR and control block

IDs –9901 to –9900–NCONTR must not be defined by the user in the TRACIN file. Twice as many signal variable ID numbers than control block ID numbers are reserved because CSS type 3 controllers require two internally defined signal variables and one control block while all other CSS controllers require one signal variable and one control block.

36. A maximum Stanton number of 1.759790E+03 in the plant-model heat-structure components was determined by TRAC-P to be in unpowered HTSTR component SLAB 931 (the loop 1 steam-generator wrapper wall between the boiler and downcomer). The dimensionless Stanton number is the ratio of the dimensionless Nusselt number divided by the product of the dimensionless Reynolds and Prandtl numbers for a heat-transfer surface coupled to a hydraulic channel.

37. Only the large-edit output from the first PIPE component 10 and last HTSTR component ROD 938 is shown with 9119 lines deleted in between. The PIPE component 10 output shows hydraulic-parameter values in its first table and pipe-wall heat-transfer parameters in its second table. The power from the pipe wall is zero because the wall and single-phase liquid coolant temperatures are initially the same at 591.1 K (604.3°F). The last line shows the current component-summed coolant mass and energy. The calculated initial mass is the current coolant mass plus the net coolant-mass inflow since the start of the calculation. This value should not change from large edit to large edit if the calculated coolant mass of the component is conserved.

38. The HTSTR component ROD 938 output shows for each of its NCRX = 3 (loop 1, 2, and 3 steam-generator dryer structure) ROD elements the r vs z node temperatures in its first table and the inner and outer surface heat-transfer parameters for coupling to their hydraulic channels in its second and third tables. Both hydraulic channels only have steam; therefore, the liquid heat-transfer coefficients are zero. Surface and volume-averaged thermal conductivities (0.00000E+00 in this initial large edit because they are not yet evaluated), total surface areas, and total power across each surface are shown at the end of the ROD 938 output. These total values are summed over all NCRX = 3 ROD elements.

39. The current total coolant mass and energy in the entire system model and the total mass discharged to all BREAK components and total mass injected from all FILL components during the calculation are printed at the end of each large edit. The computed system initial total coolant mass (which should not change from large edit to large edit if the calculated system coolant mass is conserved) is the current total coolant mass minus the total mass discharged by all BREAK components plus the total mass injected by all FILL components.

40. The liquid-level trip signal of pressurizer-heater low-level trip –407 rises above the trip's S_2 = 1.5000E-01 setpoint causing TRAC-P to change the trip set status from OFF to $ON_{forward}$ with no setpoint delay time. Trip –407 is the

only trip with a negative ID number that is evaluated during the steady-state calculation. When the trip's ITST input-data parameter has a positive value, a trip must be evaluated and its trip signal must cross a tested setpoint to output the first two lines of this message. Its setpoint delay time then must pass before the third line is output indicating a change in the trip's set status.

41. At problem time 2.071103 s, the steady-state power level is reset to 2.30000E+09 W (7.84792E+09 Btu h^{-1}) in the powered fuel rods of the reactor-core region modeled by HTSTR component ROD 900. Before this time, the power in the fuel rods was 0.0 W (0.0 Btu h^{-1}). NAMELIST variables IPOWR = –1 and TPOWR = 2.0 s controlled the TRAC-P logic for turning the steady-state reactor-core power on at the start of the first timestep after 2.0 s.

42. During a steady-state calculation, TRAC-P tests for steady-state solution convergence every 5 timesteps and for every timestep when a large edit is output to the TRCOUT file (except for the initial large edit discussed above). The information in this steady-state convergence-test results table is output to the TRCOUT file every 100 timesteps and for every timestep when a large edit is output to the TRCOUT file. The steady-state solution convergence test is based on comparing the maximum fractional change per second of each of the seven thermal-hydraulic parameters shown in the table (total pressure, liquid velocity, gas velocity, gas volume fraction, liquid temperature, gas temperature, and noncondensable-gas pressure) everywhere in the system model with the user input-specified EPSS (word 2 on Main-Data card 5) steady-state convergence criterion. All seven maximum fractional change per second values must be less than EPSS for steady-state solution convergence to be satisfied and for TRAC-P to end the calculation before the time domains of all Timestep Data have been evaluated. We see in this output table at timestep number 100 and problem time 2.234650 s that the maximum fractional change per second values are large compared with EPSS = 1.0000E-04. The solution state of the system model still is changing rather rapidly. Testing against the maximum fractional change per second rather than per timestep provides a better test for steady-state convergence because it doesn't depend on the timestep size that is being used.

43. When the steady-state calculation is a CSS calculation, a table showing the current status of all CSS controllers is printed after the steady-state convergence-test table discussed in note 42. The columns denoting component type and number, minimum and maximum values of the adjusted parameter, and the desired value for the monitored parameter are input-specified values for each of the controllers. The current status of the controller action is seen in the values of the adjusted parameter and the monitored parameter. By making changes in the adjusted parameter, the controller is attempting to affect the solution state of the system model in a way that causes the monitored parameter value to change to the desired value. Adjustment is not allowed outside the minimum to maximum value

range. When the adjusted parameter reaches either limit, the controller has no further ability to affect the system model until the controller adjustment changes direction. Constraining an adjusted parameter to a reasonable adjustment range keeps inappropriate conditions of a rapidly changing solution from causing a controller to make inappropriate adjustments that may hinder or prevent a steady-state solution from being determined. Before steady-state convergence EPSS-test conditions can be satisfied, CSS controller adjustments must become very small. Because local conditions of the monitored parameter can change somewhat irregularly at times as the solution approaches steady-state conditions, constraining the rate of change of the component actions controlled by the CSS controllers is sometimes necessary to achieve steady-state convergence. This is done with the component-action maximum rate of change input parameter that is part of the component data (for example, ROMGMX = 5.0000E+01 rad s^{-2} for the PUMP components).

44. The second and third Timestep-Data sets do not output short and large edits because their values of TEND – set-use start time < EDINT or SEDINT + DTMAX.

45. A steady-state convergence-test results table and a constrained steady-state calculation parameters table are output every 100 timesteps. The CSS pump controller adjustments have settled down and become small by the timestep number 200 edit at problem time 12.539873 s and thereafter. The maximum fractional change per second of the liquid velocity, gas velocity, and gas volume fraction in secondary-side components does not settle down and stays large through the entire TEND = 2.0000E+02 s calculation.

46. At problem time 200.0693 s, TEND = 2.0000E+02 s of the third Timestep-Data set is exceeded. DTMIN = –1.0000E+00 is read in and defines the end flag for TRAC-P terminating the steady-state calculation.

47. TRAC–M outputs a final short and large edit with problem time reset to 0.0 s to signify that this is the solution-state data output to the final data dump. This is done when a short and large edit isn't output by TRAC-P at the final problem time of 200.0693 s based on the EDINT and SEDINT time intervals of the final Timestep-Data set. This large edit shows the steady-state solution of interest that will be used to restart the transient calculation. Having only an initial and final large edit from a steady-state calculation generally provides sufficient calculative information for most users. Generating a hard copy of the TRCOUT file may require only printing the last large-edit portion of the file. With a text editor, the user can search for the character string "large" to find the first line of each large edit. The last large-edit portion of the TRCOUT file can then be copied to another file for printing.

48. Items in the final short edit will be discussed that were not commented on in note 33 for the initial short edit (because they did not have calculational values). The final timestep number 1262 required 2 outer iterations to converge the outer-stage pressure-matrix solution. The maximum con-

vective power difference was a large 5.423525E+07 W (1.8506E+08 Btu h^{-1}) in HTSTR component ROD 900 early in the calculation (a wrong problem time of –1.0 s is output by this new programmed feature). The coolant-flow material-Courant limit in mesh cell 1 of the loop 2 main steam-line TEE component 210 would have limited the current timestep size to 1.1290E-02 s without the SETS1D numerical method. Instead, the current timestep size was 2.1930E-01 s. The average number of outer iterations per timestep was 2.279 over the last 1267 timesteps. That means that 5 of those timesteps were backup calculations because the current timestep number is 1262. For the 1262 timestep calculations whose outer-iteration converged, the maximum number of outer iterations was 6 at timestep number 100. The tabular data defines the number of timesteps since the last short edit at the beginning of the calculation where each hydraulic component was the last to satisfy the EPSO (word 1 on Main-Data card 5) convergence criterion for the outer-stage pressure-matrix solution. The hydraulic-component numbers (shown in parentheses) are ordered according to the reordered IORDER-array output list discussed in note 23. Note that outer-iteration convergence was limited primarily by the secondary-side components. The different timestep size maximum values are shown next. They are based on criteria for a stable numerical evaluation of various transient phenomena. Values of 1.0000E+08 s indicate that this criterion currently does not limit the timestep size or that its limit exceeds the 1.05*DELT maximum-increased timestep size for the next timestep. The number of timesteps since the last short edit where that criterion limited the timestep size is shown by the integer values. Only 74+1+1 = 76 timesteps were limited by these criteria. This does not included the timesteps where DTMAX limited the timestep size. The total CPU execution time was 1.841768E+04 s (5.1160 h) for the steady-state calculation on a SUN Sparc 2 workstation.

49. The signal-variable, control-block and trip parameter values output define the control-procedure logic state of the assumed (because convergence wasn't satisfied) steady-state solution. The signal-variable parameter labels and the units symbols help define the values. Their comment lines in the TRACIN file and operator diagrams in the input-data echoed portion of this TRCOUT file provide further defining information.

50. PIPE component 100 and TEE components 105 and 190 model the secondary side of the loop 1 steam generator. The initial liquid drained state, with the liquid being in the boiler and lower downcomer sections, now for the steady-state solution, has a significant amount of liquid (0.2 to 0.3 liquid volume fraction) in the separator and (0.6 to 1.0 liquid volume fraction) in the upper downcomer. The initial total coolant mass inventories of 2.51389E+04 kg, 1.58817E+03 kg, and 8.75076E+03 kg for these components from the initial large edit closely agree with their final large edit computed initial total coolant mass inventories of 2.51389E+04 kg, 1.58810E+03 kg, and 8.75075E+03 kg, respectively. The largest mass conservation error is –0.07 kg in TEE component 105.

51. The VESSEL component 1 output is organized by levels with the array parameters of levels 1 and 12 shown in their entirety and of levels 2 and 11 shown in part. The total power to the single-phase liquid in the VESSEL is 2.29951E+09 W (7.84625E+09 Btu h^{-1}) in the summary output after the level array data. This is the heat flux summed over the outer surface of all HTSTR components coupled to VESSEL component 1. The heat flux is summed over the outer surfaces of powered HTSTR component ROD 900 [which has a steady-state power of 2.3000E+09 W (7.8479E+09 Btu h^{-1})] and unpowered HTSTR component SLABs 901 through 909. For a fully converged steady-state solution, 2.29951E+09 W would be 2.3000E+09 W (HTSTR power in equals HTSTR power out). Volume summed and averaged parameters are shown for the lower plenum, reactor core, upper plenum and downcomer regions in the VESSEL. The calculated initial total coolant mass of 6.78684E+04 kg is identical to the initial total coolant mass in VESSEL component 1 in the initial large edit.

52. The HTSTR component ROD 900 output shows the node temperatures and outer-surface heat-transfer parameters for the NCRX = 6 powered average ROD elements and the NRODS–NCRX = 6 powered supplemental ROD elements that have power peaking factors of 1.6780. The total power generated in these average ROD elements is shown in the second output line to be a reactor-core power of 2.300000E+09 W (7.8479E+09 Btu h^{-1}). The total power from the outer surface of these average ROD elements is shown in the summary output after the data of all 12 ROD elements to be 2.29995E+09 W (7.84791E+09 Btu h^{-1}). The difference of the later from 2.29951E+09 W (7.84625E+09 Btu h^{-1}) transferred to the VESSEL coolant (see note 51) is 4.4E+05 W (1.66E+05 Btu h^{-1}), which is still heating up the HTSTR components that are couple to the VESSEL.

53. The HTSTR component ROD 938 outputs NCRX = 3 ROD elements that model the structure of the steam dryers of the loop 1, 2, and 3 steam generators. We see slight differences in the steady-state solution among the 3 ROD elements. That is because the secondary-side piping of each steam generator is slightly different.

54. The summary parameters at the end of the large edit show the steady-state solution 4.544427E+13 kg (1.001874E+14 lb_m) total coolant mass of the system model hasn't changed (to within the ±5.0E+06 kg significant-digit accuracy of the output value) from its initial solution estimate that was input. The summed BREAK and FILL inflows of 3.882591E+04 kg + 1.751353E+03 kg = 4.057726E+04 kg (8.945752E+04 lb_m) on the secondary side are less than that roundoff.

55. The constrained steady-state calculation parameters table was output to the TRCOUT file at problem time 200.0693 s because a large edit was generated. A steady-state convergence-test table was not output because the EDINT large-edit frequency did not control the output of the large edit, and the timestep number 1262 was not a multiple of 5. Either one of these needs to

be satisfied for the seven maximum fractional change per second parameters to be evaluated by TRAC-P and their values output by the table.

56. A data dump is not sent to the TRCDMP file up to problem time 200.0693 s because the DMPINT = 1.0030E+02 s data-dump edit time interval (specified in the last Timestep-Data set) defined an unreachable later edit time (100.174 s + 100.30 s = 200.474 s) because TEND = 2.0000E+02 s and DTMAX = 3.0000E-01 s. A final data dump, labeled with problem time 0.000000 s, is generated automatically by TRAC-P at the end of a steady-state calculation. It is the data dump that will be used for the restart transient calculation.

57. At TEND = 2.0000E+02 s of the last Timestep-Data set, TRAC-P ends the CSS calculation without having satisfied the EPSS = 1.0000E-04 steady-state convergence test criterion. A warning message to that effect is output 7 lines from the end of the TRCOUT file. Timestep number 1200 maximum fractional change per second values of –3.315537 s^{-1} for the liquid velocity, –1.849876 s^{-1} for the gas velocity, and -0.696953 s^{-1} for the gas volume fraction at the TEE component 305 internal-junction JCELL = 6 of the loop 3 steam-generator separator indicate the secondary-side solution is not settling down. It is felt that the nature of the steam-generator secondary-side model has created oscillatory behavior. To diagnose the cause and be able to better converge the steady-state solution by introducing appropriate modeling changes, the steam-generator secondary-side solution behavior would need to be examined and its cause-and-effect understood. This can be done most effectively with graphics output.

58. The CPU execution time of 1.8424E+04 s (5.1178 h) for the TRAC-P steady-state calculation was on a SUN Sparc 2 workstation.

H.2. Listing of the Steady-State Calculation TRCOUT-File Segments.

```
                     transient  reactor  analysis  code

              tttt                   cccc                     pppppppppppp
            ttt  t                  cc  cc                  pp            pp
          ttt                      cc                     pp   ppp          pp
 t      tttt                tt    cc          c          p     pp            pp
tt   ttt tt               aaaaa   cc        cc           p     pp             pp
ttttt   tt               aa  aa   ccc    ccc              p p  pp             pp
        tt        rrr   aa   aa  cc ccccc                  p   pp            pp
        tt      rrrrr   aa   aaaaa                             pp          pp
        tt     rr  rr   aa  aa aa                             pppp      ppp
       tt      rr  rr   aaaaa                     ****        pp  pppppp      1
       tt      rr  rr aa aa                                   pp
       tt     rrr  rrrrr                                      pp
       tt     rr    rr                                       pp
      tt     rr                                              pp
      tt    rr                                               pp
t    tt                                                 p    pp
tt  ttt                                                 pp  ppp
 ttttt                                                   ppppp
```

```
         *****************
         **   warning   **
         *****************

 *trac* this executable has memory preset to zero

 current overlays in memory: cbmain
     real variables preset to zero
     integer variables preset to zero
     ***code may not function in the same manner as***
     ***lanl internal version which presets memory ***
     ***to negative indefinites                    ***
 *** Official TRAC-P Version 5.4.19   ***
Program library created Thu May 2 14:50:51 MDT 1996          2


 ---------------------------------------------------------------------------
                  Change History
 ---------------------------------------------------------------------------
  5.4      Date Stamp Fri Apr 2 14:46:00  MDT 1993 **date not automated**
  5.4.01   Date Stamp Thu Jun 9 11:23:55 MDT 1994
  5.4.02   Date Stamp Mon. Oct. 3 1994            **date not automated**
  5.4.03   Date Stamp Thu. Oct 13 1994            **date not automated**
  5.4.04   Date Stamp Thu. Dec 08 1994            **date not automated**
  5.4.05   Date Stamp Tue. Dec 20 1994            **date not automated**          2
  5.4.06   Date Stamp Tue. Mar 14 1995            **date not automated**
```

```
5.4.07   Date Stamp Mon June 19 1995            **date not automated**
5.4.08   Date Stamp Thu June 22 1995            **date not automated**
5.4.09   Date Stamp Fri July 14 1995            **date not automated**
5.4.10   Date Stamp Fri. Aug 18 1995            **date revised in 5.4.11**
5.4.11   Date Stamp Fri Aug. 25 1995            **date not automated**
5.4.12   Date Stamp Wed Sep 13 13:53:12 MDT 1995
5.4.13   Date Stamp Fri Oct 27 11:17:11 MDT 1995
5.4.14   Date Stamp Wed Nov 29 09:26:17 MST 1995
5.4.15   Date Stamp Mon Dec 4 14:28:15 MST 1995
5.4.16   Date Stamp Fri Jan 19 10:50:18 MST 1996
5.4.17   Date Stamp Mon Jan 29 15:45:39 MST 1996
5.4.18   Date Stamp Wed Apr 17 12:08:23 MDT 1996
5.4.19   Date Stamp Thu May 2 14:50:51 MDT 1996
-------------------------------------------------------------------------
Version 5.4.01   created from version 5.4    using the following updates:
    fxchfit   pltvar    fxrfdz    fsurflx   vector2
    upnljf    fans792   fxibf     fxcidc    fxwpkxx
    fixml3    fxmfg     fxbktrl   fxtss     upnvpl
    fxcvm     fxmrod    fxblb2    upxtvp2   fxbit
    morml3    fxsmvt    v5p4p01
Version 5.4.02   created from version 5.4.01 using the following updates:
    uphtmlb   fxlptre   no360     dcomer    fxnffz2
    fxtee     fxltfcb3  fxincb    fxtkf     uphep
    uphsrd2   ieeeg     upmld     brksat    genbrk
    fxlabc    v5p4p02
Version 5.4.03   created from version 5.4.02 using the following updates:
    upmld2    modig     upjfl     fxisrb    fxfxtkf
    hpconv    v5p4p03
Version 5.4.04   created from version 5.4.03 using the following updates:
    updmfc    fxsave    fixcpu    realfix   fxigmod
    fhtbdc    fxetime   cifblas   v5p4p04
Version 5.4.05   created from version 5.4.04 using the following updates:
    fixcdeq   fixsg     v5p4p05
Version 5.4.06   created from version 5.4.05 using the following updates:
    fixtype   units     v5p4p06
Version 5.4.07   created from version 5.4.06 using the following updates:
    cpuprt    v5p4p07
Version 5.4.08   created from version 5.4.07 using the following updates:
    fixbr     fxfachk   fxudid    rstub     v5p4p08
Version 5.4.09   created from version 5.4.08 using the following updates:
    uphsbu    upldpt    fxrgs     upnouc    fixhsft
    hsflip2   cnlist    xtvi3e    fxgbit    fixbul
    gnwkst2   fxnul     ssavg     aenergy   upenwrt
    labout09  upencyl   upenhts   fixb21    v5p4p09
Version 5.4.10   created from version 5.4.09 using the following updates:   <----- 2
    fxnstl    uprad3n   radhyd    radhts    fxshstr
    radrd     radi      gamhtl    gamht2    upfind5
    fprad     vmatrix   raddmp3   uplinalg  csst5c
    fxuphts   v5p4p10
Version 5.4.11   created from version 5.4.10 using the following updates:
    fxivsl    fxdef     fxuc2     fixfr     fxifdf
    labout11  fxvstp    v5p4p11
Version 5.4.12   created from version 5.4.11 using the following updates:
    fxvadj2   hpssi     labout12  fxdsln2   fxsct
    fxsahsl   xtvl2b    fixfr2    upenwrt2  fxcnlist
    fxsedit   fxradln   upfxrad   upenrad   ngenwks2
    v5p4p12
Version 5.4.13   created from version 5.4.12 using the following updates:
    fxencyl   rmcom     xtvibm    fxency2   smatsol
    fxname    v5p4p13
Version 5.4.14   created from version 5.4.13 using the following updates:
    newlogo   fxunits   faxbugs   v5p4p14
Version 5.4.15   created from version 5.4.14 using the following updates:
    fxflowin  fxrsudul  fxwhtstr  v5p4p15
Version 5.4.16   created from version 5.4.15 using the following updates:
    ifrd      hp9kdef   rs6kdef   sundef    unixdef
    v5p4p16
Version 5.4.17   created from version 5.4.16 using the following updates:
    prgast    v5p4p17
Version 5.4.18   created from version 5.4.17 using the following updates:
    d2o       fxface2   chdefs    tsdiag2   labout18
    v5p4p18
Version 5.4.19   created from version 5.4.18 using the following updates:
    vectrz    unixdef   v5p4p19
-------------------------------------------------------------------------


                    input data is being processed
main control card parameters

    numctr =   27,    ieos =      0,    inopt =      1,    nmat =      0,    id2o =     0
    4                    h2o properties are used   3                                     3

number of title cards is:   27
this is a sample problem for the trac-p users guide manual.  it models
a westinghouse 2308-mwt powered nuclear-core, three-loop pressurized
water reactor with constrained steady-state and transient calculations.
this full-plant model evaluates a steam-generator single-tube double-
ended-guillotine break transient with primary-coolant pumps operating.
this input-data model contains the following components and subsystems:
```

```
  1) three-dimensional (r=2,t=6,z=12) reactor vessel;
  2) vessel upper-plenum guide tubes;
  3) powered-rod and unpowered-slab heat structures in the vessel;
  4) three primary- and secondary-coolant loops modeled individually;
  5) makeup, letdown, and pressurizer-sprayer cvcs flows;
  6) accumulator and hpsi fills in each primary-coolant loop;               4
  7) pressurizer and pressurizer porv and srv;
  8) pressurizer, steam generator, and steam-dump control systems;
  9) single-tube degb leakage path in loop 2 steam generator;
 10) main-steam and steam-dump lines;
 11) high-pressure feedwater system after hp heaters; and
 12) auxiliary-feedwater fills (motor and steam driven).
the w3loop input-data model has the following developmental history:
  james lime created the trac-pf1/mod1 input-data model on 7/84.
  robert steinke converted the trac-pf1/mod1 input-data model with
  gocnvt to a trac-pf1/mod2 input-data model and added component-
  network diagrams on 9/90. marvin salazar added units labels to
  the control blocks and trips for si/english units i/o on 10/93.
  robert steinke replaced stgen components with htstr, pipe, and tee
  components on 2/96.  James lime upgraded the w3loop input-data model
  to be consistent with the current h.b.robinson plant model on 5/96.
executed on  /21/96 at  10:46:03                                                      5

inopts namelist variables
       alp = 1.0000E+20,      ccif = 1.0000E+04,      cfz3 = 1.0000E+20,     chm12 = 1.0000E+00,     chm22 = 1.0000E+00
                     -                  kg/m4                      -                      -                      -
     chm13 = 1.0000E+00,     chm23 = 1.0000E+00,     chm14 = 1.0000E+00,     chm24 = 1.0000E+00,     chm15 = 1.0000E+00
                     -                      -                      -                      -                      -
     chm25 = 1.0000E+00,    dtstrt =-1.0000E+00,     fdfhl = 0.0000E+00
                     -                      s                      -
       hd3 = 1.0000E+20,      hstn = 1.0000E+20,     htcwl = 1.0000E+01
                     m                      k                 w/m2/k
     htcwv = 1.0000E+01,    iadded =         10,    iblaus =          0,    icdelt =          0,    icflow =          2
                w/m2/k
    iconht =          0,     idiag =          0,     ieeeg =          0,      ielv =          0,      igas =          1
    igeom3 =          0,    ih2src =          0,      ihor =          1,     ikfac =          1,      imfr =          3
     inlab =          0,     invan =          0,    iofftk =          0,     iogrf =          0,     ioinp =          0
     iolab =          1,     ioout =          0,      ipowr =         -1,    ireset =          0
    isolcn =          0,    istopt =          0
      ithd =          0,    iunlab =          8,    iunout =          1,    levstg =          0,    mhtli =          0
     mhtlo =          0,     mhtvi =          0,     mhtvo =          0,      mwfl =          0,     mwfv =          0
     ndial =          1,    newrfd =          1,     nfrcl =          2,     nfrc3 =          1,   nhtstr =         21
     nifsh =          0,       nlt =         10,     noair =          0,    nosets =          2,    nrslv =          0
      nsdl =         -1,      nsdu =         -1,     nsend =         -1,      nspl =         -1,     nspu =         -1
    nvgrav =          0,         p = 1.0000E+20,        pa = 1.0000E+20,      qppp = 1.0000E+20,    timdl =-1.0000E+00
                                               pa                     pa                      -                      s
     timdu =-1.0000E+00,        tl = 1.0000E+20,     tpowr = 2.0000E+00,        tv = 1.0000E+20,       tw = 1.0000E+20
                     s                      k   41                 s                      k                      k
        vl = 1.0000E+20,        vv = 1.0000E+20
                   m/s                    m/s

si units of the internally defined units-name labels are
  lunounit -              luspvol  m3/kg          luprsrat pa/s           luhtc     w/m2/k        luangle  rad
  lutime   s              lumass   kg             luminert kg*m2          luihttf   w/k           luburnup mwd/mtu
  lutemp   k              lumassfw kg/s           lutorque pa*m3          luenergy  w*s           luenfiss mev/fiss
  lutempd  k              lumfwrat kg/s2          lubtork  pa*m3*s/rad    luspener  w*s/kg        lugapgas g-moles
  lulength m              lumassfx kg/m2/s        luctork  pa*m3*s2/r2    luspheat  w*s/kg/k      lurtmsq  1/k2
  luarea   m2             luvapgen kg/m3/s        lupower  w              lurtime   1/s           lunitnam *
  luvolume m3             luden    kg/m3          lupowrat w/s            lurtemp   1/k           luserdef *
  luvel    m/s            luddendt kg/m3/k        lulinhts w/m            lurmass   1/kg          luserdef *     6
  luacc    m/s2           luidrag  kg/m4          luheatfx w/m2           lurpress  1/pa          luserdef *
  lupumphd m2/s2          lupressa pa             luvolhts w/m3           luspeed   rad/s         luserdef *
  luvolflw m3/s           lupressd pa             luthcond w/m/k          luradacc  rad/s2        luserdef *

graphics data is defined in si units

input data is defined in si units          6

output data is defined in si units

you have requested 1-d two-way loss coefficients          7


default solubility parameters

    cntlmn = 3.0300E+02,     cnmin = 6.3500E-02,    cntlmx = 3.7300E+02,     cnmax = 2.7600E-01          8
                     k                      -                      k                      -

main-data cards

     dstep =          0,     timet = 0.0000E+00
                                              s                9
    stdyst =          2,    transi =          0,     ncomp =        132,      njun =        123,      ipak =          1
      epso = 1.0000E-04,      epss = 1.0000E-04
                     -                      -
    oitmax =         10,    sitmax =         10,    isolut =          1,    ncontr =          3,    nccfl =          0
      ntsv =         65,      ntcb =        238,      ntcf =         80,      ntrp =         72,     ntcp =          1

homogeneous nucleation tmin used          10

solute tracking option on          11

system components          1   2   3   4   5   6   7  10  12  14  16  17  18  20  22  24  26  27  28  30  32  34  36  37  38
                          40  41  42  43  44  45  46  47  48  49  50  52  54  56  59  60  62  64  66  69  70  72  74  76  91
                          92  93 100 105 110 112 114 116 118 120 150 154 169 170 179 180 190 200 202 203 205 210 212 214 216
   12                    218 220 250 254 269 270 279 280 290 300 305 310 312 314 316 318 320 350 354 369 370 379 380 390 400
```

410 420 422 424 430 432 434 436 438 576 578 900 901 902 903 904 905 906 907 908 909 910 920 930 931
932 933 934 935 936 937 938

constrained steady-state data cards

numcss =	16,	amncss =	0.0000E+00, rad/s	amxcss =	2.0000E+02, rad/s	nmpcss =	-1,	napcss =	0
numcss =	26,	amncss =	0.0000E+00, rad/s	amxcss =	2.0000E+02, rad/s	nmpcss =	-1,	napcss =	0
numcss =	36,	amncss =	0.0000E+00, rad/s	amxcss =	2.0000E+02, rad/s	nmpcss =	-1,	napcss =	0

13

14

signal-variable data cards

idsv =	1,	isvn =	0,	ilcn =	0,	icn1 =	0,	icn2 =	0
idsv =	11,	isvn =	18,	ilcn =	900,	icn1 =	0,	icn2 =	0
idsv =	101,	isvn =	23,	ilcn =	10,	icn1 =	1,	icn2 =	0
idsv =	111,	isvn =	21,	ilcn =	110,	icn1 =	3,	icn2 =	0
idsv =	161,	isvn =	32,	ilcn =	16,	icn1 =	1,	icn2 =	0
idsv =	171,	isvn =	21,	ilcn =	17,	icn1 =	1,	icn2 =	0
idsv =	181,	isvn =	23,	ilcn =	18,	icn1 =	4,	icn2 =	0
idsv =	201,	isvn =	23,	ilcn =	20,	icn1 =	1,	icn2 =	0
idsv =	222,	isvn =	21,	ilcn =	210,	icn1 =	3,	icn2 =	0
idsv =	261,	isvn =	32,	ilcn =	26,	icn1 =	1,	icn2 =	0
idsv =	271,	isvn =	21,	ilcn =	27,	icn1 =	1,	icn2 =	0
idsv =	281,	isvn =	23,	ilcn =	28,	icn1 =	4,	icn2 =	0
idsv =	301,	isvn =	23,	ilcn =	30,	icn1 =	1,	icn2 =	0
idsv =	333,	isvn =	21,	ilcn =	310,	icn1 =	3,	icn2 =	0
idsv =	361,	isvn =	32,	ilcn =	36,	icn1 =	1,	icn2 =	0
idsv =	371,	isvn =	21,	ilcn =	37,	icn1 =	1,	icn2 =	0
idsv =	381,	isvn =	23,	ilcn =	38,	icn1 =	4,	icn2 =	0
idsv =	401,	isvn =	21,	ilcn =	40,	icn1 =	1,	icn2 =	0
idsv =	421,	isvn =	21,	ilcn =	42,	icn1 =	1,	icn2 =	0
idsv =	501,	isvn =	21,	ilcn =	50,	icn1 =	1,	icn2 =	0
idsv =	601,	isvn =	21,	ilcn =	60,	icn1 =	1,	icn2 =	0
idsv =	701,	isvn =	21,	ilcn =	70,	icn1 =	1,	icn2 =	0
idsv =	521,	isvn =	-21,	ilcn =	52,	icn1 =	2,	icn2 =	3
idsv =	621,	isvn =	-21,	ilcn =	62,	icn1 =	2,	icn2 =	3
idsv =	721,	isvn =	-21,	ilcn =	72,	icn1 =	2,	icn2 =	3
idsv =	1000,	isvn =	69,	ilcn =	100,	icn1 =	1,	icn2 =	0
idsv =	1051,	isvn =	21,	ilcn =	105,	icn1 =	8,	icn2 =	0
idsv =	1100,	isvn =	69,	ilcn =	110,	icn1 =	5,	icn2 =	0
idsv =	1101,	isvn =	21,	ilcn =	110,	icn1 =	3,	icn2 =	0
idsv =	1121,	isvn =	21,	ilcn =	112,	icn1 =	1,	icn2 =	0
idsv =	1135,	isvn =	-21,	ilcn =	110,	icn1 =	3,	icn2 =	5
idsv =	1501,	isvn =	32,	ilcn =	150,	icn1 =	1,	icn2 =	0
idsv =	1541,	isvn =	42,	ilcn =	154,	icn1 =	0,	icn2 =	0
idsv =	1700,	isvn =	69,	ilcn =	170,	icn1 =	4,	icn2 =	0
idsv =	1714,	isvn =	-21,	ilcn =	170,	icn1 =	1,	icn2 =	4
idsv =	1903,	isvn =	21,	ilcn =	190,	icn1 =	5,	icn2 =	0
idsv =	1910,	isvn =	21,	ilcn =	190,	icn1 =	12,	icn2 =	0
idsv =	2000,	isvn =	69,	ilcn =	200,	icn1 =	1,	icn2 =	0
idsv =	2051,	isvn =	21,	ilcn =	205,	icn1 =	8,	icn2 =	0
idsv =	2100,	isvn =	69,	ilcn =	210,	icn1 =	5,	icn2 =	0
idsv =	2101,	isvn =	21,	ilcn =	210,	icn1 =	3,	icn2 =	0
idsv =	2121,	isvn =	21,	ilcn =	212,	icn1 =	1,	icn2 =	0
idsv =	2135,	isvn =	-21,	ilcn =	210,	icn1 =	3,	icn2 =	5
idsv =	2541,	isvn =	42,	ilcn =	254,	icn1 =	0,	icn2 =	0
idsv =	2700,	isvn =	69,	ilcn =	270,	icn1 =	4,	icn2 =	0
idsv =	2714,	isvn =	-21,	ilcn =	270,	icn1 =	1,	icn2 =	4
idsv =	2903,	isvn =	21,	ilcn =	290,	icn1 =	5,	icn2 =	0
idsv =	2910,	isvn =	21,	ilcn =	290,	icn1 =	12,	icn2 =	0
idsv =	3000,	isvn =	69,	ilcn =	300,	icn1 =	1,	icn2 =	0
idsv =	3051,	isvn =	21,	ilcn =	305,	icn1 =	8,	icn2 =	0
idsv =	3100,	isvn =	69,	ilcn =	310,	icn1 =	5,	icn2 =	0
idsv =	3101,	isvn =	21,	ilcn =	310,	icn1 =	3,	icn2 =	0
idsv =	3121,	isvn =	21,	ilcn =	312,	icn1 =	1,	icn2 =	0
idsv =	3135,	isvn =	-21,	ilcn =	310,	icn1 =	3,	icn2 =	5
idsv =	3501,	isvn =	32,	ilcn =	350,	icn1 =	1,	icn2 =	0
idsv =	3541,	isvn =	42,	ilcn =	354,	icn1 =	0,	icn2 =	0
idsv =	3700,	isvn =	69,	ilcn =	370,	icn1 =	4,	icn2 =	0
idsv =	3714,	isvn =	-21,	ilcn =	370,	icn1 =	1,	icn2 =	4
idsv =	3903,	isvn =	21,	ilcn =	390,	icn1 =	5,	icn2 =	0
idsv =	3910,	isvn =	21,	ilcn =	390,	icn1 =	12,	icn2 =	0
idsv =	4001,	isvn =	21,	ilcn =	410,	icn1 =	2,	icn2 =	0
idsv =	4220,	isvn =	42,	ilcn =	422,	icn1 =	0,	icn2 =	0
idsv =	4240,	isvn =	56,	ilcn =	16,	icn1 =	0,	icn2 =	0
idsv =	9000,	isvn =	59,	ilcn =	900,	icn1 =	0,	icn2 =	0
idsv =	9010,	isvn =	60,	ilcn =	900,	icn1 =	0,	icn2 =	0

user-defined unit-labels data cards

lulabel =	lusqrden,	lunitsi =	lusqrt(kg/m3),	luniteng =	lusqr(lb/ft3),	ufactor =	2.4986E-01,	ushift =	0.0000E+00
lulabel =	ludtpdp,	lunitsi =	luk/pa,	luniteng =	luf/psid,	ufactor =	1.2411E+04,	ushift =	0.0000E+00
lulabel =	lurpress,	lunitsi =	lu1/pa,	luniteng =	lu1/psia,	ufactor =	6.8948E+03,	ushift =	0.0000E+00
lulabel =	lupresst,	lunitsi =	lupaxs,	luniteng =	lupsidxs,	ufactor =	1.4504E-04,	ushift =	0.0000E+00
lulabel =	lurtime,	lunitsi =	lu1/s,	luniteng =	lu1/s,	ufactor =	1.0000E+00,	ushift =	0.0000E+00
lulabel =	luasqrtp,	lunitsi =	lum2xsqrt(pa),	luniteng =	luft2sq(psid),	ufactor =	1.2963E-01,	ushift =	0.0000E+00
lulabel =	lusqrtml,	lunitsi =	lusqrt(kgxm),	luniteng =	lusqr(lbmxft),	ufactor =	2.6894E+00,	ushift =	0.0000E+00
lulabel =	lurmflow,	lunitsi =	lus/kg,	luniteng =	luhr/lbm,	ufactor =	1.2600E-04,	ushift =	0.0000E+00

15

control-block data cards

idcb =	-1,	icbn =	9,	icb1 =	0,	icb2 =	0,	icb3 =	0
lugain =	lunounit,	luxmin =	lutempd,	luxmax =	lutempd,	lucon1 =	lutempd,	lucon2 =	lutempd
cbgain =	1.0000E+00,	cbxmin =	0.0000E+00,	cbxmax =	0.0000E+00,	cbcon1 =	0.0000E+00,	cbcon2 =	0.0000E+00

```
                               -                     k                         k                         k                         k
the above control block has the                   **********
 following input ids, function                    *  const * ---->    -1                           16
 operator type, and output id                     **********

##########  103 lines deleted here  ##########

     idcb =       -15,      icbn =        101,      icb1 =       4001,      icb2 =         13,      icb3 =          0
   lugain =   lunounit,   luxmin =   lusqrden,    luxmax =   lusqrden,    lucon1 =   lunounit,    lucon2 =   lusqrden
   cbgain = 1.0000E+00,   cbxmin = 7.7356E-01,    cbxmax = 7.5000E+00,    cbcon1 = 0.0000E+00,    cbcon2 = 4.5813E+00
                    -          sqrt(kg/m3)              sqrt(kg/m3)                        -            sqrt(kg/m3)
the above control block has the          4001 ----> **********
 following input ids, function             13 ----> * table1 * ---->   -15
 operator type, and output id                       **********
   luytab =   lusqrden,    luxtab =    lupressa

cbftab        1.00000E+05  7.73560E-01  5.00000E+05  1.66850E+00  1.00000E+06  2.29850E+00  1.50000E+06  2.77420E+00
              2.00000E+06  3.18750E+00  3.00000E+06  3.90640E+00  4.00000E+06  4.52000E+06  5.00000E+06  5.07150E+00
              6.00000E+06  5.58570E+00  7.00000E+06  6.07620E+00  8.00000E+06  6.55440E+00  9.00000E+06  7.02640E+00
              1.00000E+07  7.50000E+00
              independent variable unit is pa and dependent variable unit is sqrt(kg/m3)

##########  31 lines deleted here  ##########

     idcb =       -22,      icbn =          5,      icb1 =       -142,      icb2 =       -242,      icb3 =          0
   lugain =   lunounit,   luxmin =   lunounit,    luxmax =   lunounit,    lucon1 =   lunounit,    lucon2 =   lunounit
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,    cbxmax = 1.0000E+00,    cbcon1 = 0.0000E+00,    cbcon2 = 0.0000E+00
                    -                      -                        -                        -                        -
the above control block has the          -142 ----> **********
 following input ids, function           -242 ----> *   and  * ---->   -22
 operator type, and output id                       **********

##########  15 lines deleted here  ##########

     idcb =       -28,      icbn =         25,      icb1 =        -22,      icb2 =        -24,      icb3 =          0
   lugain =   lunounit,   luxmin =   lunounit,    luxmax =   lunounit,    lucon1 =   lunounit,    lucon2 =   lunounit
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,    cbxmax = 1.0000E+00,    cbcon1 = 0.0000E+00,    cbcon2 = 0.0000E+00
                    -                      -                        -                        -                        -
the above control block has the           -22 ----> **********
 following input ids, function            -24 ----> * inc.or * ---->   -28
 operator type, and output id                       **********

     idcb =       -30,      icbn =         25,      icb1 =        -28,      icb2 =        -26,      icb3 =          0
   lugain =   lunounit,   luxmin =   lunounit,    luxmax =   lunounit,    lucon1 =   lunounit,    lucon2 =   lunounit
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,    cbxmax = 1.0000E+00,    cbcon1 = 0.0000E+00,    cbcon2 = 0.0000E+00
                    -                      -                        -                        -                        -
the above control block has the           -28 ----> **********
 following input ids, function            -26 ----> * inc.or * ---->   -30
 operator type, and output id                       **********

##########  47 lines deleted here  ##########

     idcb =       -55,      icbn =         35,      icb1 =       -210,      icb2 =       -310,      icb3 =          0
   lugain =   lunounit,   luxmin =     lutemp,    luxmax =     lutemp,    lucon1 =   lunounit,    lucon2 =     lutemp
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,    cbxmax = 2.0000E+03,    cbcon1 = 0.0000E+00,    cbcon2 = 0.0000E+00
                    -                      k                        k                        -                        k
the above control block has the          -210 ----> **********
 following input ids, function           -310 ----> *  max2  * ---->   -55
 operator type, and output id                       **********

     idcb =      -108,      icbn =          3,      icb1 =        101,      icb2 =        181,      icb3 =          0
   lugain =   lunounit,   luxmin =     lutemp,    luxmax =     lutemp,    lucon1 =   lunounit,    lucon2 =     lutemp
   cbgain = 5.0000E-01,   cbxmin = 0.0000E+00,    cbxmax = 2.0000E+03,    cbcon1 = 0.0000E+00,    cbcon2 = 0.0000E+00
                    -                      k                        k                        -                        k
the above control block has the           101 ----> **********
 following input ids, function            181 ----> *   add  * ---->  -108
 operator type, and output id                       **********

     idcb =      -109,      icbn =          3,      icb1 =       -110,      icb2 =       -110,      icb3 =          0
   lugain =   lunounit,   luxmin =     lutemp,    luxmax =     lutemp,    lucon1 =   lunounit,    lucon2 =   lunounit
   cbgain = 5.0000E-01,   cbxmin = 0.0000E+00,    cbxmax = 2.0000E+03,    cbcon1 = 0.0000E+00,    cbcon2 = 5.7510E+02
                    -                      k                        k                        -                        -
the above control block has the          -110 ----> **********
 following input ids, function           -110 ----> *   add  * ---->  -109
 operator type, and output id                       **********

     idcb =      -110,      icbn =         59,      icb1 =       -108,      icb2 =       -109,      icb3 =          0
   lugain =   lunounit,   luxmin =     lutemp,    luxmax =     lutemp,    lucon1 =   lunounit,    lucon2 =   lunounit
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,    cbxmax = 2.0000E+03,    cbcon1 = 5.0000E-01,    cbcon2 = 5.0000E-01
                    -                      k                        k                        -                        -
the above control block has the          -108 ----> **********
 following input ids, function           -109 ----> * wt.sum * ---->  -110
 operator type, and output id                       **********

     idcb =      -118,      icbn =         54,      icb1 =        101,      icb2 =        181,      icb3 =          0
   lugain =   lunounit,   luxmin =    lutempd,    luxmax =    lutempd,    lucon1 =   lunounit,    lucon2 =   lunounit
   cbgain = 1.0000E+00,   cbxmin =-2.0000E+03,    cbxmax = 2.0000E+03,    cbcon1 = 0.0000E+00,    cbcon2 = 0.0000E+00
                    -                      k                        k                        -                        -
the above control block has the           101 ----> **********
 following input ids, function            181 ----> *  subtr * ---->  -118
 operator type, and output id                       **********

##########  23 lines deleted here  ##########

     idcb =      -132,      icbn =         30,      icb1 =       -130,      icb2 =          0,      icb3 =          0
   lugain =   lunounit,   luxmin =    lutempd,    luxmax =    lutempd,    lucon1 =     lutime,    lucon2 =     lutime
```

```
   cbgain = 1.0000E+00,   cbxmin =-5.0000E-01,   cbxmax = 5.0000E-01,   cbcon1 = 2.0000E+01,   cbcon2 = 3.0000E+00
                     -                       k                      k                      s                      s
 the above control block has the                ***********
  following input ids, function     -130 ----> * ledlag * ---->  -132
  operator type, and output id                  ***********

 ##########  31 lines deleted here  ##########

     idcb =        -142,   icbn =          21,   icb1 =        -120,   icb2 =        -140,   icb3 =           0
   lugain =    lunounit,  luxmin =   lunounit,  luxmax =   lunounit,  lucon1 =   lunounit,  lucon2 =    lunounit
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,   cbxmax = 1.0000E+00,   cbcon1 = 0.0000E+00,   cbcon2 = 0.0000E+00
                     -                       -                      -                      -                      -
 the above control block has the    -120 ----> ***********
  following input ids, function     -140 ----> *  .gt.  * ---->  -142
  operator type, and output id                  ***********

     idcb =        -148,   icbn =          53,   icb1 =           0,   icb2 =           0,   icb3 =           0
   lugain =    lunounit,  luxmin =   lunounit,  luxmax =   lunounit,  lucon1 =      lutime,  lucon2 =    lunounit
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,   cbxmax = 1.0000E+00,   cbcon1 = 1.0000E-04,   cbcon2 = 0.0000E+00
                     -                       -                      -                      s                      -
 the above control block has the                ***********
  following input ids, function                 *  step  * ---->  -148
  operator type, and output id                  ***********

     idcb =        -149,   icbn =          12,   icb1 =        -110,   icb2 =           0,   icb3 =           0
   lugain =      lutime,  luxmin =    lutempd,  luxmax =    lutempd,  lucon1 =   lunounit,  lucon2 =     lutempd
   cbgain = 1.0000E+01,   cbxmin =-1.0000E+02,   cbxmax = 1.0000E+02,   cbcon1 = 0.0000E+00,   cbcon2 = 0.0000E+00
                     s                       k                      k                      -                      k
 the above control block has the                ***********
  following input ids, function     -110 ----> *  deriv * ---->  -149
  operator type, and output id                  ***********

     idcb =        -150,   icbn =          39,   icb1 =        -148,   icb2 =        -149,   icb3 =           0
   lugain =    lunounit,  luxmin =    lutempd,  luxmax =    lutempd,  lucon1 =   lunounit,  lucon2 =     lutempd
   cbgain = 1.0000E+00,   cbxmin =-1.0000E+02,   cbxmax = 1.0000E+02,   cbcon1 = 0.0000E+00,   cbcon2 = 0.0000E+00
                     -                       k                      k                      -                      k
 the above control block has the    -148 ----> ***********
  following input ids, function     -149 ----> *  mult  * ---->  -150
  operator type, and output id                  ***********

     idcb =        -152,   icbn =          26,   icb1 =        -150,   icb2 =           0,   icb3 =           0
   lugain =    lunounit,  luxmin =    lutempd,  luxmax =    lutempd,  lucon1 =      lutime,  lucon2 =     lutempd
   cbgain = 1.0000E+00,   cbxmin =-1.0000E+02,   cbxmax = 1.0000E+02,   cbcon1 = 1.0000E+01,   cbcon2 = 0.0000E+00
                     -                       k                      k                      s                      k
 the above control block has the                ***********
  following input ids, function     -150 ----> * 1stlag * ---->  -152
  operator type, and output id                  ***********

 ##########  315 lines deleted here  ##########

     idcb =        -412,   icbn =          23,   icb1 =        -410,   icb2 =           0,   icb3 =           0
   lugain =    lunounit,  luxmin =   lunounit,  luxmax =   lunounit,  lucon1 =   lunounit,  lucon2 =    lunounit
   cbgain = 1.0000E+00,   cbxmin =-1.0000E-01,   cbxmax = 1.0000E-01,   cbcon1 = 0.0000E+00,   cbcon2 = 0.0000E+00
                     -                       -                      -                      -                      -
 the above control block has the                ***********
  following input ids, function     -410 ----> * integl * ---->  -412
  operator type, and output id                  ***********

 ##########  67 lines deleted here  ##########

     idcb =        -444,   icbn =          22,   icb1 =         -10,   icb2 =          -2,   icb3 =        -442
   lugain =    lunounit,  luxmin =    lupower,  luxmax =    lupower,  lucon1 =   lunounit,  lucon2 =     lupower
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,   cbxmax = 4.0870E+05,   cbcon1 = 0.0000E+00,   cbcon2 = 0.0000E+00
                     -                       w                      w                      -                      w
 the above control block has the     -10 ----> ***********
  following input ids, function       -2 ----> * switch * ---->  -444
  operator type, and output id      -442 ----> ***********

     idcb =        -446,   icbn =           3,   icb1 =        -444,   icb2 =        -436,   icb3 =           0
   lugain =    lunounit,  luxmin =    lupower,  luxmax =    lupower,  lucon1 =   lunounit,  lucon2 =     lupower
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,   cbxmax = 1.3000E+06,   cbcon1 = 0.0000E+00,   cbcon2 = 0.0000E+00
                     -                       w                      w                      -                      w
 the above control block has the    -444 ----> ***********
  following input ids, function     -436 ----> *   add  * ---->  -446
  operator type, and output id                  ***********

     idcb =        -448,   icbn =          21,   icb1 =        -406,   icb2 =          -3,   icb3 =           0
   lugain =    lunounit,  luxmin =   lunounit,  luxmax =   lunounit,  lucon1 =   lunounit,  lucon2 =    lunounit
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,   cbxmax = 1.0000E+00,   cbcon1 = 0.0000E+00,   cbcon2 = 0.0000E+00
                     -                       -                      -                      -                      -
 the above control block has the    -406 ----> ***********
  following input ids, function       -3 ----> *  .gt.  * ---->  -448
  operator type, and output id                  ***********

     idcb =        -450,   icbn =          19,   icb1 =        -446,   icb2 =        -448,   icb3 =           0
   lugain =    lunounit,  luxmin =    lupower,  luxmax =    lupower,  lucon1 =   lunounit,  lucon2 =     lupower
   cbgain = 1.0000E+00,   cbxmin = 0.0000E+00,   cbxmax = 1.3000E+06,   cbcon1 = 0.0000E+00,   cbcon2 = 0.0000E+00
                     -                       w                      w                      -                      w
 the above control block has the    -446 ----> ***********
  following input ids, function     -448 ----> *  gate  * ---->  -450
  operator type, and output id                  ***********

 ##########  135 lines deleted here  ##########

     idcb =       -1104,   icbn =           1,   icb1 =        1135,   icb2 =           0,   icb3 =           0
   lugain =    lunounit,  luxmin =   lupressd,  luxmax =   lupressd,  lucon1 =   lunounit,  lucon2 =    lupressd
```

```
     cbgain = 1.0000E+00,     cbxmin = 0.0000E+00,     cbxmax = 1.0000E+08,     cbcon1 = 0.0000E+00,     cbcon2 = 0.0000E+00
                       -                       pa                       pa                        -                       pa
 the above control block has the                    **********
  following input ids, function       1135 ----> *   abs   * ----> -1104
  operator type, and output id                      **********

       idcb =       -1106,      icbn =          52,      icb1 =       -1104,      icb2 =           0,      icb3 =           0
     lugain =      luarea,    luxmin =   luasqrtp,     luxmax =   luasqrtp,     lucon1 =    lunounit,    lucon2 =    luasqrtp
     cbgain = 8.4779E-01,     cbxmin =-1.0000E+08,     cbxmax = 1.0000E+08,     cbcon1 = 0.0000E+00,     cbcon2 = 0.0000E+00
                      m2             m2xsqrt(pa)              m2xsqrt(pa)                         -              m2xsqrt(pa)
 the above control block has the                    **********
  following input ids, function      -1104 ----> *  sqrt   * ----> -1106
  operator type, and output id                      **********

       idcb =       -1109,      icbn =          39,      icb1 =       -1106,      icb2 =         -15,      icb3 =           0
     lugain =    lunounit,    luxmin =   lumassfw,     luxmax =   lumassfw,     lucon1 =    lunounit,    lucon2 =    lumassfw
     cbgain = 1.0000E+00,     cbxmin = 0.0000E+00,     cbxmax = 1.0000E+06,     cbcon1 = 0.0000E+00,     cbcon2 = 0.0000E+00
                       -                     kg/s                     kg/s                        -                     kg/s
 the above control block has the     -1106 ----> **********
  following input ids, function        -15 ----> *  mult   * ----> -1109
  operator type, and output id                      **********

       idcb =       -1110,      icbn =          34,      icb1 =        -110,      icb2 =         -14,      icb3 =           0
     lugain =    lunounit,    luxmin =   lunounit,     luxmax =   lunounit,     lucon1 =    lunounit,    lucon2 =    lunounit
     cbgain = 1.0000E+00,     cbxmin = 0.0000E+00,     cbxmax = 1.0000E+00,     cbcon1 = 0.0000E+00,     cbcon2 = 0.0000E+00
                       -                        -                        -                        -                        -
 the above control block has the      -110 ----> **********
  following input ids, function        -14 ----> *  .lt.   * ----> -1110
  operator type, and output id                      **********

 ##########  519 lines deleted here  ##########

       idcb =       -3110,      icbn =          34,      icb1 =        -310,      icb2 =         -14,      icb3 =           0
     lugain =    lunounit,    luxmin =   lunounit,     luxmax =   lunounit,     lucon1 =    lunounit,    lucon2 =    lunounit
     cbgain = 1.0000E+00,     cbxmin = 0.0000E+00,     cbxmax = 1.0000E+00,     cbcon1 = 0.0000E+00,     cbcon2 = 0.0000E+00
                       -                        -                        -                        -                        -
 the above control block has the      -310 ----> **********
  following input ids, function        -14 ----> *  .lt.   * ----> -3110
  operator type, and output id                      **********

 ##########  251 lines deleted here  ##########

 trip-dimension data card
       ntse =           3,      ntct =          20,      ntsf =           0,      ntdp =           0,      ntsd =           0
                                  17
 trip data cards

       idtp =           1,      isrt =           2,      iset =           1,      itst =          -1,      idsg =           1
    setp(1) =-1.0000E+00,    setp(2) = 0.0000E+00
                       s                        s                               18
    dtsp(1) = 0.0000E+00,    dtsp(2) = 0.0000E+00
                       s                        s
    ifsp(1) =           0,   ifsp(2) =           0

       idtp =          10,      isrt =           2,      iset =           0,      itst =           3,      idsg =         100
    setp(1) = 1.0000E-01,    setp(2) = 9.0000E-01
                       -                        -
    dtsp(1) = 1.0000E+06,    dtsp(2) = 0.0000E+00
                       s                        s
    ifsp(1) =           0,   ifsp(2) =           0

       idtp =          12,      isrt =           2,      iset =           0,      itst =          -3,      idsg =         120
    setp(1) = 1.0000E-01,    setp(2) = 9.0000E-01
                       -                        -
    dtsp(1) = 1.0000E+06,    dtsp(2) = 0.0000E+00
                       s                        s
    ifsp(1) =           0,   ifsp(2) =           0

 ##########  146 lines deleted here  ##########

       idtp =          54,      isrt =           5,      iset =           0,      itst =           1,      idsg =         421
    setp(1) = 1.2800E+07,    setp(2) = 1.2817E+07,    setp(3) = 1.6400E+07,    setp(4) = 1.6485E+07
                      pa                       pa                       pa                       pa
    dtsp(1) = 0.0000E+00,    dtsp(2) = 0.0000E+00,    dtsp(3) = 0.0000E+00,    dtsp(4) = 0.0000E+00
                       s                        s                        s                        s
    ifsp(1) =           0,   ifsp(2) =           0,   ifsp(3) =           0,   ifsp(4) =           0

       idtp =          56,      isrt =           2,      iset =           0,      itst =           1,      idsg =        -406
    setp(1) = 5.0000E-01,    setp(2) = 9.1000E-01
                       -                        -
    dtsp(1) = 0.0000E+00,    dtsp(2) = 0.0000E+00
                       s                        s
    ifsp(1) =           0,   ifsp(2) =           0

 ##########  125 lines deleted here  ##########

       idtp =         720,      isrt =          -3,      iset =          -1,      itst =          -1,      idsg =         721
    setp(1) =-2.7100E+02,    setp(2) =-1.3550E+02,    setp(3) = 1.3550E+03,    setp(4) = 2.7100E+03
                       m                        m                        m                        m
    dtsp(1) = 0.0000E+00,    dtsp(2) = 0.0000E+00,    dtsp(3) = 0.0000E+00,    dtsp(4) = 0.0000E+00
                       s                        s                        s                        s
    ifsp(1) =           0,   ifsp(2) =           0,   ifsp(3) =           0,   ifsp(4) =           0

 ##########  170 lines deleted here  ##########

       idtp =        9997,      isrt =           2,      iset =           0,      itst =           1,      idsg =           1
```

```
  setp(1) =-1.0000E+00,   setp(2) = 1.0000E+10
                     s                       s
  dtsp(1) = 0.0000E+00,   dtsp(2) = 0.0000E+00
                     s                       s
  ifsp(1) =          0,   ifsp(2) =          0

     idtp =       9998,      isrt =          2,     iset =            0,     itst =          -1,     idsg =            1
  setp(1) = 0.0000E+00,   setp(2) = 1.0000E+10
                     s                       s
  dtsp(1) = 0.0000E+00,   dtsp(2) = 0.0000E+00
                     s                       s
  ifsp(1) =          0,   ifsp(2) =          0

     idtp =       9999,      isrt =          2,     iset =            0,     itst =          -1,     idsg =            1
  setp(1) = 0.0000E+00,   setp(2) = 1.0000E+10
                     s                       s
  dtsp(1) = 0.0000E+00,   dtsp(2) = 0.0000E+00
                     s                       s
  ifsp(1) =          0,   ifsp(2) =          0

there are  48 signal-variable trips,   3 signal-expression trips, and  21 trip-controlled trips      19

this requires  3 signal-exp. trip signals and 20 trip-cont. trip signals to be input next

trip signal-expressions cards
     idse =       1120,      inse =          2,      incn =           0
trip-signal subexpression  1
   ise(1) =          2,    ise(2) =        111,    ise(3) =         222
trip-signal subexpression  2
   ise(1) =          8,    ise(2) =        901,    ise(3) =           0
     idse =       1130,      inse =          2,      incn =           0
trip-signal subexpression  1
   ise(1) =          2,    ise(2) =        111,    ise(3) =         333              19
trip-signal subexpression  2
   ise(1) =          8,    ise(2) =        901,    ise(3) =           0
     idse =       1230,      inse =          2,      incn =           0
trip-signal subexpression  1
   ise(1) =          2,    ise(2) =        222,    ise(3) =         333
trip-signal subexpression  2
   ise(1) =          8,    ise(2) =        901,    ise(3) =           0

trip-controlled trip id numbers cards
     idtn =        100,      intn =          2
   itn(1) =         12,    itn(2) =         14                                  19
     idtn =        120,      intn =         10
   itn(1) =         16,    itn(2) =         18,    itn(3) =          20,    itn(4) =          30,    itn(5) =          48
   itn(6) =         50,    itn(7) =         52,    itn(8) =          54,    itn(9) =          56,   itn(10) =          58
     idtn =        140,      intn =          2
   itn(1) =         32,    itn(2) =         34
     idtn =        160,      intn =          4
   itn(1) =         10,    itn(2) =         36,    itn(3) =          48,    itn(4) =          50
     idtn =        180,      intn =          2
   itn(1) =         16,    itn(2) =       9999
     idtn =        200,      intn =          3
   itn(1) =         24,    itn(2) =         38,    itn(3) =          60
     idtn =        220,      intn =          2
   itn(1) =         58,    itn(2) =       9996
     idtn =        240,      intn =          3
   itn(1) =         40,    itn(2) =         42,    itn(3) =          44
     idtn =        260,      intn =          2
   itn(1) =         20,    itn(2) =         34
     idtn =        280,      intn =          2
   itn(1) =         46,    itn(2) =       9999
     idtn =        300,      intn =          3
   itn(1) =        110,    itn(2) =        210,    itn(3) =         310
     idtn =        320,      intn =          3
   itn(1) =        100,    itn(2) =        200,    itn(3) =         300
     idtn =        340,      intn =          3
   itn(1) =       1010,    itn(2) =       2010,    itn(3) =        3010
     idtn =        360,      intn =          3
   itn(1) =       1030,    itn(2) =       2030,    itn(3) =        3030
     idtn =        380,      intn =          3
   itn(1) =       1001,    itn(2) =       1002,    itn(3) =        1003
     idtn =        400,      intn =          5
   itn(1) =         20,    itn(2) =         36,    itn(3) =         423,    itn(4) =        1500,    itn(5) =        3500
     idtn =        460,      intn =          3
   itn(1) =       1010,    itn(2) =       2010,    itn(3) =        3010
     idtn =       1000,      intn =          2
   itn(1) =       1020,    itn(2) =       1040
     idtn =       2000,      intn =          2
   itn(1) =       2020,    itn(2) =       2040
     idtn =       3000,      intn =          2
   itn(1) =       3030,    itn(2) =       3040

---------------------------------------------------------------------------------------------------------------
                                                                                                              1
                                                                                                             11
                                   $1$ reactor vessel                                                         1
                                                                                                              1
                                                                                          20                111
---------------------------------------------------------------------------------------------------------------
                          20
component number         1,      type = vessel     ,        id =            1,    ctitle = $1$ reactor vessel
     nasx =             12,      nrsx =          2,      ntsx =             6,      ncsr =          18,    ivssbf =           0
     idcu =              0,      idcl =          0,      idcr =             0,      icru =           6,      icrl =           2
     icrr =              1,     ilcsp =          2,     iucsp =             6,      iuhp =          10,     iconc =           1
```

```
     igeom =          0,      nvent =          0,      nvvtb =          0,     nsgrid =          0,      iext =           0
     shelv = 0.0000E+00,       epsw = 0.0000E+00
                      m                        m

z            1.75260E+00  3.00040E+00  3.91480E+00  4.82920E+00  5.74360E+00  6.65800E+00  7.67140E+00  8.52870E+00
             9.36130E+00  1.01940E+01  1.11270E+01  1.22450E+01
                       m

r            1.70020E+00  1.97490E+00
                       m

t            1.04720E+00  2.09440E+00  3.14159E+00  4.18879E+00  5.23599E+00  6.28319E+00
                     rad

funh         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

nhsca                900          900          900          900          900          900          900          900
                     900          900          900          900

     lisrl =          8,      lisrc =          1,      lisrf =          3,      ljuns =          10
     lisrl =          8,      lisrc =          3,      lisrf =          3,      ljuns =          20
     lisrl =          8,      lisrc =          5,      lisrf =          3,      ljuns =          30
     lisrl =          8,      lisrc =          8,      lisrf =          3,      ljuns =          19
     lisrl =          8,      lisrc =         10,      lisrf =          3,      ljuns =          29
     lisrl =          8,      lisrc =         12,      lisrf =          3,      ljuns =          39
     lisrl =          7,      lisrc =          1,      lisrf =          2,      ljuns =           2
     lisrl =          9,      lisrc =          2,      lisrf =          2,      ljuns =           3
     lisrl =          7,      lisrc =          3,      lisrf =          2,      ljuns =           4
     lisrl =          9,      lisrc =          4,      lisrf =          2,      ljuns =           5
     lisrl =          7,      lisrc =          5,      lisrf =          2,      ljuns =           6
     lisrl =          9,      lisrc =          6,      lisrf =          2,      ljuns =           7
     lisrl =         12,      lisrc =          1,      lisrf =         -2,      ljuns =          94
     lisrl =         12,      lisrc =          2,      lisrf =         -2,      ljuns =          95
     lisrl =         12,      lisrc =          3,      lisrf =         -2,      ljuns =          96
     lisrl =         12,      lisrc =          4,      lisrf =         -2,      ljuns =          97
     lisrl =         12,      lisrc =          5,      lisrf =         -2,      ljuns =          98
     lisrl =         12,      lisrc =          6,      lisrf =         -2,      ljuns =          99

level   1 data  <------------ 20

cfzlyt       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfzlz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E-02  1.00000E-02
             1.00000E-02  1.00000E-02  1.00000E-02  1.00000E-02
                       -

cfzlxr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfzvyt       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfzvz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E-02  1.00000E-02
             1.00000E-02  1.00000E-02  1.00000E-02  1.00000E-02
                       -

cfzvxr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

frvol        7.52600E-01  7.52600E-01  7.52600E-01  7.52600E-01  7.52600E-01  7.52600E-01  3.15100E-01  3.15100E-01
             3.15100E-01  3.15100E-01  3.15100E-01  3.15100E-01
                       -

frfayt       7.52600E-01  7.52600E-01  7.52600E-01  7.52600E-01  7.52600E-01  7.52600E-01  2.50000E-01  2.50000E-01
             2.50000E-01  2.50000E-01  2.50000E-01  2.50000E-01
                       -

frfaz        4.10600E-01  4.10600E-01  4.10600E-01  4.10600E-01  4.10600E-01  4.10600E-01  3.15000E-01  3.15000E-01
             3.15000E-01  3.15000E-01  3.15000E-01  3.15000E-01
                       -

frfaxr       3.40000E-01  3.40000E-01  3.40000E-01  3.40000E-01  3.40000E-01  3.40000E-01  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

hdyt         9.72000E-01  9.72000E-01  9.72000E-01  9.72000E-01  9.72000E-01  9.72000E-01  6.68000E-01  6.68000E-01
             6.68000E-01  6.68000E-01  6.68000E-01  6.68000E-01
                       m

hdz          2.08300E-01  2.08300E-01  2.08300E-01  2.08300E-01  2.08300E-01  2.08300E-01  6.68000E-01  6.68000E-01
             6.68000E-01  6.68000E-01  6.68000E-01  6.68000E-01
                       m

hdxr         9.72000E-01  9.72000E-01  9.72000E-01  9.72000E-01  9.72000E-01  9.72000E-01  6.68000E-01  6.68000E-01
             6.68000E-01  6.68000E-01  6.68000E-01  6.68000E-01
                       m

alpn         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
```

```
vvnyt      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                   m/s

vvnz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                   m/s

vvnxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                   m/s

vlnyt      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                   m/s

vlnz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                   m/s

vlnxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                   m/s

tvn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
           5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
                     k

tln        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
           5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
                     k

pn         1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
           1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
                    pa

pan        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    pa

vwfmly     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmlz     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmlx     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmvy     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmvz     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmvx     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

conc       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     -

level   2 data   <------ 20
cfzlyt     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     -

##########  213 lines deleted here  ##########                 20
pan        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    pa

vwfmly     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmlz     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmlx     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmvy     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
```

```
vwfmvz      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                      -

vwfmvx      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                      -

conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

level   4 data

level  3 repeated for level  4


level   5 data

level  3 repeated for level  5         20


level   6 data

level  3 repeated for level  6


level   7 data  <----------  20

cfzlyt      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

##########  745 lines deleted here  ##########

conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

------------------------------------------------------------------------------------------------------------------------
                                                                                                                   22222
                                                                                                                       2
                                            $2$ rod guide tube 1 (long)                                            22222
                                                                                       21                          2
                                                                                                                   22222
------------------------------------------------------------------------------------------------------------------------

   component number   2,      type = pipe      ,         id =            2,     ctitle = $2$ rod guide tube 1 (long)
    ncells =          4,      nodes =           0,       jun1 =          2,       jun2 =              94,      epsw = 0.0000E+00
                                                                                                                          m
      ichf =          1,      iconc =           1,       iacc =          0,       ipow =            0
     radin = 4.0945E-01,         th = 6.3500E-03,       houtl = 0.0000E+00,      houtv = 0.0000E+00,      toutl = 3.0000E+02
                      m                         m                  w/m2/k                     w/m2/k                      k
     toutv = 3.0000E+02
                      k

dx          8.57250E-01  8.32640E-01  8.32640E-01  9.33450E-01
                      m

vol         1.78800E-02  1.73700E-02  1.73700E-02  1.94700E-02
                     m3

fa          2.08600E-02  2.08600E-02  2.08600E-02  2.08600E-02  2.08600E-02
                     m2

fric        5.00000E-01  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00
                      -

fricr       1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  5.00000E-01
                      -

grav        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                      -

hd          6.00000E-02  6.00000E-02  6.00000E-02  6.00000E-02  6.00000E-02
                      m

icflg                 0            0            0            0            0

nff                   1            1            1            1            1

alp         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

vl          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    m/s

vv          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    m/s
```

```
tl          5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
                      k

tv          5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
                      k

p           1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
                     pa

pa          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     pa

conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

total volume of the component section is 7.20900E-02 m3
total length of the component section is 3.45598E+00 m

##########  424 lines deleted here  ##########
```

```
-------------------------------------------------------------------------------------------------------------
                                                                                              1   22222
                                                                                             11       2
                                        $12$ steam-gen primary 1                              1   22222
                                                                                              1   2
                                                                          21                111   22222
-------------------------------------------------------------------------------------------------------------

  component number  12,      type = pipe       ,       id =         12,     ctitle = $12$ steam-gen primary 1
   ncells =         18,      nodes =           0,      jun1 =       12,      jun2 =          14,      epsw = 0.0000E+00
                                                                                                                    m
     ichf =          1,      iconc =           1,      iacc =        0,      ipow =           0
    radin = 9.8400E-03,         th = 1.2700E-03,     houtl = 0.0000E+00,    houtv = 0.0000E+00,     toutl = 3.0000E+02
                     m                         m                w/m2/k                w/m2/k                          k
    toutv = 3.0000E+02
                     k

dx          1.06680E+00  1.21920E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00
            1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00
            1.21920E+00  1.06680E+00
                      m

vol         1.46400E+00  2.83200E+00  1.25730E+00  1.25730E+00  1.25730E+00  1.25730E+00  1.25730E+00  1.25730E+00
            1.25730E+00  1.25730E+00  1.25730E+00  1.25730E+00  1.25730E+00  1.25730E+00  1.25730E+00  1.25730E+00
            2.83200E+00  1.46400E+00
                     m3

fa          4.86950E-01  2.32260E+00  9.43920E-01  9.43920E-01  9.43920E-01  9.43920E-01  9.43920E-01  9.43920E-01
            9.43920E-01  9.43920E-01  9.43920E-01  9.43920E-01  9.43920E-01  9.43920E-01  9.43920E-01  9.43920E-01
            9.43920E-01  2.32260E+00  4.86950E-01
                     m2

fric        5.00000E-01  0.00000E+00  3.00000E-01  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02
            1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02
            5.00000E-01  0.00000E+00  2.00000E-01
                      -

fricr       2.00000E-01  0.00000E+00  3.00000E-01  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02
            1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02  1.35300E-02
            5.00000E-01  0.00000E+00  5.00000E-01
                      -

grav        7.66000E-01  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  0.00000E+00 -1.00000E+00 -1.00000E+00 -1.00000E+00 -1.00000E+00 -1.00000E+00 -1.00000E+00
           -1.00000E+00 -1.00000E+00 -7.66000E-01
                      -

hd          7.87400E-01  1.48440E+00  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02
            1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02
            1.96850E-02  1.48440E+00  7.87400E-01
                      m

icflg                 0            0            0            0            0            0            0            0
                      0            0            0            0            0            0            0            0
                      0            0            0

nff                   1            1            1            1            1            1            1            1
                      1            1            1            1            1            1            1            1
                      1            1            1

alp         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00
                      -

vl          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00
                    m/s

vv          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00
                    m/s
```

```
tl          5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02
            5.91100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

tv          5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02  5.91100E+02
            5.91100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

p           1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
            1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
            1.55000E+07  1.55000E+07
                     pa

pa          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00
                     pa

conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00
                      -

total volume of the component section is 2.61942E+01 m3
total length of the component section is 2.32200E+01 m

##########  79 lines deleted here  ##########

---------------------------------------------------------------------------------------------------------------
                                                                                                     1   66666
                                                                                                    11   6
                                                $16$ reactor-coolant pump 1                          1   66666
                                                                                                     1   6   6
                                                                                       21          111   66666
---------------------------------------------------------------------------------------------------------------

  component number  16,     type = pump        ,        id =          16,    ctitle = $16$ reactor-coolant pump 1
   ncells =          3,    nodes =            5,      jun1 =          16,      jun2 =          17,       epsw = 0.0000E+00
                                                                                                                     m
     ichf =          1,    iconc =            1,    ipmpty =           2,       irp =           0,        ipm =          1
   ipmptr =         22,   ipmpsv =            0,    npmptb =           0,    npmpsv =           0,     npmprf =          0
   iqp3tr =          0,   iqp3sv =            0,    nqp3tb =           0,    nqp3sv =           0,     nqp3rf =          0
    radin = 1.7052E-01,       th = 4.6656E-01,     houtl = 0.0000E+00,     houtv = 0.0000E+00,      toutl = 3.0000E+02
                     m                      m                  w/m2/k                  w/m2/k                        k
    toutv = 3.0000E+02,    effmi = 2.9500E+03
                     k                  kg*m2
     tfr0 = 6.4800E+01,     tfr1 = 0.0000E+00,      tfr2 = 1.5554E+03,      tfr3 = 0.0000E+00,       tfrb = 0.0000E+00
                 pa*m3                  pa*m3                   pa*m3                   pa*m3                    rad/s
    tfr10 = 0.0000E+00,    tfr11 = 0.0000E+00,     tfr12 = 0.0000E+00,     tfr13 = 0.0000E+00
                 pa*m3                  pa*m3                   pa*m3                   pa*m3
    rhead = 7.8000E+02,    rtork = 3.2404E+04,     rflow = 5.5835E+00,      rrho = 7.5575E+02,     romega = 1.2360E+02
                 m2/s2                  pa*m3                    m3/s                   kg/m3                    rad/s
   omegan = 1.2360E+02,   omgoff = 0.0000E+00,    romgmx = 5.0000E+01,    omgscl = 1.0000E+00,     npmpsd =          0
                 rad/s                  rad/s                   rad/s2                      -
    qp3in = 0.0000E+00,   qp3off = 0.0000E+00,    rqp3mx = 0.0000E+00,    qp3scl = 1.0000E+00
                     w                      w                     w/s                       -
   option =          2                                                 43

dx          2.46400E+00  4.50000E+00  9.86400E-01
                      m

vol         1.68500E+00  3.37380E+00  3.77990E-01
                     m3

fa          4.86950E-01  6.83840E-01  6.83840E-01  3.83200E-01
                     m2

fric        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

fricr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

grav        1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

hd          7.87400E-01  9.33110E-01  9.33110E-01  6.98500E-01
                      m

icflg                 0            0            0            0

nff                   1            1            1            1

alp         0.00000E+00  0.00000E+00  0.00000E+00
                      -

ml          0.00000E+00  4.25900E+03  0.00000E+00  0.00000E+00
                   kg/s

mv          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                   kg/s

tl          5.59100E+02  5.59100E+02  5.59100E+02
                      k
```

```
tv          5.59100E+02  5.59100E+02  5.59100E+02
                      k

p           1.55000E+07  1.55000E+07  1.55000E+07
                     pa

pa          0.00000E+00  0.00000E+00  0.00000E+00
                     pa

qppp        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

matid                 7            7            7            7

tw          5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
                      k

conc        0.00000E+00  0.00000E+00  0.00000E+00
                      -

total volume of the component section is 5.43679E+00 m3
total length of the component section is 7.95040E+00 m

css-controller type 1 adjusts the speed of pump component  16 for a desired mass flow of  4.25900E+03  kg/s

##########  3658 lines deleted here  ##########

---------------------------------------------------------------------------------------------------------------
                                                                                                   99999 33333
                                                                                                   9   9     3
                                             $93$ cvcs 3 (prizer sprayer)                          99999 33333
                                                                                                       9     3
                                                                                    21             99999 33333
---------------------------------------------------------------------------------------------------------------

   component number  93,       type = fill       ,       id =          93,    ctitle = $93$ cvcs 3 (prizer sprayer)
       junl =          93,      ifty =             5,     ioff =            0
       iftr =           1,      ifsv =          -434,     nftb =            2,     nfsv =              0,      nfrf =              0
     twtold = 0.0000E+00,     rfmxm = 2.8000E+00,     concin = 0.0000E+00,       felv = 0.0000E+00
                       -                  kg/s2                          -                            m
       dxin = 1.0000E+00,     volin = 1.0000E+00,      alpin = 0.0000E+00,       vlin = 0.0000E+00,      tlin = 5.5900E+02
                       m                     m3                          -                          m/s                     k
        pin = 1.5500E+07,      pain = 0.0000E+00,     flowin = 0.0000E+00,       vvin = 0.0000E+00,      tvin = 5.5900E+02
                      pa                     pa                       kg/s                          m/s                     k
      vmscl = 1.0000E+00,     vvscl = 1.0000E+00
                       -                      -

vmtbm        1.72370E+05 -5.00000E-02  5.17110E+05 -2.82600E+01
             independent variable unit is pa and dependent variable unit is kg/s

vmtbabsm     1.72370E+05 -5.00000E-02  5.17110E+05 -2.82600E+01
             independent variable unit is pa and dependent variable unit is kg/s

---------------------------------------------------------------------------------------------------------------
                                                                                                1   00000 00000
                                                                                               11   0   0 0   0
                                             $100$ steam-gen boiler 1                           1   0   0 0   0
                                                                                                1   0   0 0   0
                                                                             21               111   00000 00000
---------------------------------------------------------------------------------------------------------------

   component number 100,       type = pipe       ,       id =         100,    ctitle = $100$ steam-gen boiler 1
     ncells =           7,     nodes =             0,     junl =         100,      jun2 =           105,      epsw = 0.0000E+00
                                                                                                                               m
       ichf =           1,     iconc =             1,     iacc =            0,      ipow =             0
      radin = 1.4821E+00,        th = 9.5250E-03,    houtl = 0.0000E+00,     houtv = 0.0000E+00,     toutl = 3.0000E+02
                       m                      m                    w/m2/k                    w/m2/k                    k
      toutv = 3.0000E+02
                       k

dx          1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00
                      m

vol         5.84900E+00  5.84900E+00  5.84900E+00  5.84900E+00  5.84900E+00  5.84900E+00  6.74400E+00
                     m3

fa          2.84560E+00  4.39110E+00  4.39110E+00  4.39110E+00  4.39110E+00  4.39110E+00  4.39110E+00  4.25000E+00
                     m2

fric        2.15000E+02  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

fricr       1.00000E+03  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

grav        0.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                      -

hd          9.12000E-03  9.12000E-03  9.12000E-03  9.12000E-03  9.12000E-03  9.12000E-03  9.12000E-03  3.24100E+00
                      m

icflg                 0            0            0            0            0            0            0            0
```

```
nff             1            1            1            1            1            1            1            1

alp    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  5.00000E-01  1.00000E+00
                 -

vl     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
               m/s

vv     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
               m/s

tl     5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
                 k

tv     5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02
                 k

p      5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06
                pa

pa     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                pa

conc   0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                 -

total volume of the component section is 4.18380E+01 m3
total length of the component section is 9.32400E+00 m

----------------------------------------------------------------------------------------------------------
                                                                                      1   00000 55555
                                                                                     11   0    0 5
                                   $105$ separator & dome 1                           1   0    0 55555
                                                                       21             1   0    0     5
                                                                                    111   00000 55555
----------------------------------------------------------------------------------------------------------

   component number 105,     type = tee        ,      id =        105,     ctitle = $105$ separator & dome 1
     jcell =           6,    nodes =          0,    ichf =          1,       cost = 0.0000E+00,      epsw = 0.0000E+00
                                                                                             -                  m

tee primary side
    iconc1 =           1,    ncell1 =          8,      jun1 =        105,      jun2 =        190,     ipow1 =          0
    radin1 = 6.5380E-01,        th1 = 9.5250E-03,    houtl1 = 0.0000E+00,   houtv1 = 0.0000E+00,   toutl1 = 3.0000E+02
                      m                         m                w/m2/k                 w/m2/k                      k
    toutv1 = 3.0000E+02
                      k

tee secondary side
    iconc2 =           1,    ncell2 =          4,      jun3 =        110,     ipow2 =          0,    njivdv =          0
    radin2 = 2.0193E+00,        th2 = 8.8900E-02,    houtl2 = 0.0000E+00,   houtv2 = 0.0000E+00,   toutl2 = 3.0000E+02
                      m                         m                w/m2/k                 w/m2/k                      k
    toutv2 = 3.0000E+02
                      k

dx     1.24400E+00  1.16700E+00  1.09100E+00  1.00000E+00  3.33330E-01  3.33330E-01  3.33330E-01  1.00000E+00
                 m

vol    7.64600E+00  4.55700E+00  4.55700E+00  5.66300E+00  2.43530E+00  2.43530E+00  2.43530E+00  8.96100E+00
                m3

fa     4.25000E+00  4.03200E+00  4.03200E+00  4.03200E+00  5.57400E+00  7.30600E+00  7.30600E+00  6.98800E+00
       8.55900E+00
                m2

fric   0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
       0.00000E+00
                 -

fricr  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
       0.00000E+00
                 -

grav   1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
      -1.00000E+00
                 -

hd     3.24100E+00  1.30800E+00  1.30800E+00  1.30800E+00  2.66400E+00  2.82100E+00  2.82100E+00  2.97800E+00
       1.20700E+00
                 m

icflg           0            0            0            0            0            0            0            0
                0

nff             1            1            1            1            1            1            1            1
                1

alp    1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                 -

vl     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
       0.00000E+00
               m/s

vv     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
       0.00000E+00
```

```
            m/s
tl          5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
                      k
tv          5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02
                      k
p           5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06
                     pa
pa          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     pa
conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

total volume of the component section is 3.86899E+01 m3
total length of the component section is 6.50199E+00 m

dx          1.01500E+00  9.39000E-01  7.00000E-01  2.39000E-01
                      m
vol         5.10800E+00  5.10800E+00  7.00000E+00  1.62200E+00
                     m3
fa          5.03250E+00  5.03250E+00  6.00000E+00  6.78660E+00  1.28970E-01
                     m2
fric        1.00000E-10  1.00000E-10  0.00000E+00  0.00000E+00  0.00000E+00
                      -
fricr       1.00000E-10  1.00000E-10  0.00000E+00  0.00000E+00  0.00000E+00
                      -
grav        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                      -
hd          4.32200E+00  3.43800E+00  2.04800E+00  1.00000E+00  6.09850E-01
                      m
icflg                 0            0            0            0            1
nff                   1            1            1            1           -1
alp         1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                      -
vl          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    m/s
vv          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    m/s
tl          5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
                      k
tv          5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02
                      k
p           5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06
                     pa
pa          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     pa
conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

total volume of the component section is 1.88380E+01 m3
total length of the component section is 2.89300E+00 m

-------------------------------------------------------------------------------------------------------------
                                                                                          1     1   00000
                                                                                         11    11   0   0
                                    $110$ main steam line 1                               1     1   0   0
                                                                         21               1     1   0   0
                                                                                        111   111   00000
-------------------------------------------------------------------------------------------------------------

   component number 110,     type = tee         ,       id =        110,    ctitle = $110$ main steam line 1
      jcell =          16,   nodes =          1,     ichf =           1,      cost = 0.0000E+00,       epsw = 0.0000E+00
                                                                                         -                        m

 tee primary side
      iconc1 =          1,   ncell1 =         16,     jun1 =         110,     jun2 =          120,    ipow1 =          0
      iqptr1 =          0,   iqpsv1 =          0,   nqptb1 =           0,   nqpsv1 =            0,   nqprf1 =          0
      radin1 = 3.0493E-01,      th1 = 2.5270E-02,  houtl1 = 0.0000E+00,   houtv1 = 0.0000E+00,   toutl1 = 3.0000E+02
                        m                     m              w/m2/k                   w/m2/k                      k
      toutv1 = 3.0000E+02
                        k
       qpin1 = 0.0000E+00,   qpoff1 = 0.0000E+00,  rqpmx1 = 0.0000E+00,   qpscl1 = 1.0000E+00
                        w                     w                 w/s                       -

 tee secondary side
      iconc2 =          1,   ncell2 =          1,     jun3 =         112,     ipow2 =          0,    njivdv =          0
```

```
     iqptr2 =          0,     iqpsv2 =          0,     nqptb2 =          0,     nqpsv2 =          0,     nqprf2 =          0
     radin2 = 3.0493E-01,        th2 = 2.5270E-02,     houtl2 = 0.0000E+00,     houtv2 = 0.0000E+00,     toutl2 = 3.0000E+02
                       m                        m                   w/m2/k                   w/m2/k                        k
     toutv2 = 3.0000E+02
                       k
       qpin2 = 0.0000E+00,     qpoff2 = 0.0000E+00,     rqpmx2 = 0.0000E+00,     qpscl2 = 1.0000E+00
                       w                        w                      w/s                        -

dx          2.28600E+00  5.02920E+00  4.48060E+00  4.48060E+00  4.48060E+00  4.51260E+00  4.51260E+00  4.51260E+00
            4.51260E+00  4.51260E+00  4.51260E+00  4.51260E+00  4.51260E+00  4.51260E+00  4.51260E+00  2.28600E+00
                      m

vol         6.67750E-01  1.47330E+00  1.30880E+00  1.30880E+00  1.30880E+00  1.31810E+00  1.31810E+00  1.31810E+00
            1.31810E+00  1.31810E+00  1.31810E+00  1.31810E+00  1.31810E+00  1.31810E+00  1.31810E+00  6.67750E-01
                     m3

##########  1277 lines deleted here  ##########

-------------------------------------------------------------------------------------------------------------------
                                                                                                 22222 00000 00000
                                                                                                     2 0   0 0   0
                                          $200$ steam-gen boiler 2                          21   22222 0   0 0   0
                                                                                                 2     0   0 0   0
                                                                                                 22222 00000 00000
-------------------------------------------------------------------------------------------------------------------

   component number 200,      type = tee       ,       id =        200,     ctitle = $200$ steam-gen boiler 2
     jcell =          5,     nodes =          0,     ichf =          1,       cost = 0.0000E+00,       epsw = 0.0000E+00
                                                                                         -                         m

tee primary side
     iconc1 =          1,     ncell1 =          7,       jun1 =        200,       jun2 =        205,      ipow1 =          0
     radin1 = 1.4821E+00,        th1 = 9.5250E-03,     houtl1 = 0.0000E+00,     houtv1 = 0.0000E+00,     toutl1 = 3.0000E+02
                       m                        m                   w/m2/k                   w/m2/k                        k
     toutv1 = 3.0000E+02
                       k

tee secondary side
     iconc2 =          1,     ncell2 =          1,       jun3 =        203,      ipow2 =          0,     njivdv =          0
     radin2 = 9.8400E-03,        th2 = 1.2700E-03,     houtl2 = 0.0000E+00,     houtv2 = 0.0000E+00,     toutl2 = 3.0000E+02
                       m                        m                   w/m2/k                   w/m2/k                        k
     toutv2 = 3.0000E+02
                       k

dx          1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00
                      m

vol         5.84900E+00  5.84900E+00  5.84900E+00  5.84900E+00  5.84900E+00  5.84900E+00  6.74400E+00
                     m3

fa          2.84560E+00  4.39110E+00  4.39110E+00  4.39110E+00  4.39110E+00  4.39110E+00  4.39110E+00  4.25000E+00
                     m2

fric        2.15000E+02  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

fricr       1.00000E+03  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

grav        0.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                      -

hd          9.12000E-03  9.12000E-03  9.12000E-03  9.12000E-03  9.12000E-03  9.12000E-03  9.12000E-03  3.24100E+00
                      m

icflg                 0            0            0            0            0            0            0            0

nff                   1            1            1            1            1            1            1            1

alp         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  5.00000E-01  1.00000E+00
                      -

vl          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    m/s

vv          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    m/s

tl          5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
                      k

tv          5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02  5.42120E+02
                      k

p           5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06  5.41580E+06
                     pa

pa          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     pa

conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

total volume of the component section is 4.18380E+01 m3
total length of the component section is 9.32400E+00 m
```

```
dx          5.00000E-01
                      m

vol         6.08680E-04
                     m3

fa          1.21736E-03  1.21736E-03
                     m2

fric        1.00000E-10  0.00000E+00
                      -

fricr       1.00000E-10  0.00000E+00
                      -

grav        0.00000E+00  0.00000E+00
                      -

hd          1.96850E-02  1.96850E-02
                      m

icflg                 0            0

nff                   1           -1

alp         0.00000E+00
                      -

vl          0.00000E+00  0.00000E+00
                    m/s

vv          0.00000E+00  0.00000E+00
                    m/s

tl          5.42110E+02
                      k

tv          5.42120E+02
                      k

p           5.41580E+06
                     pa

pa          0.00000E+00
                     pa

conc        0.00000E+00
                      -

total volume of the component section is 6.08680E-04 m3
total length of the component section is 5.00000E-01 m
------------------------------------------------------------------------------------------------------
                                                                                     22222 00000 22222
                                                                                        2 0    0     2
                               $202$ sgtr bc during s/s                              22222 0    0 22222
                                                                     21              2     0    0 2
                                                                                     22222 00000 22222
------------------------------------------------------------------------------------------------------

   component number 202,     type = fill      ,     id =       202,   ctitle = $202$ sgtr bc during s/s
        junl =       201,    ifty =          2,   ioff =          0
     twtold = 0.0000E+00,   rfmxm = 1.0000E+20,   concin = 0.0000E+00,   felv = 0.0000E+00
                       -                kg/s2                      -                     m
       dxin = 1.0000E+00,   volin = 5.0870E-02,    alpin = 0.0000E+00,   vlin = 0.0000E+00,    tlin = 5.4800E+02
                       m                   m3                      -                   m/s                 k
        pin = 5.0000E+06,    pain = 0.0000E+00,   flowin = 0.0000E+00,   vvin = 0.0000E+00,    tvin = 5.4800E+02
                      pa                   pa                   kg/s                   m/s                 k
------------------------------------------------------------------------------------------------------
                                                                                     22222 00000 33333
                                                                                        2 0    0     3
                               $203$ sgtr bc during s/s                              22222 0    0 33333
                                                                     21              2     0    0     3
                                                                                     22222 00000 33333
------------------------------------------------------------------------------------------------------

   component number 203,     type = fill      ,     id =       203,   ctitle = $203$ sgtr bc during s/s
        junl =       203,    ifty =          2,   ioff =          0
     twtold = 0.0000E+00,   rfmxm = 1.0000E+20,   concin = 0.0000E+00,   felv = 0.0000E+00
                       -                kg/s2                      -                     m
       dxin = 1.0000E+00,   volin = 5.0870E-02,    alpin = 0.0000E+00,   vlin = 0.0000E+00,    tlin = 5.4800E+02
                       m                   m3                      -                   m/s                 k
        pin = 5.0000E+06,    pain = 0.0000E+00,   flowin = 0.0000E+00,   vvin = 0.0000E+00,    tvin = 5.4800E+02
                      pa                   pa                   kg/s                   m/s                 k
------------------------------------------------------------------------------------------------------
                                                                                     22222 00000 55555
                                                                                        2 0    0 5
                               $205$ separator & dome 2                              22222 0    0 55555
                                                                     21              2     0    0     5
                                                                                     22222 00000 55555
------------------------------------------------------------------------------------------------------

   component number 205,     type = tee       ,     id =       205,   ctitle = $205$ separator & dome 2
       jcell =         6,   nodes =          0,   ichf =          1,     cost = 0.0000E+00,    epsw = 0.0000E+00
```

```
tee primary side
    iconc1 =          1,     ncell1 =            8,      jun1 =          205,      jun2 =          290,     ipow1 =              0
    radin1 = 6.5380E-01,        th1 = 9.5250E-03,    houtl1 = 0.0000E+00,    houtv1 = 0.0000E+00,    toutl1 = 3.0000E+02
                      m                          m                    w/m2/k                   w/m2/k                      k
    toutv1 = 3.0000E+02
                      k

tee secondary side
    iconc2 =          1,     ncell2 =            4,      jun3 =          210,     ipow2 =            0,    njivdv =              0
    radin2 = 2.0193E+00,        th2 = 8.8900E-02,    houtl2 = 0.0000E+00,    houtv2 = 0.0000E+00,    toutl2 = 3.0000E+02
                      m                          m                    w/m2/k                   w/m2/k                      k
    toutv2 = 3.0000E+02
                      k

dx           1.24400E+00  1.16700E+00  1.09100E+00  1.00000E+00  3.33330E-01  3.33330E-01  3.33330E-01  1.00000E+00
                       m

vol          7.64600E+00  4.55700E+00  4.55700E+00  5.66300E+00  2.43530E+00  2.43530E+00  2.43530E+00  8.96100E+00
                      m3

##########  3853 lines deleted here  ##########

---------------------------------------------------------------------------------------------------------------------
                                                                                                   99999 00000 00000
                                                                                                   9   9 0   0 0   0
                                       $900$ reactor-core fuel rods                                99999 0   0 0   0
                                                                                                       9 0   0 0   0
                                                                                      22           99999 00000 00000
---------------------------------------------------------------------------------------------------------------------

  component number 900,        type = rod        ,       id =          900,     ctitle = $900$ reactor-core fuel rods
        ncrx =          6,        ncrz =            4,     ittc =            0,       iext =            0,        mld =              0
      nopowr =          0,       nridr =            0,    modez =            0,     liqlev =            1,     iaxcnd =              1
       idbci =          0,       idbco =            2,     hdri = 0.0000E+00,       hdro = 0.0000E+00
                                                                             m                        m
       nrods =         12,       nodes =            8,    irftr =         9997,      nzmax =          200,     irftr2 =           9998
  dtxht(1) = 3.0000E+00,  dtxht(2) = 1.0000E+01,     dznht = 5.0000E-03,      hgapo = 1.7000E+04,      shelv = 0.0000E+00
                        k                          k                        m                 w/m2/k                          m
      irpwty =          4,        ndgx =            6,     ndhx =           11,       nrts =           10,      nhist =              0
      irpwtr =         10,      irpwsv =            1,   nrpwtb =           -4,     nrpwsv =            0,     nrpwrf =              0
      izpwtr =          0,      izpwsv =            1,   nzpwtb =            1,     nzpwsv =            0,     nzpwrf =              0
      nmwrx =           1,        nfci =            1,    nfcil =            1,     ipwrad =            0,     ipwdep =              0
22    nzpwz =           0,       nzpwi =            0,   nfbpwt =            0,      nrpwr =            0,      nrpwi =              0
       react = 0.0000E+00,       tneut = 1.6250E-05,  rpwoffr =-1.0000E+20,    rrpwmxr = 1.0000E+20,     rpwscl = 1.0000E+00
                        -                          s                        -                    1/s                          -
      rpowri = 2.3000E+09,       zpwin = 1.0000E+00,   zpwoff =-1.0000E+20,     rzpwmx = 1.0000E+20
                        w                          s                        s                    1/s
      extsou = 0.0000E+00,        pldr = 0.0000E+00,    pdrat = 1.3280E+00,     fucrac = 5.0000E-01
                        w                          m                        -                      -

outer heat surface fluid cells ranging from one below to one above the metal structure ends

nhcomo                 1            1            1            1            1            1

nhcelo                -3            3            4            5            6            7

htmli        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                       -

htmlo        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                       -

htmvi        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                       -

htmvo        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                       -

z            3.00040E+00  3.91480E+00  4.82920E+00  5.74360E+00  6.65800E+00
                       m

grav         1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                       -

idrod                  1            2            3            4            5            6

rdx          5.33800E+03  5.33800E+03  5.33800E+03  5.33800E+03  5.33800E+03  5.33800E+03
                       -

radrd        0.00000E+00  1.13190E-03  2.26380E-03  3.39570E-03  4.52750E-03  4.62280E-03  5.00380E-03  5.38480E-03
                       m

matrd                  1            1            1            1            3            2            2

nfax                   5            5            5            5

rftn         5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
             5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
             5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
             5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
             5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
                       k

rftn         5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
```

	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rftn	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02	5.59100E+02
	k							
rdpwr	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-							
rdpwrabs	1.37202E+00	1.37202E+00	1.37202E+00	1.37202E+00	1.37202E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-							
cpowr	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00		
	-							
cpowrabs	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00		
	-							
rpkf	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.67800E+00	1.67800E+00
	1.67800E+00	1.67800E+00	1.67800E+00	1.67800E+00				
	-							
zpwzt	3.00040E+00	3.91480E+00	4.82920E+00	5.74360E+00	6.65800E+00			
	m							
zpwtb	0.00000E+00							

```
                s
             9.00000E-01  1.54600E+00  1.65700E+00  1.52200E+00  9.26000E-01
                -

zpwtbabs     0.00000E+00
                s
             6.38524E-01  1.09684E+00  1.17559E+00  1.07982E+00  6.56971E-01
                -

rpwtbr       1.00000E+00  0.00000E+00  1.60000E+00 -8.40000E-03  2.00000E+00 -3.25000E-02  2.20000E+00 -3.50000E-02
             independent variable unit is s and dependent variable unit is -

rpwtbabr     1.00000E+00  0.00000E+00  1.60000E+00 -8.40000E-03  2.00000E+00 -3.25000E-02  2.20000E+00 -3.50000E-02
             independent variable unit is s and dependent variable unit is -

beta         1.69000E-04  8.32000E-04  2.64000E-03  1.22000E-03  1.38000E-03  2.47000E-04
                -

lamda        3.87000E+00  1.40000E+00  3.11000E-01  1.15000E-01  3.17000E-02  1.27000E-02
                1/s

cdgn         6.18090E+09  8.41140E+10  1.20150E+12  1.50150E+12  6.16160E+12  2.75280E+12
                w

lamdh        1.77200E+00  5.77400E-01  6.74300E-02  6.21400E-03  4.73900E-04  4.81000E-05  5.34400E-06  5.72600E-07
             1.03600E-07  2.95900E-08  7.58500E-10
                1/s

edh          2.99000E-03  8.25000E-03  1.55000E-02  1.93500E-02  1.16500E-02  6.45000E-03  2.31000E-03  1.64000E-03
             8.50000E-04  4.30000E-04  5.70000E-04
                -

cdhn         3.88090E+06  3.28630E+07  5.28700E+08  7.16210E+09  5.65410E+10  3.08420E+11  9.94200E+11  6.58750E+12
             1.88710E+13  3.34230E+13  1.72840E+15
                w

fpuo2        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                -

ftd          9.40000E-01  9.40000E-01  9.40000E-01  9.40000E-01  9.40000E-01  9.40000E-01
                -

gmix         1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00
                -

gmles        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                g-moles

pgapt        1.00000E+07  1.00000E+07  1.00000E+07  1.00000E+07  1.00000E+07  1.00000E+07
                pa

plvol        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                m3

pslen        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                m

clenn        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                m

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn         1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu
```

22

```
burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

------------------------------------------------------------------------------------------------------------------
                                                                                          99999 00000   1
                                                                                          9   9 0    0  11
                                           $901$ level 1, rings 1-2                       99999 0    0   1
                                                                                              9 0    0   1
                                                                         22               99999 00000  111
------------------------------------------------------------------------------------------------------------------

   component number 901,       type = slab       ,         id =          901,    ctitle = $901$ level 1, rings 1-2
          ncrx =          12,       ncrz =              1,      ittc =            0,      iext =            0,       mld =            0
        nopowr =           1,      nridr =              1,     modez =            1,    liqlev =            0,    iaxcnd =            0
         idbci =           0,      idbco =              2,      hdri = 0.0000E+00,      hdro = 0.0000E+00
                                                                                  m                       m
     width = 1.3930E+01,     ipatch =            0
                          m
         nrods =          12,       nodes =              5,     irftr =            0,     nzmax =            5,    irftr2 =            0
   dtxht(1) = 3.0000E+00,  dtxht(2) = 1.0000E+01,     dznht = 5.0000E-03,     hgapo = 0.0000E+00,     shelv = 0.0000E+00
                          k                       k                       m                   w/m2/k                        m

outer heat surface fluid cells ranging from one below to one above the metal structure ends

nhcomo              1            1            1

nhcelo             -1            1            2

htmli       1.00000E+00  1.00000E+00
                      -

htmlo       1.00000E+00  1.00000E+00
                      -

htmvi       1.00000E+00  1.00000E+00
                      -

htmvo       1.00000E+00  1.00000E+00
                      -

dz          1.75260E+00
                      m

z           0.00000E+00  1.75260E+00
                      m

grav        1.00000E+00
                      -

idrod                 1            2            3            4            5            6            7            8
                      9           10           11           12

rdx         9.51330E-02  9.51330E-02  9.51330E-02  9.51330E-02  9.51330E-02  9.51330E-02  7.15340E-02  7.15340E-02
            7.15340E-02  7.15340E-02  7.15340E-02  7.15340E-02
                      -

radrd       0.00000E+00  9.29100E-02  1.85820E-01  2.78730E-01  3.69160E-01
                      m

matrd                 9            9            9            9

nfax                 1.

rftn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

rftn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

rftn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

rftn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

rftn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

rftn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

rftn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
                      k

rftn        5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
            5.59100E+02  5.59100E+02
```

```
                   k
rftn         5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
             5.59100E+02  5.59100E+02
                   k
rftn         5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
             5.59100E+02  5.59100E+02
                   k
rftn         5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
             5.59100E+02  5.59100E+02
                   k
rftn         5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02  5.59100E+02
             5.59100E+02  5.59100E+02
                   k

##########  697 lines deleted here  ##########

-------------------------------------------------------------------------------------------------------------------
                                                                                                99999   1   00000
                                                                                                9   9  11   0   0
                                          $910$ st-gen-1 tube bundle                            99999   1   0   0
                                                                                                    9   1   0   0
                                                                                     22         99999 111   00000
-------------------------------------------------------------------------------------------------------------------

  component number 910,       type = rod            ,      id =          910,    ctitle = $910$ st-gen-1 tube bundle
        ncrx =              1,     ncrz =            14,     ittc =            0,      iext =            0,      mld =            0
      nopowr =              1,     nridr =            0,     modez =           1,      liqlev =          0,      iaxcnd =         1
       idbci =              2,     idbco =            2,     hdri = 1.9680E-02,      hdro = 2.2220E-02
                                                                  m                           m
      nrods =               1,     nodes =            3,     irftr =           0,      nzmax =          15,      irftr2 =         0
 dtxht(1) = 3.0000E+00,   dtxht(2) = 1.0000E+01,     dznht = 5.0000E-03,     hgapo = 0.0000E+00,     shelv = 0.0000E+00
                     k                       k                    m                        w/m2/k                             m

inner heat surface fluid cells ranging from one below to one above the metal structure ends

nhcomi              12           12           12           12           12           12           12           12
                    12           12           12           12           12           12           12           12

nhceli              -3            3            4            5            6            7            8            9
                    10           11           12           13           14           15           16           17

outer heat surface fluid cells ranging from one below to one above the metal structure ends

nhcomo             100          100          100          100          100          100          100          100
                   100          100          100          100          100          100          100          100

nhcelo              -1            1            2            3            4            5            6            7
                    -7           -6           -5           -4           -3           -2           -1           -1

htmli        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
             1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                   -

htmlo        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
             1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                   -

htmvi        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
             1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                   -

htmvo        1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
             1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                   -

dz           1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00
             1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00  1.33200E+00
                   m

z            0.00000E+00  1.33200E+00  2.66400E+00  3.99600E+00  5.32800E+00  6.66000E+00  7.99200E+00  9.32400E+00
             1.06560E+01  1.19880E+01  1.33200E+01  1.46520E+01  1.59840E+01  1.73160E+01  1.86480E+01
                   m

grav         1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00 -1.00000E+00
            -1.00000E+00 -1.00000E+00 -1.00000E+00 -1.00000E+00 -1.00000E+00 -1.00000E+00
                   -

rdx          3.10220E+03
                   -

radrd        9.84000E-03  1.04750E-02  1.11100E-02
                   m

matrd               12           12

nfax                 0            0            0            0            0            0            0            0
                     0            0            0            0            0            0

rftn         5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
             5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
             5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
             5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
```

```
5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02  5.42110E+02
         k
------------------------------------------------------------------------------------------------------------
                                                                                         99999 22222 00000
                                                                                         9   9    2 0    0
                                  $920$ st-gen-2 tube bundle                             99999 22222 0    0
                                                                                             9 2    0    0
                                                                  22                     99999 22222 00000
------------------------------------------------------------------------------------------------------------

 component number 920,     type = rod        ,        id =         920,   ctitle = $920$ st-gen-2 tube bundle
      ncrx =           1,     ncrz =          14,      ittc =           0,     iext =            0,     mld =          0
    nopowr =           1,    nridr =           0,     modez =           1,   liqlev =            0,  iaxcnd =          1
     idbci =           2,    idbco =           2,      hdri = 1.9680E-02,     hdro = 2.2220E-02
                                                              m                       m
     nrods =           1,    nodes =           3,     irftr =           0,    nzmax =           15,  irftr2 =          0
 dtxht(1) = 3.0000E+00,  dtxht(2) = 1.0000E+01,     dznht = 5.0000E-03,    hgapo = 0.0000E+00,   shelv = 0.0000E+00
                     k                        k                       m               w/m2/k                         m

inner heat surface fluid cells ranging from one below to one above the metal structure ends

nhcomi          22        22        22        22        22        22        22        22
                22        22        22        22        22        22        22        22

nhceli          -3         3         4         5         6         7         8         9
                10        11        12        13        14        15        16        17

outer heat surface fluid cells ranging from one below to one above the metal structure ends

nhcomo         200       200       200       200       200       200       200       200
               200       200       200       200       200       200       200       200

nhcelo          -1         1         2         3         4         5         6         7
                -7        -6        -5        -4        -3        -2        -1        -1

##########  126 lines deleted here  ##########

------------------------------------------------------------------------------------------------------------
                                                                                         99999 33333   1
                                                                                         9   9     3  11
                                  $931$ st-gen-1,2,3 wrapper                             99999 33333   1
                                                                                             9     3   1
                                                                  22                     99999 33333 111
------------------------------------------------------------------------------------------------------------

 component number 931,     type = slab       ,        id =         931,   ctitle = $931$ st-gen-1,2,3 wrapper
      ncrx =           3,     ncrz =          12,      ittc =           0,     iext =            0,     mld =          1
    nopowr =           1,    nridr =           0,     modez =           1,   liqlev =            0,  iaxcnd =          1
     idbci =           2,    idbco =           2,      hdri = 2.9642E+00,     hdro = 2.9832E+00
                                                              m                       m
     width = 9.3422E+00,    ipatch =           0
                     m
     nrods =           3,    nodes =           3,     irftr =           0,    nzmax =           25,  irftr2 =          0
 dtxht(1) = 3.0000E+00,  dtxht(2) = 1.0000E+01,     dznht = 5.0000E-03,    hgapo = 0.0000E+00,   shelv = 0.0000E+00
                     k                        k                       m               w/m2/k                         m

inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   1

nhcomi         100       100       100       100       100       100       100       100
               105       105       105       105       105       105

nhceli          -1         1         2         3         4         5         6         7
                 1         2         2         2         3         4

outer heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   1

nhcomo         190       190       190       190       190       190       190       190
               190       190       190       190       190       190

nhcelo          12       -12       -11       -10        -9        -8        -7        -6
                -5        -4        -3        -2        -1        -1

inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   2

nhcomi         200       200       200       200       200       200       200       200
               205       205       205       205       205       205

nhceli          -1         1         2         3         4         5         6         7
                 1         2         2         2         3         4

outer heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   2

nhcomo         290       290       290       290       290       290       290       290
               290       290       290       290       290       290

nhcelo          12       -12       -11       -10        -9        -8        -7        -6
```

```
              -5          -4          -3          -2          -1          -1

inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   3

nhcomi           300         300         300         300         300         300         300         300
                 305         305         305         305         305         305

nhceli            -1           1           2           3           4           5           6           7
                   1           2           2           2           3           4

outer heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   3

nhcomo           390         390         390         390         390         390         390         390
                 390         390         390         390         390         390

nhcelo            12         -12         -11         -10          -9          -8          -7          -6
                  -5          -4          -3          -2          -1          -1

htmli    1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
         1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
                   -

htmlo    1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
         1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
                   -

htmvi    1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
         1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
                   -

htmvo    1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
         1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
                   -

dz       1.02720E+00 1.33200E+00 1.33200E+00 1.33200E+00 1.33200E+00 1.33200E+00 1.39399E+00 1.46717E+00
         5.16890E-01 5.16890E-01 5.16890E-01 1.44969E+00
                   m

z        0.00000E+00 1.02720E+00 2.35920E+00 3.69120E+00 5.02320E+00 6.35520E+00 7.68720E+00 9.08119E+00
         1.05484E+01 1.10652E+01 1.15821E+01 1.20990E+01 1.35487E+01
                   m

grav     1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
         1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
                   -

rdx      1.00000E+00 1.00000E+00 1.00000E+00
                   -

radrd    0.00000E+00 4.76250E-03 9.52500E-03
                   m

matrd              9           9

nfax               0           0           0           0.          0           0           0           0
                   0           0           0           0

rftn     5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
                   k

rftn     5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
                   k

rftn     5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
         5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02 5.42110E+02
                   k

-----------------------------------------------------------------------------------------------------------
                                                                                      99999 33333 22222
                                                                                      9   9     3     2
                                            $932$ st-gen-1,2,3 l.o.shell              99999 33333 22222
                                                                        22                9     3 2
                                                                                      99999 33333 22222
-----------------------------------------------------------------------------------------------------------

   component number 932,      type = rod       ,       id =         932,     ctitle = $932$ st-gen-1,2,3 l.o.shell
           ncrx =       3,       ncrz =        6,     ittc =          0,         iext =         0,     mld =          2
         nopowr =       1,      nridr =        0,    modez =          1,       liqlev =         0,   iaxcnd =          1
          idbci =       2,      idbco =        1,     hdri = 3.0924E+00,         hdro = 0.0000E+00
                                                                      m                         m
           tlo = 3.0000E+02,      tvo = 3.0000E+02,      hlo = 0.0000E+00,        hvo = 0.0000E+00
```

```
                      k                         k                 w/m2/k                  w/m2/k
     nrods =          3,     nodes =            3,     irftr =        0,     nzmax =          8,     irftr2 =          0
  dtxht(1) = 3.0000E+00,  dtxht(2) = 1.0000E+01,     dznht = 5.0000E-03,     hgapo = 0.0000E+00,      shelv = 0.0000E+00
                      k                         k                      m                  w/m2/k                       m

inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.    1

nhcomi          190          190          190          190          190          190          190          190

nhceli           12          -12          -11          -10           -9           -8           -7           -7

inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.    2

nhcomi          290          290          290          290          290          290          290          290

nhceli           12          -12          -11          -10           -9           -8           -7           -7

inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.    3

nhcomi          390          390          390          390          390          390          390          390

nhceli           12          -12          -11          -10           -9           -8           -7           -7

##########  632 lines deleted here  ##########

system components    10  12  14  16  17  18  54  52  50  49  91  56  20  22  24  26  27  28  64  62  60 202  59  92  66
                     30  32  34  36  37  38  40  41  42  74  72  70  44  45  46  43  69  93  47  76  48   2   3   4   5
                      6   7 100 105 190 110 120 400 410 420 422 180 170 154 150 250 350 112 220 210 205 290 200 320 310
                    305 390 300 430 432 254 270 280 354 370 380 116 212 312 436 216 316 424 578 114 434 179 169 576 118
                    214 203 314 438 269 279 369 379 218 318   1 900 901 902 903 904 905 906 907 908 909 910 920 930 931
                    932 933 934 935 936 937 938
                                                                     12 — 23

the vessel-matrix array storage is dimensioned for 12 diagonals
above and below the main diagonal defining the matrix bandwidth      24
with 12 matrix rows of nonzero elements outside the bandwidth


  component type is a rod  and component number is 900
      rod  linear power generation rate (w/m)
--------------------------------------------------------

rod  number is  1 and power-peaking factor is 1.00000E+00
                    nz    rod  linear power (w/m)
                                1        1.253658E+04
                                2        2.153507E+04
                                3        2.308125E+04
                                4        2.120076E+04          25
                                5        1.289875E+04

rod  number is  2 and power-peaking factor is 1.00000E+00
                    nz    rod  linear power (w/m)
                                1        1.253658E+04
                                2        2.153507E+04
                                3        2.308125E+04
                                4        2.120076E+04
                                5        1.289875E+04

##########  71 lines deleted here  ##########

rod  number is 12 and power-peaking factor is 1.67800E+00       25
                    nz    rod  linear power (w/m)
                                1        2.103639E+04
                                2        3.613584E+04
                                3        3.873033E+04
                                4        3.557487E+04
                                5        2.164411E+04

linear-power values are based on a heat-structure component power of 2.300000E+09    w      25

cell-geometry parameters for vessel component    1


total volume in level  1 is 1.372984E+01 m3
total volume up to and including level  1 is 1.372984E+01 m3
                                                                           26
level  1 geometry parameters

vol         1.99639E+00  1.99639E+00  1.99639E+00  1.99639E+00  1.99639E+00  1.99639E+00  2.91916E-01  2.91916E-01
            2.91916E-01  2.91916E-01  2.91916E-01  2.91916E-01
            m3

fayt        2.24258E+00  2.24258E+00  2.24258E+00  2.24258E+00  2.24258E+00  2.24258E+00  1.20360E-01  1.20360E-01
            1.20360E-01  1.20360E-01  1.20360E-01  1.20360E-01
            m2

faz         6.21466E-01  6.21466E-01  6.21466E-01  6.21466E-01  6.21466E-01  6.21466E-01  1.66509E-01  1.66509E-01
            1.66509E-01  1.66509E-01  1.66509E-01  1.66509E-01
            m2
```

```
faxr       1.06094E+00  1.06094E+00  1.06094E+00  1.06094E+00  1.06094E+00  1.06094E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m2

total volume in level  2 is 9.656278E+00 m3
total volume up to and including level  2 is 2.338612E+01 m3                    26

level  2 geometry parameters

vol        1.12373E+00  1.12373E+00  1.12373E+00  1.12373E+00  1.12373E+00  1.12373E+00  4.85653E-01  4.85653E-01
           4.85653E-01  4.85653E-01  4.85653E-01  4.85653E-01
           m3

##########  200 lines deleted here  ##########

total volume in level 12 is 5.242977E+00 m3
total volume up to and including level 12 is 9.517555E+01 m3            26

level 12 geometry parameters

vol        8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  1.00000E-12  1.00000E-12
           1.00000E-12  1.00000E-12  1.00000E-12  1.00000E-12
           m3

fayt       9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m2

faz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m2

faxr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m2

height change across component  10 from the joining cell of component   1 to cell  6 is  0.00000E+00 m     27

k factor to fric conversions for component  10 ( pipe    ) faces  1 through  7

fric       7.59590E-02  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.73911E-01      28
           -

height change across component  12 from the joining cell of component  10 to cell 18 is  8.67035E-01 m     27

k factor to fric conversions for component  12 ( pipe    ) faces  1 through 19

fric       1.73911E-01  0.00000E+00  2.31479E-03  9.99767E-05  9.99767E-05  9.99767E-05  9.99767E-05  9.99767E-05
           9.99767E-05  9.99767E-05  9.99767E-05  9.99767E-05  9.99767E-05  9.99767E-05  9.99767E-05  9.99767E-05
           3.85799E-03  0.00000E+00  7.77879E-02                    28
           -

height change across component  14 from the joining cell of component  12 to cell  6 is -2.66814E+00 m     27

##########  340 lines deleted here  ##########

k factor to fric conversions for component   6 ( pipe    ) faces  1 through  5

fric       1.60372E-02  0.00000E+00  0.00000E+00  0.00000E+00  2.92476E-02      28                  27
           -

height change across component   7 from component   1 joining cell to component   1 joining cell is  2.74139E+00 m

k factor to fric conversions for component   7 ( pipe    ) faces  1 through  3

fric       1.80154E-02  0.00000E+00  2.92476E-02      28
           -

height change across component 100 from cell  1 to cell  7 is  7.99200E+00 m      27                   28

k factor to fric conversions for component 100 ( pipe    ) faces  1 through  8

fric       7.36036E-01  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

height change across component 105 from the joining cell of component 100 to cell  8 is  4.66800E+00 m     27

k factor to fric conversions for component 105 ( tee     ) faces  1 through  9

fric       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00                   28
           -

height change across component 105 from the joining cell of component 105 to cell 13 is  4.18400E+00 m     27

k factor to fric conversions for component 105 ( tee     ) faces 10 through 14

fric       1.12669E-10  1.75947E-10  0.00000E+00  0.00000E+00  0.00000E+00      28                  27
           -

height change across component 190 from component 105 joining cell to component 100 joining cell is -1.26600E+01 m

k factor to fric conversions for component 190 ( tee     ) faces  1 through 13

fric       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  8.42009E-02  6.98758E-02  2.84685E-02  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  7.36036E-01      28
```

```
height change across component 190 from the joining cell of component 190 to cell 14 is  0.00000E+00 m      27

k factor to fric conversions for component 190 ( tee      ) faces 14 through 15

fric        6.25022E-02  1.57096E-02      28

height change across component 110 from the joining cell of component 105 to cell 16 is -1.24536E+01 m      27

k factor to fric conversions for component 110 ( tee      ) faces  1 through 17

fric        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00
                                               28

##########  420 lines deleted here  ##########

height change across component 316 from the joining cell of component 312 to cell  1 is  0.00000E+00 m      27

k factor to fric conversions for component 316 ( valve   ) faces  1 through  2

fric        0.00000E+00  0.00000E+00      28

restart dump generated at problem time      0.000000 s after      0 time steps      29

     dtmin = 1.0000E-03,      dtmax = 1.0000E-01,      tend = 1.0000E+01,      rtwfp = 1.0000E+01,      powerc = 1.0000E+20
                      s                         s                       s                       -                      w
     edint = 1.0100E+01,      gfint = 5.0000E-01,     dmpint = 1.0100E+01,     sedint = 1.0100E+01
                      s                         s                       s                       s

*************************************************************************
*                    time domain data to be used                        *
*   minimum   maximum    time      long    graphics    dump     short   *
*    time      time     domain     edit      edit      edit      edit   *      30    32
*  step (s)  step (s)   end (s)  step (s)  step (s)  step (s)  step (s) *
* 1.000E-03 1.000E-01 1.000E+01 1.010E+01 5.000E-01 1.010E+01 1.010E+01 *
*************************************************************************

steady-state calculation heat-transfer/hydraulic time-step ratio is 1.0000E+01
*   convective energy-error controller is  1.0000E+20    w
*************************************************************************


***** warning *****  zpwin =  1.0000E+00 does not equal the axial-      31
                     power shape table abscissa-coordinate value
                     of  0.0000E+00 at     0.000000 s problem time

1
 trac large edit      32

 problem time is 0.000000E+00 s, time-step size is  1.0000E-03 s, time-step number is     0, outer-iteration number is  0

 maximum convective power differance has been-0.1000000E+01    w    in component    0 at time-1.0000000E+00 s
 time-step size was limited by component   0 at cell    0 to 1.0000E+08 s
 average outer-iteration count over the last    0 time steps was   0.000
 last minimum number of outer iterations was  0 at time step    0 (limited by component   0 with fr.error of 0.0000E+00)
 last maximum number of outer iterations was  0 at time step    0 (limited by component   0 with fr.error of 0.0000E+00)
 total number of times that each component (id#) was the last to converge since the last short edit
    0( 10)    0( 12)    0( 14)    0( 16)    0( 17)    0( 18)    0( 54)    0( 52)    0( 50)    0( 49)    0( 91)    0( 56)
    0( 20)    0( 22)    0( 24)    0( 26)    0( 27)    0( 28)    0( 64)    0( 62)    0( 60)    0(202)    0( 59)    0( 92)
    0( 66)    0( 30)    0( 32)    0( 34)    0( 36)    0( 37)    0( 38)    0( 40)    0( 41)    0( 42)    0( 74)    0( 72)
    0( 70)    0( 44)    0( 45)    0( 46)    0( 43)    0( 69)    0( 93)    0( 47)    0( 76)    0( 48)    0(  2)    0(  3)
    0(  4)    0(  5)    0(  6)    0(  7)    0(100)    0(105)    0(190)    0(110)    0(120)    0(400)    0(410)    0(420)
    0(422)    0(180)    0(170)    0(154)    0(150)    0(250)    0(350)    0(112)    0(220)    0(210)    0(205)    0(290)
    0(200)    0(320)    0(310)    0(305)    0(390)    0(300)    0(430)    0(432)    0(254)    0(270)    0(280)    0(354)
    0(370)    0(380)    0(116)    0(212)    0(312)    0(436)    0(216)    0(316)    0(424)    0(578)    0(114)    0(434)
    0(179)    0(169)    0(576)    0(118)    0(214)    0(203)    0(314)    0(438)    0(269)    0(279)    0(369)    0(379)
    0(218)    0(318)    0(  1)
 current maximum time-step sizes and limitation counts since the last short edit      33
     delamx        delcmx        deldmx        delemx        delpmx        delrmx        delvmx        delxmx
  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  9.0072E+00 s
       0             0             0             0             0             0             0             0
 further limitation counts on what controls delcmx
     dtlmx         dtvmx         dprmx         dtsms         dtrmx         delt/2
       0             0             0             0             0             0

   cpu execution time of this run is 7.106700E+01 s

 total time steps since time 0.0 s is             0      34
   total cpu time since time 0.0 s is 7.106700E+01 s

************************************* signal-variable values at time     0.00000 s *************************************

    id       sig.var.           id      sig.var.           id      sig.var.           id      sig.var.           id      sig.var.

     1   0.000000E+00           11   0.000000E+00         101   5.911000E+02         111   5.415800E+06         161   0.000000E+00
             time (s)              core power (w)              liq temp (k)              pressure (pa)              z lq mf (kg/s)
   171   1.550000E+07          181   5.591000E+02         201   5.911000E+02         222   5.415800E+06         261   0.000000E+00
         pressure (pa)               liq temp (k)              liq temp (k)              pressure (pa)              z lq mf (kg/s)
   271   1.550000E+07          281   5.591000E+02         301   5.911000E+02         333   5.415800E+06         361   0.000000E+00
         pressure (pa)               liq temp (k)              liq temp (k)              pressure (pa)              z lq mf (kg/s)
   371   1.550000E+07          381   5.591000E+02         401   1.550000E+07         421   1.550000E+07         501   4.447100E+06
```

```
      pressure (pa)               liq temp (k)               pressure (pa)               pressure (pa)               pressure (pa)
 521  -1.105290E+07      601   4.447100E+06      621  -1.105290E+07      701   4.447100E+06      721  -1.105290E+07
       pressure (pa)              pressure (pa)               pressure (pa)              pressure (pa)               pressure (pa)
1000   0.000000E+00     1051   5.415800E+06     1100   0.000000E+00     1101   5.415800E+06     1121   5.415800E+06
     z m mfw (kg/s)              pressure (pa)             z m mfw (kg/s)              pressure (pa)               pressure (pa)
1135   0.000000E+00     1501   0.000000E+00     1541   4.000000E-01     1700   0.000000E+00     1714   0.000000E+00
       pressure (pa)             z lq mf (kg/s)            valve farea fr            z m mfw (kg/s)              pressure (pa)
1903   5.415800E+06     1910   5.415800E+06     2000   0.000000E+00     2051   5.415800E+06     2100   0.000000E+00
       pressure (pa)              pressure (pa)            z m mfw (kg/s)              pressure (pa)             z m mfw (kg/s)
2101   5.415800E+06     2121   5.415800E+06     2135   0.000000E+00     2541   4.000000E-01     2700   0.000000E+00
       pressure (pa)              pressure (pa)               pressure (pa)            valve farea fr            z m mfw (kg/s)
2714   0.000000E+00     2903   5.415800E+06     2910   5.415800E+06     3000   0.000000E+00     3051   5.415800E+06
       pressure (pa)              pressure (pa)               pressure (pa)            z m mfw (kg/s)              pressure (pa)
3100   0.000000E+00     3101   5.415800E+06     3121   5.415800E+06     3135   0.000000E+00     3501   0.000000E+00
     z m mfw (kg/s)              pressure (pa)               pressure (pa)              pressure (pa)             z lq mf (kg/s)
3541   4.000000E-01     3700   0.000000E+00     3714   0.000000E+00     3903   5.415800E+06     3910   5.415800E+06
     valve farea fr            z m mfw (kg/s)              pressure (pa)              pressure (pa)               pressure (pa)
4001   5.415800E+06     4220   1.000000E+00     4240   0.000000E+00     9000   0.000000E+00     9010   0.000000E+00
       pressure (pa)             valve farea fr            trp set status            a mx sf tp (k)            s mx sf tp (k)
9901   4.259000E+03     9902   4.259000E+03     9903   4.259000E+03
     z m mfw (kg/s)            z m mfw (kg/s)            z m mfw (kg/s)
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********************************* control-block output values at time    0.00000 s **********************************

   id     con.blk.          id     con.blk.          id     con.blk.          id     con.blk.          id     con.blk.

   -1   0.000000E+00        -2   0.000000E+00        -3   1.440000E-01        -4   1.551300E+07        -5   1.620300E+07
                   k                    w                    -                   pa                   pa
   -6   1.723700E+07        -7   5.742000E+02        -8   5.000000E-02        -9  -1.379000E+05       -10   4.087000E+05
                  pa                    k                    -                   pa                    w
  -11   2.423000E-03       -12   4.540000E+02       -13   4.330000E+06       -14   5.570000E+02       -15   4.581300E+00
                s/kg                 kg/s                   pa                    k           sqrt(kg/m3)
  -16   5.751000E+02       -17   1.162000E+00       -18   0.000000E+00       -19   1.072000E+00       -22   0.000000E+00
                   k                    k                    k                    k                    -
  -24   0.000000E+00       -26   0.000000E+00       -28   0.000000E+00       -30   0.000000E+00       -32   0.000000E+00
                   -                    -                    -                    -                    -
  -34   0.000000E+00       -36   0.000000E+00       -38   0.000000E+00       -40   0.000000E+00       -50   5.751000E+02
                   -                    -                    -                    -                    k
  -55   5.751000E+02      -108   5.751000E+02      -109   5.751000E+02      -110   5.751000E+02      -118   3.200000E+01
                   k                    k                    k                    k                    k
 -119   3.200000E+01      -120   3.200000E+01      -130   0.000000E+00      -132   0.000000E+00      -134  -1.504360E-03
                   k                    k                    k                    k                    k
 -136   1.162000E+00      -138   1.160496E+00      -140   3.713586E+01      -142   0.000000E+00      -148   0.000000E+00
                   k                    k                    k                    -                    -
 -149   0.000000E+00      -150   0.000000E+00      -152   0.000000E+00      -154   0.000000E+00      -156   0.000000E+00
                   k                    k                    k                    -                    k
 -158   1.072000E+00      -160   0.000000E+00      -162   0.000000E+00      -164   0.000000E+00      -166   1.072000E+00
                   k                    k                    -                    k                    k
 -168   3.430400E+01      -170   0.000000E+00      -208   5.751000E+02      -209   5.751000E+02      -210   5.751000E+02
                   k                    -                    k                    k                    k
 -218   3.200000E+01      -219   3.200000E+01      -220   3.200000E+01      -230   0.000000E+00      -232   0.000000E+00
                   k                    k                    k                    k                    k
 -234  -1.504360E-03      -236   1.162000E+00      -238   1.160496E+00      -240   3.713586E+01      -242   0.000000E+00
                   k                    k                    k                    k                    -
 -248   0.000000E+00      -249   0.000000E+00      -250   0.000000E+00      -252   0.000000E+00      -254   0.000000E+00
                   -                    k                    k                    k                    -
 -256   0.000000E+00      -258   1.072000E+00      -260   0.000000E+00      -262   0.000000E+00      -264   0.000000E+00
                   k                    k                    k                    -                    k
 -266   1.072000E+00      -268   3.430400E+01      -270   0.000000E+00      -308   5.751000E+02      -309   5.751000E+02
                   k                    k                    -                    k                    k
 -310   5.751000E+02      -318   3.200000E+01      -319   3.200000E+01      -320   3.200000E+01      -330   0.000000E+00
                   k                    k                    k                    k                    k
 -332   0.000000E+00      -334  -1.504360E-03      -336   1.162000E+00      -338   1.160496E+00      -340   3.713586E+01
                   k                    k                    k                    k                    k
 -342   0.000000E+00      -348   0.000000E+00      -349   0.000000E+00      -350   0.000000E+00      -352   0.000000E+00
                   -                    -                    k                    k                    k
 -354   0.000000E+00      -356   0.000000E+00      -358   1.072000E+00      -360   0.000000E+00      -362   0.000000E+00
                   -                    k                    k                    k                    -
 -364   0.000000E+00      -366   1.072000E+00      -368   3.430400E+01      -370   0.000000E+00      -406   0.000000E+00
                   k                    k                    k                    -                    -
 -408   4.580000E-01      -410  -1.000000E-01      -412   0.000000E+00      -414  -1.000000E+00      -430  -1.300000E+04
                   -                    -                    -                    -                   pa
 -432   0.000000E+00      -434  -1.300000E+04      -436   1.022721E+05      -438   0.000000E+00      -440   0.000000E+00
                paxs                   pa                    w                    -                    -
 -442   0.000000E+00      -444   0.000000E+00      -446   1.022721E+05      -448   0.000000E+00      -450   0.000000E+00
                   -                    w                    w                    -                    w
 -521  -1.000000E+07      -621  -1.000000E+07      -721  -1.000000E+07     -1000   1.000000E+00     -1001   1.000000E-06
                  pa                   pa                   pa                    -                    -
-1002   0.000000E+00     -1004   0.000000E+00     -1005   0.000000E+00     -1006   5.200000E-01     -1007   0.000000E+00
                   -                    -                    -                    -                    s
-1008   5.200000E-01     -1009   0.000000E+00     -1010   0.000000E+00     -1011   5.200000E-01     -1012   0.000000E+00
                   -                 kg/s                    -                    -                    s
-1013   1.000000E-01     -1014   5.000000E-01     -1104   0.000000E+00     -1106   0.000000E+00     -1109   0.000000E+00
                   -                    -                   pa          m2xsqrt(pa)                 kg/s
-1110   0.000000E+00     -1112   0.000000E+00     -1114   0.000000E+00     -1116   0.000000E+00     -1118   0.000000E+00
                   -                    -                    -                    -                    -
-1160   0.000000E+00     -1162   0.000000E+00     -1704   0.000000E+00     -1706   0.000000E+00     -2000   1.000000E+00
                   -                    -                   pa                 kg/s                 kg/s
-2001   1.000000E-06     -2002   0.000000E+00     -2004   0.000000E+00     -2005   0.000000E+00     -2006   5.200000E-01
                kg/s                 kg/s                    -                    -                    -
-2007   0.000000E+00     -2008   5.200000E-01     -2009   0.000000E+00     -2010   0.000000E+00     -2011   5.200000E-01
                   s                    -                 kg/s                    -                    -
-2012   0.000000E+00     -2013   1.000000E-01     -2014   5.000000E-01     -2104   0.000000E+00     -2106   0.000000E+00
                   s                    -                    -                   pa          m2xsqrt(pa)
-2109   0.000000E+00     -2110   0.000000E+00     -2112   0.000000E+00     -2114   0.000000E+00     -2116   0.000000E+00
                kg/s                    -                    -                    -                    -
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-2118  0.000000E+00   -2160  0.000000E+00   -2162  0.000000E+00   -2704  0.000000E+00   -2706  0.000000E+00
                  -                     -                     -                    pa                  kg/s
-3000  1.000000E+00   -3001  1.000000E-06   -3002  0.000000E+00   -3004  0.000000E+00   -3004  0.000000E+00
      m2xsqrt(pa)           m2xsqrt(pa)           m2xsqrt(pa)                     -                     -
-3005  0.000000E+00   -3005  0.000000E+00   -3006  5.200000E-01   -3006  5.200000E-01   -3007  0.000000E+00
                  -                     -                     -                     -                     s
-3007  0.000000E+00   -3008  5.200000E-01   -3008  5.200000E-01   -3009  0.000000E+00   -3009  0.000000E+00
                  s                     -                     -                  kg/s                  kg/s
-3010  0.000000E+00   -3010  0.000000E+00   -3011  5.200000E-01   -3011  5.200000E-01   -3012  0.000000E+00
                  -                     -                     -                     -                     s
-3012  0.000000E+00   -3013  1.000000E-01   -3013  1.000000E-01   -3014  5.000000E-01   -3014  5.000000E-01
                  s                     -                     -                     -                     -
-3104  0.000000E+00   -3104  0.000000E+00   -3106  0.000000E+00   -3106  0.000000E+00   -3109  0.000000E+00
                 pa                    pa           m2xsqrt(pa)           m2xsqrt(pa)                  kg/s
-3110  0.000000E+00   -3112  0.000000E+00   -3114  0.000000E+00   -3116  0.000000E+00   -3118  0.000000E+00
                  -                     -                     -                     -                     -
-3160  0.000000E+00   -3162  0.000000E+00   -3704  0.000000E+00   -3706  0.000000E+00   -4241  5.617200E+06
                  -                     -                    pa                  kg/s                    pa
-4242  1.000000E+00   -4243  5.200000E-01   -4300  5.593000E+02   -4302  3.812800E+06   -4304  5.689000E+02
                  -                     -                     k                    pa                     k
-4310  5.751000E+02   -4312  5.751000E+02   -4314  5.751000E+02   -4316  1.580000E+01   -4318  1.000000E+00
                  k                     k                     k                     k                     -
-4320  8.656716E-01   -4330  5.751000E+02   -4332  6.200000E+00   -4334  9.073084E-01   -4336  0.000000E+00
                  -                     k                     k                     -                     -
-4338  0.000000E+00   -4340  9.073084E-01   -4342  0.000000E+00   -9901  1.236000E+02   -9902  1.236000E+02
                  -                     -                     -                 rad/s                 rad/s
-9903  1.236000E+02
              rad/s

*************************************** trip set status at time    0.00000 s ***************************************

  id   set status      id   set status      id   set status      id   set status      id   set status
   1   on-forward      10   off             12   off             14   off             16   off
  18   off             20   off             21   off             22   off             24   off
  26   off             28   off             30   off             32   off             34   off
  36   off             38   off             40   off             42   off             44   off
  46   off             48   off             50   off             52   off             54   off
  56   off             58   off             60   off            100   off            110   off
 120   off            200   off            210   off            220   off            300   off
 310   off            320   off           -407   off            422   off            423   off
 450   on-reverse     460   on-reverse     520   on-reverse     620   on-reverse     720   on-reverse
1001   off           1002   off           1003   off           1010   off           1020   off
1030   off           1040   off           1050   off           1060   off           1500   off
2010   off           2020   off           2030   off           2040   off           2050   off
2060   off           3010   off           3020   off           3030   off           3040   off
3050   off           3060   off           3500   off           9996   off           9997   off
9998   off           9999   off

*************************************** trip signal values at time    0.00000 s ***************************************

  id   trp.sig.        id   trp.sig.        id   trp.sig.        id   trp.sig.        id   trp.sig.
   1   1.000000E+20    10   1.000000E+20    12   1.000000E+20    14   1.000000E+20    16   1.000000E+20
                  s                  -                  -                  -                  -
  18   1.000000E+20    20   1.000000E+20    21   1.000000E+20    22   1.000000E+20    24   1.000000E+20
                  -                  -                  -                  -                  -
  26   1.000000E+20    28   1.000000E+20    30   1.000000E+20    32   1.000000E+20    34   1.000000E+20
                  -                  -                  -                  -                  -
  36   1.000000E+20    38   1.000000E+20    40   1.000000E+20    42   1.000000E+20    44   1.000000E+20
                  -                  -                  -                  -                  -
  46   1.000000E+20    48   1.000000E+20    50   1.000000E+20    52   1.000000E+20    54   1.000000E+20
                  -                  -                  -                  w                 pa
  56   1.000000E+20    58   1.000000E+20    60   1.000000E+20   100   1.000000E+20   110   1.000000E+20
                  -                 pa                 pa                  -               kg/s
 120   1.000000E+20   200   1.000000E+20   210   1.000000E+20   220   1.000000E+20   300   1.000000E+20
                  k                  -               kg/s                  k                  -
 310   1.000000E+20   320   1.000000E+20  -407   0.000000E+00   422   1.000000E+20   423   1.000000E+20
               kg/s                  k                  -                  -                  s
 450   1.000000E+20   460   1.000000E+20   520   1.000000E+20   620   1.000000E+20   720   1.000000E+20
                 pa                 pa                  m                  m                  m
1001   1.000000E+20  1002   1.000000E+20  1003   1.000000E+20  1010   1.000000E+20  1020   1.000000E+20
                 pa                 pa                 pa                  -                  -
1030   1.000000E+20  1040   1.000000E+20  1050   1.000000E+20  1060   1.000000E+20  1500   1.000000E+20
                  -               kg/s               kg/s                 pa               kg/s
2010   1.000000E+20  2020   1.000000E+20  2030   1.000000E+20  2040   1.000000E+20  2050   1.000000E+20
                  -                  -                  -               kg/s               kg/s
2060   1.000000E+20  3010   1.000000E+20  3020   1.000000E+20  3030   1.000000E+20  3040   1.000000E+20
                 pa                  -                  -                  -               kg/s
3050   1.000000E+20  3060   1.000000E+20  3500   1.000000E+20  9996   1.000000E+20  9997   1.000000E+20
               kg/s                 pa               kg/s                  s                  s
9998   1.000000E+20  9999   1.000000E+20
                  s                  s

at time     0.0000 s in component number 931 at cell   7, the maximum stanton number is 1.759790E+03
at time     0.0000 s in component number 900 at cell   1, the minimum tld is 6.179053E+02 k
             where tld is the liquid temperature at bubble detachment from a heated surface

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          1                                                                                          1   00000
         11   time is      0.000000 s, time-step size is    0.001000 s, time-step number is    0    11   0   0
          1                                                                                          1   0   0
          1                            $10$ hot leg 1                                                1   0   0
        111                                                                                        111   00000
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the component type is a pipe, component number is  10, first junction number is  10, and second junction number is  12

                  ncd-gas
      pressure    pressure    void fr.  temp.sat.  temp.liq.  temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas   wf.liq.
cell     pa          pa          -          k          k          k        kg/m3     kg/m3       m/s         m/s        -
  1 1.55000E+07 0.00000E+00 0.000E+00 6.179E+02 5.911E+02 6.179E+02 6.844E+02 1.019E+02  0.000E+00  0.000E+00 3.960E-01
  2 1.55000E+07 0.00000E+00 0.000E+00 6.179E+02 5.911E+02 6.179E+02 6.844E+02 1.019E+02  0.000E+00  0.000E+00 3.200E-01
  3 1.55000E+07 0.00000E+00 0.000E+00 6.179E+02 5.911E+02 6.179E+02 6.844E+02 1.019E+02  0.000E+00  0.000E+00 3.200E-01
  4 1.55000E+07 0.00000E+00 0.000E+00 6.179E+02 5.911E+02 6.179E+02 6.844E+02 1.019E+02  0.000E+00  0.000E+00 3.200E-01
  5 1.55000E+07 0.00000E+00 0.000E+00 6.179E+02 5.911E+02 6.179E+02 6.844E+02 1.019E+02  0.000E+00  0.000E+00 3.200E-01
  6 1.55000E+07 0.00000E+00 0.000E+00 6.179E+02 5.911E+02 6.179E+02 6.844E+02 1.019E+02  0.000E+00  0.000E+00 3.200E-01
  7                                                                                      0.000E+00  0.000E+00 4.939E-01
                                                                                                            37
     idr    liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
cell  -     ----- w/m2/k ------     w/k         w          w          k               k
  1  1.0   2.829E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 6.184E+02      591.10
  2  1.0   2.829E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 6.184E+02      591.10
  3  1.0   2.829E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 6.184E+02      591.10            37
  4  1.0   2.829E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 6.184E+02      591.10
  5  1.0   2.829E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 6.184E+02      591.10
  6  1.0   2.735E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 6.184E+02      591.10

total power to the component from all heat-transfer surfaces is  0.000000E+00   w
total power to the liquid is  0.000000E+00   w    and total power to the gas is  0.000000E+00   w        37

total convective energy transported to the fluid from component wall:  0.0000000E+00 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                  inside convective energy error: absolute=  0.00000E+00 w*s      effective=  0.00000E+00 w*s

pipe  component  total coolant mass is  1.93238E+03 kg , total coolant energy is  2.73572E+09 w*s, and       37
computed initial total coolant mass is  1.93238E+03 kg

##########  9119 lines deleted here  ##########          37

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  1    33333 22222                                                                                      99999 33333 88888
 11        3      2 time is      0.000000 s, time-step size is     0.001000 s, time-step number is     0 9    9      3 8    8
  1    33333 22222                                                                                      99999 33333 88888
  1        3 2                              $938$ st-gen-1,2,3 sec.dryer                    37                9      3 8    8
111    33333 22222                                                                                      99999 33333 88888
------------------------------------------------------------------------------------------------------------------------
               38
the heat-structure component type is a rod  and the component number is 938

rod   1   plane (perpendicular to z direction) coupled to cells   1 (inner) and   0 (outer)

 id    row    z(m)     heat-structure temperatures (k)
1001    1   0.0000E+00 5.4211E+02 5.4211E+02 5.4211E+02          38
1002    2   5.7542E+00 5.4211E+02 5.4211E+02 5.4211E+02                                                           38
1003    3   1.1508E+01 5.4211E+02 5.4211E+02 5.4211E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k          k         w/m2/k          k             w/m2/k          k         w/m2/k          k         w/m2/k
1001 11   0.0000E+00   5.4211E+02   1.5020E+04   5.4212E+02   11   0.0000E+00   5.4211E+02   1.5020E+04   5.4212E+02   0.0000E+00
1002 11   0.0000E+00   5.4211E+02   1.3531E+04   5.4212E+02   11   0.0000E+00   5.4211E+02   1.3531E+04   5.4212E+02   0.0000E+00
1003 11   0.0000E+00   5.4211E+02   1.2042E+04   5.4212E+02   11   0.0000E+00   5.4211E+02   1.2042E+04   5.4212E+02   0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001   0.0000E+00 -1.5020E+02 -1.5020E+02  0.0000E+00   0.00E+00   0.0000E+00 -1.5020E+02 -1.5020E+02  0.0000E+00   0.00E+00
1002   0.0000E+00 -1.3531E+02 -1.3531E+02  0.0000E+00   0.00E+00   0.0000E+00 -1.3531E+02 -1.3531E+02  0.0000E+00   0.00E+00
1003   0.0000E+00 -1.2042E+02 -1.2042E+02  0.0000E+00   0.00E+00   0.0000E+00 -1.2042E+02 -1.2042E+02  0.0000E+00   0.00E+00

         stanton      liq.temp.      stanton     liq.temp.
          number     bubble det.     number     bubble det.
 id    inner surf.   inner surf.   outer surf.  outer surf.
            -             k             -            k                                                                38
1001   0.00000E+00   5.42114E+02   0.00000E+00   5.42114E+02
1002   0.00000E+00   5.42114E+02   0.00000E+00   5.42114E+02
1003   0.00000E+00   5.42114E+02   0.00000E+00   5.42114E+02

total convective energy to the fluid during hydro solution:
                  inside surface=  0.0000000E+00 w*s       outside surface=  0.0000000E+00 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
             38   inside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s
                 outside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s

rod   2   plane (perpendicular to z direction) coupled to cells   2 (inner) and**** (outer)

 id    row    z(m)     heat-structure temperatures (k)
1001    1   0.0000E+00 5.4211E+02 5.4211E+02 5.4211E+02
1002    2   5.7542E+00 5.4211E+02 5.4211E+02 5.4211E+02
1003    3   1.1508E+01 5.4211E+02 5.4211E+02 5.4211E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k          k         w/m2/k          k             w/m2/k          k         w/m2/k          k         w/m2/k
1001 11   0.0000E+00   5.4211E+02   1.5020E+04   5.4212E+02   11   0.0000E+00   5.4211E+02   1.5020E+04   5.4212E+02   0.0000E+00
1002 11   0.0000E+00   5.4211E+02   1.3531E+04   5.4212E+02   11   0.0000E+00   5.4211E+02   1.3531E+04   5.4212E+02   0.0000E+00
1003 11   0.0000E+00   5.4211E+02   1.2042E+04   5.4212E+02   11   0.0000E+00   5.4211E+02   1.2042E+04   5.4212E+02   0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
```

```
1001  0.0000E+00 -1.5020E+02 -1.5020E+02  0.0000E+00  0.00E+00  0.0000E+00 -1.5020E+02 -1.5020E+02  0.0000E+00  0.00E+00
1002  0.0000E+00 -1.3531E+02 -1.3531E+02  0.0000E+00  0.00E+00  0.0000E+00 -1.3531E+02 -1.3531E+02  0.0000E+00  0.00E+00
1003  0.0000E+00 -1.2042E+02 -1.2042E+02  0.0000E+00  0.00E+00  0.0000E+00 -1.2042E+02 -1.2042E+02  0.0000E+00  0.00E+00

       stanton      liq.temp.     stanton     liq.temp.
        number     bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  5.42114E+02  0.00000E+00  5.42114E+02
1002  0.00000E+00  5.42114E+02  0.00000E+00  5.42114E+02
1003  0.00000E+00  5.42114E+02  0.00000E+00  5.42114E+02

total convective energy to the fluid during hydro solution:
                inside surface=  0.0000000E+00 w*s       outside surface=  0.0000000E+00 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s
   38     outside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s

rod    3    plane (perpendicular to z direction) coupled to cells    3 (inner) and**** (outer)

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.4211E+02 5.4211E+02 5.4211E+02
1002   2  5.7542E+00 5.4211E+02 5.4211E+02 5.4211E+02
1003   3  1.1508E+01 5.4211E+02 5.4211E+02 5.4211E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido    hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k          k         w/m2/k          k               w/m2/k          k         w/m2/k          k         w/m2/k
1001 11   0.0000E+00  5.4211E+02  1.5020E+04  5.4212E+02   11  0.0000E+00  5.4211E+02  1.5020E+04  5.4212E+02  0.0000E+00
1002 11   0.0000E+00  5.4211E+02  1.3531E+04  5.4212E+02   11  0.0000E+00  5.4211E+02  1.3531E+04  5.4212E+02  0.0000E+00
1003 11   0.0000E+00  5.4211E+02  1.2042E+04  5.4212E+02   11  0.0000E+00  5.4211E+02  1.2042E+04  5.4212E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi       qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2        w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00 -1.5020E+02 -1.5020E+02  0.0000E+00  0.00E+00  0.0000E+00 -1.5020E+02 -1.5020E+02  0.0000E+00  0.00E+00
1002  0.0000E+00 -1.3531E+02 -1.3531E+02  0.0000E+00  0.00E+00  0.0000E+00 -1.3531E+02 -1.3531E+02  0.0000E+00  0.00E+00
1003  0.0000E+00 -1.2042E+02 -1.2042E+02  0.0000E+00  0.00E+00  0.0000E+00 -1.2042E+02 -1.2042E+02  0.0000E+00  0.00E+00

       stanton      liq.temp.     stanton     liq.temp.
        number     bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  5.42114E+02  0.00000E+00  5.42114E+02
1002  0.00000E+00  5.42114E+02  0.00000E+00  5.42114E+02
1003  0.00000E+00  5.42114E+02  0.00000E+00  5.42114E+02

total convective energy to the fluid during hydro solution:
                inside surface=  0.0000000E+00 w*s       outside surface=  0.0000000E+00 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s
          outside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s

inner-surface node-interval thermal conductivity is  0.00000E+00    w/m/k
outer-surface node-interval thermal conductivity is  0.00000E+00    w/m/k       38
effective  r-direction wall thermal conductivity is  0.00000E+00    w/m/k
which have been axially averaged over all    3 average-power rod s

total inner surface area is  6.61197E+02 m2  and
total outer surface area is  6.62564E+02 m2  of all    3 average-power rod s       38

total power from the heat-structure inner surface is -8.94663E+04   w    and outer surface is -8.96513E+04    w       38

system results

                          system total coolant energy is  9.312152E+18 w*s

                            system total coolant mass is  4.544427E+13 kg

total coolant mass discharged by break components is  0.000000E+00 kg      39

   total coolant mass injected by fill components is  0.000000E+00 kg

       system computed initial total coolant mass is  4.544427E+13 kg

at     0.001659 s, the trip -407 signal crossed setpoint s2 =  1.500000E-01 -
at     0.002000 s, the trip -407 signal is  1.801346E-01 -                       40

at     0.002000 s, trip -407 is reset from  0 to  1 with a set status of on-forward

*htstrl*  heat structure 900 is set to a steady-state power of 2.30000E+09    w
          problem time is      2.071103 s and the time-step number is    98       41

               generalized steady-state convergence-test results

     problem time is       2.234650 s and time-step size is    0.081774 s
       time-step number is    100 and number of outer iterations is  3

    parameters tested     max.fr.change per second   component     cell
     for convergence        over last time step       number      number
        pressure                 0.110635              200           2
     liquid velocity            10.105591              205           4       42
       gas velocity              4.222451              200           7
```

```
      void fraction                -1.147031          205          3
    liquid temperature             -0.022811            1         90
      gas temperature               0.020845          200          3
     ncd-gas pressure              -0.000041           50          1

            constrained steady-state calculation parameters

component    minimum     adjusted     maximum     monitored     desired
and number    value      parameter     value      parameter      value
pump   16  0.00000E+00  1.30287E+02  2.00000E+02  4.58485E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s      43
pump   26  0.00000E+00  1.30300E+02  2.00000E+02  4.58456E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s
pump   36  0.00000E+00  1.30045E+02  2.00000E+02  4.55714E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s


   dtmin = 1.0000E-03,     dtmax = 2.0000E-01,      tend = 1.0000E+02,      rtwfp = 3.0000E+00,      powerc = 1.0000E+20
                    s                       s                        s                        -                         w
   edint = 9.0200E+01,     gfint = 1.0000E+00,    dmpint = 9.0200E+01,     sedint = 9.0200E+01
                    s                       s                        s                        s

*************************************************************************
*                        time domain data to be used                    *
*  minimum   maximum    time      long    graphics    dump      short   *
*   time      time     domain     edit      edit      edit      edit    *
*  step (s)  step (s)  end (s)  step (s)  step (s)  step (s)  step (s)  *      44
* 1.000E-03 2.000E-01 1.000E+02 9.020E+01 1.000E+00 9.020E+01 9.020E+01 *
*************************************************************************

steady-state calculation heat-transfer/hydraulic time-step ratio is 3.0000E+00
*   convective energy-error controller is  1.0000E+20   w
*************************************************************************


             generalized steady-state convergence-test results

      problem time is     12.539873 s and time-step size is    0.200000 s
        time-step number is    200 and number of outer iterations is  3

   parameters tested     max.fr.change per second    component      cell
    for convergence         over last time step        number       number
        pressure                -0.009036                290          3
    liquid velocity             -0.880862                190          3
      gas velocity               0.853617                205          8
      void fraction             -0.442276                290          4            45
   liquid temperature            0.022910                290          4
     gas temperature            -0.003021                205          4
    ncd-gas pressure            -0.000024                 50          1

            constrained steady-state calculation parameters

component    minimum     adjusted     maximum     monitored     desired
and number    value      parameter     value      parameter      value
pump   16  0.00000E+00  1.23069E+02  2.00000E+02  4.27555E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s
pump   26  0.00000E+00  1.23105E+02  2.00000E+02  4.27527E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s
pump   36  0.00000E+00  1.23310E+02  2.00000E+02  4.28473E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s

             generalized steady-state convergence-test results

      problem time is     26.121772 s and time-step size is    0.200000 s
        time-step number is    300 and number of outer iterations is  2

   parameters tested     max.fr.change per second    component      cell
    for convergence         over last time step        number       number
        pressure                -0.013218                354          2
    liquid velocity              0.200403                205          9
      gas velocity              -0.055897                205          9
      void fraction             -0.046856                305          1
   liquid temperature            0.001671                290          4
     gas temperature            -0.000419                105          7
    ncd-gas pressure            -0.000024                 50          1            45

            constrained steady-state calculation parameters

component    minimum     adjusted     maximum     monitored     desired
and number    value      parameter     value      parameter      value
pump   16  0.00000E+00  1.23306E+02  2.00000E+02  4.25898E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s
pump   26  0.00000E+00  1.23336E+02  2.00000E+02  4.25843E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s
pump   36  0.00000E+00  1.23378E+02  2.00000E+02  4.26102E+03  4.25900E+03
                 rad/s        rad/s        rad/s         kg/s         kg/s

             generalized steady-state convergence-test results

      problem time is     46.121772 s and time-step size is    0.200000 s
        time-step number is    400 and number of outer iterations is  2

   parameters tested     max.fr.change per second    component      cell
    for convergence         over last time step        number       number
```

pressure	0.005767	154	2
liquid velocity	0.138618	105	9
gas velocity	-0.061429	105	9
void fraction	0.033206	290	1
liquid temperature	-0.001569	390	4
gas temperature	0.000642	305	4
ncd-gas pressure	-0.000024	50	1

45

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23491E+02 rad/s	2.00000E+02 rad/s	4.25701E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23581E+02 rad/s	2.00000E+02 rad/s	4.25626E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23605E+02 rad/s	2.00000E+02 rad/s	4.25402E+03 kg/s	4.25900E+03 kg/s

generalized steady-state convergence-test results

problem time is 65.773748 s and time-step size is 0.200000 s
time-step number is 500 and number of outer iterations is 2

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	0.009779	154	2
liquid velocity	0.885266	290	5
gas velocity	-0.320182	290	1
void fraction	0.328091	290	4
liquid temperature	-0.036486	290	1
gas temperature	-0.001815	205	4
ncd-gas pressure	-0.000024	50	1

45

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23737E+02 rad/s	2.00000E+02 rad/s	4.25768E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23909E+02 rad/s	2.00000E+02 rad/s	4.25756E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23994E+02 rad/s	2.00000E+02 rad/s	4.25834E+03 kg/s	4.25900E+03 kg/s

generalized steady-state convergence-test results

problem time is 85.773748 s and time-step size is 0.200000 s
time-step number is 600 and number of outer iterations is 2

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	0.020327	154	2
liquid velocity	0.156745	400	4
gas velocity	-0.069365	105	9
void fraction	0.042481	205	2
liquid temperature	-0.002164	290	12
gas temperature	-0.000511	205	4
ncd-gas pressure	-0.000024	50	1

45

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23803E+02 rad/s	2.00000E+02 rad/s	4.25876E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23991E+02 rad/s	2.00000E+02 rad/s	4.25917E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23970E+02 rad/s	2.00000E+02 rad/s	4.25860E+03 kg/s	4.25900E+03 kg/s

dtmin = 1.0000E-03, s   dtmax = 3.0000E-01, s   tend = 2.0000E+02, s   rtwfp = 1.0000E+00, -   powerc = 1.0000E+20 w
edint = 1.0030E+02, s   gfint = 2.0000E+00, s   dmpint = 1.0030E+02, s   sedint = 1.0030E+02 s

```
*************************************************************************
*                      time domain data to be used                      *
*  minimum   maximum    time      long   graphics   dump     short     *
*   time      time     domain     edit     edit     edit      edit     *
* step (s)  step (s)   end (s)  step (s) step (s)  step (s)  step (s)  *
* 1.000E-03 3.000E-01 2.000E+02 1.003E+02 2.000E+00 1.003E+02 1.003E+02 *
*************************************************************************
```

44

steady-state calculation heat-transfer/hydraulic time-step ratio is 1.0000E+00
*   convective energy-error controller is 1.0000E+20   w
****

generalized steady-state convergence-test results

problem time is 106.309090 s and time-step size is 0.250027 s
time-step number is 700 and number of outer iterations is 3

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	0.008198	154	2
liquid velocity	2.547990	305	7
gas velocity	-1.628743	305	7
void fraction	0.785299	305	6
liquid temperature	0.002992	290	3
gas temperature	-0.017311	305	7
ncd-gas pressure	-0.000020	50	1

45

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23762E+02 rad/s	2.00000E+02 rad/s	4.25961E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23709E+02 rad/s	2.00000E+02 rad/s	4.25991E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23934E+02 rad/s	2.00000E+02 rad/s	4.25978E+03 kg/s	4.25900E+03 kg/s

generalized steady-state convergence-test results

problem time is 122.454592 s and time-step size is 0.181828 s
time-step number is 800 and number of outer iterations is 2

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	-0.011721	254	2
liquid velocity	0.178387	205	3
gas velocity	-0.111389	290	5
void fraction	0.050457	305	6
liquid temperature	-0.001100	290	4
gas temperature	0.001691	290	4
ncd-gas pressure	-0.000026	50	1

45

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23730E+02 rad/s	2.00000E+02 rad/s	4.25900E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23722E+02 rad/s	2.00000E+02 rad/s	4.25938E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23911E+02 rad/s	2.00000E+02 rad/s	4.25875E+03 kg/s	4.25900E+03 kg/s

generalized steady-state convergence-test results

problem time is 139.896958 s and time-step size is 0.178364 s
time-step number is 900 and number of outer iterations is 3

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	-0.025155	154	2
liquid velocity	-2.935348	305	7
gas velocity	1.930202	305	7
void fraction	-0.701062	305	6
liquid temperature	0.001246	305	6
gas temperature	-0.032385	305	6
ncd-gas pressure	-0.000027	50	1

45

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value
pump 16	0.00000E+00 rad/s	1.23751E+02 rad/s	2.00000E+02 rad/s	4.25876E+03 kg/s	4.25900E+03 kg/s
pump 26	0.00000E+00 rad/s	1.23726E+02 rad/s	2.00000E+02 rad/s	4.25937E+03 kg/s	4.25900E+03 kg/s
pump 36	0.00000E+00 rad/s	1.23937E+02 rad/s	2.00000E+02 rad/s	4.25873E+03 kg/s	4.25900E+03 kg/s

generalized steady-state convergence-test results

problem time is 156.531585 s and time-step size is 0.152480 s
time-step number is 1000 and number of outer iterations is 3

parameters tested for convergence	max.fr.change per second over last time step	component number	cell number
pressure	0.010948	154	2
liquid velocity	-2.801336	290	5
gas velocity	1.117346	290	5
void fraction	-0.170374	290	4
liquid temperature	-0.000871	290	4
gas temperature	0.000768	290	5
ncd-gas pressure	-0.000029	50	1

45

constrained steady-state calculation parameters

component and number	minimum value	adjusted parameter	maximum value	monitored parameter	desired value

```
pump    16   0.00000E+00  1.23800E+02  2.00000E+02  4.25867E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
pump    26   0.00000E+00  1.23767E+02  2.00000E+02  4.25868E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
pump    36   0.00000E+00  1.23966E+02  2.00000E+02  4.25867E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s

           generalized steady-state convergence-test results

      problem time is    172.672565 s and time-step size is    0.116133 s
        time-step number is  1100 and number of outer iterations is  2

    parameters tested    max.fr.change per second   component      cell
     for convergence        over last time step      number       number
          pressure                0.019037             254           2
     liquid velocity             -1.240295             305           7
        gas velocity              0.472313             305           7
       void fraction             -0.306315             305           6
    liquid temperature            0.004046             290           4
       gas temperature           -0.006893             305           6
      ncd-gas pressure           -0.000035              50           1                    45

           constrained steady-state calculation parameters

 component     minimum      adjusted      maximum     monitored     desired
 and number     value      parameter       value      parameter      value
 pump    16  0.00000E+00  1.23828E+02  2.00000E+02  4.25893E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
 pump    26  0.00000E+00  1.23841E+02  2.00000E+02  4.25888E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
 pump    36  0.00000E+00  1.24010E+02  2.00000E+02  4.25897E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s

           generalized steady-state convergence-test results

      problem time is    189.860423 s and time-step size is    0.108199 s
        time-step number is  1200 and number of outer iterations is  3

    parameters tested    max.fr.change per second   component      cell
     for convergence        over last time step      number       number
          pressure                0.033624             154           2
     liquid velocity             -3.315537             305           7
        gas velocity             -1.849876             305           6
       void fraction             -0.696953             305           6                    45 57
    liquid temperature           -0.001120             290           3
       gas temperature           -0.005255             305           6
      ncd-gas pressure           -0.000041              50           1

           constrained steady-state calculation parameters

 component     minimum      adjusted      maximum     monitored     desired
 and number     value      parameter       value      parameter      value
 pump    16  0.00000E+00  1.23809E+02  2.00000E+02  4.25925E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
 pump    26  0.00000E+00  1.23778E+02  2.00000E+02  4.25974E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
 pump    36  0.00000E+00  1.23967E+02  2.00000E+02  4.25957E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s

    endflag =-1.0000E+00                 46

1
 trac large edit                         47

 problem time is 0.000000E+00 s, time-step size is  2.1930E-01 s, time-step number is  1262, outer-iteration number is  2

 maximum convective power differance has been 0.5423525E+08    w    in component  900 at time-1.0000000E+00 s
 time-step size was limited by component 210 at cell   1 to 1.1290E-02 s
 average outer-iteration count over the last 1267 time steps was   2.279
 last minimum number of outer iterations was  2 at time step 1261 (limited by component 190 with fr.error of 2.8460E-06)
 last maximum number of outer iterations was  6 at time step  100 (limited by component 300 with fr.error of 9.9536E-06)
 total number of times that each component (id#) was the last to converge since the last short edit
    0( 10)   18( 12)    0( 14)    0( 16)    0( 17)    0( 18)    0( 54)    1( 52)    0( 50)    0( 49)    0( 91)    0( 56)
    0( 20)    1( 22)    0( 24)    0( 26)    0( 27)    0( 28)    0( 64)    0( 62)    0( 60)    0(202)    0( 59)    0( 92)
    0( 66)   17( 30)   17( 32)    0( 34)    0( 36)    0( 37)    0( 38)    0( 40)    0( 41)    0( 42)    0( 74)    1( 72)
    0( 70)    0( 44)    0( 45)    0( 46)    0( 43)    0( 69)    0( 93)    0( 47)    0( 76)    0( 48)    0(  2)    0(  3)
    0(  4)    0(  5)    0(  6)    0(  7)    7(100)   43(105)  239(190)   22(110)    1(120)    1(400)    2(410)    2(420)
    0(422)    2(180)    0(170)    0(154)    0(150)    0(250)    0(350)    0(112)    2(220)   20(210)  128(205)  172(290)
   10(200)    2(320)   26(310)  443(305)   56(390)   17(300)    5(430)    0(432)    0(254)    0(270)    9(280)    0(354)
    0(370)    3(380)    0(116)    0(212)    0(312)    0(436)    0(216)    0(316)    0(424)    0(578)    0(114)    0(434)
    0(179)    0(169)    0(576)    0(118)    0(214)    0(203)    0(314)    0(438)    0(269)    0(279)    0(369)    0(379)
    0(218)    0(318)    0(  1)                                                                                          48
 current maximum time-step sizes and limitation counts since the last short edit
     delamx         delcmx         deldmx         delemx         delpmx         delrmx         delvmx         delxmx
  1.0000E+08 s   1.0000E+08 s   1.0000E+08 s   1.0000E+08 s   1.0000E+08 s   1.0000E+08 s   1.1286E+01 s   5.0000E+00 s
      74             1              0              0              0              0              0              0
 further limitation counts on what controls delcmx
      dtlmx          dtvmx          dprmx          dtsms          dtrmx          delt/2
        0              1              0              0              0              0

    cpu execution time of this run is 1.841768E+04 s

 total time steps since time 0.0 s is         1262
```

total cpu time since time 0.0 s is 1.841768E+04 s

************************************ signal-variable values at time -0.21930 s ************************************

49

id	sig.var.		id	sig.var.		id	sig.var.		id	sig.var.		id	sig.var.	
1	1.998500E+02	time (s)	11	2.300000E+09	core power (w)	101	5.921511E+02	liq temp (k)	111	5.576127E+06	pressure (pa)	161	4.259223E+03	z lq mf (kg/s)
171	1.590629E+07	pressure (pa)	181	5.593088E+02	liq temp (k)	201	5.918520E+02	liq temp (k)	222	5.566893E+06	pressure (pa)	261	4.259080E+03	z lq mf (kg/s)
271	1.590644E+07	pressure (pa)	281	5.591794E+02	liq temp (k)	301	5.920945E+02	liq temp (k)	333	5.699063E+06	pressure (pa)	361	4.259064E+03	z lq mf (kg/s)
371	1.590640E+07	pressure (pa)	381	5.598837E+02	liq temp (k)	401	1.552666E+07	pressure (pa)	421	1.550000E+07	pressure (pa)	501	4.443107E+06	pressure (pa)
521	-1.143384E+07	pressure (pa)	601	4.443107E+06	pressure (pa)	621	-1.143398E+07	pressure (pa)	701	4.443107E+06	pressure (pa)	721	-1.143395E+07	pressure (pa)
1000	1.728014E+03	z m mfw (kg/s)	1051	5.638953E+06	pressure (pa)	1100	4.144985E+02	z m mfw (kg/s)	1101	5.576127E+06	pressure (pa)	1121	5.546683E+06	pressure (pa)
1135	8.565842E+03	pressure (pa)	1501	1.080653E+03	z lq mf (kg/s)	1541	1.505911E-01	valve farea fr	1700	4.136885E+02	z m mfw (kg/s)	1714	8.300776E+04	pressure (pa)
1903	5.658541E+06	pressure (pa)	1910	5.719226E+06	pressure (pa)	2000	1.533850E+03	z m mfw (kg/s)	2051	5.629317E+06	pressure (pa)	2100	4.146839E+02	z m mfw (kg/s)
2101	5.566893E+06	pressure (pa)	2121	5.549614E+06	pressure (pa)	2135	8.608019E+03	pressure (pa)	2541	1.459406E-01	valve farea fr	2700	4.106589E+02	z m mfw (kg/s)
2714	8.595368E+04	pressure (pa)	2903	5.633935E+06	pressure (pa)	2910	5.696463E+06	pressure (pa)	3000	1.607684E+03	z m mfw (kg/s)	3051	5.819626E+06	pressure (pa)
3100	1.187725E+03	z m mfw (kg/s)	3101	5.699063E+06	pressure (pa)	3121	5.651412E+06	pressure (pa)	3135	1.456314E+04	pressure (pa)	3501	9.452979E+02	z lq mf (kg/s)
3541	1.000000E+00	valve farea fr	3700	1.201459E+03	z m mfw (kg/s)	3714	2.952196E+05	pressure (pa)	3903	5.843500E+06	pressure (pa)	3910	5.909729E+06	pressure (pa)
4001	5.411823E+06	pressure (pa)	4220	1.000000E+00	valve farea fr	4240	0.000000E+00	trp set status	9000	6.091765E+02	a mx sf tp (k)	9010	6.219611E+02	s mx sf tp (k)
9901	4.259230E+03	z m mfw (kg/s)	9902	4.259107E+03	z m mfw (kg/s)	9903	4.259076E+03	z m mfw (kg/s)						

********************************* control-block output values at time -0.21930 s *********************************

49

id	con.blk.		id	con.blk.		id	con.blk.		id	con.blk.		id	con.blk.	
-1	0.000000E+00	k	-2	0.000000E+00	w	-3	1.440000E-01	-	-4	1.551300E+07	pa	-5	1.620300E+07	pa
-6	1.723700E+07	pa	-7	5.742000E+02	k	-8	5.000000E-02	-	-9	-1.379000E+05	pa	-10	4.087000E+05	w
-11	2.423000E-03	s/kg	-12	4.540000E+02	kg/s	-13	4.330000E+06	pa	-14	5.570000E+02	k	-15	5.283260E+00	sqrt(kg/m3)
-16	5.751000E+02	k	-17	1.162000E+00	k	-18	0.000000E+00	k	-19	1.072000E+00	k	-22	0.000000E+00	-
-24	0.000000E+00	-	-26	0.000000E+00	-	-28	0.000000E+00	-	-30	0.000000E+00	-	-32	0.000000E+00	-
-34	0.000000E+00	-	-36	0.000000E+00	-	-38	0.000000E+00	-	-40	0.000000E+00	-	-50	5.759877E+02	k
-55	5.759881E+02	k	-108	5.757300E+02	k	-109	5.757293E+02	k	-110	5.757296E+02	k	-118	3.284233E+01	k
-119	3.284226E+01	k	-120	3.284230E+01	k	-130	1.173035E-02	k	-132	1.212430E-02	k	-134	-1.504360E-03	k
-136	1.149876E+00	k	-138	1.148371E+00	k	-140	3.674788E+01	k	-142	0.000000E+00	-	-148	1.000000E+00	-
-149	1.502804E-02	k	-150	1.502804E-02	k	-152	8.044176E-03	-	-154	3.600000E-02	-	-156	2.895903E-04	k
-158	1.071710E+00	k	-160	6.296485E-01	k	-162	4.023000E-03	-	-164	2.533076E-03	k	-166	1.069177E+00	k
-168	3.421367E+01	k	-170	0.000000E+00	-	-208	5.755157E+02	k	-209	5.755143E+02	k	-210	5.755150E+02	k
-218	3.267262E+01	k	-219	3.267497E+01	k	-220	3.267380E+01	k	-230	7.731550E-03	k	-232	8.194382E-03	k
-234	-1.504360E-03	k	-236	1.153806E+00	k	-238	1.152301E+00	k	-240	3.687364E+01	k	-242	0.000000E+00	-
-248	1.000000E+00	-	-249	3.361817E-02	k	-250	3.361817E-02	k	-252	1.775180E-02	k	-254	3.600000E-02	-
-256	6.390649E-04	k	-258	1.071361E+00	k	-260	4.150053E-01	k	-262	4.023000E-03	-	-264	1.669567E-03	k
-266	1.069691E+00	k	-268	3.423012E+01	k	-270	0.000000E+00	-	-308	5.759891E+02	k	-309	5.759881E+02	k
-310	5.759886E+02	k	-318	3.221077E+01	k	-319	3.221221E+01	k	-320	3.221149E+01	k	-330	1.655509E-02	k
-332	1.707072E-02	k	-334	-1.504360E-03	k	-336	1.144929E+00	k	-338	1.143425E+00	k	-340	3.658960E+01	k
-342	0.000000E+00	-	-348	1.000000E+00	-	-349	2.404430E-02	k	-350	2.404430E-02	k	-352	1.264746E-02	k
-354	3.600000E-02	-	-356	4.553086E-04	k	-358	1.071545E+00	k	-360	8.886254E-01	k	-362	4.023000E-03	-
-364	3.574940E-03	k	-366	1.067970E+00	k	-368	3.417503E+01	k	-370	0.000000E+00	-	-406	4.613388E-01	-
-408	4.580000E-01	-	-410	3.338842E-03	-	-412	2.363531E-02	-	-414	3.699068E-01	-	-430	-1.300000E+04	pa
-432	-1.000000E+02	paxs	-434	-1.300833E+04	pa	-436	1.022721E+05	w	-438	0.000000E+00	-	-440	0.000000E+00	-
-442	0.000000E+00	-	-444	0.000000E+00	w	-446	1.022721E+05	w	-448	1.000000E+00	-	-450	1.022721E+05	w
-521	-1.000000E+07	pa	-621	-1.000000E+07	pa	-721	-1.000000E+07	pa	-1000	1.000000E+00	-	-1001	4.144985E+02	-
-1002	4.168928E+00	-	-1004	5.164026E-01	-	-1005	5.153498E-01	-	-1006	4.650164E-03	-	-1007	1.000000E-01	s
-1008	1.465016E-02	-	-1009	8.236047E+00	kg/s	-1010	1.995594E-02	-	-1011	3.460611E-02	-	-1012	5.435173E-03	s
-1013	3.514962E-02		-1014	1.857407E-01		-1104	8.565842E+03		-1106	7.846452E+01		-1109	4.145484E+02	

id	value	id	value	id	value	id	value	id	value
	-		-		pa		m2xsqrt(pa)		kg/s
-1110	0.000000E+00	-1112	0.000000E+00	-1114	0.000000E+00	-1116	0.000000E+00	-1118	0.000000E+00
	-		-		-		-		-
-1160	0.000000E+00	-1162	0.000000E+00	-1704	8.300776E+04	-1706	4.235198E+02	-2000	1.000000E+00
	-		-		pa		kg/s		kg/s
-2001	4.146839E+02	-2002	3.698841E+00	-2004	1.217531E-01	-2005	1.196297E-01	-2006	4.003703E-01
	kg/s		kg/s		-		-		-
-2007	1.000000E-01	-2008	4.103703E-01	-2009	-1.720601E+02	-2010	-4.169016E-01	-2011	-6.531306E-03
	s		-		kg/s		-		-
-2012	3.062041E-02	-2013	-3.469264E-03	-2014	1.424713E-01	-2104	8.608019E+03	-2106	7.865745E+00
	s		-		-		pa		m2xsqrt(pa)
-2109	4.155677E+01	-2110	0.000000E+00	-2112	0.000000E+00	-2114	0.000000E+00	-2116	0.000000E+00
	kg/s		-		-		-		-
-2118	0.000000E+00	-2160	0.000000E+00	-2162	0.000000E+00	-2704	8.595368E+04	-2706	2.177261E+02
	-		-		-		pa		kg/s
-3000	1.000000E+00	-3001	1.187725E+03	-3002	1.353582E+00	-3004	6.293942E-01	-3004	6.293942E-01
	m2xsqrt(pa)		m2xsqrt(pa)		m2xsqrt(pa)		-		-
-3005	6.294477E-01	-3005	6.294477E-01	-3006	-1.094477E-01	-3006	-1.094477E-01	-3007	-1.000000E-01
	-		-		-		-		s
-3007	-1.000000E-01	-3008	-1.194477E-01	-3008	-1.194477E-01	-3009	1.369408E+02	-3009	1.369408E+02
	s		-		-		kg/s		kg/s
-3010	3.318075E-01	-3010	3.318075E-01	-3011	2.123597E-01	-3011	2.123597E-01	-3012	1.000000E-01
	-		-		-		-		s
-3012	1.000000E-01	-3013	1.000000E-01	-3013	1.000000E-01	-3014	1.000000E+00	-3014	1.000000E+00
	s		-		-		-		-
-3104	1.456314E+04	-3104	1.456314E+04	-3106	1.773952E+02	-3106	1.023094E+02	-3109	9.372248E+02
	pa		pa		m2xsqrt(pa)		m2xsqrt(pa)		kg/s
-3110	0.000000E+00	-3112	0.000000E+00	-3114	1.000000E+00	-3116	0.000000E+00	-3118	0.000000E+00
	-		-		-		-		-
-3160	0.000000E+00	-3162	0.000000E+00	-3704	2.952196E+05	-3706	7.987061E+02	-4241	5.617200E+06
	-		-		pa		kg/s		pa
-4242	1.000000E+00	-4243	5.200000E-01	-4300	5.593000E+02	-4302	3.812800E+06	-4304	5.751000E+02
	-		-		k		pa		k
-4310	5.757296E+02	-4312	5.759886E+02	-4314	5.759886E+02	-4316	1.668863E+01	-4318	1.000000E+00
	k		k		k		k		-
-4320	9.983023E-01	-4330	5.760223E+02	-4332	9.222566E-01	-4334	0.000000E+00	-4336	0.000000E+00
	-		k		k		-		-
-4338	0.000000E+00	-4340	0.000000E+00	-4342	0.000000E+00	-9901	1.237870E+02	-9902	1.237503E+02
	-		-		-		rad/s		rad/s
-9903	1.239520E+02								
	rad/s								

49

** trip set status at time -0.21930 s **

id	set status	id	set status	id	set status	id	set status	id	set status
1	on-forward	10	off	12	off	14	off	16	off
18	off	20	off	21	off	22	off	24	off
26	off	28	off	30	off	32	off	34	off
36	off	38	off	40	off	42	off	44	off
46	off	48	off	50	off	52	off	54	off
56	off	58	off	60	off	100	off	110	off
120	off	200	off	210	off	220	off	300	off
310	off	320	off	-407	on-forward	422	off	423	off
450	on-reverse	460	on-reverse	520	on-reverse	620	on-reverse	720	on-reverse
1001	off	1002	off	1003	off	1010	off	1020	off
1030	off	1040	off	1050	off	1060	off	1500	off
2010	off	2020	off	2030	off	2040	off	2050	off
2060	off	3010	off	3020	off	3030	off	3040	off
3050	off	3060	off	3500	off	9996	off	9997	off
9998	off	9999	off						

49

************************************** trip signal values at time -0.21930 s **************************************

id	trp.sig.	id	trp.sig.	id	trp.sig.	id	trp.sig.	id	trp.sig.
1	1.000000E+20	10	1.000000E+20	12	1.000000E+20	14	1.000000E+20	16	1.000000E+20
	s		-		-		-		-
18	1.000000E+20	20	1.000000E+20	21	1.000000E+20	22	1.000000E+20	24	1.000000E+20
	-		-		-		-		-
26	1.000000E+20	28	1.000000E+20	30	1.000000E+20	32	1.000000E+20	34	1.000000E+20
	-		-		-		-		-
36	1.000000E+20	38	1.000000E+20	40	1.000000E+20	42	1.000000E+20	44	1.000000E+20
	-		-		-		-		-
46	1.000000E+20	48	1.000000E+20	50	1.000000E+20	52	1.000000E+20	54	1.000000E+20
	-		-		-		w		pa
56	1.000000E+20	58	1.000000E+20	60	1.000000E+20	100	1.000000E+20	110	1.000000E+20
	-		pa		pa		-		kg/s
120	1.000000E+20	200	1.000000E+20	210	1.000000E+20	220	1.000000E+20	300	1.000000E+20
	k		-		kg/s		k		-
310	1.000000E+20	320	1.000000E+20	-407	4.613388E-01	422	1.000000E+20	423	1.000000E+20
	kg/s		k		-		-		s
450	1.000000E+20	460	1.000000E+20	520	1.000000E+20	620	1.000000E+20	720	1.000000E+20
	pa		pa		m		m		m
1001	1.000000E+20	1002	1.000000E+20	1003	1.000000E+20	1010	1.000000E+20	1020	1.000000E+20
	pa		pa		pa		-		-
1030	1.000000E+20	1040	1.000000E+20	1050	1.000000E+20	1060	1.000000E+20	1500	1.000000E+20
	-		kg/s		kg/s		pa		kg/s
2010	1.000000E+20	2020	1.000000E+20	2030	1.000000E+20	2040	1.000000E+20	2050	1.000000E+20
	-		-		-		kg/s		kg/s
2060	1.000000E+20	3010	1.000000E+20	3020	1.000000E+20	3030	1.000000E+20	3040	1.000000E+20
	pa		-		-		-		kg/s
3050	1.000000E+20	3060	1.000000E+20	3500	1.000000E+20	9996	1.000000E+20	9997	1.000000E+20
	kg/s		pa		kg/s		s		s
9998	1.000000E+20	9999	1.000000E+20						
	s		s						

49

```
at time    0.0000 s in component number 931 at cell   7, the maximum stanton number is 1.759790E+03
at time    3.1031 s in component number 906 at cell   1, the minimum tld is 6.220945E+02 k
            where tld is the liquid temperature at bubble detachment from a heated surface

##########  1890 lines deleted here  ##########

-------------------------------------------------------------------------------------------------------------
      55555 22222                                                                                       77777
      5         2 time is       0.000000 s, time-step size is     0.219304 s, time-step number is  1262     7
      55555 22222                                                                                          7
          5 2                                $7$ rod guide tube 6 (short)                                 7
      55555 22222                                                                                        7
-------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is    7, first junction number is    7, and second junction number is  99

                  ncd-gas
      pressure    pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas   wf.liq.
cell     pa          pa          -         k         k         k       kg/m3     kg/m3       m/s        m/s        -
  1 1.56852E+07 0.00000E+00 0.000E+00 6.189E+02 5.928E+02 6.189E+02 6.803E+02 1.039E+02  1.122E+00  1.125E+00 2.449E-02
  2 1.56792E+07 0.00000E+00 0.000E+00 6.188E+02 5.928E+02 6.188E+02 6.803E+02 1.039E+02  1.122E+00  1.124E+00 6.479E-03
  3                                                                                     1.122E+00  1.124E+00 3.571E-02

pipe  component  total coolant mass is  2.50635E+01 kg , total coolant energy is  3.57175E+07 w*s, and
computed initial total coolant mass is  2.61042E+01 kg

-------------------------------------------------------------------------------------------------------------
      55555 33333                                                                                 1  00000 00000
      5         3 time is       0.000000 s, time-step size is     0.219304 s, time-step number is  1262  11   0   0 0   0
      55555 33333                                                                                 1   0   0 0   0
          5     3                            $100$ steam-gen boiler 1                             1   0   0 0   0
      55555 33333                                                                               111  00000 00000
-------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is 100, first junction number is 100, and second junction number is 105

                  ncd-gas
      pressure    pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas   wf.liq.
cell     pa          pa          -         k         k         k       kg/m3     kg/m3       m/s        m/s        -
  1 5.67851E+06 0.00000E+00 1.433E-01 5.452E+02 5.430E+02 5.452E+02 7.717E+02 2.904E+01  7.674E-01  1.190E+00 7.465E-01
  2 5.67112E+06 0.00000E+00 4.860E-01 5.451E+02 5.444E+02 5.451E+02 7.692E+02 2.900E+01  5.881E-01  1.140E+00 1.162E-02
  3 5.66577E+06 0.00000E+00 6.248E-01 5.450E+02 5.453E+02 5.450E+02 7.674E+02 2.897E+01  9.438E-01  1.452E+00 1.110E-02
  4 5.66125E+06 0.00000E+00 6.982E-01 5.450E+02 5.453E+02 5.450E+02 7.674E+02 2.895E+01  1.245E+00  1.952E+00 1.078E-02
  5 5.65704E+06 0.00000E+00 7.285E-01 5.449E+02 5.452E+02 5.449E+02 7.676E+02 2.893E+01  1.478E+00  2.541E+00 1.052E-02
  6 5.65293E+06 0.00000E+00 7.415E-01 5.449E+02 5.452E+02 5.449E+02 7.676E+02 2.890E+01  1.572E+00  3.142E+00 1.040E-02
  7 5.64884E+06 0.00000E+00 7.385E-01 5.448E+02 5.451E+02 5.449E+02 7.678E+02 2.888E+01  1.569E+00  3.843E+00 1.032E-02
  8                                  50                                                 1.541E+00  4.565E+00 3.735E-03

total power to the component from all heat-transfer surfaces is  7.721081E+08   w
total power to the liquid is  7.717426E+08   w    and total power to the gas is  3.655038E+05   w

pipe  component  total coolant mass is  1.36755E+04 kg , total coolant energy is  1.72130E+10 w*s, and
computed initial total coolant mass is  2.51389E+04 kg                                                  50

-------------------------------------------------------------------------------------------------------------
      55555 4   4                                                                                 1  00000 55555
      5     4   4 time is       0.000000 s, time-step size is     0.219304 s, time-step number is  1262  11   0   0 5
      55555 44444                                                                                 1   0   0 55555
          5     4                            $105$ separator & dome 1                             1   0   0     5
      55555     4                                                                               111  00000 55555
-------------------------------------------------------------------------------------------------------------

the component type is a tee, component number is 105, first junction number is 105, second junction number is 190,
third junction number is 110, and internal-junction main-tube cell number is    6

tee primary side

                  ncd-gas
      pressure    pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas   wf.liq.
cell     pa          pa          -         k         k         k       kg/m3     kg/m3       m/s        m/s        -
  1 5.64609E+06 0.00000E+00 7.397E-01 5.448E+02 5.448E+02 5.448E+02 7.683E+02 2.887E+01  1.541E+00  4.565E+00 3.735E-03
  2 5.64315E+06 0.00000E+00 7.420E-01 5.448E+02 5.448E+02 5.448E+02 7.684E+02 2.885E+01  1.630E+00  4.816E+00 4.207E-03
  3 5.64080E+06 0.00000E+00 7.457E-01 5.447E+02 5.447E+02 5.447E+02 7.684E+02 2.884E+01  1.644E+00  4.805E+00 4.206E-03
  4 5.63899E+06 0.00000E+00 8.049E-01 5.447E+02 5.447E+02 5.447E+02 7.685E+02 2.883E+01  1.668E+00  4.784E+00 4.241E-03
  5 5.63901E+06 0.00000E+00 7.856E-01 5.447E+02 5.447E+02 5.447E+02 7.685E+02 2.883E+01  1.574E+00  3.207E+00 3.913E-03
  6 5.63899E+06 0.00000E+00 7.731E-01 5.447E+02 5.447E+02 5.447E+02 7.685E+02 2.883E+01  1.093E+00  2.507E+00 4.052E-03
  7 5.63899E+06 0.00000E+00 7.693E-01 5.447E+02 5.447E+02 5.448E+02 7.685E+02 2.881E+01  1.029E+00  2.203E-03 4.235E-03
  8 5.63899E+06 0.00000E+00 7.591E-01 5.447E+02 5.447E+02 5.447E+02 7.685E+02 2.883E+01  1.058E+00  2.731E-03 4.170E-03
  9                                  50                                                 8.380E-01 -5.660E-03 4.684E-03

total power to the component from all heat-transfer surfaces is -3.523715E+05   w
total power to the liquid is -3.329648E+05   w    and total power to the gas is -1.940673E+04   w

tee secondary side

                  ncd-gas
      pressure    pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas   wf.liq.
cell     pa          pa          -         k         k         k       kg/m3     kg/m3       m/s        m/s        -
  1 5.63539E+06 0.00000E+00 8.851E-01 5.447E+02 5.446E+02 5.447E+02 7.688E+02 2.881E+01  5.701E-03  3.695E+00 4.566E-03
  2 5.63421E+06 0.00000E+00 8.432E-01 5.447E+02 5.444E+02 5.447E+02 7.690E+02 2.880E+01  1.843E-03  3.230E+00 4.386E-03
  3 5.63352E+06 0.00000E+00 1.000E+00 5.446E+02 5.446E+02 5.446E+02 7.686E+02 2.880E+01 -1.204E-01  2.845E+00 3.995E-03
  4 5.63337E+06 0.00000E+00 1.000E+00 5.446E+02 5.446E+02 5.446E+02 7.686E+02 2.880E+01  1.982E+00  2.121E+00 4.787E-03
  5                                                                                     1.112E+02  1.116E+02 2.513E-02

total power to the component from all heat-transfer surfaces is -1.430041E+04   w
```

```
ne component  total  coolant mass is  [illegible] kg , total coolant energy is  [illegible] w*s, and        50
omputed initial total coolant mass is  1.58810E+03 kg

-------------------------------------------------------------------------------------------------------------
    55555 55555                                                                                 1   99999 00000
    5     5     time is      0.000000 s, time-step size is    0.219304 s, time-step number is  1262  11    9   9 0   0
    55555 55555                                                                                 1   99999 0   0
        5     5                         $190$ steam-gen downcomer 1                             1       9 0   0
    55555 55555                                                                               111   99999 00000
-------------------------------------------------------------------------------------------------------------

he component type is a tee, component number is 190, first junction number is 190, second junction number is 100,
hird junction number is 185, and internal-junction main-tube cell number is   3

he primary side

                   ncd-gas
      pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas    wf.liq.
ell     pa           pa           -         k         k         k        kg/m3     kg/m3       m/s         m/s         -
 1 5.64274E+06 0.00000E+00 3.401E-01 5.448E+02 5.447E+02 5.448E+02 7.685E+02 2.885E+01  8.380E-01 -5.660E-03 4.684E-03
 2 5.64662E+06 0.00000E+00 3.020E-01 5.448E+02 5.448E+02 5.448E+02 7.684E+02 2.887E+01  2.987E-01  4.001E-03 5.081E-03
 3 5.64918E+06 0.00000E+00 0.000E+00 5.448E+02 5.319E+02 5.448E+02 7.916E+02 2.888E+01  2.914E-01 -1.270E+00 4.952E-03
 4 5.65219E+06 0.00000E+00 0.000E+00 5.449E+02 5.319E+02 5.449E+02 7.916E+02 2.890E+01  2.602E-01  2.568E-01 4.954E-03
 5 5.65850E+06 0.00000E+00 0.000E+00 5.449E+02 5.319E+02 5.449E+02 7.917E+02 2.893E+01  2.520E-01  2.486E-01 8.918E-02
 6 5.66805E+06 0.00000E+00 0.000E+00 5.450E+02 5.319E+02 5.450E+02 7.916E+02 2.899E+01  6.493E-01  6.460E-01 7.476E-02
 7 5.67328E+06 0.00000E+00 0.000E+00 5.451E+02 5.319E+02 5.451E+02 7.915E+02 2.902E+01  1.767E+00  1.765E+00 3.326E-02
 8 5.68111E+06 0.00000E+00 0.000E+00 5.452E+02 5.320E+02 5.452E+02 7.914E+02 2.906E+01  4.188E+00  4.185E+00 4.770E-03
 9 5.69064E+06 0.00000E+00 0.000E+00 5.453E+02 5.321E+02 5.453E+02 7.914E+02 2.911E+01  4.188E+00  4.185E+00 4.770E-03
10 5.70017E+06 0.00000E+00 0.000E+00 5.454E+02 5.321E+02 5.454E+02 7.913E+02 2.916E+01  4.189E+00  4.185E+00 4.770E-03
11 5.70970E+06 0.00000E+00 0.000E+00 5.455E+02 5.322E+02 5.455E+02 7.912E+02 2.922E+01  4.189E+00  4.186E+00 4.770E-03
12 5.71923E+06 0.00000E+00 0.000E+00 5.456E+02 5.322E+02 5.456E+02 7.912E+02 2.927E+01  4.189E+00  4.186E+00 4.770E-03
13                              50                                                        7.674E-01  1.190E+00 7.465E-01

otal power to the component from all heat-transfer surfaces is  2.886260E+06   w
otal power to the liquid is  2.886260E+06   w    and total power to the gas is  0.000000E+00   w

he secondary side

                   ncd-gas
      pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas    wf.liq.
ell     pa           pa           -         k         k         k        kg/m3     kg/m3       m/s         m/s         -
 1 5.65995E+06 0.00000E+00 0.000E+00 5.449E+02 4.884E+02 5.449E+02 8.502E+02 2.894E+01 -4.986E+00 -4.990E+00 1.289E-01
 2                                                                                       -4.986E+00 -4.990E+00 1.970E-02

he  component  total  coolant mass is  2.36555E+04 kg , total coolant energy is  2.71195E+10 w*s, and        50
omputed initial total coolant mass is  8.75075E+03 kg

-------------------------------------------------------------------------------------------------------------
    55555 66666                                                                                 1     1   00000
    5     6     time is      0.000000 s, time-step size is    0.219304 s, time-step number is  1262  11    11    0   0
    55555 66666                                                                                 1     1    0   0
        5 6   6                         $110$ main steam line 1                                 1     1    0   0
    55555 66666                                                                               111   111   00000
-------------------------------------------------------------------------------------------------------------

he component type is a tee, component number is 110, first junction number is 110, second junction number is 120,
hird junction number is 112, and internal-junction main-tube cell number is  16

he primary side

                   ncd-gas
      pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas    wf.liq.
ell     pa           pa           -         k         k         k        kg/m3     kg/m3       m/s         m/s         -
 1 5.57985E+06 0.00000E+00 1.000E+00 5.440E+02 5.440E+02 5.437E+02 7.697E+02 2.856E+01  1.112E+02  1.116E+02 2.513E-02
 2 5.57691E+06 0.00000E+00 1.000E+00 5.440E+02 5.440E+02 5.438E+02 7.698E+02 2.852E+01  6.870E+01  6.892E+01 3.175E-03
 3 5.57615E+06 0.00000E+00 1.000E+00 5.440E+02 5.440E+02 5.439E+02 7.698E+02 2.850E+01  4.961E+01  4.972E+01 3.309E-03
 4 5.57422E+06 0.00000E+00 9.999E-01 5.440E+02 5.440E+02 5.439E+02 7.698E+02 2.848E+01  6.866E+01  6.888E+01 3.176E-03
 5 5.56758E+06 0.00000E+00 9.999E-01 5.439E+02 5.439E+02 5.438E+02 7.700E+02 2.845E+01  1.118E+02  1.120E+02 2.992E-03
 6 5.56433E+06 0.00000E+00 9.999E-01 5.439E+02 5.439E+02 5.438E+02 7.701E+02 2.843E+01  6.865E+01  6.898E+01 3.176E-03
 7 5.56256E+06 0.00000E+00 9.999E-01 5.438E+02 5.438E+02 5.438E+02 7.701E+02 2.842E+01  4.949E+01  4.984E+01 3.309E-03
 8 5.56080E+06 0.00000E+00 9.999E-01 5.438E+02 5.438E+02 5.438E+02 7.701E+02 2.840E+01  4.950E+01  4.985E+01 3.309E-03
 9 5.55904E+06 0.00000E+00 9.999E-01 5.438E+02 5.438E+02 5.438E+02 7.702E+02 2.839E+01  4.950E+01  4.987E+01 3.309E-03
10 5.55729E+06 0.00000E+00 9.999E-01 5.438E+02 5.438E+02 5.437E+02 7.702E+02 2.838E+01  4.951E+01  4.988E+01 3.309E-03
11 5.55553E+06 0.00000E+00 9.999E-01 5.437E+02 5.437E+02 5.437E+02 7.702E+02 2.837E+01  4.952E+01  4.990E+01 3.309E-03
12 5.55378E+06 0.00000E+00 9.999E-01 5.437E+02 5.437E+02 5.437E+02 7.703E+02 2.836E+01  4.953E+01  4.991E+01 3.309E-03
13 5.55202E+06 0.00000E+00 9.999E-01 5.437E+02 5.437E+02 5.437E+02 7.703E+02 2.835E+01  4.954E+01  4.993E+01 3.309E-03
14 5.55027E+06 0.00000E+00 9.999E-01 5.437E+02 5.437E+02 5.437E+02 7.703E+02 2.835E+01  4.954E+01  4.994E+01 3.309E-03
15 5.54851E+06 0.00000E+00 9.999E-01 5.437E+02 5.437E+02 5.436E+02 7.704E+02 2.834E+01  4.955E+01  4.996E+01 3.309E-03
16 5.54718E+06 0.00000E+00 9.999E-01 5.437E+02 5.437E+02 5.436E+02 7.704E+02 2.833E+01  4.956E+01  4.997E+01 3.309E-03
17                                                                                        4.957E+01  4.998E+01 3.309E-03

    idr   liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
ell  -    ----- w/m2/k ------     w/k         w          w         k                k
 1 11.0   8.530E-01 4.695E+05 9.511E+05-3.025E-01-1.354E+02 5.445E+02     543.68
 2 11.0   1.713E+00 2.535E+05 1.789E+06-3.338E-01-1.744E+02 5.445E+02     543.80
 3 11.0   2.501E+00 1.508E+05 1.465E+06-2.843E-01-1.967E+02 5.445E+02     543.87
 4 11.0   4.302E+00 1.124E+05 1.411E+06-3.300E-01-2.030E+02 5.445E+02     543.89
 5 11.0   5.269E+00 1.357E+05 1.418E+06-4.313E-01-1.863E+02 5.444E+02     543.81
 6 11.0   4.352E+00 1.645E+05 1.406E+06-2.854E-01-1.762E+02 5.444E+02     543.79
 7 11.0   4.167E+00 1.321E+05 1.382E+06-2.034E-01-1.833E+02 5.443E+02     543.78
 8 11.0   4.488E+00 1.128E+05 1.369E+06-1.770E-01-1.848E+02 5.443E+02     543.77
 9 11.0   4.769E+00 1.015E+05 1.362E+06-1.630E-01-1.835E+02 5.443E+02     543.76
10 11.0   5.031E+00 9.496E+04 1.357E+06-1.570E-01-1.808E+02 5.443E+02     543.74
11 11.0   5.282E+00 9.115E+04 1.355E+06-1.558E-01-1.777E+02 5.442E+02     543.72
```

```
 12 11.0  5.530E+00 8.893E+04 1.354E+06-1.577E-01-1.743E+02 5.442E+02      543.70
 13 11.0  5.777E+00 8.765E+04 1.353E+06-1.615E-01-1.710E+02 5.442E+02      543.68
 14 11.0  6.026E+00 8.689E+04 1.352E+06-1.664E-01-1.677E+02 5.442E+02      543.66
 15 11.0  6.277E+00 8.643E+04 1.352E+06-1.720E-01-1.645E+02 5.442E+02      543.64
 16 11.0  6.424E+00 9.310E+04 6.871E+05-1.950E-01-1.586E+02 5.442E+02      543.62

total power to the component from all heat-transfer surfaces is -2.935938E+04   w
total power to the liquid is -3.013810E+01   w    and total power to the gas is -2.932924E+04   w

total convective energy transported to the fluid from component wall: -9.9544288E+06 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                  inside convective energy error: absolute=  2.60243E+07 w*s     effective= -2.46493E+06 w*s

tee secondary side

                  ncd-gas
      pressure    pressure   void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas   wf.liq.
cell     pa          pa         -         k         k         k       kg/m3     kg/m3      m/s        m/s        -
  1 5.54696E+06 0.00000E+00 1.000E+00 5.436E+02 5.436E+02 5.444E+02 7.704E+02 2.821E+01 -8.652E-03  3.939E-05 3.200E-01
  2                                                                                    -6.050E-03  3.072E-05 3.200E-01

    idr   liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
cell  -   ----- w/m2/k ------     w/k        w          w          k             k
  1  3.0  0.000E+00 2.654E+01 4.639E+01 0.000E+00-1.986E+01 5.441E+02     543.66

total power to the component from all heat-transfer surfaces is -3.805560E+01   w
total power to the liquid is  0.000000E+00   w    and total power to the gas is -3.805560E+01   w

tee wall total power loss on the inner surface is  2.33171E+04   w    and on the outer surface is  0.00000E+00   w

tee  component  total  coolant mass is  5.75163E+02 kg , total coolant energy is  1.49013E+09 w*s, and
computed initial total coolant mass is  5.57889E+02 kg

##########  2099 lines deleted here  ##########

---------------------------------------------------------------------------------------------------------------------
  1    1   00000                                                                                   33333   1   88888
 11   11   0   0 time is      0.000000 s, time-step size is     0.219304 s, time-step number is  1262     3  11   8   8
  1    1   0   0                                                                                   33333   1   88888
  1    1   0   0                           $318$ msl 3 porv boundary                                   3   1   8   8
111  111   00000                                                                                   33333  111  88888
---------------------------------------------------------------------------------------------------------------------

the component type is a break, component number is 318, and junction number is 318

                  ncd-gas
      pressure    pressure   void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas   wf.liq.
cell     pa          pa         -         k         k         k       kg/m3     kg/m3      m/s        m/s        -
  1 1.01350E+05 0.00000E+00 1.000E+00 3.734E+02 3.732E+02 3.732E+02 9.581E+02 5.885E-01  0.000E+00  0.000E+00 0.000E+00
  2                                                                                     0.000E+00  0.000E+00 0.000E+00

ncd-gas mass inflow to the break is  0.00000E+00  kg/s  and total ncd-gas mass in to the break is  0.00000E+00 kg
coolant mass inflow to the break is  0.00000E+00  kg/s  and total coolant mass in to the break is  0.00000E+00 kg

---------------------------------------------------------------------------------------------------------------------
  1    1    1                                                                                                   1
 11   11   11   time is      0.000000 s, time-step size is     0.219304 s, time-step number is  1262               11
  1    1    1                                                                                                   1
  1    1    1                              $1$ reactor vessel                                                    1
111  111  111                                                                                                 111
---------------------------------------------------------------------------------------------------------------------

the component type is a vessel, the component number is   1, and the junction numbers are    10    20    30    19    29    39
                                                                                              2     3     4     5     6     7
                                                                                             94    95    96    97    98    99

level  1 data                                                                                                    51

alpn        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            -

rovn        1.05620E+02  1.05619E+02  1.05620E+02  1.05619E+02  1.05620E+02  1.05619E+02  1.05843E+02  1.05843E+02
            1.05843E+02  1.05843E+02  1.05843E+02  1.05843E+02
            kg/m3

roln        7.53774E+02  7.54347E+02  7.54478E+02  7.54615E+02  7.53910E+02  7.53207E+02  7.53786E+02  7.54360E+02
            7.54490E+02  7.54623E+02  7.53920E+02  7.53217E+02
            kg/m3

vvnyt      -1.71889E-03  3.87624E-04 -7.42757E-04  1.78877E-03 -1.17812E-04  4.03219E-04 -6.68265E-02  6.46697E-02
           -6.58090E-02  6.72151E-02 -6.39050E-02  6.46561E-02
            m/s

vvnz        4.51604E+00  4.48593E+00  4.51093E+00  4.48372E+00  4.51497E+00  4.49444E+00 -1.67215E+01 -1.68575E+01
           -1.67165E+01 -1.68562E+01 -1.67206E+01 -1.68658E+01
            m/s

vvnxr      -2.64293E+00 -2.63446E+00 -2.64204E+00 -2.63407E+00 -2.64276E+00 -2.63610E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

vlnyt      -1.74526E-03  4.13377E-04 -7.68896E-04  1.81528E-03 -1.43322E-04  4.28976E-04 -6.68262E-02  6.46701E-02
           -6.58091E-02  6.72147E-02 -6.39057E-02  6.46566E-02
            m/s
```

```
vlnz      4.51190E+00  4.48179E+00  4.50679E+00  4.47959E+00  4.51083E+00  4.49030E+00 -1.67140E+01 -1.68501E+01
         -1.67091E+01 -1.68487E+01 -1.67132E+01 -1.68584E+01
          m/s

vlnxr    -2.63829E+00 -2.62981E+00 -2.63740E+00 -2.62942E+00 -2.63812E+00 -2.63144E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

tvn       6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19758E+02  6.19758E+02
          6.19758E+02  6.19758E+02  6.19758E+02  6.19758E+02
          k

tln       5.59561E+02  5.59274E+02  5.59208E+02  5.59139E+02  5.59493E+02  5.59845E+02  5.59570E+02  5.59282E+02
          5.59217E+02  5.59150E+02  5.59503E+02  5.59855E+02
          k

tsat      6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19758E+02  6.19758E+02
          6.19758E+02  6.19758E+02  6.19758E+02  6.19758E+02
          k

pn        1.58408E+07  1.58407E+07  1.58408E+07  1.58407E+07  1.58408E+07  1.58407E+07  1.58610E+07  1.58610E+07
          1.58610E+07  1.58610E+07  1.58610E+07  1.58610E+07
          pa

pan       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          pa

conc      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

solid     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          kg/m3

level  2 data

alpn      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

rovn      1.05347E+02  1.05347E+02  1.05347E+02  1.05347E+02  1.05347E+02  1.05347E+02  1.06696E+02  1.06700E+02
          1.06696E+02  1.06700E+02  1.06696E+02  1.06699E+02
          kg/m3

roln      7.53758E+02  7.54329E+02  7.54462E+02  7.54598E+02  7.53893E+02  7.53192E+02  7.53841E+02  7.54415E+02
          7.54545E+02  7.54678E+02  7.53974E+02  7.53272E+02
          kg/m3

vvnyt     3.30133E-03 -2.35950E-03  2.64322E-03 -3.37696E-03  2.08269E-03 -2.29068E-03 -6.73939E-02  6.55485E-02
         -6.66061E-02  6.77439E-02 -6.49555E-02  6.56634E-02
          m/s

##########  613 lines deleted here  ##########

tvn       6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02
          6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02
          k

tln       5.76196E+02  5.76549E+02  5.76221E+02  5.76553E+02  5.76202E+02  5.76528E+02  5.71731E+02  5.73686E+02
          5.71638E+02  5.73673E+02  5.71713E+02  5.73776E+02
          k

tsat      6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02
          6.18830E+02  6.18830E+02  6.18830E+02  6.18830E+02
          k

pn        1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07
          1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07
          pa

pan       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          pa

conc      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

solid     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          kg/m3

level 12 data                                                                                                   51

alpn      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

rovn      1.03780E+02  1.03780E+02  1.03780E+02  1.03780E+02  1.03780E+02  1.03780E+02  1.01931E+02  1.01931E+02
          1.01931E+02  1.01931E+02  1.01931E+02  1.01931E+02
          kg/m3

roln      7.04574E+02  7.04534E+02  7.04637E+02  7.04544E+02  7.04583E+02  7.04432E+02  7.08582E+02  7.08582E+02
          7.08582E+02  7.08582E+02  7.08582E+02  7.08582E+02
          kg/m3
```

```
vvnyt      -2.72334E-02  2.88037E-02 -2.84270E-02  2.71077E-02 -2.95349E-02  2.92796E-02  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

vvnz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

vvnxr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

vlnyt      -2.72334E-02  2.88037E-02 -2.84269E-02  2.71076E-02 -2.95348E-02  2.92796E-02  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

vlnz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

vlnxr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

tvn         6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.17905E+02  6.17905E+02
            6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
            k

tln         5.82977E+02  5.82994E+02  5.82948E+02  5.82990E+02  5.82972E+02  5.83040E+02  5.81000E+02  5.81000E+02
            5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
            k

tsat        6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.17905E+02  6.17905E+02
            6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
            k

pn          1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.55000E+07  1.55000E+07
            1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
            pa

pan         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            pa

conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            -

solid       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            kg/m3

total power to the vessel coolant from all heat surfaces is  2.29951E+09   w                                  51
total power to the liquid is  2.29951E+09   w    and total power to the gas is  0.00000E+00   w

vessel lower plenum
liquid volume is  2.33861E+01 m3 , liquid volume fraction is  1.00000E+00 and liquid mass is  1.76345E+04 kg
volume-averaged liquid temperature is  5.59422E+02 k and volume-averaged saturation temperature is  6.19688E+02 k

vessel reactor core
liquid volume fraction is  1.00000E+00 and liquid mass is  1.05398E+04 kg
volume-averaged liquid temperature is  5.80884E+02 k and volume-averaged saturation temperature is  6.19192E+02 k

vessel reactor core
inlet  liquid mass flow is  1.26440E+04  kg/s  and inlet  gas mass flow is  0.00000E+00  kg/s
outlet liquid mass flow is  1.26440E+04  kg/s  and outlet gas mass flow is  0.00000E+00  kg/s               51

vessel upper plenum
liquid volume fraction is  1.00000E+00 and liquid mass is  2.48499E+04 kg
volume-averaged liquid temperature is  5.85162E+02 k and volume-averaged saturation temperature is  6.19152E+02 k

vessel downcomer
liquid volume fraction is  0.00000E+00, liquid mass is  0.00000E+00 kg , volume-averaged pressure is  0.00000E+00  pa
volume-averaged liquid temperature is  0.00000E+00 k and volume-averaged saturation temperature is  0.00000E+00 k

vessel component total coolant mass is  6.84358E+04 kg , total coolant energy is  9.08112E+10 w*s, and        51
computed initial total coolant mass is  6.78684E+04 kg

----------------------------------------------------------------------------------------------------------------------
  1     1   22222                                                                                    99999 00000 00000
 11    11       2 time is      0.000000 s, time-step size is     0.219304 s, time-step number is  1262 9   9 0   0 0   0
  1     1   22222                                                                                    99999 0   0 0   0
  1     1   2                              $900$ reactor-core fuel rods                                  9 0   0 0   0
111   111   22222                                                                                    99999 00000 00000
----------------------------------------------------------------------------------------------------------------------
                52
the heat-structure component type is a rod  and the component number is 900

reactor-core power is 2.300000E+09   w    and neutron multiplication constant keff is 1.000000

rod   1   plane (perpendicular to z direction) coupled to cells   0 (inner) and   1 (outer), peaking factor is   1.0000

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 1.0052E+03 9.8669E+02 9.3278E+02 8.4820E+02 7.4015E+02 5.9859E+02 5.8897E+02 5.8000E+02
```

```
1002   2  9.1440E-01 1.3598E+03 1.3197E+03 1.2048E+03 1.0313E+03 8.2282E+02 6.2438E+02 6.0811E+02 5.9287E+02
1003   3  1.8288E+00 1.4322E+03 1.3875E+03 1.2599E+03 1.0680E+03 8.3978E+02 6.3679E+02 6.1950E+02 6.0329E+02
1004   4  2.7432E+00 1.3646E+03 1.3250E+03 1.2116E+03 1.0398E+03 8.3286E+02 6.3956E+02 6.2371E+02 6.0887E+02
1005   5  3.6576E+00 1.0440E+03 1.0244E+03 9.6729E+02 8.7780E+02 7.6375E+02 6.2301E+02 6.1328E+02 6.0420E+02

 id  idi   hliqi       tliqi        hvapi       tvapi      ido   hliqo       tliqo        hvapo       tvapo        hgap
          w/m2/k         k         w/m2/k         k               w/m2/k        k          w/m2/k         k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1574E+04  5.6826E+02  0.0000E+00  6.1936E+02  3.0807E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1973E+04  5.7296E+02  0.0000E+00  6.1936E+02  3.7750E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2192E+04  5.8210E+02  0.0000E+00  6.1925E+02  3.9555E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2374E+04  5.8952E+02  0.0000E+00  6.1914E+02  3.8153E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2696E+04  5.9254E+02  0.0000E+00  6.1902E+02  3.1882E+03

 heat flux to the hydro cells
 idz    qliqi       qvapi        qtoti       qchfi    qchfi/qtoti   qliqo       qvapo        qtoto       qchfo    qchfo/qtoto
         w/m2        w/m2         w/m2        w/m2         -         w/m2        w/m2         w/m2        w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.7053E+05  0.0000E+00  3.7053E+05  2.0137E+06  5.43E+00
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.3648E+05  0.0000E+00  6.3648E+05  2.0149E+06  3.17E+00
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.8218E+05  0.0000E+00  6.8218E+05  2.0168E+06  2.96E+00
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.2660E+05  0.0000E+00  6.2660E+05  2.0172E+06  3.22E+00
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.8123E+05  0.0000E+00  3.8123E+05  2.0169E+06  5.29E+00

        stanton      liq.temp.     stanton     liq.temp.
        number      bubble det.     number    bubble det.
 id   inner surf.   inner surf.  outer surf.  outer surf.
           -             k            -            k
1001  0.00000E+00  2.73150E+02  4.17175E-04  6.19359E+02
1002  0.00000E+00  2.73150E+02  6.45040E-04  6.19248E+02
1003  0.00000E+00  2.73150E+02  8.79880E-04  6.19136E+02
1004  0.00000E+00  2.73150E+02  1.02606E-03  6.19023E+02
1005  0.00000E+00  2.73150E+02  7.29101E-04  6.19023E+02

total convective energy to the fluid during hydro solution:
                     inside surface=  0.0000000E+00 w*s       outside surface=  1.7021290E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
          inside convective energy error: absolute=  0.00000E+00 w*s      effective=  0.00000E+00 w*s
   52    outside convective energy error: absolute=  1.10575E+09 w*s      effective= -4.78088E+08 w*s

rod    2   plane (perpendicular to z direction) coupled to cells   0 (inner) and   2 (outer), peaking factor is   1.0000

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 1.0049E+03 9.8642E+02 9.3252E+02 8.4796E+02 7.3994E+02 5.9834E+02 5.8872E+02 5.7974E+02
1002   2  9.1440E-01 1.3595E+03 1.3194E+03 1.2046E+03 1.0311E+03 8.2264E+02 6.2414E+02 6.0787E+02 5.9263E+02
1003   3  1.8288E+00 1.4319E+03 1.3873E+03 1.2597E+03 1.0678E+03 8.3961E+02 6.3658E+02 6.1928E+02 6.0307E+02
1004   4  2.7432E+00 1.3644E+03 1.3248E+03 1.2114E+03 1.0396E+03 8.3271E+02 6.3936E+02 6.2352E+02 6.0868E+02
1005   5  3.6576E+00 1.0438E+03 1.0242E+03 9.6710E+02 8.7762E+02 7.6359E+02 6.2282E+02 6.1309E+02 6.0401E+02

 id  idi   hliqi       tliqi        hvapi       tvapi      ido   hliqo       tliqo        hvapo       tvapo        hgap
          w/m2/k         k         w/m2/k         k               w/m2/k        k          w/m2/k         k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1544E+04  5.6799E+02  0.0000E+00  6.1936E+02  3.0798E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1944E+04  5.7270E+02  0.0000E+00  6.1936E+02  3.7740E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2162E+04  5.8186E+02  0.0000E+00  6.1925E+02  3.9545E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2333E+04  5.8930E+02  0.0000E+00  6.1914E+02  3.8144E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2630E+04  5.9233E+02  0.0000E+00  6.1902E+02  3.1875E+03

 heat flux to the hydro cells
 idz    qliqi       qvapi        qtoti       qchfi    qchfi/qtoti   qliqo       qvapo        qtoto       qchfo    qchfo/qtoto
         w/m2        w/m2         w/m2        w/m2         -         w/m2        w/m2         w/m2        w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.7053E+05  0.0000E+00  3.7053E+05  2.0142E+06  5.44E+00
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.3649E+05  0.0000E+00  6.3649E+05  2.0155E+06  3.17E+00
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.8218E+05  0.0000E+00  6.8218E+05  2.0176E+06  2.96E+00
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.2660E+05  0.0000E+00  6.2660E+05  2.0183E+06  3.22E+00
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.8123E+05  0.0000E+00  3.8123E+05  2.0182E+06  5.29E+00

        stanton      liq.temp.     stanton     liq.temp.
        number      bubble det.     number    bubble det.
 id   inner surf.   inner surf.  outer surf.  outer surf.
           -             k            -            k
1001  0.00000E+00  2.73150E+02  4.15745E-04  6.19359E+02
1002  0.00000E+00  2.73150E+02  6.42170E-04  6.19249E+02
1003  0.00000E+00  2.73150E+02  8.75169E-04  6.19137E+02
1004  0.00000E+00  2.73150E+02  1.02017E-03  6.19023E+02
1005  0.00000E+00  2.73150E+02  7.25875E-04  6.19023E+02

total convective energy to the fluid during hydro solution:
                     inside surface=  0.0000000E+00 w*s       outside surface=  1.7023117E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
          inside convective energy error: absolute=  0.00000E+00 w*s      effective=  0.00000E+00 w*s
   52    outside convective energy error: absolute=  1.11409E+09 w*s      effective= -4.60890E+08 w*s

rod    3   plane (perpendicular to z direction) coupled to cells   0 (inner) and   3 (outer), peaking factor is   1.0000

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 1.0049E+03 9.8634E+02 9.3245E+02 8.4789E+02 7.3987E+02 5.9826E+02 5.8864E+02 5.7966E+02
1002   2  9.1440E-01 1.3594E+03 1.3193E+03 1.2045E+03 1.0310E+03 8.2257E+02 6.2406E+02 6.0779E+02 5.9254E+02
1003   3  1.8288E+00 1.4318E+03 1.3872E+03 1.2596E+03 1.0678E+03 8.3954E+02 6.3648E+02 6.1919E+02 6.0297E+02
1004   4  2.7432E+00 1.3643E+03 1.3247E+03 1.2112E+03 1.0395E+03 8.3262E+02 6.3925E+02 6.2341E+02 6.0857E+02
1005   5  3.6576E+00 1.0437E+03 1.0241E+03 9.6699E+02 8.7752E+02 7.6350E+02 6.2271E+02 6.1298E+02 6.0390E+02

 id  idi   hliqi       tliqi        hvapi       tvapi      ido   hliqo       tliqo        hvapo       tvapo        hgap
          w/m2/k         k         w/m2/k         k               w/m2/k        k          w/m2/k         k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1566E+04  5.6792E+02  0.0000E+00  6.1936E+02  3.0796E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1964E+04  5.7263E+02  0.0000E+00  6.1936E+02  3.7736E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2188E+04  5.8178E+02  0.0000E+00  6.1925E+02  3.9541E+03
```

1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2374E+04	5.8921E+02	0.0000E+00	6.1914E+02	3.8139E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2695E+04	5.9224E+02	0.0000E+00	6.1902E+02	3.1871E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.7053E+05	0.0000E+00	3.7053E+05	2.0136E+06	5.43E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3649E+05	0.0000E+00	6.3649E+05	2.0148E+06	3.17E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.8218E+05	0.0000E+00	6.8218E+05	2.0168E+06	2.96E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2660E+05	0.0000E+00	6.2660E+05	2.0171E+06	3.22E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.8123E+05	0.0000E+00	3.8123E+05	2.0168E+06	5.29E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.14873E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	6.40620E-04	6.19248E+02
1003	0.00000E+00	2.73150E+02	8.72309E-04	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.01561E-03	6.19023E+02
1005	0.00000E+00	2.73150E+02	7.22017E-04	6.19023E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7022595E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.11082E+09 w*s effective= -4.66580E+08 w*s

rod 4 plane (perpendicular to z direction) coupled to cells 0 (inner) and 4 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.0048E+03	9.8629E+02	9.3240E+02	8.4784E+02	7.3983E+02	5.9821E+02	5.8859E+02	5.7961E+02
1002	2	9.1440E-01	1.3594E+03	1.3193E+03	1.2045E+03	1.0310E+03	8.2254E+02	6.2402E+02	6.0775E+02	5.9250E+02
1003	3	1.8288E+00	1.4318E+03	1.3871E+03	1.2596E+03	1.0677E+03	8.3952E+02	6.3646E+02	6.1916E+02	6.0295E+02
1004	4	2.7432E+00	1.3643E+03	1.3247E+03	1.2112E+03	1.0395E+03	8.3262E+02	6.3925E+02	6.2340E+02	6.0856E+02
1005	5	3.6576E+00	1.0437E+03	1.0241E+03	9.6698E+02	8.7752E+02	7.6349E+02	6.2271E+02	6.1297E+02	6.0390E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1541E+04	5.6786E+02	0.0000E+00	6.1936E+02	3.0794E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1941E+04	5.7257E+02	0.0000E+00	6.1936E+02	3.7734E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2160E+04	5.8173E+02	0.0000E+00	6.1925E+02	3.9539E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2333E+04	5.8918E+02	0.0000E+00	6.1914E+02	3.8139E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2629E+04	5.9221E+02	0.0000E+00	6.1902E+02	3.1871E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.7053E+05	0.0000E+00	3.7053E+05	2.0142E+06	5.44E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3649E+05	0.0000E+00	6.3649E+05	2.0155E+06	3.17E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.8218E+05	0.0000E+00	6.8218E+05	2.0175E+06	2.96E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2660E+05	0.0000E+00	6.2660E+05	2.0183E+06	3.22E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.8123E+05	0.0000E+00	3.8123E+05	2.0182E+06	5.29E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.14860E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	6.40477E-04	6.19249E+02
1003	0.00000E+00	2.73150E+02	8.72272E-04	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.01618E-03	6.19023E+02
1005	0.00000E+00	2.73150E+02	7.23184E-04	6.19023E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7023396E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.12219E+09 w*s effective= -4.58686E+08 w*s

rod 5 plane (perpendicular to z direction) coupled to cells 0 (inner) and 5 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.0051E+03	9.8662E+02	9.3272E+02	8.4814E+02	7.4010E+02	5.9853E+02	5.8891E+02	5.7993E+02
1002	2	9.1440E-01	1.3597E+03	1.3196E+03	1.2048E+03	1.0312E+03	8.2278E+02	6.2432E+02	6.0805E+02	5.9281E+02
1003	3	1.8288E+00	1.4321E+03	1.3875E+03	1.2599E+03	1.0680E+03	8.3973E+02	6.3673E+02	6.1944E+02	6.0323E+02
1004	4	2.7432E+00	1.3646E+03	1.3250E+03	1.2115E+03	1.0397E+03	8.3281E+02	6.3950E+02	6.2366E+02	6.0882E+02
1005	5	3.6576E+00	1.0440E+03	1.0243E+03	9.6723E+02	8.7774E+02	7.6370E+02	6.2295E+02	6.1322E+02	6.0414E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1572E+04	5.6819E+02	0.0000E+00	6.1936E+02	3.0805E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1971E+04	5.7290E+02	0.0000E+00	6.1936E+02	3.7748E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2191E+04	5.8204E+02	0.0000E+00	6.1925E+02	3.9552E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2373E+04	5.8946E+02	0.0000E+00	6.1914E+02	3.8150E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2695E+04	5.9248E+02	0.0000E+00	6.1902E+02	3.1879E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.7053E+05	0.0000E+00	3.7053E+05	2.0136E+06	5.43E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3648E+05	0.0000E+00	6.3648E+05	2.0149E+06	3.17E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.8218E+05	0.0000E+00	6.8218E+05	2.0168E+06	2.96E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2660E+05	0.0000E+00	6.2660E+05	2.0172E+06	3.22E+00

1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.8123E+05	0.0000E+00	3.8123E+05	2.0169E+06	5.29E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.16733E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	6.44190E-04	6.19248E+02
1003	0.00000E+00	2.73150E+02	8.78424E-04	6.19136E+02
1004	0.00000E+00	2.73150E+02	1.02405E-03	6.19023E+02
1005	0.00000E+00	2.73150E+02	7.27747E-04	6.19023E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7021451E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.10630E+09 w*s effective= -4.76767E+08 w*s

rod 6 plane (perpendicular to z direction) coupled to cells 0 (inner) and 6 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.0055E+03	9.8699E+02	9.3307E+02	8.4846E+02	7.4039E+02	5.9888E+02	5.8926E+02	5.8028E+02
1002	2	9.1440E-01	1.3601E+03	1.3200E+03	1.2051E+03	1.0316E+03	8.2304E+02	6.2467E+02	6.0840E+02	5.9316E+02
1003	3	1.8288E+00	1.4325E+03	1.3879E+03	1.2602E+03	1.0683E+03	8.4000E+02	6.3708E+02	6.1980E+02	6.0359E+02
1004	4	2.7432E+00	1.3650E+03	1.3254E+03	1.2119E+03	1.0400E+03	8.3309E+02	6.3985E+02	6.2401E+02	6.0918E+02
1005	5	3.6576E+00	1.0444E+03	1.0247E+03	9.6759E+02	8.7807E+02	7.6399E+02	6.2330E+02	6.1357E+02	6.0450E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1556E+04	5.6854E+02	0.0000E+00	6.1936E+02	3.0817E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1955E+04	5.7325E+02	0.0000E+00	6.1936E+02	3.7763E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2165E+04	5.8238E+02	0.0000E+00	6.1925E+02	3.9568E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2331E+04	5.8980E+02	0.0000E+00	6.1914E+02	3.8165E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2630E+04	5.9282E+02	0.0000E+00	6.1902E+02	3.1892E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.7053E+05	0.0000E+00	3.7053E+05	2.0144E+06	5.44E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3648E+05	0.0000E+00	6.3648E+05	2.0156E+06	3.17E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.8218E+05	0.0000E+00	6.8218E+05	2.0177E+06	2.96E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2660E+05	0.0000E+00	6.2660E+05	2.0184E+06	3.22E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.8123E+05	0.0000E+00	3.8123E+05	2.0183E+06	5.29E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.19529E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	6.49442E-04	6.19248E+02
1003	0.00000E+00	2.73150E+02	8.87654E-04	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.03743E-03	6.19023E+02
1005	0.00000E+00	2.73150E+02	7.37553E-04	6.19023E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7020583E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.11769E+09 w*s effective= -4.83729E+08 w*s

rod 7 plane (perpendicular to z direction) coupled to cells 0 (inner) and -1 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3349E+03	1.2962E+03	1.1855E+03	1.0179E+03	8.1594E+02	6.1885E+02	6.0290E+02	5.8795E+02
1002	2	9.1440E-01	1.9489E+03	1.8656E+03	1.6255E+03	1.2733E+03	8.8472E+02	6.5837E+02	6.3161E+02	6.0637E+02
1003	3	1.8288E+00	2.0557E+03	1.9676E+03	1.7062E+03	1.3182E+03	8.9474E+02	6.7289E+02	6.4449E+02	6.1766E+02
1004	4	2.7432E+00	1.9453E+03	1.8632E+03	1.6269E+03	1.2794E+03	8.9435E+02	6.7237E+02	6.4630E+02	6.2170E+02
1005	5	3.6576E+00	1.3856E+03	1.3447E+03	1.2277E+03	1.0506E+03	8.3804E+02	6.4335E+02	6.2722E+02	6.1211E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1574E+04	5.6826E+02	0.0000E+00	6.1936E+02	3.7129E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1973E+04	5.7296E+02	0.0000E+00	6.1936E+02	5.5533E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2192E+04	5.8210E+02	0.0000E+00	6.1925E+02	6.0731E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2674E+04	5.8952E+02	0.0000E+00	6.1914E+02	5.5751E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2696E+04	5.9254E+02	0.0000E+00	6.1902E+02	3.8673E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0137E+06	3.24E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0149E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0168E+06	1.76E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0172E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3971E+05	0.0000E+00	6.3971E+05	2.0169E+06	3.15E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	7.00023E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.22007E-03	6.19248E+02
1003	0.00000E+00	2.73150E+02	1.63486E-03	6.19136E+02
1004	0.00000E+00	2.73150E+02	1.85131E-03	6.11480E+02

1005	0.00000E+00	2.73150E+02	1.22344E-03	6.19023E+02

rod 8 plane (perpendicular to z direction) coupled to cells 0 (inner) and -2 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3346E+03	1.2959E+03	1.1852E+03	1.0177E+03	8.1575E+02	6.1860E+02	6.0265E+02	5.8770E+02
1002	2	9.1440E-01	1.9487E+03	1.8653E+03	1.6252E+03	1.2731E+03	8.8457E+02	6.5814E+02	6.3139E+02	6.0614E+02
1003	3	1.8288E+00	2.0555E+03	1.9674E+03	1.7060E+03	1.3180E+03	8.9460E+02	6.7269E+02	6.4428E+02	6.1745E+02
1004	4	2.7432E+00	1.9451E+03	1.8630E+03	1.6267E+03	1.2793E+03	8.9425E+02	6.7223E+02	6.4615E+02	6.2155E+02
1005	5	3.6576E+00	1.3854E+03	1.3446E+03	1.2275E+03	1.0505E+03	8.3791E+02	6.4318E+02	6.2705E+02	6.1193E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1544E+04	5.6799E+02	0.0000E+00	6.1936E+02	3.7118E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1944E+04	5.7270E+02	0.0000E+00	6.1936E+02	5.5516E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2162E+04	5.8186E+02	0.0000E+00	6.1925E+02	6.0714E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2600E+04	5.8930E+02	0.0000E+00	6.1914E+02	5.5740E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2630E+04	5.9233E+02	0.0000E+00	6.1902E+02	3.8665E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0142E+06	3.24E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0155E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0176E+06	1.76E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0183E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3971E+05	0.0000E+00	6.3971E+05	2.0182E+06	3.15E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	6.97622E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.21478E-03	6.19249E+02
1003	0.00000E+00	2.73150E+02	1.62636E-03	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.84093E-03	6.11463E+02
1005	0.00000E+00	2.73150E+02	1.21803E-03	6.19023E+02

rod 9 plane (perpendicular to z direction) coupled to cells 0 (inner) and -3 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3345E+03	1.2958E+03	1.1852E+03	1.0176E+03	8.1569E+02	6.1852E+02	6.0256E+02	5.8762E+02
1002	2	9.1440E-01	1.9485E+03	1.8652E+03	1.6251E+03	1.2731E+03	8.8450E+02	6.5805E+02	6.3129E+02	6.0604E+02
1003	3	1.8288E+00	2.0554E+03	1.9672E+03	1.7058E+03	1.3179E+03	8.9453E+02	6.7259E+02	6.4418E+02	6.1734E+02
1004	4	2.7432E+00	1.9450E+03	1.8629E+03	1.6266E+03	1.2792E+03	8.9418E+02	6.7214E+02	6.4605E+02	6.2145E+02
1005	5	3.6576E+00	1.3853E+03	1.3444E+03	1.2273E+03	1.0504E+03	8.3781E+02	6.4306E+02	6.2692E+02	6.1180E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1566E+04	5.6792E+02	0.0000E+00	6.1936E+02	3.7115E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1964E+04	5.7263E+02	0.0000E+00	6.1936E+02	5.5509E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2188E+04	5.8178E+02	0.0000E+00	6.1925E+02	6.0706E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2619E+04	5.8921E+02	0.0000E+00	6.1914E+02	5.5733E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2695E+04	5.9224E+02	0.0000E+00	6.1902E+02	3.8660E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0136E+06	3.24E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0148E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0168E+06	1.76E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0171E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3971E+05	0.0000E+00	6.3971E+05	2.0168E+06	3.15E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	6.96158E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.21185E-03	6.19248E+02
1003	0.00000E+00	2.73150E+02	1.62108E-03	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.83271E-03	6.11471E+02
1005	0.00000E+00	2.73150E+02	1.21156E-03	6.19023E+02

rod 10 plane (perpendicular to z direction) coupled to cells 0 (inner) and -4 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3344E+03	1.2958E+03	1.1851E+03	1.0176E+03	8.1565E+02	6.1848E+02	6.0252E+02	5.8757E+02
1002	2	9.1440E-01	1.9485E+03	1.8651E+03	1.6251E+03	1.2730E+03	8.8448E+02	6.5802E+02	6.3126E+02	6.0601E+02
1003	3	1.8288E+00	2.0554E+03	1.9672E+03	1.7058E+03	1.3179E+03	8.9452E+02	6.7257E+02	6.4416E+02	6.1733E+02
1004	4	2.7432E+00	1.9450E+03	1.8629E+03	1.6266E+03	1.2792E+03	8.9418E+02	6.7214E+02	6.4605E+02	6.2146E+02
1005	5	3.6576E+00	1.3853E+03	1.3444E+03	1.2274E+03	1.0504E+03	8.3782E+02	6.4307E+02	6.2693E+02	6.1182E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1541E+04	5.6786E+02	0.0000E+00	6.1936E+02	3.7113E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1941E+04	5.7257E+02	0.0000E+00	6.1936E+02	5.5507E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2160E+04	5.8173E+02	0.0000E+00	6.1925E+02	6.0705E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2579E+04	5.8918E+02	0.0000E+00	6.1914E+02	5.5733E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2629E+04	5.9221E+02	0.0000E+00	6.1902E+02	3.8660E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0142E+06	3.24E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0155E+06	1.89E+00

1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0175E+06	1.76E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0183E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3971E+05	0.0000E+00	6.3971E+05	2.0182E+06	3.15E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	6.96137E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.21163E-03	6.19249E+02
1003	0.00000E+00	2.73150E+02	1.62109E-03	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.83383E-03	6.11459E+02
1005	0.00000E+00	2.73150E+02	1.21351E-03	6.19023E+02

rod 11 plane (perpendicular to z direction) coupled to cells 0 (inner) and -5 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3348E+03	1.2961E+03	1.1854E+03	1.0178E+03	8.1589E+02	6.1878E+02	6.0283E+02	5.8789E+02
1002	2	9.1440E-01	1.9488E+03	1.8655E+03	1.6254E+03	1.2733E+03	8.8468E+02	6.5831E+02	6.3155E+02	6.0631E+02
1003	3	1.8288E+00	2.0557E+03	1.9675E+03	1.7061E+03	1.3181E+03	8.9470E+02	6.7284E+02	6.4443E+02	6.1760E+02
1004	4	2.7432E+00	1.9452E+03	1.8632E+03	1.6268E+03	1.2794E+03	8.9431E+02	6.7233E+02	6.4625E+02	6.2166E+02
1005	5	3.6576E+00	1.3856E+03	1.3447E+03	1.2276E+03	1.0506E+03	8.3800E+02	6.4330E+02	6.2716E+02	6.1205E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1572E+04	5.6819E+02	0.0000E+00	6.1936E+02	3.7126E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1971E+04	5.7290E+02	0.0000E+00	6.1936E+02	5.5529E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2191E+04	5.8204E+02	0.0000E+00	6.1925E+02	6.0726E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2663E+04	5.8946E+02	0.0000E+00	6.1914E+02	5.5748E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2695E+04	5.9248E+02	0.0000E+00	6.1902E+02	3.8670E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0136E+06	3.24E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0149E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0168E+06	1.76E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0172E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3971E+05	0.0000E+00	6.3971E+05	2.0169E+06	3.15E+00

52

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	6.99281E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.21849E-03	6.19248E+02
1003	0.00000E+00	2.73150E+02	1.63221E-03	6.19136E+02
1004	0.00000E+00	2.73150E+02	1.84774E-03	6.11478E+02
1005	0.00000E+00	2.73150E+02	1.22117E-03	6.19023E+02

rod 12 plane (perpendicular to z direction) coupled to cells 0 (inner) and -6 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3352E+03	1.2965E+03	1.1858E+03	1.0182E+03	8.1616E+02	6.1913E+02	6.0319E+02	5.8825E+02
1002	2	9.1440E-01	1.9493E+03	1.8659E+03	1.6258E+03	1.2736E+03	8.8492E+02	6.5866E+02	6.3191E+02	6.0667E+02
1003	3	1.8288E+00	2.0561E+03	1.9679E+03	1.7065E+03	1.3184E+03	8.9495E+02	6.7319E+02	6.4479E+02	6.1797E+02
1004	4	2.7432E+00	1.9456E+03	1.8635E+03	1.6271E+03	1.2796E+03	8.9452E+02	6.7262E+02	6.4655E+02	6.2196E+02
1005	5	3.6576E+00	1.3860E+03	1.3451E+03	1.2280E+03	1.0509E+03	8.3828E+02	6.4366E+02	6.2753E+02	6.1242E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1556E+04	5.6854E+02	0.0000E+00	6.1936E+02	3.7141E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1955E+04	5.7325E+02	0.0000E+00	6.1936E+02	5.5555E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2165E+04	5.8238E+02	0.0000E+00	6.1925E+02	6.0756E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2694E+04	5.8980E+02	0.0000E+00	6.1914E+02	5.5770E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2630E+04	5.9282E+02	0.0000E+00	6.1902E+02	3.8686E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0144E+06	3.24E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0156E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0177E+06	1.76E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0184E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3971E+05	0.0000E+00	6.3971E+05	2.0183E+06	3.16E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	7.03974E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.22831E-03	6.19248E+02
1003	0.00000E+00	2.73150E+02	1.64908E-03	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.87164E-03	6.11477E+02
1005	0.00000E+00	2.73150E+02	1.23763E-03	6.19023E+02

inner-surface node-interval thermal conductivity is 2.77658E+00 w/m/k
outer-surface node-interval thermal conductivity is 1.64769E+01 w/m/k
effective r-direction wall thermal conductivity is 3.59039E+00 w/m/k
which have been axially averaged over all 6 average-power rod s

total inner surface area is 0.00000E+00 m2 and
total outer surface area is 3.96347E+03 m2 of all 6 average-power rod s 52

total power from the heat-structure inner surface is 0.00000E+00 w and outer surface is 2.29995E+09 w

```
average-power rod   6 has the peak surface temperature of  6.09177E+02 k
supplemental  rod  12 has the peak surface temperature of  6.21962E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg

##########  3822 lines deleted here  ##########

-------------------------------------------------------------------------------------------------------------------
  1   33333 22222                                                                                  99999 33333 88888
 11       3     2 time is      0.000000 s, time-step size is     0.219304 s, time-step number is  1262 9   9     3 8   8
  1   33333 22222                                                                                  99999 33333 88888
  1       3 2                             $938$ st-gen-1,2,3 sec.dryer                                   9     3 8   8
111   33333 22222                                                                                  99999 33333 88888
-------------------------------------------------------------------------------------------------------------------
                   53
the heat-structure component type is a rod  and the component number is 938

rod   1   plane (perpendicular to z direction) coupled to cells   1 (inner) and   0 (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.4465E+02 5.4465E+02 5.4466E+02
1002   2  5.7542E+00 5.4463E+02 5.4463E+02 5.4464E+02
1003   3  1.1508E+01 5.4467E+02 5.4467E+02 5.4467E+02

 id  idi    hliqi        tliqi        hvapi       tvapi     ido   hliqo       tliqo       hvapo       tvapo        hgap
            w/m2/k         k          w/m2/k        k             w/m2/k        k         w/m2/k        k         w/m2/k
1001  6  0.0000E+00  5.4211E+02  3.9110E+01  5.4212E+02   1  2.3980E+03  5.4471E+02  0.0000E+00  5.4471E+02  0.0000E+00
1002 12  1.1930E+02  5.4458E+02  1.3598E+02  5.4212E+02   1  2.2846E+03  5.4471E+02  0.0000E+00  5.4471E+02  0.0000E+00
1003 12  4.0255E+01  5.4458E+02  2.9581E-08  5.4466E+02   1  2.2846E+03  5.4471E+02  0.0000E+00  5.4471E+02  0.0000E+00

 heat flux to the hydro cells
 idz      qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
           w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  9.8824E+01  9.8824E+01  0.0000E+00  0.00E+00 -1.2202E+02  0.0000E+00 -1.2202E+02  0.0000E+00  0.00E+00
1002  6.3614E+00  3.4132E+02  3.4768E+02  9.7993E+02  2.82E+00 -1.6181E+02  0.0000E+00 -1.6181E+02  0.0000E+00  0.00E+00
1003  3.6815E+00  3.6806E-10  3.6815E+00  1.9599E+03  5.32E+02 -8.5494E+01  0.0000E+00 -8.5494E+01  0.0000E+00  0.00E+00

       stanton     liq.temp.    stanton     liq.temp.
        number    bubble det.    number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -           k            -           k
1001  0.00000E+00  5.42114E+02  0.00000E+00  5.44709E+02
1002  5.59475E-04  5.44668E+02  0.00000E+00  5.44709E+02
1003  9.57005E-05  5.44668E+02  0.00000E+00  5.44709E+02

total convective energy to the fluid during hydro solution:
                    inside surface= -2.5451896E+07 w*s      outside surface=  1.9726086E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
              inside convective energy error: absolute=  2.96163E+06 w*s     effective=  3.82726E+05 w*s
         53   outside convective energy error: absolute=  1.32942E+06 w*s     effective=  6.89101E+05 w*s

rod   2   plane (perpendicular to z direction) coupled to cells   2 (inner) and**** (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.4452E+02 5.4453E+02 5.4454E+02
1002   2  5.7542E+00 5.4452E+02 5.4452E+02 5.4453E+02
1003   3  1.1508E+01 5.4455E+02 5.4455E+02 5.4456E+02

 id  idi    hliqi        tliqi        hvapi       tvapi     ido   hliqo       tliqo       hvapo       tvapo        hgap
            w/m2/k         k          w/m2/k        k             w/m2/k        k         w/m2/k        k         w/m2/k
1001  6  0.0000E+00  5.4211E+02  3.8457E+01  5.4212E+02   1  2.9429E+03  5.4460E+02  0.0000E+00  5.4460E+02  0.0000E+00
1002 12  1.0656E+02  5.4448E+02  1.2084E+02  5.4212E+02   1  3.3887E+03  5.4460E+02  0.0000E+00  5.4460E+02  0.0000E+00
1003 12  2.5571E+02  5.4448E+02  1.5910E-07  5.4456E+02   1  3.3887E+03  5.4460E+02  0.0000E+00  5.4460E+02  0.0000E+00

 heat flux to the hydro cells
 idz      qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
           w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  9.2414E+01  9.2414E+01  0.0000E+00  0.00E+00 -1.7178E+02  0.0000E+00 -1.7178E+02  0.0000E+00  0.00E+00
1002  4.2538E+00  2.9006E+02  2.9431E+02  0.0000E+00  0.00E+00 -2.1595E+02  0.0000E+00 -2.1595E+02  0.0000E+00  0.00E+00
1003  1.6605E+01 -2.2205E-09  1.6605E+01  0.0000E+00  0.00E+00 -1.4359E+02  0.0000E+00 -1.4359E+02  0.0000E+00  0.00E+00

       stanton     liq.temp.    stanton     liq.temp.
        number    bubble det.    number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -           k            -           k
1001  0.00000E+00  5.42114E+02  0.00000E+00  5.44599E+02
1002  1.17252E-04  5.44568E+02  0.00000E+00  5.44599E+02
1003  4.40330E-04  5.44568E+02  0.00000E+00  5.44599E+02

total convective energy to the fluid during hydro solution:
                    inside surface= -2.5763300E+07 w*s      outside surface=  1.8605412E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
              inside convective energy error: absolute=  3.33010E+06 w*s     effective=  2.44538E+05 w*s
         53   outside convective energy error: absolute=  1.47287E+06 w*s     effective=  6.54068E+05 w*s

rod   3   plane (perpendicular to z direction) coupled to cells   3 (inner) and**** (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.4660E+02 5.4661E+02 5.4663E+02
1002   2  5.7542E+00 5.4666E+02 5.4666E+02 5.4667E+02
1003   3  1.1508E+01 5.4671E+02 5.4671E+02 5.4671E+02
```

```
 id  idi   hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k       k            w/m2/k       k                w/m2/k       k            w/m2/k       k            w/m2/k
1001  6   0.0000E+00   5.4211E+02   4.7332E+01   5.4212E+02   1   1.8116E+03   5.4676E+02   0.0000E+00   5.4676E+02   0.0000E+00
1002  1   8.7408E+02   5.4671E+02   1.0510E+02   5.4212E+02   1   6.6682E+02   5.4676E+02   0.0000E+00   5.4676E+02   0.0000E+00
1003  1   1.2028E+03   5.4671E+02   4.5648E-07   5.4664E+02   1   6.6681E+02   5.4676E+02   1.6367E-09   5.4676E+02   0.0000E+00

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi     qchfi/qtoti   qliqo        qvapo        qtoto        qchfo     qchfo/qtoto
        w/m2         w/m2         w/m2         w/m2          -         w/m2         w/m2         w/m2         w/m2          -
1001  0.0000E+00   2.1209E+02   2.1209E+02   0.0000E+00   0.00E+00 -2.3361E+02   0.0000E+00 -2.3361E+02   0.0000E+00   0.00E+00
1002 -3.6896E+01   4.7759E+02   4.4070E+02   1.9693E+05   4.47E+02 -6.1474E+01   0.0000E+00 -6.1474E+01   0.0000E+00   0.00E+00
1003 -4.5675E-01   2.8836E-08  -4.5675E-01   3.9386E+05   3.94E+05 -3.3261E+01 -8.9924E-11 -3.3261E+01   0.0000E+00   0.00E+00

        stanton      liq.temp.     stanton      liq.temp.
         number     bubble det.     number     bubble det.
 id    inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  5.42114E+02  0.00000E+00  5.46753E+02
1002  0.00000E+00  5.46690E+02  0.00000E+00  5.46753E+02
1003  0.00000E+00  5.46690E+02  0.00000E+00  5.46753E+02

total convective energy to the fluid during hydro solution:
                inside surface= -3.0340471E+07 w*s       outside surface=  1.8410052E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
          inside convective energy error: absolute=  2.84834E+06 w*s     effective=  1.29664E+05 w*s
         outside convective energy error: absolute=  1.89592E+06 w*s     effective=  9.19532E+05 w*s

inner-surface node-interval thermal conductivity is  5.09374E+01   w/m/k
outer-surface node-interval thermal conductivity is  5.09369E+01   w/m/k
effective  r-direction wall thermal conductivity is  5.09372E+01   w/m/k
which have been axially averaged over all    3 average-power rod s

total inner surface area is  6.61197E+02 m2  and
total outer surface area is  6.62564E+02 m2  of all    3 average-power rod s

total power from the heat-structure inner surface is  1.42628E+05   w     and outer surface is -9.21085E+04   w

average-power rod   3 has the peak surface temperature of  5.46708E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg

system results  <------[54]
total power loss by 1-d comp.wall is  3.871331E+05 w*s on the inner surface and  9.682467E+05 w*s on the outer surface

                  system total coolant energy is  9.312152E+18 w*s

                    system total coolant mass is  4.544427E+13 kg

total coolant mass discharged by break components is -3.882591E+04 kg

   total coolant mass injected by fill components is  1.751353E+03 kg

       system computed initial total coolant mass is  4.544427E+13 kg


             constrained steady-state calculation parameters

  component    minimum     adjusted      maximum     monitored     desired
  and number    value      parameter      value      parameter      value
  pump   16  0.00000E+00  1.23787E+02  2.00000E+02  4.25923E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s    <------[55]
  pump   26  0.00000E+00  1.23750E+02  2.00000E+02  4.25911E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s
  pump   36  0.00000E+00  1.23952E+02  2.00000E+02  4.25908E+03  4.25900E+03
                   rad/s        rad/s        rad/s         kg/s         kg/s

 restart dump generated with time of     0.000000 s after  1262 time steps   <------[56]


          *****************
          **   warning   **
          *****************

 *steady* steady-state solution not converged   <------[57]

 current overlays in memory: cbmain

 problem time is      0.000000 s, time-step size is   0.219304 s, time-step number is  1262,
 outer-iteration number is   2, component number is  938, and component type is a rod


 computative timing statistics
 total time is 1.8424E+04 s, cpu time is 1.8424E+04 s, system time is   <------[58]

                        end of problem
```

H.3. Notes on the Transient Calculation TRCOUT-File Segments.

The output from the transient calculation TRCOUT file is reviewed in this section to provide a description of its contents. Items already discussed in Sec. H.1 for the steady-state calculation TRCOUT file will not be discussed here unless additional comments are needed on that item. Notes in this section are referenced by callouts that are marked on the TRCOUT-file segmented output in Section H.4. For example, $\boxed{1}$ is note 1.

1. This is a restart transient calculation from the last restart data dump of the steady-state calculation. The values of all the NAMELIST variables are output. The NAMELIST variables defined by the user in the steady-state calculation have their same values defined for the transient calculation. The only exceptions are IPOWR and TPOWR (which are not defined for the transient calculation because they control the logic for setting the steady-state calculation reactor-core power on) and DTSTRT = 1.0000E-03 s (which defines the initial timestep size for the restart calculation rather than using DELT = 0.219304 s from the last data dump).

2. NCOMP = 131 for the transient calculation is 1 less than for the steady-state calculation because FILL components 202 and 203 are replaced by PIPE component 202 to model the double-ended-guillotine break, single-tube flow path between the primary and secondary sides of the loop 2 steam generator.

3. A new signal variable IDSV = 2020 defines the ISVN = 69 coolant mixture mass flow of the single-tube, double-ended-guillotine break at interface ICN1 = 1 of PIPE component ILCN = 202. This required increasing the 65 signal variables from the steady-state calculation (which will be input from the restart data dump) by 1 to NTSV = 66 signal variables in the transient calculation. An existing control block IDCB = –414 on the restart data dump of the steady-state calculation is reinput by the TRACIN file with no change in its definition as an example of reinputting a control block with the potential of changing its definition. The NTCB = 238 total number of control blocks stays the same.

4. FILL components 91 and 92 are reinput (rather than being input from the restart data dump) to redefine the VMSCL = 0.0000e+00 scalar factor for the VMTBM table to turn off the letdown and makeup flows during the transient calculation.

5. A new PIPE component 202 is input to replace no-flow FILL components 202 and 203 and model the double-ended-guillotine break, single-tube flow path between the TEE component 22 primary-coolant side and TEE component 200 secondary-coolant side of the loop 2 steam generator. Its liquid coolant temperature and pressure are initialized to 5.66000E+02 K (5.5913E+02°F) and 1.54000E+07 Pa (2.2336E+03 psia), which are intermediate values between the JCELL steady-state values of 5.749E+02 K (5.7515E+02°F) and 1.5462E+07 Pa (2.2426E+03 psia) of TEE component 22

and 5.451E+02 K (5.2151E+02°F) and 5.6465E+06 Pa (8.1896E+02 psia) of TEE component 200, respectively.

6. The TRCRST file will be searched for the as yet undefined 65 signal variables, 237 control blocks, 72 trips, and 131 components.

7. The input-data output echo from the TRACIN file ends here. Because the control-parameter and component data were not all defined by the input-data TRACIN file, TRAC-P reads the restart data-dump TRCRST file and outputs the following header information: the date and time the restart data file was created for traceability, the problem title cards, and the timestep number of the restart data dump that is used. Main-Data card 3 variable DSTEP = –1 from the TRACIN file specifies that the last data dump on the TRCRST file is to be used for this restart transient calculation; i.e., the steady-state calculation data dump at timestep number 1262 where problem time 200.0693 s was redefined to be 0.00000E+00 s for the start of the transient calculation.

8. The parameter values from the TRCRST file are output echoed to the TRCOUT file in the same format as if they were defined by the TRACIN file. More parameter values are read from the restart data dump than are shown in the input-data format output echo. The other parameter values that are not output here are defined by the restart data dump to initialize the restart continuation of a time-dependent solution correctly. Had the input-data format parameter values been defined from the TRACIN file, these other parameters would have their values initialized by TRAC-P during the initialization-phase calculation based on assumed steady-state conditions. For the most part, TRAC-P initializes their values to the values that would come from the restart TRCRST file for a steady-state solution data dump (except for the effect of round-off due to fewer digits being defined by the TRACIN-file format). Some parameters, however, will have different values because of their being initialized to the solution state one timestep later or because of their having lost time-history effects from the prior calculation because they are time-constant averaged. In summary, the TRAC-P user should recognize that more parameters are defined from the TRCRST file than from the TRACIN file in defining the control-parameter or component solution state. Some of the parameter values that are initialized by TRAC-P (because they are not defined by the TRACIN file) may have different values than if they were defined from the TRCRST file. This can result in a restart calculation being slightly different based on the initial solution state being defined by the TRCRST file for a time-dependent solution state rather than by the TRACIN file for an assumed steady-state solution state.

9. The initial data dump generated by TRAC-P is identical to the final data dump input from the TRCRST file except for the changes made by the TRACIN file.

10. The loop 2 steam-generator single-tube, double-ended-guillotine break rupture causes a mild transient that depressurizes the primary-coolant

system in < 1000.0 s of problem time. TRAC-P will evaluate TEND = 6.0000E+02 s of that transient with timestep and output-edit control by one Timestep-Data set. NAMELIST variable DTSTRT = 0.001 s rather than DTMIN = 1.0000E-05 s defines the initial timestep size. Short and large edits are to be output every SEDINT = EDINT = 1.0000E+02 s to the TRCOUT file, graphics data are to be output every GFINT = 5.0000E+00 s to the TRCGRF file, and data dumps are to be output every DMPINT = 2.0000E+02 s to the TRCDMP file.

11. The following edit of the reactor-core total power and neutron multiplication constant K_{eff} (plus the core-region averaged reactivity feedback parameters and their associated feedback reactivities if IRPWTY > 10) is generated every NRTS timesteps. Both IRPWTY = 4 and NRTS = 10 were defined on card number 11 of HTSTR component ROD 900. When the reactor-core power is scrammed by trip IRPWTR=10 being set to $ON_{forward}$ at problem time 0.003050 s, this output shows the point-reactor kinetics solution's value of K_{eff} prompt plus decay-heat total power deposited in the fueled rods of the reactor-core region. The value of K_{eff} is affected by the programmed reactivity of the inserted safety control rods (defined by the RPWTBR array component-action table) and the feedback reactivity from changing thermal-hydraulic conditions in the reactor core (if IRPWTY > 10).

12. The initial large edit at the start of this restart transient calculation is the same as the final large edit at the end of the steady-state calculation (at the time of the final data dump) except for the TRACIN-file defined signal variable ID 2020, control block ID–414, and components FILL 91, FILL 92, and PIPE 202 and deleted FILL components 202 and 203. The control-parameter values and some of the component global parameters that are defined one timestep later may have slightly different values.

13. From problem time 0 to 61 s during the transient, messages are output that the trip signals of trip IDs 10, 16, 18, 20, 21, 26, 28, 32, 34, 46, 54, 60, –407, and 422 crossed a tested setpoint and their set status was changed. These messages were output because ITST > 0 for these trips. Other trips with ITST < 0 may have had their trip signal cross a tested setpoint followed by a change of their set status, but messages were not output because their ITST < 0. To control the amount of these trip messages, users generally only define component-action controlling trips with ITST > 0. For example, a coincidence trip controlling a component action would have ITST = 3 > 0 for change messages to be output (trip ID 10 with ITST = 3 controls the reactor-core power scram), but its trip-controlled-trip trip-signal defining trips would have ITST < 0 (the trip ID 10 trip signal is the summed set status of trip IDs 12 and 14, which have ITST = –3). Note that trip ID 21 has a 20.0 s set-status change delay time and trip IDs 26 and 28 have a 30.0 s set-status change delay time as defined by the user through input.

14. Short and large edits are output every SEDINT = EDINT = 1.0000E+02 s and data dumps are output every DMPINT = 2.0000E+02 s. Each of those large edits show only 1141 lines of control-parameter and PIPE IDs 10 and 7,

VESSEL ID 1, and HTSTR RODs 900 and 938 solution-state results, while 8604 lines of the solution-state results for the other 126 components are deleted. These segmented portions of each large edit present a reasonable amount of information and demonstrate the solution state of five components at six different problem times during the transient calculation. The set status of all trips are shown as part of the control-parameter data of each large edit. Trips whose set status changed without a descriptive message being output because ITST < 0 (see note 13) have their set status indicated in each large edit.

H.4. Listing of the Transient Calculation TRCOUT-File Segments.

```
                        transient   reactor   analysis   code

                 tttt                     cccc                 ppppppppppp
               ttt  t                   cc   cc              pp           pp
             ttt                       cc                   pp   ppp         pp
      t    tttt               aa      cc          c        p     pp           pp
     tt  ttt tt             aaaaa    cc          cc        p     pp            pp
     ttttt  tt             aa  aa    ccc     ccc            p p  pp            pp
            tt      rrr   aa    aa   cc ccccc                p   pp           pp
            tt    rrrrr   aa   aaaaa                             pp          pp
            tt   rr  rr   aa  aa aa                              pppp     ppp
           tt    rr  rr   aaaaa                        ****      pp  pppppp
           tt    rr  rr  aa aa                                   pp
           tt   rrr  rrrrr                                       pp
           tt   rr    rr                                        pp
          tt   rr                                               pp
          tt  rr                                                pp
     t   tt                                                 p   pp
     tt  ttt                                                pp ppp
      ttttt                                                  ppppp
```

```
          *****************
          **   warning   **
          *****************

 *trac* this executable has memory preset to zero

 current overlays in memory: cbmain
     real variables preset to zero
     integer variables preset to zero
     ***code may not function in the same manner as***
     ***lanl internal version which presets memory ***
     ***to negative indefinites                    ***
 *** Official TRAC-P Version 5.4.19   ***
Program library created Thu May 2 14:50:51 MDT 1996
```

```
 ---------------------------------------------------------------------------
                    Change History
 ---------------------------------------------------------------------------
  5.4       Date Stamp Fri Apr 2 14:46:00  MDT 1993 **date not automated**
  5.4.01    Date Stamp Thu Jun 9 11:23:55 MDT 1994
  5.4.02    Date Stamp Mon. Oct. 3 1994            **date not automated**
  5.4.03    Date Stamp Thu. Oct 13 1994            **date not automated**
  5.4.04    Date Stamp Thu. Dec 08 1994            **date not automated**
  5.4.05    Date Stamp Tue. Dec 20 1994            **date not automated**
  5.4.06    Date Stamp Tue. Mar 14 1995            **date not automated**
```

```
 5.4.07   Date Stamp Mon June 19 1995              **date not automated**
 5.4.08   Date Stamp Thu June 22 1995              **date not automated**
 5.4.09   Date Stamp Fri July 14 1995              **date not automated**
 5.4.10   Date Stamp Fri. Aug 18 1995              **date revised in 5.4.11**
 5.4.11   Date Stamp Fri Aug. 25 1995              **date not automated**
 5.4.12   Date Stamp Wed Sep 13 13:53:12 MDT 1995
 5.4.13   Date Stamp Fri Oct 27 11:17:11 MDT 1995
 5.4.14   Date Stamp Wed Nov 29 09:26:17 MST 1995
 5.4.15   Date Stamp Mon Dec 4 14:28:15 MST 1995
 5.4.16   Date Stamp Fri Jan 19 10:50:18 MST 1996
 5.4.17   Date Stamp Mon Jan 29 15:45:39 MST 1996
 5.4.18   Date Stamp Wed Apr 17 12:08:23 MDT 1996
 5.4.19   Date Stamp Thu May 2 14:50:51 MDT 1996
----------------------------------------------------------------------------
Version 5.4.01   created from version 5.4      using the following updates:
    fxchfit    pltvar     fxrfdz     fsurflx    vector2
    upnljf     fans792    fxibf      fxcidc     fxwpkxx
    fixml3     fxmfg      fxbktr1    fxtss      upnvp1
    fxcvm      fxmrod     fxb1b2     upxtvp2    fxbit
    morml3     fxsmvt     v5p4p01
Version 5.4.02   created from version 5.4.01   using the following updates:
    uphtmlb    fxlptre    no360      dcomer     fxnffz2
    fxtee      fxltfcb3   fxincb     fxtkf      uphep
    uphsrd2    ieeeg      upmld      brksat     genbrk
    fxlabc     v5p4p02
Version 5.4.03   created from version 5.4.02   using the following updates:
    upmld2     modig      upjfl      fxisrb     fxfxtkf
    hpconv     v5p4p03
Version 5.4.04   created from version 5.4.03   using the following updates:
    updmfc     fxsave     fixcpu     realfix    fxigmod
    fhtbdc     fxetime    cifblas    v5p4p04
Version 5.4.05   created from version 5.4.04   using the following updates:
    fixcdeq    fixsg      v5p4p05
Version 5.4.06   created from version 5.4.05   using the following updates:
    fixtype    units      v5p4p06
Version 5.4.07   created from version 5.4.06   using the following updates:
    cpuprt     v5p4p07
Version 5.4.08   created from version 5.4.07   using the following updates:
    fixbr      fxfachk    fxudid     rstub      v5p4p08
Version 5.4.09   created from version 5.4.08   using the following updates:
    uphsbu     upldpt     fxrgs      upnouc     fixhsft
    hsflip2    cnlist     xtvi3e     fxgbit     fixbul
    gnwkst2    fxnul      ssavg      aenergy    upenwrt
    labout09   upencyl    upenhts    fixb21     v5p4p09
Version 5.4.10   created from version 5.4.09   using the following updates:
    fxnstl     uprad3n    radhyd     radhts     fxshstr
    radrd      radi       gamht1     gamht2     upfind5
    fprad      vmatrix    raddmp3    uplinalg   csst5c
    fxuphts    v5p4p10
Version 5.4.11   created from version 5.4.10   using the following updates:
    fxivsl     fxdef      fxuc2      fixfr      fxifdf
    labout11   fxvstp     v5p4p11
Version 5.4.12   created from version 5.4.11   using the following updates:
    fxvadj2    hpssi      labout12   fxdsln2    fxsct
    fxsahsl    xtvl2b     fixfr2     upenwrt2   fxcnlist
    fxsedit    fxradln    upfxrad    upenrad    ngenwks2
    v5p4p12
Version 5.4.13   created from version 5.4.12   using the following updates:
    fxencyl    rmcom      xtvibm     fxency2    smatsol
    fxname     v5p4p13
Version 5.4.14   created from version 5.4.13   using the following updates:
    newlogo    fxunits    faxbugs    v5p4p14
Version 5.4.15   created from version 5.4.14   using the following updates:
    fxflowin   fxrsudul   fxwhtstr   v5p4p15
Version 5.4.16   created from version 5.4.15   using the following updates:
    ifrd       hp9kdef    rs6kdef    sundef     unixdef
    v5p4p16
Version 5.4.17   created from version 5.4.16   using the following updates:
    prgast     v5p4p17
Version 5.4.18   created from version 5.4.17   using the following updates:
    d2o        fxface2    chdefs     tsdiag2    labout18
    v5p4p18
Version 5.4.19   created from version 5.4.18   using the following updates:
    vectrz     unixdef    v5p4p19
----------------------------------------------------------------------------




                        input data is being processed
main control card parameters

    numctr =          28,      ieos =          0,     inopt =          1,      nmat =          0,      id2o =          0

                           h2o properties are used

number of title cards is:   28
this is a h.b.robinson-2 steam-generator one-tube-rupture transient.
hbr-2 is a 2300 mwt, three-loop westinghouse nuclear plant located
in hartsville, s.c., that is owned and operated by the carolina
power and light company (cp&l).  this plant model was developed for
reactor-coolant pump (rcp) trip analysis by james lime for trac-pf1
```

```
/mod1 on 7/84.  it was converted for trac-pf1/mod2 by robert steinke
and james lime on 5/96.  the trac-pf1/mod2 steady-state calculation
plant model has been modified to handle the following loss-of-coolant
accidents, through transient input-data tracin-file changes, allowing
the same steady-state restart data-dump file to be used:
  1) cold-leg small break without pump trip,
  2) cold-leg small break with pump trip,
  3) one-tube steam generator tube rupture,
  4) two-tube steam generator tube rupture, and
  5) 100% cold-leg degb large break.
this input-data model contains the following components and subsystems:
  1) three-dimensional (r=2,t=6,z=12) reactor vessel;
  2) vessel upper-plenum guide tubes;
  3) powered-rod and unpowered-slab heat structures in the vessel;
  4) three primary- and secondary-coolant loops modeled individually;
  5) makeup, letdown, and pressurizer-sprayer cvcs flows;
  6) accumulator and hpsi fills in each primary-coolant loop;
  7) pressurizer and pressurizer porv and srv;
  8) pressurizer, steam generator, and steam-dump control systems;
  9) single-tube degb leakage path in loop 2 steam generator;
 10) main-steam and steam-dump lines;
 11) high-pressure feedwater system after hp heaters; and
 12) auxiliary-feedwater fills (motor and steam driven).
executed on  /23/96 at  13:51:29
                                                 [1]-[10]
inopts namelist variables
      alp = 1.0000E+20,     ccif = 1.0000E+04,     cfz3 = 1.0000E+20,     chm12 = 1.0000E+00,     chm22 = 1.0000E+00
                  -                 kg/m4                   -                       -                       -
    chm13 = 1.0000E+00,    chm23 = 1.0000E+00,    chm14 = 1.0000E+00,     chm24 = 1.0000E+00,     chm15 = 1.0000E+00
                  -                     -                   -                       -                       -
    chm25 = 1.0000E+00,   dtstrt = 1.0000E-03,    fdfhl = 0.0000E+00
                  -                     s                   -
      hd3 = 1.0000E+20,     hstn = 1.0000E+20,    htcwl = 1.0000E+01
                  m                     k                 w/m2/k
    htcwv = 1.0000E+01,   iadded =         10,   iblaus =          0,    icdelt =          0,    icflow =          2
             w/m2/k
   iconht =          0,    idiag =          0,    ieeeg =          0,      ielv =          0,      igas =          1
   igeom3 =          0,   ih2src =          0,     ihor =          1,     ikfac =          1,      imfr =          3
    inlab =          0,    invan =          0,   iofftk =          0,     iogrf =          0,     ioinp =          0
    iolab =          1,    iooout =         0,    ipowr =          0,    ireset =          0
   isolcn =          0,   istopt =          0
     ithd =          0,   iunlab =          8,   iunout =          1,    levstg =          0,    mhtli =           0
    mhtlo =          0,    mhtvi =          0,    mhtvo =          0,      mwfl =          0,     mwfv =           0
    ndia1 =          1,   newrfd =          1,    nfrc1 =          2,     nfrc3 =          1,   nhtstr =          21
    nifsh =          0,      nlt =         10,    noair =          0,    nosets =          2,    nrslv =           0
     nsdl =         -1,     nsdu =         -1,    nsend =         -1,      nspl =         -1,     nspu =          -1
   nvgrav =          0,        p = 1.0000E+20,       pa = 1.0000E+20,      qppp = 1.0000E+20,    timdl =-1.0000E+00
                                       pa                    pa                    -                        s
    timdu =-1.0000E+00,       tl = 1.0000E+20,    tpowr = 1.0000E+30,        tv = 1.0000E+20,       tw = 1.0000E+20
                  s                     k                    s                     k                        k
       vl = 1.0000E+20,       vv = 1.0000E+20
                m/s                    m/s

si units of the internally defined units-name labels are
  lunounit -           luspvol  m3/kg        luprsrat pa/s          luhtc    w/m2/k       luangle  rad
  lutime   s           lumass   kg           luminert kg*m2         luihttf  w/k          luburnup mwd/mtu
  lutemp   k           lumassfw kg/s         lutorque pa*m3         luenergy w*s          luenfiss mev/fiss
  lutempd  k           lumfwrat kg/s2        lubtork  pa*m3*s/rad   luspener w*s/kg       lugapgas g-moles
  lulength m           lumassfx kg/m2/s      luctork  pa*m3*s2/r2   luspheat w*s/kg/k     lurtmsq  1/k2
  luarea   m2          luvapgen kg/m3/s      lupower  w             lurtime  1/s          lunitnam *
  luvolume m3          luden    kg/m3        lupowrat w/s           lurtemp  1/k          luserdef *
  luvel    m/s         luddendt kg/m3/k      lulinhts w/m           lurmass  1/kg         luserdef *
  luacc    m/s2        luidrag  kg/m4        luheatfx w/m2          lurpress 1/pa         luserdef *
  lupumphd m2/s2       lupressa pa           luvolhts w/m3          luspeed  rad/s        luserdef *
  luvolflw m3/s        lupressd pa           luthcond w/m/k         luradacc rad/s2       luserdef *

 graphics data is defined in si units

 input data is defined in si units

 output data is defined in si units

 you have requested 1-d two-way loss coefficients


 default solubility parameters

    cntlmn = 3.0300E+02,    cnmin = 6.3500E-02,    cntlmx = 3.7300E+02,     cnmax = 2.7600E-01
                   k                     -                     k                      -

 main-data cards              [7]
                                                                              [2]
     dstep =         -1,     timet = 0.0000E+00
                                              s
    stdyst =          0,    transi =          1,     ncomp =        131,      njun =        123,      ipak =           1
      epso = 1.0000E-04,      epss = 1.0000E-04
                   -                       -
    oitmax =         10,    sitmax =         10,    isolut =          1,    ncontr =          0,     nccfl =           0
      ntsv =         66,      ntcb =        238,      ntcf =         80,      ntrp =         72,      ntcp =           1
 homogeneous nucleation tmin used [3]
                                                                                                    [2]
 solute tracking option on

 system components         1   2   3   4   5   6   7  10  12  14  16  17  18  20  22  24  26  27  28  30  32  34  36  37  38
                          40  41  42  43  44  45  46  47  48  49  50  52  54  56  59  60  62  64  66  69  70  72  74  76  91
```

```
    220 250 254 269 270 279 280 290 300 305 310 312 314 316 318 320 350 354 369 370 379 380 390 400 410
    420 422 424 430 432 434 436 438 576 578 900 901 902 903 904 905 906 907 908 909 910 920 930 931 932
    933 934 935 936 937 938
                                                                                                      3
signal-variable data cards

      idsv =       2020,     isvn =         69,     ilcn =        202,     icn1 =          1,     icn2 =          0
      idsv =          0,     isvn =          0,     ilcn =          0,     icn1 =          0,     icn2 =          0

user-defined unit-labels data cards

   lulabel =   lusqrden, lunitsi =lusqrt(kg/m3), luniteng =lusqr(lb/ft3),  ufactor = 2.4986E-01,   ushift = 0.0000E+00
   lulabel =    ludtpdp, lunitsi =        luk/pa, luniteng =      luf/psid,  ufactor = 1.2411E+04,   ushift = 0.0000E+00
   lulabel =   lurpress, lunitsi =        lu1/pa, luniteng =      lu1/psia,  ufactor = 6.8948E+03,   ushift = 0.0000E+00
   lulabel =   lupresst, lunitsi =        lupaxs, luniteng =      lupsidxs,  ufactor = 1.4504E-04,   ushift = 0.0000E+00
   lulabel =    lurtime, lunitsi =         lu1/s, luniteng =         lu1/s,  ufactor = 1.0000E+00,   ushift = 0.0000E+00
   lulabel =   luasqrtp, lunitsi =lum2xsqrt(pa), luniteng =luft2sq(psid),  ufactor = 1.2963E-01,   ushift = 0.0000E+00
   lulabel =   lusqrtml, lunitsi = lusqrt(kgxm), luniteng =lusqr(lbmxft),  ufactor = 2.6894E+00,   ushift = 0.0000E+00
   lulabel =   lurmflow, lunitsi =        lus/kg, luniteng =      luhr/lbm,  ufactor = 1.2600E-04,   ushift = 0.0000E+00

control-block data cards

      idcb =       -414,     icbn =         59,     icb1 =       -410,     icb2 =       -412,     icb3 =          0
    lugain =   lunounit,    luxmin =   lunounit,    luxmax =   lunounit,    lucon1 =   lunounit,    lucon2 =   lunounit
    cbgain = 5.0000E+01,    cbxmin =-1.0000E+00,    cbxmax = 1.0000E+00,    cbcon1 = 8.0000E-01,    cbcon2 = 2.0000E-01
                      -                      -                      -                      -                      -
the above control block has the        -410 ----> **********
 following input ids, function         -412 ----> * wt.sum * ---->  -414
 operator type, and output id                     **********

      idcb =          0,     icbn =          0,     icb1 =          0,     icb2 =          0,     icb3 =          0

trip-dimension data card
      ntse =          3,     ntct =         20,     ntsf =          0,     ntdp =          0,     ntsd =          0

trip data cards

      idtp =          0,     isrt =          0,     iset =          0,     itst =          0,     idsg =          0

-------------------------------------------------------------------------------------------------------------------
                                                                                                       99999   1
                                                                                                       9   9  11
                                             $91$ cvcs 1 (letdown flow)                                99999   1
                                                                                                           9   1
                                                                                                       99999 111
-------------------------------------------------------------------------------------------------------------------

   component number  91,     type = fill       ,       id =         91,   ctitle = $91$ cvcs 1 (letdown flow)
       jun1 =        91,     ifty =          5,      ioff =          0
       iftr =         1,     ifsv =       -414,      nftb =          2,     nfsv =          0,     nfrf =          0
     twtold = 0.0000E+00,    rfmxm = 2.5750E+00,    concin = 0.0000E+00,    felv = 0.0000E+00
                      -                kg/s2                      -                      m
  4    dxin = 1.0000E+00,    volin = 1.0000E+00,     alpin = 0.0000E+00,    vlin = 0.0000E+00,     tlin = 5.5900E+02
                      m                     m3                      -                    m/s                      k
        pin = 1.5500E+07,     pain = 0.0000E+00,    flowin = 0.0000E+00,    vvin = 0.0000E+00,     tvin = 5.5900E+02
                     pa                     pa                   kg/s                    m/s                      k
      vmscl = 0.0000E+00,    vvscl = 0.0000E+00
                      -                      -

vmtbm        0.00000E+00  0.00000E+00  1.00000E+00 -2.57500E+00
             independent variable unit is - and dependent variable unit is kg/s

vmtbabsm     0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00
             independent variable unit is - and dependent variable unit is kg/s

-------------------------------------------------------------------------------------------------------------------
                                                                                                     99999 22222
                                                                                                     9   9     2
                                             $92$ cvcs 2 (makeup flow)                               99999 22222
                                                                                                         9 2
                                                                                                     99999 22222
-------------------------------------------------------------------------------------------------------------------

   component number  92,     type = fill       ,       id =         92,   ctitle = $92$ cvcs 2 (makeup flow)
       jun1 =        92,     ifty =          5,      ioff =          0
       iftr =         1,     ifsv =       -414,      nftb =          2,     nfsv =          0,     nfrf =          0
     twtold = 0.0000E+00,    rfmxm = 1.1289E+00,    concin = 0.0000E+00,    felv = 0.0000E+00
                      -                kg/s2                      -                      m
  4    dxin = 1.0000E+00,    volin = 1.0000E+00,     alpin = 0.0000E+00,    vlin = 0.0000E+00,     tlin = 5.2900E+02
                      m                     m3                      -                    m/s                      k
        pin = 1.5500E+07,     pain = 0.0000E+00,    flowin = 0.0000E+00,    vvin = 0.0000E+00,     tvin = 5.2900E+02
                     pa                     pa                   kg/s                    m/s                      k
      vmscl = 0.0000E+00,    vvscl = 0.0000E+00
                      -                      -

vmtbm       -1.00000E+00  1.12890E+01  0.00000E+00  0.00000E+00
             independent variable unit is - and dependent variable unit is kg/s

vmtbabsm    -1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             independent variable unit is - and dependent variable unit is kg/s

-------------------------------------------------------------------------------------------------------------------
                                                                                               22222 00000 22222
                                                                                                   2 0   0     2
                                             $202$ sgtr (single-tube)                          22222 0   0 22222
```

```
                                                                                                   2     0   0 2
                                                                                                   22222 00000 22222
----------------------------------------------------------------------------------------------------------------------
  component number 202,      type = pipe       ,        id =           202,     ctitle = $202$ sgtr (single-tube)      5
   ncells =          10,     nodes =            0,     jun1 =          201,      jun2 =          203,       epsw = 0.0000E+00
                                                                                                                          m
       ichf =           1,      iconc =           1,      iacc =            0,      ipow =            0
      radin = 1.0000E-02,          th = 1.3000E-03,      houtl = 0.0000E+00,      houtv = 0.0000E+00,       toutl = 3.0000E+02
                       m                          m                w/m2/k                     w/m2/k                        k
      toutv = 3.0000E+02
                       k

dx           5.00000E-01  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
             1.00000E+00  5.00000E-01
                       m

vol          3.04340E-04  6.08680E-04  6.08680E-04  6.08680E-04  6.08680E-04  6.08680E-04  6.08680E-04  6.08680E-04
             6.08680E-04  3.04340E-04
                      m3

fa           1.21736E-03  6.08680E-04  6.08680E-04  6.08680E-04  6.08680E-04  6.08680E-04  6.08680E-04  6.08680E-04
             6.08680E-04  6.08680E-04  1.21736E-03
                      m2

fric         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00
                       -

fricr        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00
                       -

grav         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00
                       -

hd           1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02  1.96850E-02
             1.96850E-02  1.96850E-02  1.96850E-02
                       m

icflg                  0            0            0            0            0            0            0            0
                       0            1            0

nff                   -1           -1           -1           -1           -1           -1           -1           -1
                      -1           -1           -1

alp          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00      5
                       -

vl           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00
                     m/s

vv           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00
                     m/s

tl           5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02
             5.66000E+02  5.66000E+02
                       k                   5

tv           5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02  5.66000E+02
             5.66000E+02  5.66000E+02
                       k

p            1.54000E+07  1.54000E+07  1.54000E+07  1.54000E+07  1.54000E+07  1.54000E+07  1.54000E+07  1.54000E+07
             1.54000E+07  1.54000E+07      5
                      pa

pa           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00
                      pa

conc         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00
                       -

total volume of the component section is 5.47812E-03 m3
total length of the component section is 9.00000E+00 m

the trcrst restart-data file will be searched for
signal variables  65
control blocks   237          6
trips             72
component id #s    1   2   3   4   5   6   7  10  12  14  16  17  18  20  22  24  26  27  28  30  32  34  36  37  38
                  40  41  42  43  44  45  46  47  48  49  50  52  54  56  59  60  62  64  66  69  70  72  74  76  93
                 100 105 110 112 114 116 118 120 150 154 169 170 179 180 190 200 205 210 212 214 216 218 220 250 254
                 269 270 279 280 290 300 305 310 312 314 316 318 320 350 354 369 370 379 380 390 400 410 420 422 424
                 430 432 434 436 438 576 578 900 901 902 903 904 905 906 907 908 909 910 920 930 931 932 933 934 935
                 936 937 938


restart file header
```

the restart file was created on 05/21/96 at 10:46:03 with 132 components. 7

the problem id was
this is a sample problem for the trac-p users guide manual. it models
a westinghouse 2308-mwt powered nuclear-core, three-loop pressurized
water reactor with constrained steady-state and transient calculations.
this full-plant model evaluates a steam-generator single-tube double-
ended-guillotine break transient with primary-coolant pumps operating.
this input-data model contains the following components and subsystems:
1) three-dimensional (r=2,t=6,z=12) reactor vessel;
2) vessel upper-plenum guide tubes;
3) powered-rod and unpowered-slab heat structures in the vessel;
4) three primary- and secondary-coolant loops modeled individually;
5) makeup, letdown, and pressurizer-sprayer cvcs flows; 7
6) accumulator and hpsi fills in each primary-coolant loop;
7) pressurizer and pressurizer porv and srv;
8) pressurizer, steam generator, and steam-dump control systems;
9) single-tube degb leakage path in loop 2 steam generator;
10) main-steam and steam-dump lines;
11) high-pressure feedwater system after hp heaters; and
12) auxiliary-feedwater fills (motor and steam driven).
the w3loop input-data model has the following developmental history:
james lime created the trac-pf1/mod1 input-data model on 7/84.
robert steinke converted the trac-pf1/mod1 input-data model with
gocnvt to a trac-pf1/mod2 input-data model and added component-
network diagrams on 9/90. marvin salazar added units labels to
the control blocks and trips for si/english units i/o on 10/93.
robert steinke replaced stgen components with htstr, pipe, and tee
components on 2/96. James lime upgraded the w3loop input-data model
to be consistent with the current h.b.robinson plant model on 5/96.

restarting from final dump found at time-step number 1262 and time 0.00000E+00 s 7

signal variables from the restart file

idsv =	1,	isvn =	0,	ilcn =	0,	icn1 =	0,	icn2 =	0
idsv =	11,	isvn =	18,	ilcn =	900,	icn1 =	0,	icn2 =	0
idsv =	101,	isvn =	23,	ilcn =	10,	icn1 =	1,	icn2 =	0
idsv =	111,	isvn =	21,	ilcn =	110,	icn1 =	3,	icn2 =	0
idsv =	161,	isvn =	32,	ilcn =	16,	icn1 =	1,	icn2 =	0
idsv =	171,	isvn =	21,	ilcn =	17,	icn1 =	1,	icn2 =	0
idsv =	181,	isvn =	23,	ilcn =	18,	icn1 =	4,	icn2 =	0
idsv =	201,	isvn =	23,	ilcn =	20,	icn1 =	1,	icn2 =	0
idsv =	222,	isvn =	21,	ilcn =	210,	icn1 =	3,	icn2 =	0
idsv =	261,	isvn =	32,	ilcn =	26,	icn1 =	1,	icn2 =	0
idsv =	271,	isvn =	21,	ilcn =	27,	icn1 =	1,	icn2 =	0
idsv =	281,	isvn =	23,	ilcn =	28,	icn1 =	4,	icn2 =	0
idsv =	301,	isvn =	23,	ilcn =	30,	icn1 =	1,	icn2 =	0
idsv =	333,	isvn =	21,	ilcn =	310,	icn1 =	3,	icn2 =	0
idsv =	361,	isvn =	32,	ilcn =	36,	icn1 =	1,	icn2 =	0
idsv =	371,	isvn =	21,	ilcn =	37,	icn1 =	1,	icn2 =	0
idsv =	381,	isvn =	23,	ilcn =	38,	icn1 =	4,	icn2 =	0
idsv =	401,	isvn =	21,	ilcn =	40,	icn1 =	1,	icn2 =	0
idsv =	421,	isvn =	21,	ilcn =	42,	icn1 =	1,	icn2 =	0
idsv =	501,	isvn =	21,	ilcn =	50,	icn1 =	1,	icn2 =	0
idsv =	521,	isvn =	-21,	ilcn =	52,	icn1 =	2,	icn2 =	3
idsv =	601,	isvn =	21,	ilcn =	60,	icn1 =	1,	icn2 =	0
idsv =	621,	isvn =	-21,	ilcn =	62,	icn1 =	2,	icn2 =	3
idsv =	701,	isvn =	21,	ilcn =	70,	icn1 =	1,	icn2 =	0
idsv =	721,	isvn =	-21,	ilcn =	72,	icn1 =	2,	icn2 =	3
idsv =	1000,	isvn =	69,	ilcn =	100,	icn1 =	1,	icn2 =	0
idsv =	1051,	isvn =	21,	ilcn =	105,	icn1 =	8,	icn2 =	0
idsv =	1100,	isvn =	69,	ilcn =	110,	icn1 =	5,	icn2 =	0
idsv =	1101,	isvn =	21,	ilcn =	110,	icn1 =	3,	icn2 =	0
idsv =	1121,	isvn =	21,	ilcn =	112,	icn1 =	1,	icn2 =	0
idsv =	1135,	isvn =	-21,	ilcn =	110,	icn1 =	3,	icn2 =	5
idsv =	1501,	isvn =	32,	ilcn =	150,	icn1 =	1,	icn2 =	0
idsv =	1541,	isvn =	42,	ilcn =	154,	icn1 =	0,	icn2 =	0
idsv =	1700,	isvn =	69,	ilcn =	170,	icn1 =	4,	icn2 =	0
idsv =	1714,	isvn =	-21,	ilcn =	170,	icn1 =	1,	icn2 =	4
idsv =	1903,	isvn =	21,	ilcn =	190,	icn1 =	5,	icn2 =	0
idsv =	1910,	isvn =	21,	ilcn =	190,	icn1 =	12,	icn2 =	0
idsv =	2000,	isvn =	69,	ilcn =	200,	icn1 =	1,	icn2 =	0
idsv =	2051,	isvn =	21,	ilcn =	205,	icn1 =	8,	icn2 =	0
idsv =	2100,	isvn =	69,	ilcn =	210,	icn1 =	5,	icn2 =	0
idsv =	2101,	isvn =	21,	ilcn =	210,	icn1 =	3,	icn2 =	0
idsv =	2121,	isvn =	21,	ilcn =	212,	icn1 =	1,	icn2 =	0
idsv =	2135,	isvn =	-21,	ilcn =	210,	icn1 =	3,	icn2 =	5
idsv =	2541,	isvn =	42,	ilcn =	254,	icn1 =	0,	icn2 =	0
idsv =	2700,	isvn =	69,	ilcn =	270,	icn1 =	4,	icn2 =	0
idsv =	2714,	isvn =	-21,	ilcn =	270,	icn1 =	1,	icn2 =	4
idsv =	2903,	isvn =	21,	ilcn =	290,	icn1 =	5,	icn2 =	0
idsv =	2910,	isvn =	21,	ilcn =	290,	icn1 =	12,	icn2 =	0
idsv =	3000,	isvn =	69,	ilcn =	300,	icn1 =	1,	icn2 =	0
idsv =	3051,	isvn =	21,	ilcn =	305,	icn1 =	8,	icn2 =	0
idsv =	3100,	isvn =	69,	ilcn =	310,	icn1 =	5,	icn2 =	0
idsv =	3101,	isvn =	21,	ilcn =	310,	icn1 =	3,	icn2 =	0
idsv =	3121,	isvn =	21,	ilcn =	312,	icn1 =	1,	icn2 =	0
idsv =	3135,	isvn =	-21,	ilcn =	310,	icn1 =	3,	icn2 =	5
idsv =	3501,	isvn =	32,	ilcn =	350,	icn1 =	1,	icn2 =	0
idsv =	3541,	isvn =	42,	ilcn =	354,	icn1 =	0,	icn2 =	0
idsv =	3700,	isvn =	69,	ilcn =	370,	icn1 =	4,	icn2 =	0
idsv =	3714,	isvn =	-21,	ilcn =	370,	icn1 =	1,	icn2 =	4
idsv =	3903,	isvn =	21,	ilcn =	390,	icn1 =	5,	icn2 =	0
idsv =	3910,	isvn =	21,	ilcn =	390,	icn1 =	12,	icn2 =	0

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     idsv =        4001,      isvn =           21,      ilcn =           410,      icn1 =             2,      icn2 =             0
     idsv =        4220,      isvn =           42,      ilcn =           422,      icn1 =             0,      icn2 =             0
     idsv =        4240,      isvn =           56,      ilcn =            16,      icn1 =             0,      icn2 =             0
     idsv =        9000,      isvn =           59,      ilcn =           900,      icn1 =             0,      icn2 =             0
     idsv =        9010,      isvn =           60,      ilcn =           900,      icn1 =             0,      icn2 =             0
                                                                                                                          8
control-block data from the restart file

     idcb =          -1,      icbn =            9,      icb1 =             0,      icb2 =             0,      icb3 =             0
   lugain =    lunounit,    luxmin =     lutempd,    luxmax =      lutempd,    lucon1 =       lutempd,    lucon2 =       lutempd
   cbgain = 1.0000E+00,     cbxmin = 0.0000E+00,     cbxmax = 0.0000E+00,     cbcon1 = 0.0000E+00,      cbcon2 = 0.0000E+00
                      -                         k                         k                          k                          k
the above control block has the                 **********
 following input ids, function                  *  const * ---->    -1
 operator type, and output id                   **********

##########  1924 lines deleted here  ##########

     idcb =       -4342,      icbn =           22,      icb1 =         -4320,      icb2 =         -4336,      icb3 =          4240
   lugain =    lunounit,    luxmin =    lunounit,    luxmax =     lunounit,    lucon1 =      lunounit,    lucon2 =      lunounit
   cbgain = 1.0000E+00,     cbxmin = 0.0000E+00,     cbxmax = 1.0000E+00,     cbcon1 = 0.0000E+00,      cbcon2 = 0.0000E+00
                      -                         -                         -                          -                          -
the above control block has the       -4320 ----> **********
 following input ids, function        -4336 ----> * switch * ----> -4342
 operator type, and output id          4240 ----> **********
                                                                                                                            8
trip-defining variables from the restart file

     idtp =           1,      isrt =            2,      iset =             1,      itst =            -1,      idsg =             1
  setp(1) =-1.0000E+00,    setp(2) = 0.0000E+00
                      s                         s
  dtsp(1) = 0.0000E+00,    dtsp(2) = 0.0000E+00
                      s                         s
  ifsp(1) =           0,   ifsp(2) =            0

##########  492 lines deleted here  ##########

     idtp =        9999,      isrt =            2,      iset =             0,      itst =            -1,      idsg =             1
  setp(1) = 0.0000E+00,    setp(2) = 1.0000E+10
                      s                         s
  dtsp(1) = 0.0000E+00,    dtsp(2) = 0.0000E+00
                      s                         s
  ifsp(1) =           0,   ifsp(2) =            0

there are  48 signal-variable trips,   3 signal-expression trips, and  21 trip-controlled trips from the restart file

trip signal-expressions from the restart file
     idse =        1120,      inse =            2,      incn =             0
trip-signal subexpression  1
   ise(1) =           2,    ise(2) =          111,    ise(3) =           222
trip-signal subexpression  2
   ise(1) =           8,    ise(2) =          901,    ise(3) =             0
     idse =        1130,      inse =            2,      incn =             0
trip-signal subexpression  1
   ise(1) =           2,    ise(2) =          111,    ise(3) =           333
trip-signal subexpression  2
   ise(1) =           8,    ise(2) =          901,    ise(3) =             0
     idse =        1230,      inse =            2,      incn =             0
trip-signal subexpression  1
   ise(1) =           2,    ise(2) =          222,    ise(3) =           333
trip-signal subexpression  2
   ise(1) =           8,    ise(2) =          901,    ise(3) =             0

trip-controlled trip id numbers from the restart file
     idtn =         100,      intn =            2
   itn(1) =          12,    itn(2) =           14
     idtn =         120,      intn =           10
   itn(1) =          16,    itn(2) =           18,    itn(3) =            20,    itn(4) =            30,    itn(5) =            48
   itn(6) =          50,    itn(7) =           52,    itn(8) =            54,    itn(9) =            56,   itn(10) =            58
     idtn =         140,      intn =            2
   itn(1) =          32,    itn(2) =           34
     idtn =         160,      intn =            4
   itn(1) =          10,    itn(2) =           36,    itn(3) =            48,    itn(4) =            50
     idtn =         180,      intn =            2
   itn(1) =          16,    itn(2) =         9999
     idtn =         200,      intn =            3
   itn(1) =          24,    itn(2) =           38,    itn(3) =            60
     idtn =         220,      intn =            2
   itn(1) =          58,    itn(2) =         9996
     idtn =         240,      intn =            3
   itn(1) =          40,    itn(2) =           42,    itn(3) =            44
     idtn =         260,      intn =            2
   itn(1) =          20,    itn(2) =           34
     idtn =         280,      intn =            2
   itn(1) =          46,    itn(2) =         9999
     idtn =         300,      intn =            3
   itn(1) =         110,    itn(2) =          210,    itn(3) =           310
     idtn =         320,      intn =            3
   itn(1) =         100,    itn(2) =          200,    itn(3) =           300
     idtn =         340,      intn =            3
   itn(1) =        1010,    itn(2) =         2010,    itn(3) =          3010
     idtn =         360,      intn =            3
   itn(1) =        1030,    itn(2) =         2030,    itn(3) =          3030
     idtn =         380,      intn =            3
   itn(1) =        1001,    itn(2) =         1002,    itn(3) =          1003
     idtn =         400,      intn =            5
```

```
    itn(1) =          20,    itn(2) =          36,    itn(3) =         423,    itn(4) =        1500,    itn(5) =        3500
      idtn =         460,      intn =           3
    itn(1) =        1010,    itn(2) =        2010,    itn(3) =        3010
      idtn =        1000,      intn =           2
    itn(1) =        1020,    itn(2) =        1040
      idtn =        2000,      intn =           2
    itn(1) =        2020,    itn(2) =        2040
      idtn =        3000,      intn =           2
    itn(1) =        3030,    itn(2) =        3040

--------------------------------------------------------------------------------------------------------------------------------
                                                                                                                        1  00000
                                                                                                                       11  0   0
                                                 $10$ hot leg 1                                                          1  0   0
                                                                                                                        1  0   0
                                                                                                                      111  00000
--------------------------------------------------------------------------------------------------------------------------------
                                                                                                                            8
   component number  10,      type = pipe      ,       id =          10,    ctitle = $10$ hot leg 1
    ncells =           6,     nodes =           1,     jun1 =          10,     jun2 =          12,      epsw = 0.0000E+00
                                                                                                                          m
      ichf =           1,     iconc =           1,      iacc =           0,      ipow =           0
    iqp3tr =           0,    iqp3sv =           0,    nqp3tb =           0,    nqp3sv =           0,    nqp3rf =           0
     radin = 3.6830E-01,         th = 6.3500E-02,     houtl = 0.0000E+00,     houtv = 0.0000E+00,     toutl = 3.0000E+02
                       m                       m                  w/m2/k                  w/m2/k                          k
     toutv = 3.0000E+02
                       k
     qp3in = 0.0000E+00,     qp3off = 0.0000E+00,     rqp3mx = 0.0000E+00,     qp3scl = 1.0000E+00
                       w                       w                     w/s                       -

dx           1.20900E+00  1.20900E+00  1.20900E+00  1.20900E+00  5.92500E-01  1.19700E+00
                       m

vol          5.15200E-01  5.15200E-01  5.15200E-01  5.15200E-01  2.52500E-01  5.10070E-01
                      m3

fa           4.26140E-01  4.26140E-01  4.26140E-01  4.26140E-01  4.26140E-01  4.26140E-01  4.86950E-01
                      m2

fric         7.59590E-02  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.73911E-01
                       -

fricr        1.51918E-01  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  6.95644E-02
                       -

grav         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  7.66000E-01
                       -

hd           7.36600E-01  7.36600E-01  7.36600E-01  7.36600E-01  7.36600E-01  7.36600E-01  7.87400E-01
                       m

nff                    1            1            1            1            1            1            1

alp          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

vl           1.46578E+01  1.46603E+01  1.46603E+01  1.46603E+01  1.46603E+01  1.46603E+01  1.28295E+01
                     m/s

vv           1.46692E+01  1.46612E+01  1.46612E+01  1.46612E+01  1.46612E+01  1.46612E+01  1.28235E+01
                     m/s

tl           5.92151E+02  5.92151E+02  5.92150E+02  5.92150E+02  5.92149E+02  5.92149E+02
                       k

tv           6.18191E+02  6.18187E+02  6.18183E+02  6.18180E+02  6.18177E+02  6.18174E+02
                       k

p            1.55552E+07  1.55545E+07  1.55537E+07  1.55530E+07  1.55524E+07  1.55519E+07
                      pa

pa           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      pa

qppp         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

matid                  7

tw           5.92140E+02  5.92139E+02  5.92139E+02  5.92138E+02  5.92138E+02  5.92137E+02
                       k

conc         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

solid        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                   kg/m3

##########  9700 lines deleted here  ##########

--------------------------------------------------------------------------------------------------------------------------------
                                                                                                           33333   1   88888
                                                                                                               3  11   8   8
                                                 $318$ msl 3 porv boundary                                 33333   1   88888
                                                                                                               3   1   8   8
```

```
--------------------------------------------------------------------------------------------------------------

  component number 318,     type = break      ,        id =          318,    ctitle = $318$ msl 3 porv boundary
      junl =           318,    ibty =             0,     isat =           0,      ioff =          1
      dxin = 1.0000E+00,     volin = 2.9210E-01,     alpin = 1.0000E+00,       tin = 3.7316E+02,       pin = 1.0135E+05
                        m                    m3                          -                   k                     pa
      pain = 0.0000E+00,    concin = 0.0000E+00,      rbmx = 0.0000E+00,      poff = 1.0135E+05,      belv = 0.0000E+00
                       pa                      -                      pa/s                  pa                      m

--------------------------------------------------------------------------------------------------------------
                                                                                                             1
                                                                                                            11
                                     $1$ reactor vessel                                                      1
                                                                                                             1
                                                                                                           111
--------------------------------------------------------------------------------------------------------------

  component number    1,     type = vessel     ,        id =            1,    ctitle = $1$ reactor vessel
      nasx =          12,    nrsx =             2,     ntsx =            6,      ncsr =          18,    ivssbf =          0
      idcu =           0,    idcl =             0,     idcr =            0,      icru =           6,      icrl =          2
      icrr =           1,   ilcsp =             2,    iucsp =            6,      iuhp =          10,     iconc =          1
     igeom =           0,   nvent =             0,    nvvtb =            0,    nsgrid =           0,      iext =          0
     shelv = 0.0000E+00,     epsw = 0.0000E+00
                       m                      m

z             1.75260E+00  3.00040E+00  3.91480E+00  4.82920E+00  5.74360E+00  6.65800E+00  7.67140E+00  8.52870E+00
              9.36130E+00  1.01940E+01  1.11270E+01  1.22450E+01
                        m

r             1.70020E+00  1.97490E+00
                        m

t             1.04720E+00  2.09440E+00  3.14159E+00  4.18879E+00  5.23599E+00  6.28319E+00
                      rad

funh          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                        -

nhsca                 900          900          900          900          900          900          900          900
                      900          900          900          900
     lisrl =           8,    lisrc =             1,    lisrf =            3,    ljuns =         10
     lisrl =           8,    lisrc =             3,    lisrf =            3,    ljuns =         20
     lisrl =           8,    lisrc =             5,    lisrf =            3,    ljuns =         30
     lisrl =           8,    lisrc =             8,    lisrf =            3,    ljuns =         19
     lisrl =           8,    lisrc =            10,    lisrf =            3,    ljuns =         29
     lisrl =           8,    lisrc =            12,    lisrf =            3,    ljuns =         39
     lisrl =           7,    lisrc =             1,    lisrf =            2,    ljuns =          2
     lisrl =           9,    lisrc =             2,    lisrf =            2,    ljuns =          3
     lisrl =           7,    lisrc =             3,    lisrf =            2,    ljuns =          4
     lisrl =           9,    lisrc =             4,    lisrf =            2,    ljuns =          5
     lisrl =           7,    lisrc =             5,    lisrf =            2,    ljuns =          6
     lisrl =           9,    lisrc =             6,    lisrf =            2,    ljuns =          7
     lisrl =          12,    lisrc =             1,    lisrf =           -2,    ljuns =         94
     lisrl =          12,    lisrc =             2,    lisrf =           -2,    ljuns =         95
     lisrl =          12,    lisrc =             3,    lisrf =           -2,    ljuns =         96
     lisrl =          12,    lisrc =             4,    lisrf =           -2,    ljuns =         97
     lisrl =          12,    lisrc =             5,    lisrf =           -2,    ljuns =         98
     lisrl =          12,    lisrc =             6,    lisrf =           -2,    ljuns =         99
level  1 data

cfzlyt        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00                                                  8
                        -

cfzlz         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  3.33289E-03  3.33289E-03
              3.33289E-03  3.33289E-03  3.33289E-03  3.33289E-03
                        -

cfzlxr        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                        -

cfzvyt        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                        -

cfzvz         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  3.33289E-03  3.33289E-03
              3.33289E-03  3.33289E-03  3.33289E-03  3.33289E-03
                        -

cfzvxr        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                        -

cfrlyt        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                        -

cfrlz         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  3.33289E-03  3.33289E-03
              3.33289E-03  3.33289E-03  3.33289E-03  3.33289E-03
                        -
```

cfrlxr	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	-							
cfrvyt	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	-							
cfrvz	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.33289E-03	3.33289E-03
	3.33289E-03	3.33289E-03	3.33289E-03	3.33289E-03				
	-							
cfrvxr	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	-							
vol	1.99639E+00	1.99639E+00	1.99639E+00	1.99639E+00	1.99639E+00	1.99639E+00	2.91916E-01	2.91916E-01
	2.91916E-01	2.91916E-01	2.91916E-01	2.91916E-01				
	m3							
fayt	2.24258E+00	2.24258E+00	2.24258E+00	2.24258E+00	2.24258E+00	2.24258E+00	1.20360E-01	1.20360E-01
	1.20360E-01	1.20360E-01	1.20360E-01	1.20360E-01				
	m2							
faz	6.21466E-01	6.21466E-01	6.21466E-01	6.21466E-01	6.21466E-01	6.21466E-01	1.66509E-01	1.66509E-01
	1.66509E-01	1.66509E-01	1.66509E-01	1.66509E-01				
	m2							
faxr	1.06094E+00	1.06094E+00	1.06094E+00	1.06094E+00	1.06094E+00	1.06094E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	m2							
hdyt	9.72000E-01	9.72000E-01	9.72000E-01	9.72000E-01	9.72000E-01	9.72000E-01	6.68000E-01	6.68000E-01
	6.68000E-01	6.68000E-01	6.68000E-01	6.68000E-01				
	m							
hdz	2.08300E-01	2.08300E-01	2.08300E-01	2.08300E-01	2.08300E-01	2.08300E-01	6.68000E-01	6.68000E-01
	6.68000E-01	6.68000E-01	6.68000E-01	6.68000E-01				
	m							
hdxr	9.72000E-01	9.72000E-01	9.72000E-01	9.72000E-01	9.72000E-01	9.72000E-01	6.68000E-01	6.68000E-01
	6.68000E-01	6.68000E-01	6.68000E-01	6.68000E-01				
	m							
alpn	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	-							
vvnyt	-1.71889E-03	3.87624E-04	-7.42757E-04	1.78877E-03	-1.17812E-04	4.03219E-04	-6.68265E-02	6.46697E-02
	-6.58090E-02	6.72151E-02	-6.39050E-02	6.46561E-02				
	m/s							
vvnz	4.51604E+00	4.48593E+00	4.51093E+00	4.48372E+00	4.51497E+00	4.49444E+00	-1.67215E+01	-1.68575E+01
	-1.67165E+01	-1.68562E+01	-1.67206E+01	-1.68658E+01				
	m/s							
vvnxr	-2.64293E+00	-2.63446E+00	-2.64204E+00	-2.63407E+00	-2.64276E+00	-2.63610E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	m/s							
vlnyt	-1.74526E-03	4.13377E-04	-7.68896E-04	1.81528E-03	-1.43322E-04	4.28976E-04	-6.68262E-02	6.46701E-02
	-6.58091E-02	6.72147E-02	-6.39057E-02	6.46566E-02				
	m/s							
vlnz	4.51190E+00	4.48179E+00	4.50679E+00	4.47959E+00	4.51083E+00	4.49030E+00	-1.67140E+01	-1.68501E+01
	-1.67091E+01	-1.68487E+01	-1.67132E+01	-1.68584E+01				
	m/s							
vlnxr	-2.63829E+00	-2.62981E+00	-2.63740E+00	-2.62942E+00	-2.63812E+00	-2.63144E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	m/s							
tvn	6.19655E+02	6.19655E+02	6.19655E+02	6.19655E+02	6.19655E+02	6.19655E+02	6.19758E+02	6.19758E+02
	6.19758E+02	6.19758E+02	6.19758E+02	6.19758E+02				
	k							8
tln	5.59561E+02	5.59274E+02	5.59208E+02	5.59139E+02	5.59493E+02	5.59845E+02	5.59570E+02	5.59282E+02
	5.59217E+02	5.59150E+02	5.59503E+02	5.59855E+02				
	k							
pn	1.58408E+07	1.58407E+07	1.58408E+07	1.58407E+07	1.58408E+07	1.58407E+07	1.58610E+07	1.58610E+07
	1.58610E+07	1.58610E+07	1.58610E+07	1.58610E+07				
	pa							
pan	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	pa							
vwfmly	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00
	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00				
	-							
vwfmlz	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00
	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00				
	-							

```
vwfmlx     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

vwfmvy      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

vwfmvz      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

vwfmvx      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

level  2 data
cfzlyt      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

cfzlz       1.15160E+00  1.15160E+00  1.15160E+00  1.15160E+00  1.15160E+00  1.15160E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

cfzlxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

##########  1449 lines deleted here  ##########
pn          1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07
            1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07
                  pa

pan         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  pa

vwfmly      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

vwfmlz      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

vwfmlx      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

vwfmvy      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

vwfmvz      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

vwfmvx      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
            1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                  -

conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

level 12 data
cfzlyt      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

cfzlz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

cfzlxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

cfzvyt      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

cfzvz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                  -

cfzvxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
```

```
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfrlyt       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfrlz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfrlxr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfrvyt       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfrvz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

cfrvxr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

vol          8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  1.00000E-12  1.00000E-12
             1.00000E-12  1.00000E-12  1.00000E-12  1.00000E-12
                      m3

fayt         9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      m2

faz          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      m2

faxr         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      m2

hdyt         1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  3.00000E+00  3.00000E+00
             3.00000E+00  3.00000E+00  3.00000E+00  3.00000E+00
                       m

hdz          1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  3.00000E+00  3.00000E+00
             3.00000E+00  3.00000E+00  3.00000E+00  3.00000E+00
                       m

hdxr         1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  1.00600E+00  3.00000E+00  3.00000E+00
             3.00000E+00  3.00000E+00  3.00000E+00  3.00000E+00
                       m

alpn         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                       -

vvnyt       -2.72334E-02  2.88037E-02 -2.84270E-02  2.71077E-02 -2.95349E-02  2.92796E-02  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     m/s

vvnz         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     m/s

vvnxr        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     m/s

vlnyt       -2.72334E-02  2.88037E-02 -2.84269E-02  2.71076E-02 -2.95348E-02  2.92796E-02  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     m/s

vlnz         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     m/s

vlnxr        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     m/s

tvn          6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.17905E+02  6.17905E+02
             6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
                       k

tln          5.82977E+02  5.82994E+02  5.82948E+02  5.82990E+02  5.82972E+02  5.83040E+02  5.81000E+02  5.81000E+02
             5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
                       k

pn           1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.55000E+07  1.55000E+07
             1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
                      pa

pan          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
```

```
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                    pa

vwfmly     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmlz     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmlx     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmvy     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmvz     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

vwfmvx     1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
           1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

conc       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     -

-------------------------------------------------------------------------------------------------------------
                                                                                            99999 00000 00000
                                                                                            9   9 0   0 0   0
                                     $900$ reactor-core fuel rods                           99999 0   0 0   0
                                                                                                9 0   0 0   0
                                                                                            99999 00000 00000
-------------------------------------------------------------------------------------------------------------

  component number 900,     type = rod         ,       id =        900,   ctitle = $900$ reactor-core fuel rods
      ncrx =          6,     ncrz =           4,     iext =          0,      m1d =          0
    nopowr =          0,    nridr =           0,    modez =          0,   liqlev =          1,   iaxcnd =          1
     idbci =          0,    idbco =           2,     hdri = 0.0000E+00,     hdro = 0.0000E+00
                                                                     m                      m
     nrods =         12,    nodes =           8,    irftr =       9997,    nzmax =        200,   irftr2 =       9998
 dtxht(1) = 3.0000E+00, dtxht(2) = 1.0000E+01,    dznht = 5.0000E-03,    hgapo = 1.7000E+04,    shelv = 3.0004E+00
                      k                       k                     m                w/m2/k                       m
    irpwty =          4,     ndgx =           6,     ndhx =         11,     nrts =         10,    nhist =          0
    irpwtr =         10,   irpwsv =           1,   nrpwtb =         -4,   nrpwsv =          0,   nrpwrf =          0
    izpwtr =          0,   izpwsv =           1,   nzpwtb =          1,   nzpwsv =          0,   nzpwrf =          0
     nmwrx =          1,     nfci =           1,    nfcil =          1,   ipwrad =          0,   ipwdep =          0
     nzpwz =          5,    nzpwi =           0,   nfbpwt =          0,    nrpwr =          1,    nrpwi =          0
     react = 0.0000E+00,    tneut = 1.6250E-05,  rpwoffr =-1.0000E+20,   rrpwmxr = 1.0000E+20,   rpwscl = 1.0000E+00
                      -                       s                     -                   1/s                       -
    rpowri = 2.3000E+09,    zpwin = 1.0227E+05,   zpwoff =-1.0000E+20,    rzpwmx = 1.0000E+20
                      w                       s                     s                   1/s
    extsou = 0.0000E+00,     pldr = 0.0000E+00,    pdrat = 1.3280E+00,    fucrac = 5.0000E-01
                      w                       m                     -                     -

outer heat surface fluid cells ranging from one below to one above the metal structure ends

comp                 1            1            1            1            1            1

cell                -3            3            4            5            6            7

htmli      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

htmlo      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

htmvi      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

htmvo      1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

z          3.00040E+00  3.91480E+00  4.82920E+00  5.74360E+00  6.65800E+00
                     m

grav       1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
                     -

idrod                1            2            3            4            5            6           -1           -2
                    -3           -4           -5           -6

rdx        5.33800E+03  5.33800E+03  5.33800E+03  5.33800E+03  5.33800E+03  5.33800E+03
                     -

radrd      0.00000E+00  1.13190E-03  2.26380E-03  3.39570E-03  4.52750E-03  4.62280E-03  5.00380E-03  5.38480E-03
                     m

matrd                1            1            1            1            3            2            2

nfax                 5            5            5            5
```

rftn	1.00520E+03 k	9.86689E+02	9.32779E+02	8.48195E+02	7.40152E+02	5.98594E+02	5.88972E+02	5.79995E+02	
rftn	1.35979E+03 k	1.31967E+03	1.20484E+03	1.03129E+03	8.22823E+02	6.24381E+02	6.08114E+02	5.92871E+02	
rftn	1.43220E+03 k	1.38753E+03	1.25992E+03	1.06805E+03	8.39779E+02	6.36794E+02	6.19504E+02	6.03293E+02	$\boxed{8}$
rftn	1.36464E+03 k	1.32503E+03	1.21156E+03	1.03977E+03	8.32856E+02	6.39555E+02	6.23713E+02	6.08875E+02	
rftn	1.04403E+03 k	1.02440E+03	9.67288E+02	8.77796E+02	7.63745E+02	6.23007E+02	6.13277E+02	6.04200E+02	
rftn	1.00493E+03 k	9.86422E+02	9.32524E+02	8.47959E+02	7.39940E+02	5.98340E+02	5.88716E+02	5.79737E+02	
rftn	1.35952E+03 k	1.31940E+03	1.20459E+03	1.03107E+03	8.22640E+02	6.24143E+02	6.07873E+02	5.92628E+02	
rftn	1.43194E+03 k	1.38728E+03	1.25969E+03	1.06785E+03	8.39613E+02	6.36576E+02	6.19284E+02	6.03070E+02	
rftn	1.36442E+03 k	1.32481E+03	1.21136E+03	1.03959E+03	8.32705E+02	6.39361E+02	6.23517E+02	6.08676E+02	
rftn	1.04383E+03 k	1.02421E+03	9.67099E+02	8.77621E+02	7.63588E+02	6.22820E+02	6.13089E+02	6.04011E+02	
rftn	1.00485E+03 k	9.86340E+02	9.32445E+02	8.47885E+02	7.39873E+02	5.98260E+02	5.88636E+02	5.79657E+02	
rftn	1.35942E+03 k	1.31931E+03	1.20450E+03	1.03100E+03	8.22574E+02	6.24057E+02	6.07787E+02	5.92540E+02	
rftn	1.43183E+03 k	1.38718E+03	1.25959E+03	1.06776E+03	8.39541E+02	6.36480E+02	6.19187E+02	6.02972E+02	
rftn	1.36429E+03 k	1.32469E+03	1.21124E+03	1.03949E+03	8.32622E+02	6.39254E+02	6.23408E+02	6.08566E+02	
rftn	1.04371E+03 k	1.02409E+03	9.66987E+02	8.77518E+02	7.63496E+02	6.22710E+02	6.12978E+02	6.03899E+02	
rftn	1.00480E+03 k	9.86289E+02	9.32397E+02	8.47840E+02	7.39832E+02	5.98211E+02	5.88587E+02	5.79607E+02	
rftn	1.35938E+03 k	1.31927E+03	1.20446E+03	1.03096E+03	8.22544E+02	6.24018E+02	6.07747E+02	5.92500E+02	
rftn	1.43181E+03 k	1.38715E+03	1.25957E+03	1.06774E+03	8.39522E+02	6.36456E+02	6.19162E+02	6.02947E+02	
rftn	1.36429E+03 k	1.32468E+03	1.21124E+03	1.03948E+03	8.32616E+02	6.39245E+02	6.23400E+02	6.08558E+02	
rftn	1.04371E+03 k	1.02409E+03	9.66984E+02	8.77515E+02	7.63493E+02	6.22706E+02	6.12974E+02	6.03895E+02	
rftn	1.00514E+03 k	9.86622E+02	9.32715E+02	8.48136E+02	7.40099E+02	5.98530E+02	5.88907E+02	5.79930E+02	
rftn	1.35972E+03 k	1.31960E+03	1.20477E+03	1.03124E+03	8.22775E+02	6.24318E+02	6.08051E+02	5.92807E+02	
rftn	1.43213E+03 k	1.38746E+03	1.25986E+03	1.06799E+03	8.39734E+02	6.36734E+02	6.19444E+02	6.03232E+02	
rftn	1.36457E+03 k	1.32496E+03	1.21150E+03	1.03972E+03	8.32812E+02	6.39498E+02	6.23655E+02	6.08816E+02	
rftn	1.04397E+03 k	1.02434E+03	9.67230E+02	8.77743E+02	7.63698E+02	6.22950E+02	6.13220E+02	6.04143E+02	
rftn	1.00551E+03 k	9.86988E+02	9.33065E+02	8.48461E+02	7.40391E+02	5.98879E+02	5.89259E+02	5.80284E+02	
rftn	1.36011E+03 k	1.31999E+03	1.20514E+03	1.03156E+03	8.23043E+02	6.24667E+02	6.08404E+02	5.93164E+02	
rftn	1.43253E+03 k	1.38786E+03	1.26023E+03	1.06832E+03	8.40001E+02	6.37084E+02	6.19799E+02	6.03591E+02	
rftn	1.36498E+03 k	1.32536E+03	1.21187E+03	1.04004E+03	8.33086E+02	6.39851E+02	6.24013E+02	6.09177E+02	
rftn	1.04435E+03 k	1.02472E+03	9.67586E+02	8.78073E+02	7.63993E+02	6.23302E+02	6.13574E+02	6.04499E+02	
rftn	1.33485E+03 k	1.29620E+03	1.18549E+03	1.01790E+03	8.15939E+02	6.18847E+02	6.02896E+02	5.87952E+02	
rftn	1.94891E+03 k	1.86555E+03	1.62548E+03	1.27335E+03	8.84724E+02	6.58366E+02	6.31613E+02	6.06368E+02	

rftn	2.05574E+03	1.96760E+03	1.70619E+03	1.31815E+03	8.94739E+02	6.72894E+02	6.44490E+02	6.17661E+02
	k							
rftn	1.94529E+03	1.86321E+03	1.62686E+03	1.27942E+03	8.94347E+02	6.72375E+02	6.46296E+02	6.21703E+02
	k							
rftn	1.38564E+03	1.34474E+03	1.22765E+03	1.05064E+03	8.38041E+02	6.43352E+02	6.27219E+02	6.12106E+02
	k							
rftn	1.33457E+03	1.29593E+03	1.18524E+03	1.01767E+03	8.15751E+02	6.18602E+02	6.02649E+02	5.87702E+02
	k							
rftn	1.94865E+03	1.86529E+03	1.62523E+03	1.27314E+03	8.84569E+02	6.58143E+02	6.31385E+02	6.06137E+02
	k							
rftn	2.05552E+03	1.96737E+03	1.70596E+03	1.31796E+03	8.94598E+02	6.72693E+02	6.44284E+02	6.17452E+02
	k							
rftn	1.94512E+03	1.86304E+03	1.62670E+03	1.27928E+03	8.94246E+02	6.72230E+02	6.46149E+02	6.21553E+02
	k							
rftn	1.38545E+03	1.34455E+03	1.22747E+03	1.05049E+03	8.37910E+02	6.43182E+02	6.27048E+02	6.11932E+02
	k							
rftn	1.33448E+03	1.29583E+03	1.18515E+03	1.01759E+03	8.15686E+02	6.18518E+02	6.02564E+02	5.87616E+02
	k							
rftn	1.94854E+03	1.86518E+03	1.62513E+03	1.27306E+03	8.84505E+02	6.58050E+02	6.31291E+02	6.06041E+02
	k							
rftn	2.05540E+03	1.96725E+03	1.70585E+03	1.31786E+03	8.94525E+02	6.72587E+02	6.44177E+02	6.17342E+02
	k							
rftn	1.94500E+03	1.86292E+03	1.62659E+03	1.27919E+03	8.94175E+02	6.72129E+02	6.46046E+02	6.21449E+02
	k							
rftn	1.38530E+03	1.34441E+03	1.22734E+03	1.05037E+03	8.37813E+02	6.43057E+02	6.26921E+02	6.11805E+02
	k							
rftn	1.33443E+03	1.29579E+03	1.18511E+03	1.01756E+03	8.15653E+02	6.18476E+02	6.02521E+02	5.87572E+02
	k							
rftn	1.94851E+03	1.86515E+03	1.62510E+03	1.27303E+03	8.84485E+02	6.58021E+02	6.31262E+02	6.06011E+02
	k							
rftn	2.05539E+03	1.96724E+03	1.70583E+03	1.31785E+03	8.94516E+02	6.72574E+02	6.44164E+02	6.17329E+02
	k							
rftn	1.94501E+03	1.86293E+03	1.62659E+03	1.27920E+03	8.94180E+02	6.72135E+02	6.46052E+02	6.21455E+02
	k							
rftn	1.38532E+03	1.34443E+03	1.22736E+03	1.05038E+03	8.37823E+02	6.43069E+02	6.26933E+02	6.11817E+02
	k							
rftn	1.33478E+03	1.29613E+03	1.18543E+03	1.01784E+03	8.15891E+02	6.18783E+02	6.02832E+02	5.87887E+02
	k							
rftn	1.94884E+03	1.86548E+03	1.62541E+03	1.27329E+03	8.84682E+02	6.58305E+02	6.31551E+02	6.06305E+02
	k							
rftn	2.05568E+03	1.96753E+03	1.70613E+03	1.31810E+03	8.94698E+02	6.72835E+02	6.44430E+02	6.17600E+02
	k							
rftn	1.94524E+03	1.86315E+03	1.62680E+03	1.27937E+03	8.94315E+02	6.72328E+02	6.46249E+02	6.21655E+02
	k							
rftn	1.38558E+03	1.34468E+03	1.22759E+03	1.05059E+03	8.37998E+02	6.43295E+02	6.27163E+02	6.12049E+02
	k							
rftn	1.33518E+03	1.29652E+03	1.18579E+03	1.01816E+03	8.16161E+02	6.19134E+02	6.03187E+02	5.88246E+02
	k							
rftn	1.94926E+03	1.86590E+03	1.62580E+03	1.27362E+03	8.84925E+02	6.58655E+02	6.31908E+02	6.06669E+02
	k							
rftn	2.05607E+03	1.96794E+03	1.70653E+03	1.31843E+03	8.94947E+02	6.73192E+02	6.44794E+02	6.17971E+02
	k							
rftn	1.94559E+03	1.86351E+03	1.62713E+03	1.27965E+03	8.94522E+02	6.72624E+02	6.46550E+02	6.21962E+02
	k							
rftn	1.38600E+03	1.34509E+03	1.22797E+03	1.05093E+03	8.38280E+02	6.43660E+02	6.27531E+02	6.12421E+02
	k							
rdpwr	1.37202E+00	1.37202E+00	1.37202E+00	1.37202E+00	1.37202E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-							
cpowr	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00		
	-							

```
                 m
zpwtbabs    0.00000E+00
                      s
            6.38524E-01  1.09684E+00  1.17559E+00  1.07982E+00  6.56971E-01
                      -

rpwtbabr    1.00000E+00  0.00000E+00  1.60000E+00 -8.40000E-03  2.00000E+00 -3.25000E-02  2.20000E+00 -3.50000E-02
            independent variable unit is s and dependent variable unit is -

beta        1.69000E-04  8.32000E-04  2.64000E-03  1.22000E-03  1.38000E-03  2.47000E-04
                      -

lamda       3.87000E+00  1.40000E+00  3.11000E-01  1.15000E-01  3.17000E-02  1.27000E-02
                    1/s

cdgn        6.18090E+09  8.41140E+10  1.20150E+12  1.50150E+12  6.16160E+12  2.75280E+12
                      w

lamdh       1.77200E+00  5.77400E-01  6.74300E-02  6.21400E-03  4.73900E-04  4.81000E-05  5.34400E-06  5.72600E-07
            1.03600E-07  2.95900E-08  7.58500E-10
                    1/s

edh         2.99000E-03  8.25000E-03  1.55000E-02  1.93500E-02  1.16500E-02  6.45000E-03  2.31000E-03  1.64000E-03
            8.50000E-04  4.30000E-04  5.70000E-04
                      -

cdhn        3.88090E+06  3.28630E+07  5.28700E+08  7.16210E+09  5.65410E+10  3.08420E+11  9.94200E+11  6.58750E+12
            1.88710E+13  3.34230E+13  1.72840E+15
                      w

fpuo2       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      -

ftd         9.40000E-01  9.40000E-01  9.40000E-01  9.40000E-01  9.40000E-01  9.40000E-01
                      -

gmix        1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00
                      -

gmles       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                g-moles

pgapt       1.00000E+07  1.00000E+07  1.00000E+07  1.00000E+07  1.00000E+07  1.00000E+07
                     pa

plvol       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                     m3

pslen       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      m

clenn       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
                      m

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu

burn        1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04  1.01270E+04
                mwd/mtu
```

```
------------------------------------------------------------------------------------------------------------
                                                                                           99999 33333 88888
                                                                                           9   9     3 8   8
                                           $938$ st-gen-1,2,3 sec.dryer                    99999 33333 88888
                                                                                               9     3 8   8
                                                                                           99999 33333 88888
------------------------------------------------------------------------------------------------------------

  component number 938,     type = rod        ,       id =        938,    ctitle = $938$ st-gen-1,2,3 sec.dryer
      ncrx =            3,    ncrz =            2,     iext =          0,      m1d =           8
    nopowr =            1,   nridr =            0,    modez =          0,   liqlev =           0,   iaxcnd =            1
     idbci =            2,   idbco =            2,     hdri = 6.0960E+00,     hdro = 6.1087E+00
                                                                     m                       m
     nrods =            3,   nodes =            3,    irftr =          0,   nzmax =            8,   irftr2 =            0
 dtxht(1) = 3.0000E+00,  dtxht(2) = 1.0000E+01;   dznht = 5.0000E-03,   hgapo = 0.0000E+00,    shelv = 0.0000E+00
                      k                       k                      m                  w/m2/k                     m
```

```
inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   1

comp                 105          105          105          105

cell                  -9            9           10           10

outer heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   1

comp                 105          105          105          105

cell                  -6            6            6            6

inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   2

comp                 205          205          205          205

cell                  -9            9           10           10

outer heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   2

comp                 205          205          205          205

cell                  -6            6            6            6

inner heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   3

comp                 305          305          305          305

cell                  -9            9           10           10

outer heat surface fluid cells ranging from one below to one above the metal structure ends

rod no.   3

comp                 305          305          305          305

cell                  -6            6            6            6

htmli        1.00000E+00  1.00000E+00  1.00000E+00
                       -

htmlo        1.00000E+00  1.00000E+00  1.00000E+00
                       -

htmvi        1.00000E+00  1.00000E+00  1.00000E+00
                       -

htmvo        1.00000E+00  1.00000E+00  1.00000E+00
                       -

z            0.00000E+00  5.75420E+00  1.15084E+01
                       m

grav         0.00000E+00  0.00000E+00
                       -

idrod                  1            2            3

rdx          1.00000E+00  1.00000E+00  1.00000E+00
                       -

radrd        3.04800E+00  3.05120E+00  3.05430E+00
                       m

matrd                  9            9
```

```
nfax                  0                0

rftn        5.44647E+02  5.44653E+02  5.44660E+02
                      k

rftn        5.44630E+02  5.44633E+02  5.44640E+02
                      k

rftn        5.44668E+02  5.44670E+02  5.44674E+02
                      k

rftn        5.44523E+02  5.44530E+02  5.44539E+02
                      k

rftn        5.44520E+02  5.44524E+02  5.44534E+02
                      k

rftn        5.44545E+02  5.44548E+02  5.44555E+02
                      k

rftn        5.46601E+02  5.46615E+02  5.46629E+02
                      k

rftn        5.46664E+02  5.46663E+02  5.46666E+02
                      k

rftn        5.46706E+02  5.46706E+02  5.46708E+02
                      k

system components    10  12  14  16  17  18  54  52  50  49  91  56  20  22  24  26  27  28 202 200 205 290  64  62  60
                    210 220 400 410 420 422 280 270 254 250 350 212 120 110 105 190 100 320 310 305 390 300 430 432 150
                    354 370 380 216 112 180 170 154 312 436 116 316  59  92 424 578  66 214 434 279 269 576 218 114 314
                    438 369 379 118 179 169 318  30  32  34  36  37  38  40  41  42  74  72  70  44  45  46  43  69  93
                     47  76  48   2   3   4   5   6   7   1 900 901 902 903 904 905 906 907 908 909 910 920 930 931 932
                    933 934 935 936 937 938


the vessel-matrix array storage is dimensioned for 12 diagonals
above and below the main diagonal defining the matrix bandwidth
with 12 matrix rows of nonzero elements outside the bandwidth


  component type is a rod  and component number is 900
      rod  linear power generation rate (w/m)
-------------------------------------------------------

rod  number is  1 and power-peaking factor is 1.00000E+00
                       nz      rod  linear power (w/m)
                                 1        1.253658E+04
                                 2        2.153507E+04
                                 3        2.308125E+04
                                 4        2.120076E+04
                                 5        1.289875E+04

rod  number is  2 and power-peaking factor is 1.00000E+00
                       nz      rod  linear power (w/m)
                                 1        1.253658E+04
                                 2        2.153507E+04
                                 3        2.308125E+04
                                 4        2.120076E+04
                                 5        1.289875E+04

##########  71 lines deleted here  ##########

rod  number is 12 and power-peaking factor is 1.67800E+00
                       nz      rod  linear power (w/m)
                                 1        2.103639E+04
                                 2        3.613584E+04
                                 3        3.873033E+04
                                 4        3.557487E+04
                                 5        2.164411E+04

linear-power values are based on a heat-structure component power of 2.300000E+09   w

cell-geometry parameters for vessel component   1


total volume in level  1 is 1.372984E+01 m3
total volume up to and including level  1 is 1.372984E+01 m3

level  1 geometry parameters

vol         1.99639E+00  1.99639E+00  1.99639E+00  1.99639E+00  1.99639E+00  1.99639E+00  2.91916E-01  2.91916E-01
            2.91916E-01  2.91916E-01  2.91916E-01  2.91916E-01
            m3

fayt        2.24258E+00  2.24258E+00  2.24258E+00  2.24258E+00  2.24258E+00  2.24258E+00  1.20360E-01  1.20360E-01
            1.20360E-01  1.20360E-01  1.20360E-01  1.20360E-01
            m2

faz         6.21466E-01  6.21466E-01  6.21466E-01  6.21466E-01  6.21466E-01  6.21466E-01  1.66509E-01  1.66509E-01
            1.66509E-01  1.66509E-01  1.66509E-01  1.66509E-01
            m2

faxr        1.06094E+00  1.06094E+00  1.06094E+00  1.06094E+00  1.06094E+00  1.06094E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
```

```
          m2

total volume in level  2 is 9.656278E+00 m3
total volume up to and including level  2 is 2.338612E+01 m3

##########  206 lines deleted here  ##########

total volume in level 12 is 5.242977E+00 m3
total volume up to and including level 12 is 9.517555E+01 m3

level 12 geometry parameters

vol         8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  8.73829E-01  1.00000E-12  1.00000E-12
            1.00000E-12  1.00000E-12  1.00000E-12  1.00000E-12
            m3

fayt        9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  9.81585E-01  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m2

faz         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m2

faxr        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m2

height change across component 202 from the joining cell of component  22 to cell 10 is  0.00000E+00 m

k factor to fric conversions for component 202 ( pipe    ) faces  1 through 11

fric        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00
                 -

restart dump generated at problem time    0.000000 s after    0 time steps      <---- 9

     dtmin = 1.0000E-05,     dtmax = 5.0000E-01,     tend = 6.0000E+02,     rtwfp = 1.0000E+00,     powerc = 1.0000E+20
                      s                      s                     s                     -                          w
     edint = 1.0000E+02,     gfint = 5.0000E+00,    dmpint = 2.0000E+02,    sedint = 1.0000E+02
                      s                      s                     s                     s

*************************************************************************
*                       time domain data to be used                     *
*  minimum   maximum    time      long    graphics    dump     short    *
*   time      time     domain     edit      edit      edit     edit     *      <---- 10
* step (s)  step (s)  end (s)   step (s)  step (s)  step (s)  step (s)  *
* 1.000E-05 5.000E-01 6.000E+02 1.000E+02 5.000E+00 2.000E+02 1.000E+02 *
*************************************************************************
*   convective energy-error controller is  1.0000E+20    w
*************************************************************************


    time   dtime   power     keff
      s      s       w         -
    0.000  0.001 2.300E+09 1.000000      <---- 11
1
 trac large edit

 problem time is 0.000000E+00 s, time-step size is  1.0000E-03 s, time-step number is      0, outer-iteration number is  0

 maximum convective power differance has been-0.1000000E+01    w    in component     0 at time-1.0000000E+00 s
 time-step size was limited by component    0 at cell    0 to 1.0000E+08 s
 average outer-iteration count over the last     0 time steps was   0.000
 last minimum number of outer iterations was  0 at time step    0 (limited by component    0 with fr.error of 0.0000E+00)
 last maximum number of outer iterations was  0 at time step    0 (limited by component    0 with fr.error of 0.0000E+00)
 total number of times that each component (id#) was the last to converge since the last short edit
    0( 10)     0( 12)     0( 14)     0( 16)     0( 17)     0( 18)     0( 54)     0( 52)     0( 50)     0( 49)     0( 91)     0( 56)
    0( 20)     0( 22)     0( 24)     0( 26)     0( 27)     0( 28)     0(202)     0(200)     0(205)     0(290)     0( 64)     0( 62)
    0( 60)     0(210)     0(220)     0(400)     0(410)     0(420)     0(422)     0(280)     0(270)     0(254)     0(250)     0(350)
    0(212)     0(120)     0(110)     0(105)     0(190)     0(100)     0(320)     0(310)     0(305)     0(390)     0(300)     0(430)
    0(432)     0(150)     0(354)     0(370)     0(380)     0(216)     0(112)     0(180)     0(170)     0(154)     0(312)     0(436)
    0(116)     0(316)     0( 59)     0( 92)     0(424)     0(578)     0( 66)     0(214)     0(434)     0(279)     0(269)     0(576)
    0(218)     0(114)     0(314)     0(438)     0(369)     0(379)     0(118)     0(179)     0(169)     0(318)     0( 30)     0( 32)
    0( 34)     0( 36)     0( 37)     0( 38)     0( 40)     0( 41)     0( 42)     0( 74)     0( 72)     0( 70)     0( 44)     0( 45)
    0( 46)     0( 43)     0( 69)     0( 93)     0( 47)     0( 76)     0( 48)     0(  2)     0(  3)     0(  4)     0(  5)     0(  6)
    0(  7)     0(  1)
 current maximum time-step sizes and limitation counts since the last short edit
     delamx        delcmx        deldmx        delemx        delpmx        delrmx        delvmx        delxmx
  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  5.0924E+02 s  1.0000E+08 s  1.1289E+01 s  5.0000E+00 s
        0             0             0             0             0             0             0             0
 further limitation counts on what controls delcmx
     dtlmx         dtvmx         dprmx         dtsms         dtrmx         delt/2
       0             0             0             0             0             0

    cpu execution time of this run is 2.903300E+01 s

 total time steps since time 0.0 s is         1262
   total cpu time since time 0.0 s is 1.845132E+04 s

************************************* signal-variable values at time    0.00000 s *************************************

    id     sig.var.          id     sig.var.          id     sig.var.          id     sig.var.          id     sig.var.

     1   0.000000E+00        11   2.300000E+09       101   5.921515E+02       111   5.576152E+06       161   4.259217E+03
```

```
         time (s)            core power (w)            liq temp (k)             pressure (pa)            z lq mf (kg/s)
  171   1.590628E+07     181   5.593092E+02     201   5.918522E+02     222   5.566886E+06     261   4.259063E+03
        pressure (pa)          liq temp (k)           liq temp (k)           pressure (pa)          z lq mf (kg/s)
  271   1.590643E+07     281   5.591809E+02     301   5.920947E+02     333   5.698602E+06     361   4.259061E+03
        pressure (pa)          liq temp (k)           liq temp (k)           pressure (pa)          z lq mf (kg/s)
  371   1.590640E+07     381   5.598847E+02     401   1.552666E+07     421   1.550000E+07     501   4.443085E+06
        pressure (pa)          liq temp (k)           pressure (pa)          pressure (pa)          pressure (pa)
  521  -1.143382E+07     601   4.443085E+06     621  -1.143397E+07     701   4.443085E+06     721  -1.143394E+07
        pressure (pa)          pressure (pa)          pressure (pa)          pressure (pa)          pressure (pa)
 1000   1.727668E+03    1051   5.638993E+06    1100   4.145522E+02    1101   5.576152E+06    1121   5.546684E+06
       z m mfw (kg/s)          pressure (pa)         z m mfw (kg/s)          pressure (pa)          pressure (pa)
 1135   8.570035E+03    1501   1.081505E+03    1541   1.526797E-01    1700   4.173765E+02    1714   8.610597E+04
        pressure (pa)         z lq mf (kg/s)         valve farea fr         z m mfw (kg/s)          pressure (pa)
 1903   5.658502E+06    1910   5.719234E+06    2000   1.532154E+03    2020   0.000000E+00    2051   5.629368E+06
        pressure (pa)          pressure (pa)         z m mfw (kg/s)         z m mfw (kg/s)          pressure (pa)
 2100   4.147437E+02    2101   5.566886E+06    2121   5.549604E+06    2135   8.611848E+03    2541   1.438520E-01
       z m mfw (kg/s)          pressure (pa)          pressure (pa)          pressure (pa)         valve farea fr
 2700   4.082209E+02    2714   7.733902E+04    2903   5.633878E+06    2910   5.696383E+06    3000   1.607697E+03
       z m mfw (kg/s)          pressure (pa)          pressure (pa)          pressure (pa)         z m mfw (kg/s)
 3051   5.819518E+06    3100   1.189791E+03    3101   5.698602E+06    3121   5.651021E+06    3135   1.457609E+04
        pressure (pa)         z m mfw (kg/s)          pressure (pa)          pressure (pa)          pressure (pa)
 3501   9.455555E+02    3541   1.000000E+00    3700   1.201499E+03    3714   2.953399E+05    3903   5.843392E+06
       z lq mf (kg/s)         valve farea fr         z m mfw (kg/s)          pressure (pa)          pressure (pa)
 3910   5.909617E+06    4001   5.411775E+06    4220   1.000000E+00    4240   0.000000E+00    9000   6.091770E+02
        pressure (pa)          pressure (pa)         valve farea fr         trp set status         a mx sf tp (k)
 9010   6.219615E+02
       s mx sf tp (k)
                                                                                          12

********************************* control-block output values at time    0.00000 s *********************************
                                                                                          12
   id      con.blk.        id      con.blk.        id      con.blk.        id      con.blk.        id      con.blk.

   -1   0.000000E+00       -2   0.000000E+00       -3   1.440000E-01       -4   1.551300E+07       -5   1.620300E+07
                   k                  w                  -                 pa                 pa
   -6   1.723700E+07       -7   5.742000E+02       -8   5.000000E-02       -9  -1.379000E+05      -10   4.087000E+05
                  pa                  k                  -                 pa                  w
  -11   2.423000E-03      -12   4.540000E+02      -13   4.330000E+06      -14   5.570000E+02      -15   5.283235E+00
                s/kg               kg/s                 pa                  k       sqrt(kg/m3)
  -16   5.751000E+02      -17   1.162000E+00      -18   0.000000E+00      -19   1.072000E+00      -22   0.000000E+00
                   k                  k                  k                  k                  -
  -24   0.000000E+00      -26   0.000000E+00      -28   0.000000E+00      -30   0.000000E+00      -32   0.000000E+00
                   -                  -                  -                  -                  -
  -34   0.000000E+00      -36   0.000000E+00      -38   0.000000E+00      -40   0.000000E+00      -50   5.759881E+02
                   -                  -                  -                  -                  k
  -55   5.759886E+02     -108   5.757303E+02     -109   5.757296E+02     -110   5.757300E+02     -118   3.284231E+01
                   k                  k                  k                  k                  k
 -119   3.284230E+01     -120   3.284231E+01     -130   1.173669E-02     -132   1.213752E-02     -134  -1.504360E-03
                   k                  k                  k                  k                  k
 -136   1.149862E+00     -138   1.148358E+00     -140   3.674746E+01     -142   0.000000E+00     -148   0.000000E+00
                   k                  k                  k                  -                  -
 -149   1.552084E-02     -150   0.000000E+00     -152   8.032080E-03     -154   0.000000E+00     -156   0.000000E+00
                   k                  k                  k                  -                  k
 -158   1.072000E+00     -160   6.299889E-01     -162   4.023000E-03     -164   2.534445E-03     -166   1.069466E+00
                   k                  k                  -                  k                  k
 -168   3.422290E+01     -170   0.000000E+00     -208   5.755166E+02     -209   5.755150E+02     -210   5.755158E+02
                   k                  -                  k                  k                  k
 -218   3.267123E+01     -219   3.267380E+01     -220   3.267251E+01     -230   7.746030E-03     -232   8.255360E-03
                   k                  k                  k                  k                  k
 -234  -1.504360E-03     -236   1.153745E+00     -238   1.152240E+00     -240   3.687169E+01     -242   0.000000E+00
                   k                  k                  k                  k                  -
 -248   0.000000E+00     -249   3.544092E-02     -250   0.000000E+00     -252   1.773002E-02     -254   0.000000E+00
                   -                  k                  k                  k                  -
 -256   0.000000E+00     -258   1.072000E+00     -260   4.157826E-01     -262   4.023000E-03     -264   1.672693E-03
                   k                  k                  k                  -                  k
 -266   1.070327E+00     -268   3.425047E+01     -270   0.000000E+00     -308   5.759897E+02     -309   5.759886E+02
                   k                  k                  -                  k                  k
 -310   5.759892E+02     -318   3.221000E+01     -319   3.221149E+01     -320   3.221074E+01     -330   1.656514E-02
                   k                  k                  k                  k                  k
 -332   1.709932E-02     -334  -1.504360E-03     -336   1.144901E+00     -338   1.143396E+00     -340   3.658868E+01
                   k                  k                  k                  k                  k
 -342   0.000000E+00     -348   0.000000E+00     -349   2.459196E-02     -350   0.000000E+00     -352   1.263294E-02
                   -                  -                  k                  k                  k
 -354   0.000000E+00     -356   0.000000E+00     -358   1.072000E+00     -360   8.891648E-01     -362   4.023000E-03
                   -                  k                  k                  k                  -
 -364   3.577110E-03     -366   1.068423E+00     -368   3.418953E+01     -370   0.000000E+00     -406   4.613114E-01
                   k                  k                  k                  -                  -
 -408   4.580000E-01     -410   3.311358E-03     -412   2.436151E-02     -414   3.760694E-01     -430  -1.300000E+04
                   -                  -                  -                  -                 pa
 -432  -1.000000E+02     -434  -1.300833E+04     -436   1.022721E+05     -438   0.000000E+00     -440   0.000000E+00
                paxs                 pa                  w                  -                  -
 -442   0.000000E+00     -444   0.000000E+00     -446   1.022721E+05     -448   1.000000E+00     -450   1.022721E+05
                   -                  w                  w                  -                  w
 -521  -1.000000E+07     -621  -1.000000E+07     -721  -1.000000E+07    -1000   1.000000E+00    -1001   4.145522E+02
                  pa                 pa                 pa                  -                  -
-1002   4.167553E+00    -1004   5.143134E-01    -1005   5.153439E-01    -1006   4.656073E-03    -1007   1.000000E-01
                   -                  -                  -                  -                  s
-1008   1.465607E-02    -1009  -8.971385E+00    -1010  -2.173767E-02    -1011  -7.081592E-03    -1012   8.453294E-03
                   -               kg/s                  -                  -                  s
-1013  -6.236263E-03    -1014   1.464434E-01    -1104   8.570035E+03    -1106   7.848372E+01    -1109   4.146479E+02
                   -                  -                 pa      m2xsqrt(pa)               kg/s
-1110   0.000000E+00    -1112   0.000000E+00    -1114   0.000000E+00    -1116   0.000000E+00    -1118   0.000000E+00
                   -                  -                  -                  -                  -
-1160   0.000000E+00    -1162   0.000000E+00    -1704   8.610597E+04    -1706   4.313512E+02    -2000   1.000000E+00
                   -                  -                 pa               kg/s               kg/s
-2001   4.147437E+02    -2002   3.694218E+00    -2004   1.188990E-01    -2005   1.197565E-01    -2006   4.002435E-01
                kg/s               kg/s                  -                  -                  -
```

id	value	unit	id	value	unit	id	value	unit	id	value	unit	id	value	unit
-2007	1.000000E-01	s	-2008	4.102435E-01	-	-2009	-1.761694E+02	kg/s	-2010	-4.268584E-01	-	-2011	-1.661490E-02	-
-2012	2.808238E-02	s	-2013	-1.380666E-02	-	-2014	1.300453E-01	-	-2104	8.611848E+03	pa	-2106	7.867495E+00	m2xsqrt(pa)
-2109	4.156582E+01	kg/s	-2110	0.000000E+00	-	-2112	0.000000E+00	-	-2114	0.000000E+00	-	-2116	0.000000E+00	-
-2118	0.000000E+00	-	-2160	0.000000E+00	-	-2162	0.000000E+00	-	-2704	7.733902E+04	pa	-2706	2.065274E+02	kg/s
-3000	1.000000E+00	m2xsqrt(pa)	-3001	1.189791E+03	m2xsqrt(pa)	-3002	1.351244E+00	m2xsqrt(pa)	-3004	6.293927E-01	-	-3004	6.293927E-01	-
-3005	6.294370E-01	-	-3005	6.294370E-01	-	-3006	-1.094370E-01	-	-3006	-1.094370E-01	-	-3007	-1.000000E-01	s
-3007	-1.000000E-01	s	-3008	-1.194370E-01	-	-3008	-1.194370E-01	-	-3009	1.385188E+02	kg/s	-3009	1.385188E+02	kg/s
-3010	3.356309E-01	-	-3010	3.356309E-01	-	-3011	2.161939E-01	-	-3011	2.161939E-01	-	-3012	1.000000E-01	s
-3012	1.000000E-01	s	-3013	1.000000E-01	-	-3013	1.000000E-01	-	-3014	1.000000E+00	-	-3014	1.000000E+00	-
-3104	1.457609E+04	pa	-3104	1.457609E+04	pa	-3106	1.774740E+02	m2xsqrt(pa)	-3106	1.023549E+02	m2xsqrt(pa)	-3109	9.376370E+02	kg/s
-3110	0.000000E+00	-	-3112	0.000000E+00	-	-3114	1.000000E+00	-	-3116	0.000000E+00	-	-3118	0.000000E+00	-
-3160	0.000000E+00	-	-3162	0.000000E+00	-	-3704	2.953399E+05	pa	-3706	7.988688E+02	kg/s	-4241	5.617200E+06	pa
-4242	1.000000E+00	-	-4243	5.200000E-01	-	-4300	5.593000E+02	k	-4302	3.812800E+06	pa	-4304	5.751000E+02	k
-4310	5.757300E+02	k	-4312	5.759892E+02	k	-4314	5.759892E+02	k	-4316	1.668916E+01	k	-4318	1.000000E+00	-
-4320	9.983828E-01	-	-4330	5.760235E+02	k	-4332	9.234634E-01	k	-4334	0.000000E+00	-	-4336	0.000000E+00	-
-4338	0.000000E+00	-	-4340	0.000000E+00	-	-4342	0.000000E+00	-						

** trip set status at time 0.00000 s **

id	set status	id	set status	id	set status	id	set status	id	set status
1	on-forward	10	off	12	off	14	off	16	off
18	off	20	off	21	off	22	off	24	off
26	off	28	off	30	off	32	off	34	off
36	off	38	off	40	off	42	off	44	off
46	off	48	off	50	off	52	off	54	off
56	off	58	off	60	off	100	off	110	off
120	off	200	off	210	off	220	off	300	off
310	off	320	off	-407	on-forward	422	off	423	off
450	on-reverse	460	on-reverse	520	on-reverse	620	on-reverse	720	on-reverse
1001	off	1002	off	1003	off	1010	off	1020	off
1030	off	1040	off	1050	off	1060	off	1500	off
2010	on-forward	2020	on-forward	2030	off	2040	off	2050	off
2060	off	3010	off	3020	off	3030	off	3040	on-forward
3050	on-forward	3060	off	3500	off	9996	off	9997	off
9998	off	9999	off						

************************************** trip signal values at time 0.00000 s **

12

id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit
1	0.000000E+00	s	10	0.000000E+00	-	12	0.000000E+00	-	14	0.000000E+00	-	16	0.000000E+00	-
18	0.000000E+00	-	20	0.000000E+00	-	21	0.000000E+00	-	22	0.000000E+00	-	24	0.000000E+00	-
26	0.000000E+00	-	28	0.000000E+00	-	30	0.000000E+00	-	32	0.000000E+00	-	34	0.000000E+00	-
36	0.000000E+00	-	38	0.000000E+00	-	40	0.000000E+00	-	42	0.000000E+00	-	44	0.000000E+00	-
46	0.000000E+00	-	48	0.000000E+00	-	50	0.000000E+00	-	52	2.300000E+09	w	54	1.550000E+07	pa
56	4.613114E-01	-	58	1.550000E+07	pa	60	1.550000E+07	pa	100	0.000000E+00	-	110	4.259217E+03	kg/s
120	5.757300E+02	k	200	0.000000E+00	-	210	4.259063E+03	kg/s	220	5.755158E+02	k	300	0.000000E+00	-
310	4.259061E+03	kg/s	320	5.759892E+02	k	-407	4.613114E-01	-	422	0.000000E+00	-	423	0.000000E+00	s
450	1.550000E+07	pa	460	1.550000E+07	pa	520	-1.143382E+07	m	620	-1.143397E+07	m	720	-1.143394E+07	m
1001	9.266003E+03	pa	1002	1.224505E+05	pa	1003	1.317165E+05	pa	1010	5.153439E-01	-	1020	5.153439E-01	-
1030	5.153439E-01	-	1040	-8.971385E+00	kg/s	1050	4.146479E+02	kg/s	1060	5.576152E+06	pa	1500	1.081505E+03	kg/s
2010	1.197565E-01	-	2020	1.197565E-01	-	2030	1.197565E-01	-	2040	-1.761694E+02	kg/s	2050	4.156582E+01	kg/s
2060	5.566886E+06	pa	3010	6.294370E-01	-	3020	6.294370E-01	-	3030	6.294370E-01	-	3040	1.385188E+02	kg/s
3050	9.376370E+02	kg/s	3060	5.698602E+06	pa	3500	9.455555E+02	kg/s	9996	0.000000E+00	s	9997	0.000000E+00	s
9998	0.000000E+00	s	9999	0.000000E+00	s									

at time 0.0000 s in component number 920 at cell 2, the maximum stanton number is 2.681169E+01
at time 0.0000 s in component number 906 at cell 1, the minimum tld is 6.202981E+02 k
where tld is the liquid temperature at bubble detachment from a heated surface

---

```
          1                                                                                  1  00000
         11  time is   0.000000 s, time-step size is   0.001000 s, time-step number is   0   11   0   0
          1                                                                                  1   0   0
```

```
            1                               $10$ hot leg 1                                          1   0   0
          111                                                                                      111  00000
--------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is  10, first junction number is  10, and second junction number is  12

                  ncd-gas
    pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas   wf.liq.
cell   pa           pa          -         k         k         k        kg/m3     kg/m3        m/s        m/s        -
 1 1.55552E+07 0.00000E+00 0.000E+00 6.182E+02 5.922E+02 6.182E+02 6.817E+02 1.025E+02  1.466E+01  1.467E+01 7.903E-02
 2 1.55545E+07 0.00000E+00 0.000E+00 6.182E+02 5.922E+02 6.182E+02 6.817E+02 1.025E+02  1.466E+01  1.466E+01 3.073E-03
 3 1.55537E+07 0.00000E+00 0.000E+00 6.182E+02 5.922E+02 6.182E+02 6.817E+02 1.025E+02  1.466E+01  1.466E+01 3.073E-03
 4 1.55530E+07 0.00000E+00 0.000E+00 6.182E+02 5.921E+02 6.182E+02 6.817E+02 1.025E+02  1.466E+01  1.466E+01 3.073E-03
 5 1.55524E+07 0.00000E+00 0.000E+00 6.182E+02 5.921E+02 6.182E+02 6.817E+02 1.025E+02  1.466E+01  1.466E+01 3.073E-03
 6 1.55519E+07 0.00000E+00 0.000E+00 6.182E+02 5.921E+02 6.182E+02 6.817E+02 1.025E+02  1.466E+01  1.466E+01 3.073E-03
 7                                                                                        1.283E+01  1.282E+01 1.770E-01

    idr   liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf  node-wise wall temperatures
cell -    ----- w/m2/k ------     w/k         w          w          k            k
 1  1.0  3.586E+04 0.000E+00 5.260E+04-4.150E+02 0.000E+00 6.187E+02     592.14
 2  1.0  3.586E+04 0.000E+00 5.260E+04-4.134E+02 0.000E+00 6.187E+02     592.14
 3  1.0  3.586E+04 0.000E+00 5.260E+04-4.118E+02 0.000E+00 6.187E+02     592.14
 4  1.0  3.586E+04 0.000E+00 5.260E+04-4.100E+02 0.000E+00 6.187E+02     592.14
 5  1.0  3.586E+04 0.000E+00 2.578E+04-4.092E+02 0.000E+00 6.187E+02     592.14
 6  1.0  3.383E+04 0.000E+00 5.208E+04-3.924E+02 0.000E+00 6.187E+02     592.14

total power to the component from all heat-transfer surfaces is -6.265027E+03   w
total power to the liquid is -6.265027E+03   w    and total power to the gas is  0.000000E+00   w

total convective energy transported to the fluid from component wall: -2.5067536E+06 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                   inside convective energy error: absolute=  2.71056E+07 w*s     effective= -2.64257E+05 w*s

pipe  component  total coolant mass is  1.92481E+03 kg , total coolant energy is  2.73661E+09 w*s, and
computed initial total coolant mass is  1.93238E+03 kg

##########  4037 lines deleted here  ##########

--------------------------------------------------------------------------------------------------------------
 1   00000 99999                                                                                        77777
 11   0   0 9   9 time is      0.000000 s, time-step size is     0.001000 s, time-step number is     0        7
 1    0   0 99999                                                                                         7
 1    0   0     9                          $7$ rod guide tube 6 (short)                                  7
 111  00000 99999                                                                                        7
--------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is   7, first junction number is   7, and second junction number is  99

                  ncd-gas
    pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas   wf.liq.
cell   pa           pa          -         k         k         k        kg/m3     kg/m3        m/s        m/s        -
 1 1.56852E+07 0.00000E+00 0.000E+00 6.189E+02 5.928E+02 6.189E+02 6.803E+02 1.039E+02  1.122E+00  1.125E+00 2.449E-02
 2 1.56792E+07 0.00000E+00 0.000E+00 6.188E+02 5.928E+02 6.188E+02 6.803E+02 1.039E+02  1.122E+00  1.124E+00 6.479E-03
 3                                                                                        1.122E+00  1.124E+00 3.571E-02

pipe  component  total coolant mass is  2.50634E+01 kg , total coolant energy is  3.57175E+07 w*s, and
computed initial total coolant mass is  2.61042E+01 kg .

--------------------------------------------------------------------------------------------------------------
 1     1   00000                                                                                            1
 11   11   0   0 time is      0.000000 s, time-step size is     0.001000 s, time-step number is     0       11
 1     1   0   0                                                                                            1
 1     1   0   0                           $1$ reactor vessel                                               1
 111 111  00000                                                                                           111
--------------------------------------------------------------------------------------------------------------

the component type is a vessel, the component number is   1, and the junction numbers are   10   20   30   19   29   39
                                                                                             2    3    4    5    6    7
                                                                                            94   95   96   97   98   99

level  1 data

alpn        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            -

rovn        1.05620E+02  1.05619E+02  1.05620E+02  1.05619E+02  1.05620E+02  1.05619E+02  1.05843E+02  1.05843E+02
            1.05843E+02  1.05843E+02  1.05843E+02  1.05843E+02
            kg/m3

roln        7.53774E+02  7.54347E+02  7.54478E+02  7.54615E+02  7.53910E+02  7.53207E+02  7.53786E+02  7.54360E+02
            7.54490E+02  7.54623E+02  7.53920E+02  7.53217E+02
            kg/m3

vvnyt      -1.71889E-03  3.87624E-04 -7.42757E-04  1.78877E-03 -1.17812E-04  4.03219E-04 -6.68265E-02  6.46697E-02
           -6.58090E-02  6.72151E-02 -6.39050E-02  6.46561E-02
            m/s

vvnz        4.51604E+00  4.48593E+00  4.51093E+00  4.48372E+00  4.51497E+00  4.49444E+00 -1.67215E+01 -1.68575E+01
           -1.67165E+01 -1.68562E+01 -1.67206E+01 -1.68658E+01
            m/s

vvnxr      -2.64293E+00 -2.63446E+00 -2.64204E+00 -2.63407E+00 -2.64276E+00 -2.63610E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s
```

```
         m/s
lnz      4.51190E+00  4.48179E+00  4.50679E+00  4.47959E+00  4.51083E+00  4.49030E+00 -1.67140E+01 -1.68501E+01
        -1.67091E+01 -1.68487E+01 -1.67132E+01 -1.68584E+01
         m/s
lnxr    -2.63829E+00 -2.62981E+00 -2.63740E+00 -2.62942E+00 -2.63812E+00 -2.63144E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         m/s
vn       6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19758E+02  6.19758E+02
         6.19758E+02  6.19758E+02  6.19758E+02  6.19758E+02
         k
ln       5.59561E+02  5.59274E+02  5.59208E+02  5.59139E+02  5.59493E+02  5.59845E+02  5.59570E+02  5.59282E+02
         5.59217E+02  5.59150E+02  5.59503E+02  5.59855E+02
         k
sat      6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19655E+02  6.19758E+02  6.19758E+02
         6.19758E+02  6.19758E+02  6.19758E+02  6.19758E+02
         k
n        1.58408E+07  1.58407E+07  1.58408E+07  1.58407E+07  1.58408E+07  1.58407E+07  1.58610E+07  1.58610E+07
         1.58610E+07  1.58610E+07  1.58610E+07  1.58610E+07
         pa
an       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         pa
onc      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         -
olid     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         kg/m3
evel  2 data
lpn      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         -
ovn      1.05347E+02  1.05347E+02  1.05347E+02  1.05347E+02  1.05347E+02  1.05347E+02  1.06696E+02  1.06700E+02
         1.06696E+02  1.06700E+02  1.06696E+02  1.06699E+02
         kg/m3
oln      7.53758E+02  7.54329E+02  7.54462E+02  7.54598E+02  7.53893E+02  7.53192E+02  7.53841E+02  7.54415E+02
         7.54545E+02  7.54678E+02  7.53974E+02  7.53272E+02
         kg/m3
vnyt     3.30133E-03 -2.35950E-03  2.64322E-03 -3.37696E-03  2.08269E-03 -2.29068E-03 -6.73939E-02  6.55485E-02
        -6.66061E-02  6.77439E-02 -6.49555E-02  6.56634E-02
         m/s
#########  625 lines deleted here  ##########
n        1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07
         1.56793E+07  1.56793E+07  1.56793E+07  1.56793E+07
         pa
an       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         pa
onc      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         -
olid     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         kg/m3
evel 12 data
lpn      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         -
ovn      1.03780E+02  1.03780E+02  1.03780E+02  1.03780E+02  1.03780E+02  1.03780E+02  1.01931E+02  1.01931E+02
         1.01931E+02  1.01931E+02  1.01931E+02  1.01931E+02
         kg/m3
oln      7.04574E+02  7.04534E+02  7.04637E+02  7.04544E+02  7.04583E+02  7.04432E+02  7.08582E+02  7.08582E+02
         7.08582E+02  7.08582E+02  7.08582E+02  7.08582E+02
         kg/m3
vnyt    -2.72334E-02  2.88037E-02 -2.84270E-02  2.71077E-02 -2.95349E-02  2.92796E-02  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         m/s
vnz      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
```

```
         m/s

vvnxr    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         m/s

vlnyt   -2.72334E-02  2.88037E-02 -2.84269E-02  2.71076E-02 -2.95348E-02  2.92796E-02  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         m/s

vlnz     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         m/s

vlnxr    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         m/s

tvn      6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.17905E+02  6.17905E+02
         6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
         k

tln      5.82977E+02  5.82994E+02  5.82948E+02  5.82990E+02  5.82972E+02  5.83040E+02  5.81000E+02  5.81000E+02
         5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
         k

tsat     6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.18793E+02  6.17905E+02  6.17905E+02
         6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
         k

pn       1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.56721E+07  1.55000E+07  1.55000E+07
         1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
         pa

pan      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         pa

conc     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         -

solid    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
         kg/m3

total power to the vessel coolant from all heat surfaces is  2.29954E+09   w
total power to the liquid is  2.29954E+09   w   and total power to the gas is  0.00000E+00   w

vessel component total coolant mass is  6.84358E+04 kg , total coolant energy is  9.08112E+10 w*s, and
computed initial total coolant mass is  6.78684E+04 kg

------------------------------------------------------------------------------------------------------------------
  1     1     1                                                                             99999 00000 00000
 11    11    11   time is      0.000000 s, time-step size is    0.001000 s, time-step number is     0 9   9 0   0 0   0
  1     1     1                                                                             99999 0     0 0   0
  1     1     1                              $900$ reactor-core fuel rods                       9 0     0 0   0
111   111   111                                                                             99999 00000 00000
------------------------------------------------------------------------------------------------------------------


the heat-structure component type is a rod  and the component number is 900

reactor-core power is 2.300000E+09   w    and neutron multiplication constant keff is 1.000000

rod   1   plane (perpendicular to z direction) coupled to cells   0 (inner) and   1 (outer), peaking factor is   1.0000

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 1.0052E+03 9.8669E+02 9.3278E+02 8.4820E+02 7.4015E+02 5.9859E+02 5.8897E+02 5.8000E+02
1002   2  9.1440E-01 1.3598E+03 1.3197E+03 1.2048E+03 1.0313E+03 8.2282E+02 6.2438E+02 6.0811E+02 5.9287E+02
1003   3  1.8288E+00 1.4322E+03 1.3875E+03 1.2599E+03 1.0680E+03 8.3978E+02 6.3679E+02 6.1950E+02 6.0329E+02
1004   4  2.7432E+00 1.3646E+03 1.3250E+03 1.2116E+03 1.0398E+03 8.3286E+02 6.3956E+02 6.2371E+02 6.0887E+02
1005   5  3.6576E+00 1.0440E+03 1.0244E+03 9.6729E+02 8.7780E+02 7.6375E+02 6.2301E+02 6.1328E+02 6.0420E+02

 id  idi    hliqi        tliqi        hvapi        tvapi       ido   hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k          k         w/m2/k          k               w/m2/k          k         w/m2/k          k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1574E+04  5.6826E+02  0.0000E+00  6.1936E+02  3.0807E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1972E+04  5.7296E+02  0.0000E+00  6.1936E+02  3.7750E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2191E+04  5.8210E+02  0.0000E+00  6.1925E+02  3.9555E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2373E+04  5.8952E+02  0.0000E+00  6.1914E+02  3.8153E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2695E+04  5.9254E+02  0.0000E+00  6.1902E+02  3.1882E+03

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.7053E+05  0.0000E+00  3.7053E+05  2.0218E+06  5.46E+00
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.3648E+05  0.0000E+00  6.3648E+05  2.0231E+06  3.18E+00
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.8217E+05  0.0000E+00  6.8217E+05  2.0242E+06  2.97E+00
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.2659E+05  0.0000E+00  6.2659E+05  2.0204E+06  3.22E+00
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.8122E+05  0.0000E+00  3.8122E+05  2.0169E+06  5.29E+00

        stanton     liq.temp.     stanton     liq.temp.
         number    bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  2.73150E+02  4.17177E-04  6.19359E+02
```

1002	0.00000E+00	2.73150E+02	6.45045E-04	6.19248E+02
1003	0.00000E+00	2.73150E+02	8.79888E-04	6.19136E+02
1004	0.00000E+00	2.73150E+02	1.02607E-03	6.19023E+02
1005	0.00000E+00	2.73150E+02	7.29109E-04	6.19023E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7021290E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.10575E+09 w*s effective= -4.78088E+08 w*s

rod 2 plane (perpendicular to z direction) coupled to cells 0 (inner) and 2 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.0049E+03	9.8642E+02	9.3252E+02	8.4796E+02	7.3994E+02	5.9834E+02	5.8872E+02	5.7974E+02
1002	2	9.1440E-01	1.3595E+03	1.3194E+03	1.2046E+03	1.0311E+03	8.2264E+02	6.2414E+02	6.0787E+02	5.9263E+02
1003	3	1.8288E+00	1.4319E+03	1.3873E+03	1.2597E+03	1.0678E+03	8.3961E+02	6.3658E+02	6.1928E+02	6.0307E+02
1004	4	2.7432E+00	1.3644E+03	1.3248E+03	1.2114E+03	1.0396E+03	8.3271E+02	6.3936E+02	6.2352E+02	6.0868E+02
1005	5	3.6576E+00	1.0438E+03	1.0242E+03	9.6710E+02	8.7762E+02	7.6359E+02	6.2282E+02	6.1309E+02	6.0401E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1544E+04	5.6799E+02	0.0000E+00	6.1936E+02	3.0798E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1944E+04	5.7270E+02	0.0000E+00	6.1936E+02	3.7740E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2161E+04	5.8186E+02	0.0000E+00	6.1925E+02	3.9545E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2333E+04	5.8930E+02	0.0000E+00	6.1914E+02	3.8144E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2630E+04	5.9233E+02	0.0000E+00	6.1902E+02	3.1875E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.7053E+05	0.0000E+00	3.7053E+05	2.0223E+06	5.46E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3648E+05	0.0000E+00	6.3648E+05	2.0237E+06	3.18E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.8218E+05	0.0000E+00	6.8218E+05	2.0249E+06	2.97E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2659E+05	0.0000E+00	6.2659E+05	2.0215E+06	3.23E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.8122E+05	0.0000E+00	3.8122E+05	2.0182E+06	5.29E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.15746E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	6.42174E-04	6.19249E+02
1003	0.00000E+00	2.73150E+02	8.75176E-04	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.02018E-03	6.19023E+02
1005	0.00000E+00	2.73150E+02	7.25883E-04	6.19023E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7023117E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.11409E+09 w*s effective= -4.60890E+08 w*s

rod 3 plane (perpendicular to z direction) coupled to cells 0 (inner) and 3 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.0049E+03	9.8634E+02	9.3245E+02	8.4789E+02	7.3987E+02	5.9826E+02	5.8864E+02	5.7966E+02
1002	2	9.1440E-01	1.3594E+03	1.3193E+03	1.2045E+03	1.0310E+03	8.2257E+02	6.2406E+02	6.0779E+02	5.9254E+02
1003	3	1.8288E+00	1.4318E+03	1.3872E+03	1.2596E+03	1.0678E+03	8.3954E+02	6.3648E+02	6.1919E+02	6.0297E+02
1004	4	2.7432E+00	1.3643E+03	1.3247E+03	1.2112E+03	1.0395E+03	8.3262E+02	6.3925E+02	6.2341E+02	6.0857E+02
1005	5	3.6576E+00	1.0437E+03	1.0241E+03	9.6699E+02	8.7752E+02	7.6350E+02	6.2271E+02	6.1298E+02	6.0390E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1565E+04	5.6792E+02	0.0000E+00	6.1936E+02	3.0796E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1964E+04	5.7263E+02	0.0000E+00	6.1936E+02	3.7736E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2188E+04	5.8178E+02	0.0000E+00	6.1925E+02	3.9541E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2373E+04	5.8921E+02	0.0000E+00	6.1914E+02	3.8139E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2695E+04	5.9224E+02	0.0000E+00	6.1902E+02	3.1871E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.7053E+05	0.0000E+00	3.7053E+05	2.0217E+06	5.46E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3648E+05	0.0000E+00	6.3648E+05	2.0230E+06	3.18E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.8218E+05	0.0000E+00	6.8218E+05	2.0241E+06	2.97E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2660E+05	0.0000E+00	6.2660E+05	2.0203E+06	3.22E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.8123E+05	0.0000E+00	3.8123E+05	2.0168E+06	5.29E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.14874E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	6.40623E-04	6.19248E+02
1003	0.00000E+00	2.73150E+02	8.72315E-04	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.01562E-03	6.19023E+02
1005	0.00000E+00	2.73150E+02	7.22022E-04	6.19023E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7022595E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s

```
          outside convective energy error: absolute=  1.11082E+09 w*s      effective= -4.66580E+08 w*s

rod   4   plane (perpendicular to z direction) coupled to cells   0 (inner) and   4 (outer), peaking factor is    1.0000

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 1.0048E+03 9.8629E+02 9.3240E+02 8.4784E+02 7.3983E+02 5.9821E+02 5.8859E+02 5.7961E+02
1002   2  9.1440E-01 1.3594E+03 1.3193E+03 1.2045E+03 1.0310E+03 8.2254E+02 6.2402E+02 6.0775E+02 5.9250E+02
1003   3  1.8288E+00 1.4318E+03 1.3871E+03 1.2596E+03 1.0677E+03 8.3952E+02 6.3646E+02 6.1916E+02 6.0295E+02
1004   4  2.7432E+00 1.3643E+03 1.3247E+03 1.2112E+03 1.0395E+03 8.3262E+02 6.3925E+02 6.2340E+02 6.0856E+02
1005   5  3.6576E+00 1.0437E+03 1.0241E+03 9.6698E+02 8.7752E+02 7.6349E+02 6.2271E+02 6.1297E+02 6.0390E+02

 id  idi   hliqi        tliqi        hvapi        tvapi       ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k               w/m2/k          k         w/m2/k          k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1541E+04  5.6786E+02  0.0000E+00  6.1936E+02  3.0794E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1941E+04  5.7257E+02  0.0000E+00  6.1936E+02  3.7734E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2160E+04  5.8173E+02  0.0000E+00  6.1925E+02  3.9539E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2333E+04  5.8918E+02  0.0000E+00  6.1914E+02  3.8139E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2629E+04  5.9221E+02  0.0000E+00  6.1902E+02  3.1871E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi     qchfi/qtoti    qliqo        qvapo        qtoto        qchfo     qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2          -          w/m2         w/m2         w/m2         w/m2          -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.7053E+05  0.0000E+00  3.7053E+05  2.0223E+06  5.46E+00
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.3648E+05  0.0000E+00  6.3648E+05  2.0236E+06  3.18E+00
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.8218E+05  0.0000E+00  6.8218E+05  2.0249E+06  2.97E+00
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.2660E+05  0.0000E+00  6.2660E+05  2.0215E+06  3.23E+00
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.8123E+05  0.0000E+00  3.8123E+05  2.0182E+06  5.29E+00

        stanton      liq.temp.     stanton      liq.temp.
         number     bubble det.     number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  2.73150E+02  4.14863E-04  6.19359E+02
1002  0.00000E+00  2.73150E+02  6.40484E-04  6.19249E+02
1003  0.00000E+00  2.73150E+02  8.72282E-04  6.19137E+02
1004  0.00000E+00  2.73150E+02  1.01619E-03  6.19023E+02
1005  0.00000E+00  2.73150E+02  7.23189E-04  6.19023E+02

total convective energy to the fluid during hydro solution:
                 inside surface=  0.0000000E+00 w*s       outside surface=  1.7023396E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  0.00000E+00 w*s      effective=  0.00000E+00 w*s
          outside convective energy error: absolute=  1.12219E+09 w*s      effective= -4.58686E+08 w*s

rod   5   plane (perpendicular to z direction) coupled to cells   0 (inner) and   5 (outer), peaking factor is    1.0000

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 1.0051E+03 9.8662E+02 9.3272E+02 8.4814E+02 7.4010E+02 5.9853E+02 5.8891E+02 5.7993E+02
1002   2  9.1440E-01 1.3597E+03 1.3196E+03 1.2048E+03 1.0312E+03 8.2278E+02 6.2432E+02 6.0805E+02 5.9281E+02
1003   3  1.8288E+00 1.4321E+03 1.3875E+03 1.2599E+03 1.0680E+03 8.3973E+02 6.3673E+02 6.1944E+02 6.0323E+02
1004   4  2.7432E+00 1.3646E+03 1.3250E+03 1.2115E+03 1.0397E+03 8.3281E+02 6.3950E+02 6.2366E+02 6.0882E+02
1005   5  3.6576E+00 1.0440E+03 1.0243E+03 9.6723E+02 8.7774E+02 7.6370E+02 6.2295E+02 6.1322E+02 6.0414E+02

 id  idi   hliqi        tliqi        hvapi        tvapi       ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k               w/m2/k          k         w/m2/k          k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1572E+04  5.6819E+02  0.0000E+00  6.1936E+02  3.0805E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1970E+04  5.7290E+02  0.0000E+00  6.1936E+02  3.7748E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2190E+04  5.8204E+02  0.0000E+00  6.1925E+02  3.9552E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2373E+04  5.8946E+02  0.0000E+00  6.1914E+02  3.8150E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2695E+04  5.9248E+02  0.0000E+00  6.1902E+02  3.1879E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi     qchfi/qtoti    qliqo        qvapo        qtoto        qchfo     qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2          -          w/m2         w/m2         w/m2         w/m2          -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.7053E+05  0.0000E+00  3.7053E+05  2.0218E+06  5.46E+00
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.3648E+05  0.0000E+00  6.3648E+05  2.0231E+06  3.18E+00
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.8218E+05  0.0000E+00  6.8218E+05  2.0242E+06  2.97E+00
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.2659E+05  0.0000E+00  6.2659E+05  2.0204E+06  3.22E+00
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  3.8123E+05  0.0000E+00  3.8123E+05  2.0169E+06  5.29E+00

        stanton      liq.temp.     stanton      liq.temp.
         number     bubble det.     number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  2.73150E+02  4.16735E-04  6.19359E+02
1002  0.00000E+00  2.73150E+02  6.44195E-04  6.19248E+02
1003  0.00000E+00  2.73150E+02  8.78432E-04  6.19136E+02
1004  0.00000E+00  2.73150E+02  1.02406E-03  6.19023E+02
1005  0.00000E+00  2.73150E+02  7.27753E-04  6.19023E+02

total convective energy to the fluid during hydro solution:
                 inside surface=  0.0000000E+00 w*s       outside surface=  1.7021451E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  0.00000E+00 w*s      effective=  0.00000E+00 w*s
          outside convective energy error: absolute=  1.10630E+09 w*s      effective= -4.76767E+08 w*s

rod   6   plane (perpendicular to z direction) coupled to cells   0 (inner) and   6 (outer), peaking factor is    1.0000

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 1.0055E+03 9.8699E+02 9.3307E+02 8.4846E+02 7.4039E+02 5.9888E+02 5.8926E+02 5.8028E+02
1002   2  9.1440E-01 1.3601E+03 1.3200E+03 1.2051E+03 1.0316E+03 8.2304E+02 6.2467E+02 6.0840E+02 5.9316E+02
1003   3  1.8288E+00 1.4325E+03 1.3879E+03 1.2602E+03 1.0683E+03 8.4000E+02 6.3708E+02 6.1980E+02 6.0359E+02
1004   4  2.7432E+00 1.3650E+03 1.3254E+03 1.2119E+03 1.0400E+03 8.3309E+02 6.3985E+02 6.2401E+02 6.0918E+02
1005   5  3.6576E+00 1.0444E+03 1.0247E+03 9.6759E+02 8.7807E+02 7.6399E+02 6.2330E+02 6.1357E+02 6.0450E+02
```

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1555E+04	5.6854E+02	0.0000E+00	6.1936E+02	3.0817E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1955E+04	5.7325E+02	0.0000E+00	6.1936E+02	3.7763E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2165E+04	5.8238E+02	0.0000E+00	6.1925E+02	3.9568E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2331E+04	5.8980E+02	0.0000E+00	6.1914E+02	3.8165E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2629E+04	5.9282E+02	0.0000E+00	6.1902E+02	3.1892E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.7052E+05	0.0000E+00	3.7052E+05	2.0225E+06	5.46E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3648E+05	0.0000E+00	6.3648E+05	2.0238E+06	3.18E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.8217E+05	0.0000E+00	6.8217E+05	2.0251E+06	2.97E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2659E+05	0.0000E+00	6.2659E+05	2.0217E+06	3.23E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.8122E+05	0.0000E+00	3.8122E+05	2.0183E+06	5.29E+00

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	4.19531E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	6.49448E-04	6.19248E+02
1003	0.00000E+00	2.73150E+02	8.87665E-04	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.03744E-03	6.19023E+02
1005	0.00000E+00	2.73150E+02	7.37563E-04	6.19023E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7020583E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.11769E+09 w*s effective= -4.83729E+08 w*s

rod 7 plane (perpendicular to z direction) coupled to cells 0 (inner) and -1 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3349E+03	1.2962E+03	1.1855E+03	1.0179E+03	8.1594E+02	6.1885E+02	6.0290E+02	5.8795E+02
1002	2	9.1440E-01	1.9489E+03	1.8656E+03	1.6255E+03	1.2733E+03	8.8472E+02	6.5837E+02	6.3161E+02	6.0637E+02
1003	3	1.8288E+00	2.0557E+03	1.9676E+03	1.7062E+03	1.3182E+03	8.9474E+02	6.7289E+02	6.4449E+02	6.1766E+02
1004	4	2.7432E+00	1.9453E+03	1.8632E+03	1.6269E+03	1.2794E+03	8.9435E+02	6.7237E+02	6.4630E+02	6.2170E+02
1005	5	3.6576E+00	1.3856E+03	1.3447E+03	1.2277E+03	1.0506E+03	8.3804E+02	6.4335E+02	6.2722E+02	6.1211E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1574E+04	5.6826E+02	0.0000E+00	6.1936E+02	3.7129E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1972E+04	5.7296E+02	0.0000E+00	6.1936E+02	5.5533E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2191E+04	5.8210E+02	0.0000E+00	6.1925E+02	6.0731E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2674E+04	5.8952E+02	0.0000E+00	6.1914E+02	5.5751E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2695E+04	5.9254E+02	0.0000E+00	6.1902E+02	3.8673E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0218E+06	3.25E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0231E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0242E+06	1.77E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0204E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3970E+05	0.0000E+00	6.3970E+05	2.0169E+06	3.15E+00

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	7.00026E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.22008E-03	6.19248E+02
1003	0.00000E+00	2.73150E+02	1.63487E-03	6.19136E+02
1004	0.00000E+00	2.73150E+02	1.85134E-03	6.11480E+02
1005	0.00000E+00	2.73150E+02	1.22346E-03	6.19023E+02

rod 8 plane (perpendicular to z direction) coupled to cells 0 (inner) and -2 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3346E+03	1.2959E+03	1.1852E+03	1.0177E+03	8.1575E+02	6.1860E+02	6.0265E+02	5.8770E+02
1002	2	9.1440E-01	1.9487E+03	1.8653E+03	1.6252E+03	1.2731E+03	8.8457E+02	6.5814E+02	6.3139E+02	6.0614E+02
1003	3	1.8288E+00	2.0555E+03	1.9674E+03	1.7060E+03	1.3180E+03	8.9460E+02	6.7269E+02	6.4428E+02	6.1745E+02
1004	4	2.7432E+00	1.9451E+03	1.8630E+03	1.6267E+03	1.2793E+03	8.9425E+02	6.7223E+02	6.4615E+02	6.2155E+02
1005	5	3.6576E+00	1.3854E+03	1.3446E+03	1.2275E+03	1.0505E+03	8.3791E+02	6.4318E+02	6.2705E+02	6.1193E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1544E+04	5.6799E+02	0.0000E+00	6.1936E+02	3.7118E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1944E+04	5.7270E+02	0.0000E+00	6.1936E+02	5.5516E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2161E+04	5.8186E+02	0.0000E+00	6.1925E+02	6.0714E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2600E+04	5.8930E+02	0.0000E+00	6.1914E+02	5.5740E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2630E+04	5.9233E+02	0.0000E+00	6.1902E+02	3.8665E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0223E+06	3.25E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0237E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0249E+06	1.77E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0215E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3970E+05	0.0000E+00	6.3970E+05	2.0182E+06	3.15E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	6.97624E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.21479E-03	6.19249E+02
1003	0.00000E+00	2.73150E+02	1.62638E-03	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.84095E-03	6.11463E+02
1005	0.00000E+00	2.73150E+02	1.21804E-03	6.19023E+02

rod 9 plane (perpendicular to z direction) coupled to cells 0 (inner) and -3 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3345E+03	1.2958E+03	1.1852E+03	1.0176E+03	8.1569E+02	6.1852E+02	6.0256E+02	5.8762E+02
1002	2	9.1440E-01	1.9485E+03	1.8652E+03	1.6251E+03	1.2731E+03	8.8450E+02	6.5805E+02	6.3129E+02	6.0604E+02
1003	3	1.8288E+00	2.0554E+03	1.9672E+03	1.7058E+03	1.3179E+03	8.9453E+02	6.7259E+02	6.4418E+02	6.1734E+02
1004	4	2.7432E+00	1.9450E+03	1.8629E+03	1.6266E+03	1.2792E+03	8.9418E+02	6.7213E+02	6.4605E+02	6.2145E+02
1005	5	3.6576E+00	1.3853E+03	1.3444E+03	1.2273E+03	1.0504E+03	8.3781E+02	6.4306E+02	6.2692E+02	6.1180E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1565E+04	5.6792E+02	0.0000E+00	6.1936E+02	3.7115E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1964E+04	5.7263E+02	0.0000E+00	6.1936E+02	5.5509E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2188E+04	5.8178E+02	0.0000E+00	6.1925E+02	6.0706E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2618E+04	5.8921E+02	0.0000E+00	6.1914E+02	5.5733E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2695E+04	5.9224E+02	0.0000E+00	6.1902E+02	3.8660E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0217E+06	3.25E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0230E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0241E+06	1.77E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0203E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3970E+05	0.0000E+00	6.3970E+05	2.0168E+06	3.15E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	6.96160E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.21186E-03	6.19248E+02
1003	0.00000E+00	2.73150E+02	1.62109E-03	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.83273E-03	6.11471E+02
1005	0.00000E+00	2.73150E+02	1.21156E-03	6.19023E+02

rod 10 plane (perpendicular to z direction) coupled to cells 0 (inner) and -4 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3344E+03	1.2958E+03	1.1851E+03	1.0176E+03	8.1565E+02	6.1848E+02	6.0252E+02	5.8757E+02
1002	2	9.1440E-01	1.9485E+03	1.8651E+03	1.6251E+03	1.2730E+03	8.8448E+02	6.5802E+02	6.3126E+02	6.0601E+02
1003	3	1.8288E+00	2.0554E+03	1.9672E+03	1.7058E+03	1.3179E+03	8.9452E+02	6.7257E+02	6.4416E+02	6.1733E+02
1004	4	2.7432E+00	1.9450E+03	1.8629E+03	1.6266E+03	1.2792E+03	8.9418E+02	6.7214E+02	6.4605E+02	6.2146E+02
1005	5	3.6576E+00	1.3853E+03	1.3444E+03	1.2274E+03	1.0504E+03	8.3782E+02	6.4307E+02	6.2693E+02	6.1182E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1541E+04	5.6786E+02	0.0000E+00	6.1936E+02	3.7113E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1941E+04	5.7257E+02	0.0000E+00	6.1936E+02	5.5507E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2160E+04	5.8173E+02	0.0000E+00	6.1925E+02	6.0705E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	2	3.2579E+04	5.8918E+02	0.0000E+00	6.1914E+02	5.5733E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2629E+04	5.9221E+02	0.0000E+00	6.1902E+02	3.8660E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.2175E+05	0.0000E+00	6.2175E+05	2.0223E+06	3.25E+00
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0680E+06	0.0000E+00	1.0680E+06	2.0236E+06	1.89E+00
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1447E+06	0.0000E+00	1.1447E+06	2.0249E+06	1.77E+00
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0514E+06	0.0000E+00	1.0514E+06	2.0215E+06	1.92E+00
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	6.3970E+05	0.0000E+00	6.3970E+05	2.0182E+06	3.15E+00

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	6.96142E-04	6.19359E+02
1002	0.00000E+00	2.73150E+02	1.21164E-03	6.19249E+02
1003	0.00000E+00	2.73150E+02	1.62111E-03	6.19137E+02
1004	0.00000E+00	2.73150E+02	1.83385E-03	6.11459E+02
1005	0.00000E+00	2.73150E+02	1.21352E-03	6.19023E+02

rod 11 plane (perpendicular to z direction) coupled to cells 0 (inner) and -5 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	1.3348E+03	1.2961E+03	1.1854E+03	1.0178E+03	8.1589E+02	6.1878E+02	6.0283E+02	5.8789E+02
1002	2	9.1440E-01	1.9488E+03	1.8655E+03	1.6254E+03	1.2733E+03	8.8468E+02	6.5831E+02	6.3155E+02	6.0631E+02
1003	3	1.8288E+00	2.0557E+03	1.9675E+03	1.7061E+03	1.3181E+03	8.9470E+02	6.7284E+02	6.4443E+02	6.1760E+02
1004	4	2.7432E+00	1.9452E+03	1.8632E+03	1.6268E+03	1.2794E+03	8.9431E+02	6.7233E+02	6.4625E+02	6.2166E+02
1005	5	3.6576E+00	1.3856E+03	1.3447E+03	1.2276E+03	1.0506E+03	8.3800E+02	6.4330E+02	6.2716E+02	6.1205E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1572E+04	5.6819E+02	0.0000E+00	6.1936E+02	3.7126E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1970E+04	5.7290E+02	0.0000E+00	6.1936E+02	5.5529E+03

```
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2190E+04  5.8204E+02  0.0000E+00  6.1925E+02  6.0726E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   2  3.2663E+04  5.8946E+02  0.0000E+00  6.1914E+02  5.5748E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2695E+04  5.9248E+02  0.0000E+00  6.1902E+02  3.8670E+03

 heat flux to the hydro cells
 idz     qliqi       qvapi       qtoti       qchfi    qchfi/qtoti    qliqo       qvapo       qtoto       qchfo    qchfo/qtoto
          w/m2        w/m2        w/m2        w/m2        -           w/m2        w/m2        w/m2        w/m2        -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.2175E+05  0.0000E+00  6.2175E+05  2.0218E+06  3.25E+00
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.0680E+06  0.0000E+00  1.0680E+06  2.0231E+06  1.89E+00
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.1447E+06  0.0000E+00  1.1447E+06  2.0242E+06  1.77E+00
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.0514E+06  0.0000E+00  1.0514E+06  2.0204E+06  1.92E+00
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.3970E+05  0.0000E+00  6.3970E+05  2.0169E+06  3.15E+00

       stanton     liq.temp.     stanton     liq.temp.
        number    bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  2.73150E+02  6.99285E-04  6.19359E+02
1002  0.00000E+00  2.73150E+02  1.21850E-03  6.19248E+02
1003  0.00000E+00  2.73150E+02  1.63223E-03  6.19136E+02
1004  0.00000E+00  2.73150E+02  1.84777E-03  6.11478E+02
1005  0.00000E+00  2.73150E+02  1.22118E-03  6.19023E+02

rod  12   plane (perpendicular to z direction) coupled to cells   0 (inner) and  -6 (outer), peaking factor is   1.6780

 id   row    z(m)     heat-structure temperatures (k)
1001   1   0.0000E+00 1.3352E+03 1.2965E+03 1.1858E+03 1.0182E+03 8.1616E+02 6.1913E+02 6.0319E+02 5.8825E+02
1002   2   9.1440E-01 1.9493E+03 1.8659E+03 1.6258E+03 1.2736E+03 8.8492E+02 6.5866E+02 6.3191E+02 6.0667E+02
1003   3   1.8288E+00 2.0561E+03 1.9679E+03 1.7065E+03 1.3184E+03 8.9495E+02 6.7319E+02 6.4479E+02 6.1797E+02
1004   4   2.7432E+00 1.9456E+03 1.8635E+03 1.6271E+03 1.2796E+03 8.9452E+02 6.7262E+02 6.4655E+02 6.2196E+02
1005   5   3.6576E+00 1.3860E+03 1.3451E+03 1.2280E+03 1.0509E+03 8.3828E+02 6.4366E+02 6.2753E+02 6.1242E+02

 id  idi    hliqi        tliqi        hvapi       tvapi       ido    hliqo        tliqo       hvapo       tvapo        hgap
           w/m2/k          k         w/m2/k         k                w/m2/k         k        w/m2/k         k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1555E+04  5.6854E+02  0.0000E+00  6.1936E+02  3.7141E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1955E+04  5.7325E+02  0.0000E+00  6.1936E+02  5.5555E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2165E+04  5.8238E+02  0.0000E+00  6.1925E+02  6.0756E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   2  3.2693E+04  5.8980E+02  0.0000E+00  6.1914E+02  5.5770E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.2629E+04  5.9282E+02  0.0000E+00  6.1902E+02  3.8686E+03

 heat flux to the hydro cells
 idz     qliqi       qvapi       qtoti       qchfi    qchfi/qtoti    qliqo       qvapo       qtoto       qchfo    qchfo/qtoto
          w/m2        w/m2        w/m2        w/m2        -           w/m2        w/m2        w/m2        w/m2        -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.2174E+05  0.0000E+00  6.2174E+05  2.0225E+06  3.25E+00
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.0680E+06  0.0000E+00  1.0680E+06  2.0238E+06  1.89E+00
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.1447E+06  0.0000E+00  1.1447E+06  2.0251E+06  1.77E+00
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.0514E+06  0.0000E+00  1.0514E+06  2.0217E+06  1.92E+00
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  6.3970E+05  0.0000E+00  6.3970E+05  2.0183E+06  3.16E+00

       stanton     liq.temp.     stanton     liq.temp.
        number    bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  2.73150E+02  7.03979E-04  6.19359E+02
1002  0.00000E+00  2.73150E+02  1.22832E-03  6.19248E+02
1003  0.00000E+00  2.73150E+02  1.64910E-03  6.19137E+02
1004  0.00000E+00  2.73150E+02  1.87168E-03  6.11477E+02
1005  0.00000E+00  2.73150E+02  1.23765E-03  6.19023E+02

inner-surface node-interval thermal conductivity is  2.77658E+00     w/m/k
outer-surface node-interval thermal conductivity is  1.64769E+01     w/m/k
effective  r-direction wall thermal conductivity is  3.59039E+00     w/m/k
which have been axially averaged over all   6 average-power rod s

total inner surface area is  0.00000E+00 m2  and
total outer surface area is  3.96347E+03 m2  of all   6 average-power rod s

total power from the heat-structure inner surface is  0.00000E+00   w   and outer surface is  2.29992E+09   w

##########  3746 lines deleted here  ##########

-----------------------------------------------------------------------------------------------------------------------
                                                                                                    99999 33333 88888
  1   33333   1                                                                                                     
 11       3  11   time is      0.000000 s, time-step size is    0.001000 s, time-step number is   0 9   9     3 8   8
  1   33333   1                                                                                 99999 33333 88888
  1       3   1                          $938$ st-gen-1,2,3 sec.dryer                                9     3 8   8
111   33333 111                                                                                 99999 33333 88888
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the heat-structure component type is a rod  and the component number is 938

rod   1   plane (perpendicular to z direction) coupled to cells   1 (inner) and   0 (outer)

 id   row    z(m)     heat-structure temperatures (k)
1001   1   0.0000E+00 5.4465E+02 5.4465E+02 5.4466E+02
1002   2   5.7542E+00 5.4463E+02 5.4463E+02 5.4464E+02
1003   3   1.1508E+01 5.4467E+02 5.4467E+02 5.4467E+02

 id  idi    hliqi        tliqi        hvapi       tvapi       ido    hliqo        tliqo       hvapo       tvapo        hgap
           w/m2/k          k         w/m2/k         k                w/m2/k         k        w/m2/k         k         w/m2/k
1001  1  1.7814E+03  5.4471E+02  0.0000E+00  5.4471E+02   1  2.3986E+03  5.4471E+02  0.0000E+00  5.4471E+02  0.0000E+00
1002 12  2.5831E+02  5.4465E+02  0.0000E+00  5.4471E+02   1  2.2862E+03  5.4471E+02  0.0000E+00  5.4471E+02  0.0000E+00
1003 12  4.0324E+01  5.4458E+02  0.0000E+00  5.4466E+02   1  2.2862E+03  5.4471E+02  0.0000E+00  5.4471E+02  0.0000E+00

 heat flux to the hydro cells
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```
 idz    qliqi        qvapi        qtoti        qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
        w/m2         w/m2         w/m2         w/m2          -          w/m2         w/m2         w/m2         w/m2          -
1001 -1.1480E+02  0.0000E+00 -1.1480E+02  0.0000E+00  0.00E+00 -1.2205E+02  0.0000E+00 -1.2205E+02  0.0000E+00  0.00E+00
1002 -4.8937E+00  0.0000E+00 -4.8937E+00  9.7823E+02  2.00E+02 -1.6192E+02  0.0000E+00 -1.6192E+02  0.0000E+00  0.00E+00
1003  3.6879E+00  0.0000E+00  3.6879E+00  1.9565E+03  5.31E+02 -8.5555E+01  0.0000E+00 -8.5555E+01  0.0000E+00  0.00E+00

       stanton     liq.temp.     stanton     liq.temp.
        number    bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
          -            k            -            k
1001  0.00000E+00  5.44710E+02  0.00000E+00  5.44710E+02
1002  5.68725E-04  5.44669E+02  0.00000E+00  5.44710E+02
1003  9.61574E-05  5.44669E+02  0.00000E+00  5.44710E+02

total convective energy to the fluid during hydro solution:
                    inside surface= -2.5451896E+07 w*s      outside surface=  1.9726086E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  2.96163E+06 w*s     effective=  3.82726E+05 w*s
          outside convective energy error: absolute=  1.32942E+06 w*s     effective=  6.89101E+05 w*s

rod   2   plane (perpendicular to z direction) coupled to cells   2 (inner) and**** (outer)

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.4452E+02 5.4453E+02 5.4454E+02
1002   2  5.7542E+00 5.4452E+02 5.4452E+02 5.4453E+02
1003   3  1.1508E+01 5.4455E+02 5.4455E+02 5.4456E+02

 id  idi   hliqi        tliqi        hvapi        tvapi      ido    hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k               w/m2/k         k          w/m2/k         k          w/m2/k
1001  1  5.1440E+03  5.4460E+02  0.0000E+00  5.4460E+02   1  2.9439E+03  5.4460E+02  0.0000E+00  5.4460E+02  0.0000E+00
1002 12  2.4322E+02  5.4455E+02  0.0000E+00  5.4460E+02   1  3.3899E+03  5.4460E+02  0.0000E+00  5.4460E+02  0.0000E+00
1003 12  2.5615E+02  5.4448E+02  0.0000E+00  5.4456E+02   1  3.3899E+03  5.4460E+02  0.0000E+00  5.4460E+02  0.0000E+00

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
        w/m2         w/m2         w/m2         w/m2          -          w/m2         w/m2         w/m2         w/m2          -
1001 -3.8346E+02  0.0000E+00 -3.8346E+02  0.0000E+00  0.00E+00 -1.7184E+02  0.0000E+00 -1.7184E+02  0.0000E+00  0.00E+00
1002 -6.2802E+00  0.0000E+00 -6.2802E+00  0.0000E+00  0.00E+00 -2.1602E+02  0.0000E+00 -2.1602E+02  0.0000E+00  0.00E+00
1003  1.6634E+01  0.0000E+00  1.6634E+01  0.0000E+00  0.00E+00 -1.4364E+02  0.0000E+00 -1.4364E+02  0.0000E+00  0.00E+00

       stanton     liq.temp.     stanton     liq.temp.
        number    bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
          -            k            -            k
1001  0.00000E+00  5.44599E+02  0.00000E+00  5.44599E+02
1002  1.21453E-04  5.44569E+02  0.00000E+00  5.44599E+02
1003  4.44727E-04  5.44569E+02  0.00000E+00  5.44599E+02

total convective energy to the fluid during hydro solution:
                    inside surface= -2.5763300E+07 w*s      outside surface=  1.8605412E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  3.33010E+06 w*s     effective=  2.44538E+05 w*s
          outside convective energy error: absolute=  1.47287E+06 w*s     effective=  6.54068E+05 w*s

rod   3   plane (perpendicular to z direction) coupled to cells   3 (inner) and**** (outer)

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.4660E+02 5.4661E+02 5.4663E+02
1002   2  5.7542E+00 5.4666E+02 5.4666E+02 5.4667E+02
1003   3  1.1508E+01 5.4671E+02 5.4671E+02 5.4671E+02

 id  idi   hliqi        tliqi        hvapi        tvapi      ido    hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k               w/m2/k         k          w/m2/k         k          w/m2/k
1001  1  5.4885E+02  5.4676E+02  0.0000E+00  5.4676E+02   1  1.8085E+03  5.4676E+02  0.0000E+00  5.4676E+02  0.0000E+00
1002  1  1.7142E+03  5.4673E+02  0.0000E+00  5.4676E+02   1  6.6797E+02  5.4676E+02  0.0000E+00  5.4676E+02  0.0000E+00
1003  1  1.2048E+03  5.4671E+02  0.0000E+00  5.4664E+02   1  6.6797E+02  5.4676E+02  0.0000E+00  5.4676E+02  0.0000E+00

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
        w/m2         w/m2         w/m2         w/m2          -          w/m2         w/m2         w/m2         w/m2          -
1001 -8.5998E+01  0.0000E+00 -8.5998E+01  0.0000E+00  0.00E+00 -2.3321E+02  0.0000E+00 -2.3321E+02  0.0000E+00  0.00E+00
1002 -1.1554E+02  0.0000E+00 -1.1554E+02  1.9663E+05  1.70E+03 -6.1581E+01  0.0000E+00 -6.1581E+01  0.0000E+00  0.00E+00
1003 -4.5754E-01  0.0000E+00 -4.5754E-01  3.9326E+05  3.93E+05 -3.3319E+01  0.0000E+00 -3.3319E+01  0.0000E+00  0.00E+00

       stanton     liq.temp.     stanton     liq.temp.
        number    bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
          -            k            -            k
1001  0.00000E+00  5.46751E+02  0.00000E+00  5.46751E+02
1002  0.00000E+00  5.46689E+02  0.00000E+00  5.46751E+02
1003  0.00000E+00  5.46689E+02  0.00000E+00  5.46751E+02

total convective energy to the fluid during hydro solution:
                    inside surface= -3.0340471E+07 w*s      outside surface=  1.8410052E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  2.84834E+06 w*s     effective=  1.29664E+05 w*s
          outside convective energy error: absolute=  1.89592E+06 w*s     effective=  9.19532E+05 w*s

inner-surface node-interval thermal conductivity is  5.09374E+01    w/m/k
outer-surface node-interval thermal conductivity is  5.09369E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.09372E+01    w/m/k
which have been axially averaged over all   3 average-power rod s
```

```
total inner surface area is  6.61197E+02 m2  and
total outer surface area is  6.62564E+02 m2  of all   3 average-power rod s

total power from the heat-structure inner surface is -4.50612E+04   w    and outer surface is -9.21328E+04   w


system results

                      system total coolant energy is  9.312152E+18 w*s

                        system total coolant mass is  4.544427E+13 kg

 total coolant mass discharged by break components is -3.882313E+04 kg

    total coolant mass injected by fill components is  3.324113E-09 kg

        system computed initial total coolant mass is  4.544427E+13 kg

 at     0.000900 s, the trip   34 signal crossed setpoint s2 =  9.000000E-01 -
 at     0.001000 s, the trip   34 signal is  1.000000E+00 -

 at     0.001000 s, trip   34 is reset from  0 to  1 with a set status of on-forward

 at     0.001900 s, the trip   26 signal crossed setpoint s2 =  9.000000E-01 -
 at     0.002000 s, the trip   26 signal is  1.000000E+00 -

 at     0.002945 s, the trip   10 signal crossed setpoint s2 =  9.000000E-01 -      11   13
 at     0.003050 s, the trip   10 signal is  1.000000E+00 -

 at     0.003050 s, trip   10 is reset from  0 to  1 with a set status of on-forward

 at     0.002945 s, the trip   16 signal crossed setpoint s2 =  9.000000E-01 -
 at     0.003050 s, the trip   16 signal is  1.000000E+00 -

 at     0.003050 s, trip   16 is reset from  0 to  1 with a set status of on-forward

 at     0.002945 s, the trip   18 signal crossed setpoint s2 =  9.000000E-01 -
 at     0.003050 s, the trip   18 signal is  1.000000E+00 -

 at     0.003050 s, trip   18 is reset from  0 to  1 with a set status of on-forward
     time   dtime   power     keff
       s      s       w         -
     0.011  0.012 2.273E+09 0.999885
     0.028  0.018 2.200E+09 0.999649
     0.055  0.028 2.089E+09 0.999267
     0.098  0.044 1.937E+09 0.998672      11
     0.157  0.061 1.759E+09 0.997855
     0.250  0.098 1.533E+09 0.996561
     0.399  0.157 1.267E+09 0.994481
     0.643  0.256 9.144E+08 0.989289
     0.928  0.289 4.993E+08 0.972768
     1.377  0.471 4.083E+08 0.966184
     2.107  0.767 3.712E+08 0.966184
     3.278  1.222 3.304E+08 0.966184
     4.931  1.685 2.910E+08 0.966184
     6.733  1.811 2.612E+08 0.966184
     8.647  1.933 2.372E+08 0.966184

 *hout*   outer iteration failed to converge at time     8.802202 s
          nstep is    152, oitno is    10, nmfail is  0, and delt is    0.051636 s

 *hout*   varerm =  8.456037E-04,  num =  430,  j =   4

     time   dtime   power     keff
       s      s       w         -
     8.877  0.212 2.359E+08 0.966184
     8.980  0.107 2.349E+08 0.966184
     9.134  0.162 2.334E+08 0.966184      11
     9.384  0.263 2.311E+08 0.966184
     9.793  0.429 2.274E+08 0.966184
    10.458  0.698 2.218E+08 0.966184
    11.535  1.125 2.137E+08 0.966184
    13.012  1.514 2.040E+08 0.966184
    14.666  1.578 1.948E+08 0.966184

 at    14.943443 s, the trip   54 signal crossed setpoint s1 =  1.280000E+07 pa      13
 at    14.953837 s, the trip   54 signal is  1.279854E+07 pa

 at    14.953837 s, trip   54 is reset from  0 to  1 with a set status of on-forward      13

     time   dtime   power     keff
       s      s       w         -
    15.768  1.149 1.893E+08 0.966184
    17.259  1.430 1.827E+08 0.966184
    18.235  1.009 1.787E+08 0.966184
    19.662  1.458 1.734E+08 0.966184
    20.907  1.226 1.692E+08 0.966184
    22.289  1.391 1.648E+08 0.966184
    23.743  1.482 1.606E+08 0.966184
    24.467  0.626 1.586E+08 0.966184
    25.171  0.716 1.568E+08 0.966184

 at    25.582519 s, the trip -407 signal crossed setpoint s1 =  1.440000E-01 -      13
 at    25.590345 s, the trip -407 signal is  1.439803E-01 -
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at   25.590345 s, trip -407 is reset from  1 to  0 with a set status of off          13

   time   dtime   power     keff
     s      s       w        -
   25.953  0.822 1.548E+08 0.966184
   26.342  0.408 1.538E+08 0.966184
   26.976  0.665 1.523E+08 0.966184
   27.980  1.050 1.500E+08 0.966184
   28.857  0.840 1.480E+08 0.966184
   29.886  1.056 1.459E+08 0.966184

at   30.003153 s, trip   26 is reset from  0 to  1 with a set status of on-forward

   time   dtime   power     keff
     s      s       w        -
   30.737  0.808 1.441E+08 0.966184

at   30.796267 s, the trip   46 signal crossed setpoint s2 =  1.800000E+00 -
at   30.811022 s, the trip   46 signal is  2.000000E+00 -

at   30.811022 s, trip   46 is reset from  0 to  1 with a set status of on-forward

at   30.758545 s, the trip   60 signal crossed setpoint s1 =  1.192800E+07 pa
at   30.811022 s, the trip   60 signal is  1.192671E+07 pa

at   30.811022 s, trip   60 is reset from  0 to  1 with a set status of on-forward

at   30.868151 s, the trip   20 signal crossed setpoint s2 =  9.000000E-01 -
at   30.874499 s, the trip   20 signal is  1.000000E+00 -

at   30.874499 s, trip   20 is reset from  0 to  1 with a set status of on-forward     13

at   30.868151 s, the trip   21 signal crossed setpoint s2 =  9.000000E-01 -
at   30.874499 s, the trip   21 signal is  1.000000E+00 -

at   30.868151 s, the trip   28 signal crossed setpoint s2 =  9.000000E-01 -
at   30.874499 s, the trip   28 signal is  1.000000E+00 -

at   30.817370 s, the trip  422 signal crossed setpoint s2 =  1.000000E-01 -
at   30.874499 s, the trip  422 signal is  1.000000E+00 -

at   30.874499 s, trip  422 is reset from  0 to -1 with a set status of on-reverse

   time   dtime   power     keff
     s      s       w        -
   31.481  0.755 1.427E+08 0.966184
   32.350  0.871 1.410E+08 0.966184
   33.259  0.911 1.394E+08 0.966184

at   33.517740 s, the trip   32 signal crossed setpoint s2 =  9.000000E-01 -        13
at   33.526171 s, the trip   32 signal is  1.000000E+00 -

at   33.526171 s, trip   32 is reset from  0 to  1 with a set status of on-forward

   time   dtime   power     keff
     s      s       w        -
   34.191  0.947 1.377E+08 0.966184
   35.198  1.016 1.360E+08 0.966184
   36.046  0.823 1.346E+08 0.966184
   36.922  0.873 1.332E+08 0.966184
   37.957  1.039 1.317E+08 0.966184
   38.538  0.549 1.308E+08 0.966184
   39.211  0.700 1.298E+08 0.966184
   40.100  0.846 1.286E+08 0.966184
   40.591  0.510 1.279E+08 0.966184
   41.329  0.771 1.269E+08 0.966184

   time   dtime   power     keff
     s      s       w        -
   42.298  0.923 1.256E+08 0.966184
   42.597  0.312 1.252E+08 0.966184
   43.081  0.509 1.246E+08 0.966184
   43.870  0.829 1.236E+08 0.966184
   44.807  0.873 1.225E+08 0.966184
   45.296  0.513 1.219E+08 0.966184
   46.092  0.836 1.210E+08 0.966184

   time   dtime   power     keff
     s      s       w        -
   46.942  0.887 1.200E+08 0.966184
   47.864  0.888 1.190E+08 0.966184
   48.408  0.566 1.184E+08 0.966184
   49.258  0.887 1.175E+08 0.966184
   49.949  0.659 1.168E+08 0.966184

at   50.868995 s, trip   21 is reset from  0 to  1 with a set status of on-forward   13

   time   dtime   power     keff
     s      s       w        -
   50.869  0.932 1.159E+08 0.966184
   51.813  0.978 1.150E+08 0.966184
   52.613  0.757 1.142E+08 0.966184
   53.568  0.998 1.133E+08 0.966184
   54.180  0.547 1.128E+08 0.966184
   54.847  0.701 1.122E+08 0.966184
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  55.934  1.134 1.112E+08 0.966184
  56.587  0.582 1.106E+08 0.966184
  57.375  0.827 1.100E+08 0.966184
  58.615  1.203 1.090E+08 0.966184
  59.153  0.538 1.085E+08 0.966184
  59.978  0.866 1.079E+08 0.966184

at   60.885077 s, trip   28 is reset from  0 to  1 with a set status of on-forward      13

   time   dtime    power      keff
    s       s        w          -
  60.948  0.926 1.071E+08 0.966184
  61.699  0.786 1.066E+08 0.966184
  62.918  1.280 1.057E+08 0.966184
  63.471  0.470 1.053E+08 0.966184
  63.848  0.396 1.050E+08 0.966184
  64.462  0.645 1.046E+08 0.966184
  65.462  1.050 1.039E+08 0.966184
  66.501  0.942 1.032E+08 0.966184
  66.901  0.418 1.029E+08 0.966184
  67.546  0.678 1.025E+08 0.966184
  68.599  1.105 1.018E+08 0.966184
  69.704  1.079 1.011E+08 0.966184
  70.337  0.665 1.007E+08 0.966184
  71.368  1.083 1.001E+08 0.966184

   time   dtime    power      keff
    s       s        w          -
  72.704  1.273 9.928E+07 0.966184
  73.132  0.447 9.903E+07 0.966184
  73.819  0.722 9.863E+07 0.966184
  74.938  1.175 9.800E+07 0.966184
  76.762  1.915 9.701E+07 0.966184
  79.732  3.119 9.546E+07 0.966184
  82.863  2.876 9.393E+07 0.966184
  84.464  1.671 9.318E+07 0.966184
  86.809  2.379 9.212E+07 0.966184
  89.579  2.854 9.093E+07 0.966184
  92.684  3.092 8.966E+07 0.966184
  96.143  3.367 8.832E+07 0.966184
  98.632  2.510 8.741E+07 0.966184
1
 trac large edit                          14

 problem time is 1.002189E+02 s, time-step size is  2.9771E-01 s, time-step number is  1046, outer-iteration number is  2

 maximum convective power differance has been 0.3176545E+08   w    in component  910 at time 7.7178549E+00 s
 time-step size was limited by component 200 at cell   1 to 9.0866E-03 s
 average outer-iteration count over the last 1051 time steps was   2.734
 last minimum number of outer iterations was  1 at time step  984 (limited by component  14 with fr.error of 9.8254E-05)
 last maximum number of outer iterations was  9 at time step  152 (limited by component 430 with fr.error of 7.4290E-08)
 total number of times that each component (id#) was the last to converge since the last short edit
    0( 10)    0( 12)    1( 14)    0( 16)    0( 17)    0( 18)    0( 54)    0( 52)    0( 50)    0( 49)    0( 91)    0( 56)
    0( 20)    0( 22)    0( 24)    0( 26)    0( 27)    0( 28)   52(202)    8(200)    9(205)   85(290)    0( 64)    0( 62)
    0( 60)    2(210)    1(220)    3(400)   49(410)    8(420)    1(422)    0(280)    3(270)    0(254)    0(250)    0(350)
    0(212)    1(120)    5(110)    9(105)   43(190)    2(100)    0(320)   29(310)  555(305)    0(390)    4(300)   59(430)
    0(432)    0(150)    0(354)   28(370)    1(380)    0(216)    0(112)    0(180)   21(170)    0(154)    0(312)   62(436)
    0(116)    0(316)    0( 59)    0( 92)    0(424)    0(578)    0( 66)    0(214)    0(434)    0(279)    0(269)    0(576)
    0(218)    0(114)    0(314)    0(438)    0(369)    0(379)    0(118)    0(179)    0(169)    0(318)    4( 30)    0( 32)
    0( 34)    0( 36)    0( 37)    0( 38)    1( 40)    3( 41)    1( 42)    0( 74)    0( 72)    0( 70)    0( 44)    0( 45)
    0( 46)    0( 43)    0( 69)    0( 93)    0( 47)    0( 76)    0( 48)    0(  2)    0(  3)    0(  4)    0(  5)    0(  6)
    0(  7)    0(  1)
 current maximum time-step sizes and limitation counts since the last short edit
     delamx         delcmx         deldmx         delemx         delpmx         delrmx         delvmx         delxmx
  1.0000E+08 s   1.0000E+08 s   1.0000E+08 s   1.0000E+08 s   2.4773E+01 s   1.0000E+08 s   9.0821E+00 s   1.0000E+08 s
      86              5              0              0              2              0              0              1
 further limitation counts on what controls delcmx
     dtlmx          dtvmx          dprmx          dtsms          dtrmx          delt/2
       0              4              0              0              0              1

    cpu execution time of this run is 1.719660E+04 s

 total time steps since time 0.0 s is          2308
   total cpu time since time 0.0 s is 3.561888E+04 s

 ************************************** signal-variable values at time   99.92115 s **************************************

    id      sig.var.           id      sig.var.           id      sig.var.           id      sig.var.          14      sig.var.

     1    9.992115E+01          11    8.695114E+07        101    5.518482E+02        111    6.295395E+06        161    4.331704E+03
               time (s)             core power (w)             liq temp (k)           pressure (pa)          z lq mf (kg/s)
   171    1.150133E+07         181    5.515918E+02        201    5.537028E+02        222    6.295614E+06        261    4.301569E+03
        pressure (pa)                liq temp (k)             liq temp (k)           pressure (pa)          z lq mf (kg/s)
   271    1.150157E+07         281    5.533048E+02        301    5.526251E+02        333    6.295572E+06        361    4.358696E+03
        pressure (pa)                liq temp (k)             liq temp (k)           pressure (pa)          z lq mf (kg/s)
   371    1.150111E+07         381    5.498992E+02        401    1.113578E+07        421    1.112976E+07        501    4.443073E+06
        pressure (pa)                liq temp (k)           pressure (pa)            pressure (pa)           pressure (pa)
   521   -7.027023E+06         601    4.443073E+06        621   -7.027272E+06        701    4.443073E+06        721   -7.026791E+06
        pressure (pa)              pressure (pa)            pressure (pa)            pressure (pa)           pressure (pa)
  1000    1.835965E+01        1051    6.295663E+06       1100   -3.206136E+00       1101    6.295395E+06       1121    6.297774E+06
       z m mfw (kg/s)              pressure (pa)           z m mfw (kg/s)            pressure (pa)           pressure (pa)
  1135   -3.045744E+03        1501    4.121214E+00       1541    0.000000E+00       1700    7.821485E+00       1714    5.383567E+04
        pressure (pa)             z lq mf (kg/s)           valve farea fr           z m mfw (kg/s)           pressure (pa)
  1903    6.301033E+06        1910    6.372235E+06       2000    3.418265E+01       2020    2.368135E+01       2051    6.295876E+06
        pressure (pa)              pressure (pa)           z m mfw (kg/s)           z m mfw (kg/s)           pressure (pa)
  2100    3.628760E+00        2101    6.295614E+06       2121    6.297678E+06       2135   -2.858520E+03       2541    0.000000E+00
```

	z m mfw (kg/s)		pressure (pa)		pressure (pa)		pressure (pa)		valve farea fr
2700	7.821225E+00	2714	5.383548E+04	2903	6.297161E+06	2910	6.364743E+06	3000	2.284018E+02
	z m mfw (kg/s)		pressure (pa)		pressure (pa)		pressure (pa)		z m mfw (kg/s)
3051	6.309230E+06	3100	1.207789E+00	3101	6.295572E+06	3121	6.297785E+06	3135	-2.861688E+03
	pressure (pa)		z m mfw (kg/s)		pressure (pa)		pressure (pa)		pressure (pa)
3501	-4.121199E+00	3541	0.000000E+00	3700	7.821536E+00	3714	5.383573E+04	3903	6.334549E+06
	z lq mf (kg/s)		valve farea fr		z m mfw (kg/s)		pressure (pa)		pressure (pa)
3910	6.405712E+06	4001	6.298459E+06	4220	0.000000E+00	4240	1.000000E+00	9000	5.552042E+02
	pressure (pa)		pressure (pa)		valve farea fr		trp set status		a mx sf tp (k)
9010	5.557157E+02								
	s mx sf tp (k)								

********************************** control-block output values at time 99.92115 s **********************************

id	con.blk.		id	con.blk.		id	con.blk.		id	con.blk.		$\boxed{14}$	con.blk.	
-1	0.000000E+00	k	-2	0.000000E+00	w	-3	1.440000E-01	-	-4	1.551300E+07	pa	-5	1.620300E+07	pa
-6	1.723700E+07	pa	-7	5.742000E+02	k	-8	5.000000E-02	-	-9	-1.379000E+05	pa	-10	4.087000E+05	w
-11	2.423000E-03	s/kg	-12	4.540000E+02	kg/s	-13	4.330000E+06	pa	-14	5.570000E+02	k	-15	5.732094E+00	sqrt(kg/m3)
-16	5.751000E+02	k	-17	1.162000E+00	k	-18	0.000000E+00	k	-19	1.072000E+00	k	-22	0.000000E+00	-
-24	0.000000E+00	-	-26	0.000000E+00	-	-28	0.000000E+00	-	-30	0.000000E+00	-	-32	0.000000E+00	-
-34	0.000000E+00	-	-36	0.000000E+00	-	-38	0.000000E+00	-	-40	0.000000E+00	-	-50	5.535029E+02	k
-55	5.535032E+02	k	-108	5.517200E+02	k	-109	5.517016E+02	k	-110	5.517108E+02	k	-118	2.563547E-01	k
-119	2.473802E-01	k	-120	2.518674E-01	k	-130	-4.357407E-01	k	-132	-4.265559E-01	k	-134	-5.072288E-01	k
-136	1.162000E+00	k	-138	6.547712E-01	k	-140	2.095268E+01	k	-142	0.000000E+00	-	-148	1.000000E+00	-
-149	3.237690E-01	k	-150	3.237690E-01	k	-152	1.559735E-01	k	-154	3.600000E-02	-	-156	5.615044E-03	k
-158	1.066385E+00	k	-160	-2.338919E+01	k	-162	0.000000E+00	-	-164	0.000000E+00	k	-166	1.066385E+00	k
-168	3.412432E+01	k	-170	0.000000E+00	-	-208	5.535038E+02	k	-209	5.535032E+02	k	-210	5.535035E+02	k
-218	3.979881E-01	k	-219	3.990803E-01	k	-220	3.985342E-01	k	-230	-4.023428E-01	k	-232	-4.025794E-01	k
-234	-5.072288E-01	k	-236	1.162000E+00	k	-238	6.547712E-01	k	-240	2.095268E+01	k	-242	0.000000E+00	-
-248	1.000000E+00	-	-249	1.151359E-02	k	-250	1.151359E-02	k	-252	-4.181820E-02	k	-254	3.600000E-02	-
-256	0.000000E+00	k	-258	1.072000E+00	k	-260	-2.159650E+01	k	-262	0.000000E+00	-	-264	0.000000E+00	k
-266	1.072000E+00	k	-268	3.430400E+01	k	-270	0.000000E+00	-	-308	5.512622E+02	k	-309	5.512266E+02	k
-310	5.512444E+02	k	-318	2.725863E+00	k	-319	2.755451E+00	k	-320	2.740657E+00	k	-330	-4.444307E-01	k
-332	-4.243952E-01	k	-334	-5.072288E-01	k	-336	1.162000E+00	k	-338	6.547712E-01	k	-340	2.095268E+01	k
-342	0.000000E+00	-	-348	1.000000E+00	-	-349	6.277837E-01	k	-350	6.277837E-01	k	-352	5.437729E-01	k
-354	3.600000E-02	-	-356	1.957582E-02	k	-358	1.052424E+00	k	-360	-2.385565E+01	k	-362	0.000000E+00	-
-364	0.000000E+00	k	-366	1.052424E+00	k	-368	3.367757E+01	k	-370	0.000000E+00	-	-406	1.041283E-01	-
-408	4.580000E-01	-	-410	-1.000000E-01	-	-412	-1.000000E-01	-	-414	-1.000000E+00	-	-430	-4.383242E+06	pa
-432	-1.000000E+02	paxs	-434	-4.383251E+06	pa	-436	1.817000E+05	w	-438	1.000000E+00	-	-440	0.000000E+00	-
-442	1.000000E+00	-	-444	4.087000E+05	w	-446	5.904000E+05	w	-448	0.000000E+00	-	-450	0.000000E+00	w
-521	-1.000000E+07	pa	-621	-1.000000E+07	pa	-721	-1.000000E+07	pa	-1000	1.000000E+00	-	-1001	1.000000E-06	-
-1002	1.835965E+07	-	-1004	1.415821E-01	-	-1005	1.413512E-01	-	-1006	3.786488E-01	-	-1007	1.000000E-01	s
-1008	3.886488E-01	-	-1009	-7.324755E+01	kg/s	-1010	-1.774788E-01	-	-1011	2.111700E-01	-	-1012	1.000000E-01	s
-1013	1.000000E-01	-	-1014	1.000000E-01	-	-1104	3.045744E+03	pa	-1106	4.678805E+01	m2xsqrt(pa)	-1109	2.681935E+02	kg/s
-1110	1.000000E+00	-	-1112	0.000000E+00	-	-1114	0.000000E+00	-	-1116	1.000000E+00	-	-1118	0.000000E+00	-
-1160	0.000000E+00	-	-1162	0.000000E+00	-	-1704	5.383567E+04	pa	-1706	3.410747E+02	kg/s	-2000	1.000000E+00	kg/s
-2001	3.628760E+00	kg/s	-2002	9.419926E+00	kg/s	-2004	3.387270E-02	-	-2005	3.388945E-02	-	-2006	4.861106E-01	-
-2007	1.000000E-01	s	-2008	4.961106E-01	-	-2009	-1.463090E+02	kg/s	-2010	-3.545067E-01	-	-2011	1.416038E-01	-
-2012	1.000000E-01	s	-2013	1.000000E-01	-	-2014	1.000000E-01	-	-2104	2.858520E+03	pa	-2106	4.532720E+00	m2xsqrt(pa)
-2109	2.598198E+01	kg/s	-2110	1.000000E+00	-	-2112	0.000000E+00	-	-2114	0.000000E+00	-	-2116	1.000000E+00	-
-2118	0.000000E+00	-	-2160	0.000000E+00	-	-2162	0.000000E+00	-	-2704	5.383548E+04	pa	-2706	1.723109E+02	kg/s
-3000	1.000000E+00	m2xsqrt(pa)	-3001	1.207789E+00	m2xsqrt(pa)	-3002	1.891074E+02	m2xsqrt(pa)	-3004	6.674752E-01	-	-3004	6.674752E-01	-
-3005	6.674735E-01	-	-3005	6.674735E-01	-	-3006	-1.474735E-01	-	-3006	-1.474735E-01	-	-3007	-1.000000E-01	s
-3007	-1.000000E-01	s	-3008	-1.574735E-01	-	-3008	-1.574735E-01	-	-3009	1.092273E+02	kg/s	-3009	1.092273E+02	kg/s
-3010	2.646578E-01	-	-3010	2.646578E-01	-	-3011	1.071843E-01	-	-3011	1.071843E-01	-	-3012	1.000000E-01	s

id	value	unit	id	value	unit	id	value	unit	id	value	unit	id	value	unit
-3012	1.000000E-01	s	-3013	1.000000E-01	-	-3013	1.000000E-01	-	-3014	1.000000E-01	-	-3014	1.000000E-01	-
-3104	2.861688E+03	pa	-3104	2.861688E+03	pa	-3106	7.863675E+01	m2xsqrt(pa)	-3106	4.535232E+01	m2xsqrt(pa)	-3109	4.507532E+02	kg/s
-3110	1.000000E+00	-	-3112	0.000000E+00	-	-3114	0.000000E+00	-	-3116	1.000000E+00	-	-3118	0.000000E+00	-
-3160	0.000000E+00	-	-3162	0.000000E+00	-	-3704	5.383573E+04	pa	-3706	3.410748E+02	kg/s	-4241	5.617200E+06	pa
-4242	1.000000E+00	-	-4243	5.200000E-01	-	-4300	5.593000E+02	k	-4302	3.812800E+06	pa	-4304	5.751000E+02	k
-4310	5.535035E+02	k	-4312	5.535035E+02	k	-4314	5.535035E+02	k	-4316	-5.796498E+00	k	-4318	0.000000E+00	-
-4320	0.000000E+00	-	-4330	5.534679E+02	k	-4332	-2.163214E+01	k	-4334	0.000000E+00	-	-4336	0.000000E+00	-
-4338	0.000000E+00	-	-4340	0.000000E+00	-	-4342	0.000000E+00	-						

** trip set status at time 99.92115 s **

14

id	set status	id	set status	id	set status	id	set status	id	set status
1	on-forward	10	on-forward	12	on-forward	14	on-forward	16	on-forward
18	on-forward	20	on-forward	21	on-forward	22	off	24	off
26	on-forward	28	on-forward	30	off	32	on-forward	34	on-forward
36	off	38	off	40	off	42	off	44	off
46	on-forward	48	off	50	off	52	off	54	on-forward
56	off	58	off	60	on-forward	100	on-forward	110	off
120	on-forward	200	off	210	off	220	on-forward	300	off
310	off	320	on-forward	-407	off	422	on-reverse	423	off
450	on-reverse	460	on-reverse	520	on-reverse	620	on-reverse	720	on-reverse
1001	off	1002	off	1003	off	1010	on-forward	1020	on-forward
1030	off	1040	off	1050	off	1060	off	1500	on-forward
2010	on-forward	2020	on-forward	2030	off	2040	off	2050	off
2060	off	3010	off	3020	off	3030	off	3040	on-forward
3050	on-forward	3060	off	3500	on-forward	9996	off	9997	off
9998	off	9999	off								

** trip signal values at time 99.92115 s **

14

id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit
1	9.992115E+01	s	10	2.000000E+00	-	12	4.000000E+00	-	14	2.000000E+00	-	16	1.000000E+00	-
18	1.000000E+00	-	20	1.000000E+00	-	21	1.000000E+00	-	22	0.000000E+00	-	24	0.000000E+00	-
26	2.000000E+00	-	28	1.000000E+00	-	30	0.000000E+00	-	32	1.000000E+00	-	34	2.000000E+00	-
36	0.000000E+00	-	38	0.000000E+00	-	40	0.000000E+00	-	42	0.000000E+00	-	44	0.000000E+00	-
46	2.000000E+00	-	48	0.000000E+00	-	50	0.000000E+00	-	52	8.695114E+07	w	54	1.112976E+07	pa
56	1.041283E-01	-	58	1.112976E+07	pa	60	1.112976E+07	pa	100	1.000000E+00	-	110	4.331704E+03	kg/s
120	5.517108E+02	k	200	1.000000E+00	-	210	4.301569E+03	kg/s	220	5.535035E+02	k	300	1.000000E+00	-
310	4.358696E+03	kg/s	320	5.512444E+02	k	-407	1.041283E-01	-	422	3.000000E+00	-	423	9.992115E+01	s
450	1.112976E+07	pa	460	1.112976E+07	pa	520	-7.027023E+06	m	620	-7.027272E+06	m	720	-7.026791E+06	m
1001	2.182098E+02	pa	1002	1.762448E+02	pa	1003	4.196492E+01	pa	1010	1.413512E-01	-	1020	1.413512E-01	-
1030	1.413512E-01	-	1040	-7.324755E+01	kg/s	1050	2.681935E+02	kg/s	1060	6.295395E+06	pa	1500	4.121214E+00	kg/s
2010	3.388945E-02	-	2020	3.388945E-02	-	2030	3.388945E-02	-	2040	-1.463090E+02	kg/s	2050	2.598198E+01	kg/s
2060	6.295614E+06	pa	3010	6.674735E-01	-	3020	6.674735E-01	-	3030	6.674735E-01	-	3040	1.092273E+02	kg/s
3050	4.507532E+02	kg/s	3060	6.295572E+06	pa	3500	-4.121199E+00	kg/s	9996	9.992115E+01	s	9997	9.992115E+01	s
9998	9.992115E+01	s	9999	9.992115E+01	s									

```
at time   63.8013 s in component number 938 at cell   1, the maximum stanton number is 1.663668E+05
at time    0.0075 s in component number 906 at cell   1, the minimum tld is 6.203117E+02 k
           where tld is the liquid temperature at bubble detachment from a heated surface
```

```
------------------------------------------------------------------------------------------------------------
                                                                                              1   00000
      1                                                                                      11    0   0
     11   time is   100.218864 s, time-step size is   0.297715 s, time-step number is  1046   1    0   0
      1                                                                                      1     0   0
      1                          $10$ hot leg 1                                         14   1   00000
    111
------------------------------------------------------------------------------------------------------------
```

the component type is a pipe, component number is 10, first junction number is 10, and second junction number is 12

cell	pressure pa	ncd-gas pressure pa	void fr. -	temp.sat. k	temp.liq. k	temp.gas k	den.liq. kg/m3	den.vap. kg/m3	vel.liq. m/s	vel.gas m/s	wf.liq. -
1	1.11550E+07	0.00000E+00	0.000E+00	5.923E+02	5.519E+02	5.923E+02	7.623E+02	6.364E+01	1.333E+01	1.334E+01	7.907E-02
2	1.11543E+07	0.00000E+00	0.000E+00	5.923E+02	5.519E+02	5.923E+02	7.623E+02	6.363E+01	1.333E+01	1.333E+01	3.115E-03
3	1.11536E+07	0.00000E+00	0.000E+00	5.923E+02	5.519E+02	5.923E+02	7.623E+02	6.363E+01	1.333E+01	1.333E+01	3.115E-03
4	1.11529E+07	0.00000E+00	0.000E+00	5.923E+02	5.518E+02	5.923E+02	7.623E+02	6.362E+01	1.333E+01	1.333E+01	3.115E-03
5	1.11524E+07	0.00000E+00	0.000E+00	5.923E+02	5.518E+02	5.923E+02	7.623E+02	6.362E+01	1.333E+01	1.333E+01	3.115E-03
6	1.11519E+07	0.00000E+00	0.000E+00	5.923E+02	5.518E+02	5.923E+02	7.623E+02	6.362E+01	1.333E+01	1.333E+01	3.115E-03
7									1.166E+01	1.166E+01	1.771E-01

```
     idr   liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
cell  -    ----- w/m2/k ------     w/k         w          w          k              k
  1  1.0  3.512E+04 0.000E+00 5.777E+04-8.699E+03 0.000E+00 5.928E+02     551.61
  2  1.0  3.512E+04 0.000E+00 5.777E+04-8.637E+03 0.000E+00 5.928E+02     551.61
  3  1.0  3.512E+04 0.000E+00 5.777E+04-8.574E+03 0.000E+00 5.928E+02     551.61
  4  1.0  3.512E+04 0.000E+00 5.777E+04-8.510E+03 0.000E+00 5.928E+02     551.60
  5  1.0  3.512E+04 0.000E+00 2.831E+04-8.478E+03 0.000E+00 5.928E+02     551.60
  6  1.0  3.313E+04 0.000E+00 5.720E+04-8.071E+03 0.000E+00 5.928E+02     551.59

total power to the component from all heat-transfer surfaces is -1.349176E+05   w
total power to the liquid is -1.349176E+05   w    and total power to the gas is  0.000000E+00   w

total convective energy transported to the fluid from component wall:  1.8153565E+08 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                     inside convective energy error: absolute=  3.18004E+07 w*s     effective=  2.40004E+06 w*s

pipe wall total power loss on the inner surface is  1.30279E+05   w    and on the outer surface is  0.00000E+00   w

pipe  component  total coolant mass is  2.15225E+03 kg , total coolant energy is  2.61094E+09 w*s, and
computed initial total coolant mass is  1.93238E+03 kg

##########  4157 lines deleted here  ##########

------------------------------------------------------------------------------------------------------------
  1   00000 99999                                                                                    77777
 11   0   0 9   9 time is     100.218864 s, time-step size is     0.297715 s, time-step number is  1046      7
  1   0   0 99999                                                                                        7
  1   0   0     9                          $7$ rod guide tube 6 (short)                         14       7
111   00000 99999                                                                                        7
------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is   7, first junction number is   7, and second junction number is  99

                     ncd-gas
      pressure      pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas   wf.liq.
cell     pa            pa          -          k         k        k        kg/m3     kg/m3       m/s         m/s        -
  1 1.12733E+07 0.00000E+00 0.000E+00 5.931E+02 5.555E+02 5.931E+02 7.552E+02 6.451E+01 -3.321E-02 -3.247E-02 4.946E-02
  2 1.12668E+07 0.00000E+00 0.000E+00 5.930E+02 5.629E+02 5.930E+02 7.398E+02 6.447E+01 -3.322E-02 -3.249E-02 1.339E-02
  3                                                                               -3.326E-02 -3.252E-02 2.797E-02

pipe  component  total coolant mass is  2.75301E+01 kg , total coolant energy is  3.44494E+07 w*s, and
computed initial total coolant mass is  2.61042E+01 kg

------------------------------------------------------------------------------------------------------------
  1     1   00000                                                                                        1
 11    11   0   0 time is     100.218864 s, time-step size is     0.297715 s, time-step number is  1046     11
  1     1   0   0                                                                                        1
  1     1   0   0                          $1$ reactor vessel                                   14       1
111   111   00000                                                                                       11
------------------------------------------------------------------------------------------------------------

the component type is a vessel, the component number is   1, and the junction numbers are    10   20   30   19   29   39
                                                                                              2    3    4    5    6    7
                                                                                             94   95   96   97   98   99

level  1 data

alpn        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            -

rovn        6.56988E+01  6.56983E+01  6.56989E+01  6.56984E+01  6.56988E+01  6.56983E+01  6.58546E+01  6.58545E+01
            6.58544E+01  6.58543E+01  6.58545E+01  6.58546E+01
            kg/m3

roln        7.65086E+02  7.63286E+02  7.61587E+02  7.59862E+02  7.63424E+02  7.66761E+02  7.65020E+02  7.63265E+02
            7.61580E+02  7.59863E+02  7.63358E+02  7.66646E+02
            kg/m3

vvnyt       2.67719E-03  4.25748E-03 -1.27632E-04 -3.62194E-03 -5.16444E-03  1.77237E-03 -5.84509E-02  7.28497E-02
           -6.18958E-02  5.44867E-02 -7.64820E-02  6.94056E-02
            m/s

vvnz        4.52609E+00  4.51403E+00  4.55280E+00  4.54091E+00  4.53851E+00  4.48606E+00 -1.68023E+01 -1.69550E+01
           -1.68256E+01 -1.69761E+01 -1.68134E+01 -1.69337E+01
            m/s

vvnxr      -2.65524E+00 -2.64982E+00 -2.65969E+00 -2.65484E+00 -2.65734E+00 -2.64478E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

vlnyt       2.65334E-03  4.28587E-03 -1.52429E-04 -3.59947E-03 -5.19408E-03  1.79980E-03 -5.84526E-02  7.28486E-02
           -6.18970E-02  5.44894E-02 -7.64799E-02  6.94047E-02
            m/s

vlnz        4.52195E+00  4.50987E+00  4.54864E+00  4.53674E+00  4.53435E+00  4.48193E+00 -1.67949E+01 -1.69475E+01
           -1.68181E+01 -1.69686E+01 -1.68059E+01 -1.69262E+01
            m/s

vlnxr      -2.65057E+00 -2.64513E+00 -2.65501E+00 -2.65013E+00 -2.65266E+00 -2.64012E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s

tvn         5.94128E+02  5.94128E+02  5.94128E+02  5.94128E+02  5.94128E+02  5.94128E+02  5.94265E+02  5.94265E+02
            5.94265E+02  5.94265E+02  5.94265E+02  5.94266E+02
```

```
            k
tln         5.50610E+02  5.51534E+02  5.52399E+02  5.53271E+02  5.51463E+02  5.49744E+02  5.50659E+02  5.51559E+02
            5.52417E+02  5.53285E+02  5.51512E+02  5.49819E+02
            k
tsat        5.94128E+02  5.94128E+02  5.94128E+02  5.94128E+02  5.94128E+02  5.94128E+02  5.94265E+02  5.94265E+02
            5.94265E+02. 5.94265E+02  5.94265E+02  5.94266E+02
            k
pn          1.14322E+07  1.14321E+07  1.14322E+07  1.14321E+07  1.14322E+07  1.14321E+07  1.14529E+07  1.14529E+07
            1.14529E+07  1.14529E+07  1.14529E+07  1.14529E+07
            pa
pan         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            pa
conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            -
solid       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            kg/m3
level  2 data
alpn        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            -
rovn        6.55091E+01  6.55091E+01  6.55092E+01  6.55092E+01  6.55091E+01  6.55090E+01  6.64502E+01  6.64521E+01
            6.64494E+01  6.64514E+01  6.64498E+01  6.64527E+01
            kg/m3
roln        7.65111E+02  7.63280E+02  7.61576E+02  7.59846E+02  7.63441E+02  7.66802E+02  7.65064E+02  7.63319E+02
            7.61636E+02  7.59923E+02  7.63402E+02  7.66682E+02
            kg/m3
vvnyt       4.15473E-04 -5.08746E-03  1.63738E-03  4.50282E-04  5.78992E-03 -3.41135E-03 -6.00481E-02  7.29778E-02
           -6.32073E-02  5.66299E-02 -7.60748E-02  6.96368E-02
            m/s
##########  625 lines deleted here  ##########
pn          1.12667E+07  1.12667E+07  1.12667E+07  1.12667E+07  1.12667E+07  1.12667E+07  1.12668E+07  1.12667E+07
            1.12668E+07  1.12667E+07  1.12668E+07  1.12667E+07
            pa
pan         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            pa
conc        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            -
solid       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            kg/m3
level 12 data
alpn        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            -
rovn        6.44110E+01  6.44110E+01  6.44110E+01  6.44110E+01  6.44110E+01  6.44110E+01  1.01931E+02  1.01931E+02
            1.01931E+02  1.01931E+02  1.01931E+02  1.01931E+02
            kg/m3
roln        7.10823E+02  7.15692E+02  7.11665E+02  7.15461E+02  7.11161E+02  7.15260E+02  7.08582E+02  7.08582E+02
            7.08582E+02  7.08582E+02  7.08582E+02  7.08582E+02
            kg/m3
vvnyt      -1.59782E-03  3.39504E-03 -4.57784E-03  4.52400E-03 -3.73326E-03  1.88531E-03  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s
vvnz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s
vvnxr       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s
vlnyt      -1.59785E-03  3.39508E-03 -4.57783E-03  4.52399E-03 -3.73326E-03  1.88529E-03  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s
vlnz        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
            m/s
```

```
vlnxr        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             m/s

tvn          5.92980E+02  5.92980E+02  5.92980E+02  5.92980E+02  5.92980E+02  5.92980E+02  6.17905E+02  6.17905E+02
             6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
             k

tln          5.76088E+02  5.73894E+02  5.75708E+02  5.73998E+02  5.75936E+02  5.74088E+02  5.81000E+02  5.81000E+02
             5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
             k

tsat         5.92980E+02  5.92980E+02  5.92980E+02  5.92980E+02  5.92980E+02  5.92980E+02  6.17905E+02  6.17905E+02
             6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
             k

pn           1.12595E+07  1.12595E+07  1.12595E+07  1.12595E+07  1.12595E+07  1.12595E+07  1.55000E+07  1.55000E+07
             1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
             pa

pan          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             pa

conc         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -

solid        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             kg/m3

total power to the vessel coolant from all heat surfaces is  9.05965E+07   w
total power to the liquid is  9.05965E+07   w    and total power to the gas is  0.00000E+00   w

vessel lower plenum
liquid volume is  2.33861E+01 m3 , liquid volume fraction is  1.00000E+00 and liquid mass is  1.78514E+04 kg
volume-averaged liquid temperature is  5.51505E+02 k and volume-averaged saturation temperature is  5.94173E+02 k

vessel reactor core
liquid volume fraction is  1.00000E+00 and liquid mass is  1.13440E+04 kg
volume-averaged liquid temperature is  5.52291E+02 k and volume-averaged saturation temperature is  5.93515E+02 k

vessel reactor core
inlet  liquid mass flow is  1.28725E+04  kg/s  and inlet  gas mass flow is  0.00000E+00  kg/s
outlet liquid mass flow is  1.28734E+04  kg/s  and outlet gas mass flow is  0.00000E+00  kg/s

vessel upper plenum
liquid volume fraction is  1.00000E+00 and liquid mass is  2.71485E+04 kg
volume-averaged liquid temperature is  5.52830E+02 k and volume-averaged saturation temperature is  5.93463E+02 k

vessel downcomer
liquid volume fraction is  0.00000E+00, liquid mass is  0.00000E+00 kg , volume-averaged pressure is  0.00000E+00  pa
volume-averaged liquid temperature is  0.00000E+00 k and volume-averaged saturation temperature is  0.00000E+00 k

vessel component total coolant mass is  7.19531E+04 kg , total coolant energy is  8.84089E+10 w*s, and
computed initial total coolant mass is  6.78684E+04 kg

-----------------------------------------------------------------------------------------------------------------
  1      1     1                                                                               99999 00000 00000
 11     11    11   time is    100.218864 s, time-step size is    0.297715 s, time-step number is  1046 9   9 0   0 0   0
  1      1     1                                                                               99999 0   0 0   0
  1      1     1                          $900$ reactor-core fuel rods                               9 0   0 0   0
111    111   111                                                                           14 9999 00000 00000
-----------------------------------------------------------------------------------------------------------------

the heat-structure component type is a rod  and the component number is 900

reactor-core power is 8.684664E+07   w    and neutron multiplication constant keff is 0.966184

rod   1   plane (perpendicular to z direction) coupled to cells   0 (inner) and   1 (outer), peaking factor is   1.0000

 id    row     z(m)     heat-structure temperatures (k)
1001    1  0.0000E+00 5.6634E+02 5.6589E+02 5.6452E+02 5.6225E+02 5.5910E+02 5.5204E+02 5.5166E+02 5.5132E+02
1002    2  9.1440E-01 5.7788E+02 5.7708E+02 5.7468E+02 5.7071E+02 5.6519E+02 5.5307E+02 5.5242E+02 5.5181E+02
1003    3  1.8288E+00 5.8020E+02 5.7934E+02 5.7675E+02 5.7248E+02 5.6655E+02 5.5356E+02 5.5286E+02 5.5222E+02
1004    4  2.7432E+00 5.7812E+02 5.7733E+02 5.7497E+02 5.7105E+02 5.6561E+02 5.5367E+02 5.5303E+02 5.5244E+02
1005    5  3.6576E+00 5.6777E+02 5.6730E+02 5.6589E+02 5.6354E+02 5.6028E+02 5.5301E+02 5.5262E+02 5.5226E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo         hgap
            w/m2/k         k          w/m2/k         k              w/m2/k         k          w/m2/k         k          w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1981E+04  5.5088E+02  0.0000E+00  5.9373E+02  2.3397E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1996E+04  5.5106E+02  0.0000E+00  5.9373E+02  2.3583E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2012E+04  5.5140E+02  0.0000E+00  5.9359E+02  2.3625E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2032E+04  5.5169E+02  0.0000E+00  5.9344E+02  2.3596E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2057E+04  5.5181E+02  0.0000E+00  5.9330E+02  2.3434E+03

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo   qchfo/qtoto
          w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3957E+04  0.0000E+00  1.3957E+04  2.4666E+06  1.77E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.4229E+04  0.0000E+00  2.4229E+04  2.4685E+06  1.02E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.6010E+04  0.0000E+00  2.6010E+04  2.4721E+06  9.50E+01
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.3879E+04  0.0000E+00  2.3879E+04  2.4754E+06  1.04E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4417E+04  0.0000E+00  1.4417E+04  2.4771E+06  1.72E+02
```

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	1.90431E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	2.55972E-05	5.93597E+02
1003	0.00000E+00	2.73150E+02	2.86258E-05	5.93451E+02
1004	0.00000E+00	2.73150E+02	2.81777E-05	5.93305E+02
1005	0.00000E+00	2.73150E+02	2.02339E-05	5.93305E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7470483E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.23124E+09 w*s effective= -3.60743E+08 w*s

rod 2 plane (perpendicular to z direction) coupled to cells 0 (inner) and 2 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6753E+02	5.6707E+02	5.6568E+02	5.6337E+02	5.6017E+02	5.5302E+02	5.5263E+02	5.5228E+02
1002	2	9.1440E-01	5.7908E+02	5.7827E+02	5.7585E+02	5.7183E+02	5.6626E+02	5.5405E+02	5.5339E+02	5.5279E+02
1003	3	1.8288E+00	5.8142E+02	5.8054E+02	5.7794E+02	5.7362E+02	5.6763E+02	5.5456E+02	5.5386E+02	5.5320E+02
1004	4	2.7432E+00	5.7936E+02	5.7856E+02	5.7617E+02	5.7221E+02	5.6672E+02	5.5469E+02	5.5404E+02	5.5344E+02
1005	5	3.6576E+00	5.6901E+02	5.6853E+02	5.6710E+02	5.6471E+02	5.6140E+02	5.5403E+02	5.5364E+02	5.5327E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1993E+04	5.5184E+02	0.0000E+00	5.9373E+02	2.3431E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2011E+04	5.5202E+02	0.0000E+00	5.9373E+02	2.3617E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2024E+04	5.5238E+02	0.0000E+00	5.9359E+02	2.3659E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2033E+04	5.5269E+02	0.0000E+00	5.9344E+02	2.3631E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2036E+04	5.5281E+02	0.0000E+00	5.9330E+02	2.3469E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4218E+04	0.0000E+00	1.4218E+04	2.4674E+06	1.74E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4491E+04	0.0000E+00	2.4491E+04	2.4692E+06	1.01E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6273E+04	0.0000E+00	2.6273E+04	2.4729E+06	9.41E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4145E+04	0.0000E+00	2.4145E+04	2.4767E+06	1.03E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4684E+04	0.0000E+00	1.4684E+04	2.4786E+06	1.69E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	1.98144E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	2.61849E-05	5.93596E+02
1003	0.00000E+00	2.73150E+02	2.93020E-05	5.93451E+02
1004	0.00000E+00	2.73150E+02	2.89002E-05	5.93305E+02
1005	0.00000E+00	2.73150E+02	2.11152E-05	5.93305E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7471817E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.23362E+09 w*s effective= -3.42002E+08 w*s

rod 3 plane (perpendicular to z direction) coupled to cells 0 (inner) and 3 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6844E+02	5.6797E+02	5.6658E+02	5.6427E+02	5.6105E+02	5.5389E+02	5.5351E+02	5.5315E+02
1002	2	9.1440E-01	5.7999E+02	5.7917E+02	5.7674E+02	5.7272E+02	5.6714E+02	5.5492E+02	5.5427E+02	5.5366E+02
1003	3	1.8288E+00	5.8232E+02	5.8145E+02	5.7883E+02	5.7451E+02	5.6851E+02	5.5543E+02	5.5473E+02	5.5408E+02
1004	4	2.7432E+00	5.8026E+02	5.7946E+02	5.7706E+02	5.7310E+02	5.6759E+02	5.5556E+02	5.5492E+02	5.5432E+02
1005	5	3.6576E+00	5.6992E+02	5.6943E+02	5.6799E+02	5.6561E+02	5.6228E+02	5.5491E+02	5.5451E+02	5.5415E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2046E+04	5.5271E+02	0.0000E+00	5.9373E+02	2.3458E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2063E+04	5.5289E+02	0.0000E+00	5.9373E+02	2.3644E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2081E+04	5.5326E+02	0.0000E+00	5.9359E+02	2.3687E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2104E+04	5.5356E+02	0.0000E+00	5.9344E+02	2.3659E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2132E+04	5.5369E+02	0.0000E+00	5.9330E+02	2.3496E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4266E+04	0.0000E+00	1.4266E+04	2.4667E+06	1.73E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4537E+04	0.0000E+00	2.4537E+04	2.4685E+06	1.01E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6317E+04	0.0000E+00	2.6317E+04	2.4721E+06	9.39E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4186E+04	0.0000E+00	2.4186E+04	2.4754E+06	1.02E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4723E+04	0.0000E+00	1.4723E+04	2.4770E+06	1.68E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.02363E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	2.66668E-05	5.93596E+02
1003	0.00000E+00	2.73150E+02	2.98453E-05	5.93450E+02
1004	0.00000E+00	2.73150E+02	2.94307E-05	5.93304E+02
1005	0.00000E+00	2.73150E+02	2.15335E-05	5.93304E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7470628E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.22797E+09 w*s effective= -3.49598E+08 w*s

rod 4 plane (perpendicular to z direction) coupled to cells 0 (inner) and 4 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6934E+02	5.6887E+02	5.6748E+02	5.6516E+02	5.6193E+02	5.5477E+02	5.5439E+02	5.5403E+02
1002	2	9.1440E-01	5.8089E+02	5.8007E+02	5.7764E+02	5.7361E+02	5.6801E+02	5.5580E+02	5.5515E+02	5.5454E+02
1003	3	1.8288E+00	5.8322E+02	5.8235E+02	5.7973E+02	5.7540E+02	5.6939E+02	5.5632E+02	5.5561E+02	5.5496E+02
1004	4	2.7432E+00	5.8116E+02	5.8036E+02	5.7796E+02	5.7399E+02	5.6847E+02	5.5645E+02	5.5580E+02	5.5520E+02
1005	5	3.6576E+00	5.7082E+02	5.7034E+02	5.6889E+02	5.6650E+02	5.6317E+02	5.5579E+02	5.5540E+02	5.5504E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2043E+04	5.5359E+02	0.0000E+00	5.9373E+02	2.3486E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2062E+04	5.5377E+02	0.0000E+00	5.9373E+02	2.3672E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2077E+04	5.5414E+02	0.0000E+00	5.9359E+02	2.3714E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2090E+04	5.5445E+02	0.0000E+00	5.9344E+02	2.3686E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2098E+04	5.5458E+02	0.0000E+00	5.9330E+02	2.3524E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4303E+04	0.0000E+00	1.4303E+04	2.4678E+06	1.73E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4573E+04	0.0000E+00	2.4573E+04	2.4696E+06	1.01E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6349E+04	0.0000E+00	2.6349E+04	2.4733E+06	9.39E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4216E+04	0.0000E+00	2.4216E+04	2.4770E+06	1.02E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4752E+04	0.0000E+00	1.4752E+04	2.4788E+06	1.68E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.07080E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	2.72271E-05	5.93596E+02
1003	0.00000E+00	2.73150E+02	3.04834E-05	5.93450E+02
1004	0.00000E+00	2.73150E+02	3.00763E-05	5.93304E+02
1005	0.00000E+00	2.73150E+02	2.20672E-05	5.93304E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7470739E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.23694E+09 w*s effective= -3.44184E+08 w*s

rod 5 plane (perpendicular to z direction) coupled to cells 0 (inner) and 5 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6723E+02	5.6677E+02	5.6540E+02	5.6312E+02	5.5996E+02	5.5290E+02	5.5252E+02	5.5218E+02
1002	2	9.1440E-01	5.7876E+02	5.7796E+02	5.7556E+02	5.7158E+02	5.6605E+02	5.5393E+02	5.5328E+02	5.5268E+02
1003	3	1.8288E+00	5.8108E+02	5.8022E+02	5.7763E+02	5.7335E+02	5.6741E+02	5.5442E+02	5.5373E+02	5.5308E+02
1004	4	2.7432E+00	5.7900E+02	5.7821E+02	5.7584E+02	5.7192E+02	5.6647E+02	5.5454E+02	5.5390E+02	5.5330E+02
1005	5	3.6576E+00	5.6865E+02	5.6818E+02	5.6676E+02	5.6441E+02	5.6115E+02	5.5387E+02	5.5349E+02	5.5313E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2009E+04	5.5174E+02	0.0000E+00	5.9373E+02	2.3424E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2025E+04	5.5192E+02	0.0000E+00	5.9373E+02	2.3610E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2042E+04	5.5227E+02	0.0000E+00	5.9359E+02	2.3652E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2063E+04	5.5256E+02	0.0000E+00	5.9344E+02	2.3623E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2090E+04	5.5268E+02	0.0000E+00	5.9330E+02	2.3461E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3992E+04	0.0000E+00	1.3992E+04	2.4668E+06	1.76E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4263E+04	0.0000E+00	2.4263E+04	2.4686E+06	1.02E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6041E+04	0.0000E+00	2.6041E+04	2.4721E+06	9.49E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3907E+04	0.0000E+00	2.3907E+04	2.4755E+06	1.04E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4443E+04	0.0000E+00	1.4443E+04	2.4771E+06	1.72E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	1.94367E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	2.60735E-05	5.93596E+02
1003	0.00000E+00	2.73150E+02	2.91676E-05	5.93450E+02
1004	0.00000E+00	2.73150E+02	2.87195E-05	5.93304E+02
1005	0.00000E+00	2.73150E+02	2.06505E-05	5.93304E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7469966E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.23089E+09 w*s effective= -3.61707E+08 w*s

rod 6 plane (perpendicular to z direction) coupled to cells 0 (inner) and 6 (outer), peaking factor is 1.0000

```
 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.6521E+02 5.6476E+02 5.6342E+02 5.6119E+02 5.5809E+02 5.5113E+02 5.5076E+02 5.5042E+02
1002   2  9.1440E-01 5.7674E+02 5.7595E+02 5.7358E+02 5.6964E+02 5.6418E+02 5.5215E+02 5.5150E+02 5.5091E+02
1003   3  1.8288E+00 5.7904E+02 5.7819E+02 5.7563E+02 5.7140E+02 5.6553E+02 5.5263E+02 5.5194E+02 5.5130E+02
1004   4  2.7432E+00 5.7695E+02 5.7617E+02 5.7383E+02 5.6996E+02 5.6458E+02 5.5273E+02 5.5209E+02 5.5151E+02
1005   5  3.6576E+00 5.6659E+02 5.6613E+02 5.6474E+02 5.6244E+02 5.5923E+02 5.5206E+02 5.5167E+02 5.5132E+02

 id  idi   hliqi        tliqi       hvapi        tvapi      ido   hliqo        tliqo       hvapo        tvapo        hgap
          w/m2/k          k        w/m2/k          k              w/m2/k          k        w/m2/k          k        w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1928E+04  5.4999E+02  0.0000E+00  5.9373E+02  2.3365E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1943E+04  5.5016E+02  0.0000E+00  5.9373E+02  2.3551E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1950E+04  5.5049E+02  0.0000E+00  5.9359E+02  2.3592E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1951E+04  5.5077E+02  0.0000E+00  5.9344E+02  2.3563E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1941E+04  5.5088E+02  0.0000E+00  5.9330E+02  2.3401E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3691E+04  0.0000E+00  1.3691E+04  2.4673E+06  1.80E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.3963E+04  0.0000E+00  2.3963E+04  2.4692E+06  1.03E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.5742E+04  0.0000E+00  2.5742E+04  2.4730E+06  9.61E+01
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.3610E+04  0.0000E+00  2.3610E+04  2.4770E+06  1.05E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4146E+04  0.0000E+00  1.4146E+04  2.4791E+06  1.75E+02

        stanton      liq.temp.      stanton      liq.temp.
         number     bubble det.     number      bubble det.
 id   inner surf.   inner surf.   outer surf.   outer surf.
           -             k             -             k
1001  0.00000E+00   2.73150E+02   1.83523E-05   5.93742E+02
1002  0.00000E+00   2.73150E+02   2.51053E-05   5.93597E+02
1003  0.00000E+00   2.73150E+02   2.80657E-05   5.93451E+02
1004  0.00000E+00   2.73150E+02   2.75996E-05   5.93306E+02
1005  0.00000E+00   2.73150E+02   1.95215E-05   5.93306E+02

total convective energy to the fluid during hydro solution:
                  inside surface=  0.0000000E+00 w*s       outside surface=  1.7470238E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s
          outside convective energy error: absolute=  1.25416E+09 w*s     effective= -3.68274E+08 w*s

rod   7   plane (perpendicular to z direction) coupled to cells   0 (inner) and  -1 (outer), peaking factor is   1.6780

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.7707E+02 5.7629E+02 5.7395E+02 5.7007E+02 5.6469E+02 5.5284E+02 5.5221E+02 5.5162E+02
1002   2  9.1440E-01 5.9640E+02 5.9501E+02 5.9088E+02 5.8406E+02 5.7463E+02 5.5444E+02 5.5335E+02 5.5234E+02
1003   3  1.8288E+00 6.0006E+02 5.9857E+02 5.9412E+02 5.8677E+02 5.7663E+02 5.5504E+02 5.5386E+02 5.5277E+02
1004   4  2.7432E+00 5.9635E+02 5.9498E+02 5.9091E+02 5.8419E+02 5.7490E+02 5.5503E+02 5.5395E+02 5.5295E+02
1005   5  3.6576E+00 5.7881E+02 5.7800E+02 5.7558E+02 5.7158E+02 5.6602E+02 5.5383E+02 5.5318E+02 5.5257E+02

 id  idi   hliqi        tliqi       hvapi        tvapi      ido   hliqo        tliqo       hvapo        tvapo        hgap
          w/m2/k          k        w/m2/k          k              w/m2/k          k        w/m2/k          k        w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1981E+04  5.5088E+02  0.0000E+00  5.9373E+02  2.3567E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1996E+04  5.5106E+02  0.0000E+00  5.9373E+02  2.3876E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2012E+04  5.5140E+02  0.0000E+00  5.9359E+02  2.3939E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2032E+04  5.5169E+02  0.0000E+00  5.9344E+02  2.3885E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2057E+04  5.5181E+02  0.0000E+00  5.9330E+02  2.3609E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.3652E+04  0.0000E+00  2.3652E+04  2.4666E+06  1.04E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  4.0882E+04  0.0000E+00  4.0882E+04  2.4685E+06  6.04E+01
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  4.3859E+04  0.0000E+00  4.3859E+04  2.4721E+06  5.64E+01
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  4.0274E+04  0.0000E+00  4.0274E+04  2.4754E+06  6.15E+01
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.4392E+04  0.0000E+00  2.4392E+04  2.4771E+06  1.02E+02

        stanton      liq.temp.      stanton      liq.temp.
         number     bubble det.     number      bubble det.
 id   inner surf.   inner surf.   outer surf.   outer surf.
           -             k             -             k
1001  0.00000E+00   2.73150E+02   3.22691E-05   5.93742E+02
1002  0.00000E+00   2.73150E+02   4.85602E-05   5.93597E+02
1003  0.00000E+00   2.73150E+02   5.34975E-05   5.93451E+02
1004  0.00000E+00   2.73150E+02   5.12094E-05   5.93305E+02
1005  0.00000E+00   2.73150E+02   3.42331E-05   5.93305E+02

rod   8   plane (perpendicular to z direction) coupled to cells   0 (inner) and  -2 (outer), peaking factor is   1.6780

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.7826E+02 5.7747E+02 5.7510E+02 5.7119E+02 5.6575E+02 5.5382E+02 5.5318E+02 5.5258E+02
1002   2  9.1440E-01 5.9760E+02 5.9620E+02 5.9205E+02 5.8518E+02 5.7568E+02 5.5543E+02 5.5433E+02 5.5331E+02
1003   3  1.8288E+00 6.0128E+02 5.9978E+02 5.9530E+02 5.8790E+02 5.7770E+02 5.5603E+02 5.5485E+02 5.5376E+02
1004   4  2.7432E+00 5.9758E+02 5.9621E+02 5.9211E+02 5.8534E+02 5.7599E+02 5.5604E+02 5.5496E+02 5.5395E+02
1005   5  3.6576E+00 5.8005E+02 5.7923E+02 5.7679E+02 5.7275E+02 5.6713E+02 5.5485E+02 5.5420E+02 5.5358E+02

 id  idi   hliqi        tliqi       hvapi        tvapi      ido   hliqo        tliqo       hvapo        tvapo        hgap
          w/m2/k          k        w/m2/k          k              w/m2/k          k        w/m2/k          k        w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1993E+04  5.5184E+02  0.0000E+00  5.9373E+02  2.3601E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2011E+04  5.5202E+02  0.0000E+00  5.9373E+02  2.3910E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2024E+04  5.5238E+02  0.0000E+00  5.9359E+02  2.3974E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2033E+04  5.5269E+02  0.0000E+00  5.9344E+02  2.3920E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.2036E+04  5.5281E+02  0.0000E+00  5.9330E+02  2.3644E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
```

	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3913E+04	0.0000E+00	2.3913E+04	2.4674E+06	1.03E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.1143E+04	0.0000E+00	4.1143E+04	2.4692E+06	6.00E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.4122E+04	0.0000E+00	4.4122E+04	2.4729E+06	5.60E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.0539E+04	0.0000E+00	4.0539E+04	2.4767E+06	6.11E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4658E+04	0.0000E+00	2.4658E+04	2.4786E+06	1.01E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.33212E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	4.96469E-05	5.93596E+02
1003	0.00000E+00	2.73150E+02	5.47332E-05	5.93451E+02
1004	0.00000E+00	2.73150E+02	5.24726E-05	5.93305E+02
1005	0.00000E+00	2.73150E+02	3.54552E-05	5.93305E+02

rod 9 plane (perpendicular to z direction) coupled to cells 0 (inner) and -3 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7916E+02	5.7837E+02	5.7600E+02	5.7208E+02	5.6663E+02	5.5469E+02	5.5405E+02	5.5346E+02
1002	2	9.1440E-01	5.9850E+02	5.9711E+02	5.9294E+02	5.8606E+02	5.7655E+02	5.5630E+02	5.5520E+02	5.5418E+02
1003	3	1.8288E+00	6.0218E+02	6.0068E+02	5.9619E+02	5.8879E+02	5.7856E+02	5.5691E+02	5.5573E+02	5.5463E+02
1004	4	2.7432E+00	5.9848E+02	5.9711E+02	5.9301E+02	5.8622E+02	5.7685E+02	5.5692E+02	5.5583E+02	5.5483E+02
1005	5	3.6576E+00	5.8095E+02	5.8013E+02	5.7769E+02	5.7363E+02	5.6801E+02	5.5573E+02	5.5507E+02	5.5446E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2046E+04	5.5271E+02	0.0000E+00	5.9373E+02	2.3628E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2063E+04	5.5289E+02	0.0000E+00	5.9373E+02	2.3938E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2081E+04	5.5326E+02	0.0000E+00	5.9359E+02	2.4001E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2104E+04	5.5356E+02	0.0000E+00	5.9344E+02	2.3947E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2132E+04	5.5369E+02	0.0000E+00	5.9330E+02	2.3672E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3961E+04	0.0000E+00	2.3961E+04	2.4667E+06	1.03E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.1190E+04	0.0000E+00	4.1190E+04	2.4685E+06	5.99E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.4165E+04	0.0000E+00	4.4165E+04	2.4721E+06	5.60E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.0580E+04	0.0000E+00	4.0580E+04	2.4754E+06	6.10E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4698E+04	0.0000E+00	2.4698E+04	2.4770E+06	1.00E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.39858E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	5.05592E-05	5.93596E+02
1003	0.00000E+00	2.73150E+02	5.57454E-05	5.93450E+02
1004	0.00000E+00	2.73150E+02	5.34313E-05	5.93304E+02
1005	0.00000E+00	2.73150E+02	3.61197E-05	5.93304E+02

rod 10 plane (perpendicular to z direction) coupled to cells 0 (inner) and -4 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.8007E+02	5.7927E+02	5.7690E+02	5.7296E+02	5.6750E+02	5.5557E+02	5.5493E+02	5.5433E+02
1002	2	9.1440E-01	5.9940E+02	5.9801E+02	5.9383E+02	5.8694E+02	5.7742E+02	5.5718E+02	5.5608E+02	5.5506E+02
1003	3	1.8288E+00	6.0308E+02	6.0158E+02	5.9709E+02	5.8967E+02	5.7943E+02	5.5779E+02	5.5661E+02	5.5552E+02
1004	4	2.7432E+00	5.9939E+02	5.9801E+02	5.9390E+02	5.8711E+02	5.7772E+02	5.5780E+02	5.5672E+02	5.5571E+02
1005	5	3.6576E+00	5.8185E+02	5.8104E+02	5.7858E+02	5.7452E+02	5.6889E+02	5.5662E+02	5.5596E+02	5.5535E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2043E+04	5.5359E+02	0.0000E+00	5.9373E+02	2.3656E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2062E+04	5.5377E+02	0.0000E+00	5.9373E+02	2.3965E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2077E+04	5.5414E+02	0.0000E+00	5.9359E+02	2.4029E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2090E+04	5.5445E+02	0.0000E+00	5.9344E+02	2.3975E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2098E+04	5.5458E+02	0.0000E+00	5.9330E+02	2.3699E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3998E+04	0.0000E+00	2.3998E+04	2.4678E+06	1.03E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.1225E+04	0.0000E+00	4.1225E+04	2.4696E+06	5.99E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.4197E+04	0.0000E+00	4.4197E+04	2.4733E+06	5.60E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.0610E+04	0.0000E+00	4.0610E+04	2.4770E+06	6.10E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4726E+04	0.0000E+00	2.4726E+04	2.4788E+06	1.00E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.47433E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	5.16215E-05	5.93596E+02
1003	0.00000E+00	2.73150E+02	5.69397E-05	5.93450E+02
1004	0.00000E+00	2.73150E+02	5.46081E-05	5.93304E+02
1005	0.00000E+00	2.73150E+02	3.69875E-05	5.93304E+02

rod 11 plane (perpendicular to z direction) coupled to cells 0 (inner) and -5 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7795E+02	5.7717E+02	5.7482E+02	5.7094E+02	5.6555E+02	5.5370E+02	5.5307E+02	5.5248E+02
1002	2	9.1440E-01	5.9728E+02	5.9589E+02	5.9176E+02	5.8492E+02	5.7547E+02	5.5530E+02	5.5421E+02	5.5320E+02
1003	3	1.8288E+00	6.0094E+02	5.9945E+02	5.9499E+02	5.8763E+02	5.7747E+02	5.5590E+02	5.5472E+02	5.5364E+02
1004	4	2.7432E+00	5.9723E+02	5.9586E+02	5.9179E+02	5.8505E+02	5.7575E+02	5.5589E+02	5.5481E+02	5.5381E+02

1005	5	3.6576E+00	5.7969E+02	5.7888E+02	5.7646E+02	5.7245E+02	5.6688E+02	5.5470E+02	5.5404E+02	5.5344E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2009E+04	5.5174E+02	0.0000E+00	5.9373E+02	2.3594E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2025E+04	5.5192E+02	0.0000E+00	5.9373E+02	2.3903E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2042E+04	5.5227E+02	0.0000E+00	5.9359E+02	2.3966E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2063E+04	5.5256E+02	0.0000E+00	5.9344E+02	2.3912E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.2090E+04	5.5268E+02	0.0000E+00	5.9330E+02	2.3636E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3687E+04	0.0000E+00	2.3687E+04	2.4668E+06	1.04E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.0916E+04	0.0000E+00	4.0916E+04	2.4686E+06	6.03E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.3889E+04	0.0000E+00	4.3889E+04	2.4721E+06	5.63E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.0302E+04	0.0000E+00	4.0302E+04	2.4755E+06	6.14E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4418E+04	0.0000E+00	2.4418E+04	2.4771E+06	1.01E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.29038E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	4.94609E-05	5.93596E+02
1003	0.00000E+00	2.73150E+02	5.45049E-05	5.93450E+02
1004	0.00000E+00	2.73150E+02	5.21862E-05	5.93304E+02
1005	0.00000E+00	2.73150E+02	3.49131E-05	5.93304E+02

rod 12 plane (perpendicular to z direction) coupled to cells 0 (inner) and -6 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7594E+02	5.7516E+02	5.7285E+02	5.6901E+02	5.6369E+02	5.5193E+02	5.5130E+02	5.5072E+02
1002	2	9.1440E-01	5.9526E+02	5.9388E+02	5.8978E+02	5.8300E+02	5.7363E+02	5.5353E+02	5.5244E+02	5.5143E+02
1003	3	1.8288E+00	5.9891E+02	5.9743E+02	5.9300E+02	5.8570E+02	5.7562E+02	5.5411E+02	5.5294E+02	5.5185E+02
1004	4	2.7432E+00	5.9518E+02	5.9382E+02	5.8978E+02	5.8311E+02	5.7388E+02	5.5408E+02	5.5301E+02	5.5202E+02
1005	5	3.6576E+00	5.7763E+02	5.7683E+02	5.7444E+02	5.7048E+02	5.6498E+02	5.5288E+02	5.5223E+02	5.5163E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1928E+04	5.4999E+02	0.0000E+00	5.9373E+02	2.3535E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1943E+04	5.5016E+02	0.0000E+00	5.9373E+02	2.3844E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1950E+04	5.5049E+02	0.0000E+00	5.9359E+02	2.3907E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1951E+04	5.5077E+02	0.0000E+00	5.9344E+02	2.3852E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1941E+04	5.5088E+02	0.0000E+00	5.9330E+02	2.3576E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3386E+04	0.0000E+00	2.3386E+04	2.4673E+06	1.06E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.0617E+04	0.0000E+00	4.0617E+04	2.4692E+06	6.08E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.3592E+04	0.0000E+00	4.3592E+04	2.4730E+06	5.67E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	4.0006E+04	0.0000E+00	4.0006E+04	2.4770E+06	6.19E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4122E+04	0.0000E+00	2.4122E+04	2.4791E+06	1.03E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.13479E-05	5.93742E+02
1002	0.00000E+00	2.73150E+02	4.76559E-05	5.93597E+02
1003	0.00000E+00	2.73150E+02	5.24856E-05	5.93451E+02
1004	0.00000E+00	2.73150E+02	5.02187E-05	5.93306E+02
1005	0.00000E+00	2.73150E+02	3.32889E-05	5.93306E+02

inner-surface node-interval thermal conductivity is 5.13977E+00 w/m/k
outer-surface node-interval thermal conductivity is 1.59303E+01 w/m/k
effective r-direction wall thermal conductivity is 5.82666E+00 w/m/k
which have been axially averaged over all 6 average-power rod s

total inner surface area is 0.00000E+00 m2 and
total outer surface area is 3.96347E+03 m2 of all 6 average-power rod s

total power from the heat-structure inner surface is 0.00000E+00 w and outer surface is 8.79439E+07 w

average-power rod 4 has the peak surface temperature of 5.55202E+02 k
supplemental rod 10 has the peak surface temperature of 5.55713E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is 0.00000E+00 kg

########## 3822 lines deleted here ##########

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-------------------------------------------------------------------------------------------------
                                                                                99999 33333 88888
  1   33333   1
 11       3  11   time is    100.218864 s, time-step size is    0.297715 s, time-step number is  1046 9   9     3 8   8
                                                                                99999 33333 88888
  1   33333   1                                                                     9     3 8   8
  1       3   1                        $938$ st-gen-1,2,3 sec.dryer          14 9999 33333 88888
111   33333 111
-------------------------------------------------------------------------------------------------
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the heat-structure component type is a rod and the component number is 938

rod 1 plane (perpendicular to z direction) coupled to cells 1 (inner) and 0 (outer)

id row z(m) heat-structure temperatures (k)

```
1001   1  0.0000E+00 5.4988E+02 5.5066E+02 5.5143E+02
1002   2  5.7542E+00 5.5086E+02 5.5119E+02 5.5152E+02
1003   3  1.1508E+01 5.5173E+02 5.5163E+02 5.5153E+02

 id  idi   hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k                w/m2/k         k          w/m2/k         k          w/m2/k
1001  2  2.3580E+03  5.4471E+02  6.1823E-01  5.4471E+02  11  8.2379E+01  5.5158E+02  1.3383E+05  5.5153E+02  0.0000E+00
1002 11  1.4184E+03  5.4487E+02  3.3607E+03  5.5183E+02  11  6.1706E+01  5.5158E+02  6.5498E+05  5.5153E+02  0.0000E+00
1003 11  4.1307E+01  5.5155E+02  1.7693E+04  5.5183E+02  11  5.6748E+01  5.5158E+02  2.6126E+05  5.5153E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi       qvapi       qtoti       qchfi    qchfi/qtoti   qliqo       qvapo       qtoto       qchfo     qchfo/qtoto
          w/m2        w/m2        w/m2        w/m2         -          w/m2        w/m2        w/m2        w/m2          -
1001  1.2186E+04  3.1962E+00  1.2189E+04  5.1032E+05  4.19E+01 -1.2284E+01 -1.2631E+04 -1.2644E+04  2.9558-122  2.34-126
1002  8.4957E+03 -3.2544E+03  5.2412E+03  2.5516E+05  4.87E+01 -3.8847E+00 -5.3867E+03 -5.3906E+03  3.3863E-59  6.28E-63
1003  7.4688E+00 -1.6949E+03 -1.6875E+03  5.8190E-03  3.45E-06 -2.7779E+00  1.5100E+03  1.5072E+03  6.7725E-59  4.49E-62

        stanton     liq.temp.    stanton     liq.temp.
        number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
          -            k            -            k
1001  9.55634E+01  5.44710E+02  0.00000E+00  5.51910E+02
1002  0.00000E+00  5.51903E+02  0.00000E+00  5.51910E+02
1003  6.28716E-03  5.51903E+02  0.00000E+00  5.51910E+02

total convective energy to the fluid during hydro solution:
                  inside surface= -1.9776774E+08 w*s      outside surface=  8.4750556E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  7.35206E+07 w*s      effective= -6.79242E+07 w*s
          outside convective energy error: absolute=  2.84806E+06 w*s      effective= -4.15660E+05 w*s

rod   2   plane (perpendicular to z direction) coupled to cells   2 (inner) and**** (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.5076E+02 5.5120E+02 5.5164E+02
1002   2  5.7542E+00 5.5136E+02 5.5150E+02 5.5164E+02
1003   3  1.1508E+01 5.5186E+02 5.5185E+02 5.5185E+02

 id  idi   hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k                w/m2/k         k          w/m2/k         k          w/m2/k
1001  2  1.1203E+03  5.4460E+02  3.8740E-01  5.4460E+02  11  4.2559E+01  5.5171E+02  7.9934E+05  5.5165E+02  0.0000E+00
1002 11  6.4084E+02  5.4486E+02  3.9961E+03  5.5186E+02  11  4.1611E+01  5.5171E+02  5.0472E+05  5.5165E+02  0.0000E+00
1003 11  4.1843E+01  5.5166E+02  6.4150E+04  5.5186E+02  12  7.1970E-01  5.5171E+02  1.9866E+01  5.5165E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi       qvapi       qtoti       qchfi    qchfi/qtoti   qliqo       qvapo       qtoto       qchfo     qchfo/qtoto
          w/m2        w/m2        w/m2        w/m2         -          w/m2        w/m2        w/m2        w/m2          -
1001  6.9056E+03  2.3877E+00  6.9080E+03  4.8910E+05  7.08E+01 -2.8242E+00 -7.1716E+03 -7.1745E+03  1.8370-122  2.56-126
1002  4.1659E+03 -1.9942E+03  2.1717E+03  2.4455E+05  1.13E+02 -2.5813E+00 -2.3446E+03 -2.3472E+03  2.5000E-01  1.07E-04
1003  8.2865E+00 -1.8626E+02 -1.7797E+02  6.8999E-03  3.88E-05  1.0233E-01  3.9646E+00  4.0670E+00  5.0000E-01  1.23E-01

        stanton     liq.temp.    stanton     liq.temp.
        number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
          -            k            -            k
1001  9.93023E+01  4.35609E+02  0.00000E+00  5.51912E+02
1002  0.00000E+00  5.51905E+02  0.00000E+00  5.51912E+02
1003  8.54621E-03  5.51905E+02  1.84490E-04  5.51912E+02

total convective energy to the fluid during hydro solution:
                  inside surface= -1.6123560E+08 w*s      outside surface=  4.3964085E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  7.20871E+07 w*s      effective= -6.79498E+07 w*s
          outside convective energy error: absolute=  3.22954E+06 w*s      effective= -6.77107E+05 w*s

rod   3   plane (perpendicular to z direction) coupled to cells   3 (inner) and**** (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.4754E+02 5.4756E+02 5.4757E+02
1002   2  5.7542E+00 5.4796E+02 5.4798E+02 5.4797E+02
1003   3  1.1508E+01 5.4897E+02 5.4895E+02 5.4890E+02

 id  idi   hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k                w/m2/k         k          w/m2/k         k          w/m2/k
1001  2  6.1839E+02  5.4676E+02  9.3260E-03  5.4676E+02  12  3.4205E+02  5.4741E+02  0.0000E+00  5.5205E+02  0.0000E+00
1002 12  8.5862E+02  5.4755E+02  4.4827E-02  5.4676E+02  12  5.2863E+02  5.4741E+02  0.0000E+00  5.5205E+02  0.0000E+00
1003  1  1.2501E+03  5.4890E+02  0.0000E+00  5.5662E+02  12  7.3683E+02  5.4741E+02  0.0000E+00  5.5205E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi       qvapi       qtoti       qchfi    qchfi/qtoti   qliqo       qvapo       qtoto       qchfo     qchfo/qtoto
          w/m2        w/m2        w/m2        w/m2         -          w/m2        w/m2        w/m2        w/m2          -
1001  4.8437E+02  7.2576E-03  4.8438E+02  4.8014E+05  9.91E+02  5.5612E+01  0.0000E+00  5.5612E+01  1.8070E+06  3.25E+04
1002  3.5370E+02  5.3824E-02  3.5375E+02  2.4007E+05  6.79E+02  2.9719E+02  0.0000E+00  2.9719E+02  1.8070E+06  6.08E+03
1003  7.8904E+01  0.0000E+00  7.8904E+01  2.0292E-11  2.57E-13  1.1033E+03  0.0000E+00  1.1033E+03  1.8070E+06  1.64E+03

        stanton     liq.temp.    stanton     liq.temp.
        number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
          -            k            -            k
1001  1.06645E+00  5.46751E+02  6.47312E-05  5.52052E+02
1002  0.00000E+00  5.51922E+02  4.29255E-04  5.52052E+02
1003  9.57051E-04  5.51922E+02  1.62237E-03  5.52052E+02

total convective energy to the fluid during hydro solution:
```

```
                 inside surface= -3.5160041E+07 w*s      outside surface=  1.4738755E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
          inside convective energy error: absolute=  3.05926E+06 w*s     effective=  2.23283E+05 w*s
         outside convective energy error: absolute=  2.48549E+06 w*s     effective=  7.49313E+05 w*s

inner-surface node-interval thermal conductivity is  5.07005E+01     w/m/k
outer-surface node-interval thermal conductivity is  5.06839E+01     w/m/k
effective  r-direction wall thermal conductivity is  5.06922E+01     w/m/k
which have been axially averaged over all    3 average-power rod s

total inner surface area is  6.61197E+02 m2  and
total outer surface area is  6.62564E+02 m2  of all    3 average-power rod s

total power from the heat-structure inner surface is  1.83636E+06    w    and outer surface is -1.76845E+06   w

average-power rod   2 has the peak surface temperature of  5.51859E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg


system results

total power loss by 1-d comp.wall is -2.708179E+06 w*s on the inner surface and  9.607074E+05 w*s on the outer surface

                     system total coolant energy is  9.312153E+18 w*s

                       system total coolant mass is  4.544427E+13 kg

total coolant mass discharged by break components is -8.335127E+04 kg

   total coolant mass injected by fill components is  2.894214E+03 kg

       system computed initial total coolant mass is  4.544427E+13 kg


    time    dtime   power      keff
     s        s       w          -
  101.566  3.081 8.638E+07 0.966184
  104.887  3.241 8.527E+07 0.966184
  108.418  3.470 8.415E+07 0.966184
  110.809  2.402 8.343E+07 0.966184
  113.749  3.001 8.257E+07 0.966184
  117.311  3.647 8.159E+07 0.966184            11
  120.163  2.762 8.083E+07 0.966184
  122.731  2.554 8.017E+07 0.966184
  126.134  3.443 7.933E+07 0.966184
  130.274  4.021 7.836E+07 0.966184
  132.474  2.227 7.787E+07 0.966184
  135.449  3.100 7.721E+07 0.966184
  139.471  3.824 7.637E+07 0.966184
  141.268  1.830 7.601E+07 0.966184
  143.576  2.403 7.555E+07 0.966184
  147.274  3.624 7.484E+07 0.966184
  149.413  2.124 7.444E+07 0.966184
  151.986  2.701 7.398E+07 0.966184
  155.313  3.306 7.339E+07 0.966184
  158.613  3.365 7.283E+07 0.966184
  161.942  3.275 7.229E+07 0.966184
  165.060  3.089 7.179E+07 0.966184
  167.811  2.709 7.137E+07 0.966184
  170.399  2.648 7.097E+07 0.966184
  173.480  2.973 7.052E+07 0.966184
  175.437  1.993 7.024E+07 0.966184
  178.218  2.851 6.985E+07 0.966184
  181.180  2.931 6.944E+07 0.966184
  184.250  3.136 6.903E+07 0.966184
  187.124  2.717 6.865E+07 0.966184
  189.468  2.462 6.835E+07 0.966184
  192.826  3.344 6.793E+07 0.966184
  195.883  3.017 6.756E+07 0.966184
  199.031  3.286 6.719E+07 0.966184

 restart dump generated at problem time   200.068671 s after  1383 time steps        14
1
 trac large edit                          14

 problem time is 2.004179E+02 s, time-step size is  3.4920E-01 s, time-step number is  1384, outer-iteration number is  2

 maximum convective power differance has been 0.3176545E+08   w    in component  910 at time 7.7178549E+00 s
 time-step size was limited by component 200 at cell   1 to 1.0489E-02 s
 average outer-iteration count over the last  338 time steps was   2.178
 last minimum number of outer iterations was  2 at time step 1383 (limited by component  32 with fr.error of 8.4807E-05)
 last maximum number of outer iterations was  4 at time step 1379 (limited by component 202 with fr.error of 6.9931E-07)
 total number of times that each component (id#) was the last to converge since the last short edit
    0( 10)     0( 12)     0( 14)     0( 16)     0( 17)     0( 18)     0( 54)     0( 52)     0( 50)     0( 49)     0( 91)     0( 56)
    0( 20)     0( 22)     0( 24)     0( 26)     0( 27)     0( 28)     7(202)     3(200)    12(205)     2(290)     0( 64)     0( 62)
    0( 60)     4(210)     0(220)    18(400)   155(410)     3(420)     0(422)     0(280)     1(270)     0(254)     0(250)     0(350)
    0(212)     1(120)     4(110)     1(105)     0(190)     2(100)    10(320)     0(310)     1(305)     0(390)     0(300)     0(430)
    0(432)     0(150)     0(354)    13(370)     0(380)     0(216)     0(112)     0(180)    10(170)     0(154)     0(312)     0(436)
    0(116)     0(316)     0( 59)     0( 92)     0(424)     0(578)     0( 66)     0(214)     0(434)     0(279)     0(269)     0(576)
    0(218)     0(114)     0(314)     0(438)     0(369)     0(379)     0(118)     0(179)     0(169)     0(318)    53( 30)    31( 32)
    1( 34)     0( 36)     0( 37)     0( 38)     6( 40)     0( 41)     0( 42)     0( 74)     0( 72)     0( 70)     0( 44)     0( 45)
    0( 46)     0( 43)     0( 69)     0( 93)     0( 47)     0( 76)     0( 48)     0(  2)     0(  3)     0(  4)     0(  5)     0(  6)
    0(  7)     0(  1)
 current maximum time-step sizes and limitation counts since the last short edit
```

delamx	delcmx	deldmx	delemx	delpmx	delrmx	delvmx	delxmx
1.0000E+08 s	1.0000E+08 s	1.0000E+08 s	1.0000E+08 s	5.7724E+01 s	1.0000E+08 s	1.0396E+01 s	1.0000E+08 s
56	0	0	0	0	0	0	0

further limitation counts on what controls delcmx

dtlmx	dtvmx	dprmx	dtsms	dtrmx	delt/2
0	0	0	0	0	0

cpu execution time of this run is 2.218212E+04 s

total time steps since time 0.0 s is 2646
total cpu time since time 0.0 s is 4.060440E+04 s

************************************ signal-variable values at time 200.06867 s ************************************

id	sig.var.	id	sig.var.	id	sig.var.	id	sig.var.	id	sig.var.
1	2.000687E+02 time (s)	11	6.706776E+07 core power (w)	101	5.555891E+02 liq temp (k)	111	6.448075E+06 pressure (pa)	161	4.285755E+03 z lq mf (kg/s)
171	1.053733E+07 pressure (pa)	181	5.549110E+02 liq temp (k)	201	5.556927E+02 liq temp (k)	222	6.448281E+06 pressure (pa)	261	4.279069E+03 z lq mf (kg/s)
271	1.053740E+07 pressure (pa)	281	5.549300E+02 liq temp (k)	301	5.556065E+02 liq temp (k)	333	6.448565E+06 pressure (pa)	361	4.295268E+03 z lq mf (kg/s)
371	1.053724E+07 pressure (pa)	381	5.547815E+02 liq temp (k)	401	1.019055E+07 pressure (pa)	421	1.018525E+07 pressure (pa)	501	4.443073E+06 pressure (pa)
521	-6.063194E+06 pressure (pa)	601	4.443073E+06 pressure (pa)	621	-6.063262E+06 pressure (pa)	701	4.443073E+06 pressure (pa)	721	-6.063100E+06 pressure (pa)
1000	-7.727170E+00 z m mfw (kg/s)	1051	6.448346E+06 pressure (pa)	1100	4.611614E-02 z m mfw (kg/s)	1101	6.448075E+06 pressure (pa)	1121	6.450885E+06 pressure (pa)
1135	-3.453696E+03 pressure (pa)	1501	3.320791E+00 z lq mf (kg/s)	1541	0.000000E+00 valve farea fr	1700	8.677085E+00 z m mfw (kg/s)	1714	5.800352E+04 pressure (pa)
1903	6.455449E+06 pressure (pa)	1910	6.526748E+06 pressure (pa)	2000	9.159034E+00 z m mfw (kg/s)	2020	2.049466E+01 z m mfw (kg/s)	2051	6.448564E+06 pressure (pa)
2100	7.210820E-01 z m mfw (kg/s)	2101	6.448281E+06 pressure (pa)	2121	6.450607E+06 pressure (pa)	2135	-3.257654E+03 pressure (pa)	2541	0.000000E+00 valve farea fr
2700	8.677114E+00 z m mfw (kg/s)	2714	5.800356E+04 pressure (pa)	2903	6.451733E+06 pressure (pa)	2910	6.521063E+06 pressure (pa)	3000	3.376200E+02 z m mfw (kg/s)
3051	6.466899E+06 pressure (pa)	3100	9.910257E-01 z m mfw (kg/s)	3101	6.448565E+06 pressure (pa)	3121	6.450903E+06 pressure (pa)	3135	-2.948387E+03 pressure (pa)
3501	-3.320779E+00 z lq mf (kg/s)	3541	0.000000E+00 valve farea fr	3700	8.677028E+00 z m mfw (kg/s)	3714	5.800408E+04 pressure (pa)	3903	6.492399E+06 pressure (pa)
3910	6.562462E+06 pressure (pa)	4001	6.451533E+06 pressure (pa)	4220	0.000000E+00 valve farea fr	4240	1.000000E+00 trp set status	9000	5.562541E+02 a mx sf tp (k)
9010	5.566463E+02 s mx sf tp (k)								

********************************* control-block output values at time 200.06867 s *********************************

id	con.blk.	id	con.blk.	id	con.blk.	id	con.blk.	id	con.blk.
-1	0.000000E+00 k	-2	0.000000E+00 w	-3	1.440000E-01 -	-4	1.551300E+07 pa	-5	1.620300E+07 pa
-6	1.723700E+07 pa	-7	5.742000E+02 k	-8	5.000000E-02 -	-9	-1.379000E+05 pa	-10	4.087000E+05 w
-11	2.423000E-03 s/kg	-12	4.540000E+02 kg/s	-13	4.330000E+06 pa	-14	5.570000E+02 k	-15	5.807177E+00 sqrt(kg/m3)
-16	5.751000E+02 k	-17	1.162000E+00 k	-18	0.000000E+00 k	-19	1.072000E+00 k	-22	0.000000E+00 -
-24	0.000000E+00 -	-26	0.000000E+00 -	-28	0.000000E+00 -	-30	0.000000E+00 -	-32	0.000000E+00 -
-34	0.000000E+00 -	-36	0.000000E+00 -	-38	0.000000E+00 -	-40	0.000000E+00 -	-50	5.552915E+02 k
-55	5.552981E+02 k	-108	5.552501E+02 k	-109	5.552355E+02 k	-110	5.552428E+02 k	-118	6.780903E-01 k
-119	6.778176E-01 k	-120	6.779539E-01 k	-130	-3.699399E-01 k	-132	-3.635516E-01 k	-134	-6.165270E-01 k
-136	1.162000E+00 k	-138	5.454730E-01 k	-140	1.745514E+01 k	-142	0.000000E+00 -	-148	1.000000E+00 -
-149	2.187584E-01 k	-150	2.187584E-01 k	-152	2.224656E-01 k	-154	3.600000E-02 -	-156	8.008760E-03 k
-158	1.063991E+00 k	-160	-1.985722E+01 k	-162	0.000000E+00 -	-164	0.000000E+00 k	-166	1.063991E+00 k
-168	3.404772E+01 k	-170	0.000000E+00 -	-208	5.553114E+02 k	-209	5.552981E+02 k	-210	5.553047E+02 k
-218	7.626831E-01 k	-219	7.641533E-01 k	-220	7.634182E-01 k	-230	-3.687856E-01 k	-232	-3.628059E-01 k
-234	-6.165270E-01 k	-236	1.162000E+00 k	-238	5.454730E-01 k	-240	1.745514E+01 k	-242	0.000000E+00 -
-248	1.000000E+00 -	-249	1.986853E-01 k	-250	1.986853E-01 k	-252	1.951467E-01 k	-254	3.600000E-02 -
-256	7.025280E-03 k	-258	1.064975E+00 k	-260	-1.979525E+01 k	-262	0.000000E+00 -	-264	0.000000E+00 k
-266	1.064975E+00 k	-268	3.407919E+01 k	-270	0.000000E+00 -	-308	5.551940E+02 k	-309	5.551776E+02 k
-310	5.551858E+02 k	-318	8.249601E-01 k	-319	8.302375E-01 k	-320	8.275988E-01 k	-330	-3.710013E-01 k
-332	-3.636359E-01 k	-334	-6.165270E-01 k	-336	1.162000E+00 k	-338	5.454730E-01 k	-340	1.745514E+01 k
-342	0.000000E+00 -	-348	1.000000E+00 -	-349	2.465963E-01 k	-350	2.465963E-01 k	-352	2.264877E-01 k
-354	3.600000E-02 -	-356	8.153557E-03 k	-358	1.063846E+00 k	-360	-1.991419E+01 k	-362	0.000000E+00 -
-364	0.000000E+00 k	-366	1.063846E+00 k	-368	3.404309E+01 k	-370	0.000000E+00 -	-406	9.167449E-02 -
-408	4.580000E-01 -	-410	-1.000000E-01 -	-412	-1.000000E-01 -	-414	-1.000000E+00 -	-430	-5.327748E+06 pa
-432	-1.000000E+02	-434	-5.327756E+06	-436	1.817000E+05	-438	1.000000E+00	-440	0.000000E+00

		paxs			pa			w			-			-
-442	1.000000E+00	-	-444	4.087000E+05	w	-446	5.904000E+05	w	-448	0.000000E+00	-	-450	0.000000E+00	w
-521	-1.000000E+07	pa	-621	-1.000000E+07	pa	-721	-1.000000E+07	pa	-1000	1.000000E+00	-	-1001	4.611614E-02	-
-1002	-1.675589E+02	-	-1004	1.872432E-01	-	-1005	1.863790E-01	-	-1006	3.336210E-01	-	-1007	1.000000E-01	s
-1008	3.436210E-01	-	-1009	-6.481943E+01	kg/s	-1010	-1.570575E-01	-	-1011	1.865636E-01	-	-1012	1.000000E-01	s
-1013	1.000000E-01	-	-1014	1.000000E-01	-	-1104	3.453696E+03	pa	-1106	4.982305E+01	m2xsqrt(pa)	-1109	2.893313E+02	kg/s
-1110	1.000000E+00	-	-1112	0.000000E+00	-	-1114	0.000000E+00	-	-1116	1.000000E+00	-	-1118	0.000000E+00	-
-1160	0.000000E+00	-	-1162	0.000000E+00	-	-1704	5.800352E+04	pa	-1706	3.540312E+02	kg/s	-2000	1.000000E+00	kg/s
-2001	7.210820E-01	kg/s	-2002	1.270179E+01	kg/s	-2004	8.354301E-02	-	-2005	8.318557E-02	-	-2006	4.368144E-01	-
-2007	1.000000E-01	s	-2008	4.468144E-01	-	-2009	-1.508629E+02	kg/s	-2010	-3.655409E-01	-	-2011	8.127357E-02	-
-2012	1.000000E-01	s	-2013	9.127357E-02	-	-2014	9.127357E-02	-	-2104	3.257654E+03	pa	-2106	4.838834E+00	m2xsqrt(pa)
-2109	2.809997E+01	kg/s	-2110	1.000000E+00	-	-2112	0.000000E+00	-	-2114	0.000000E+00	-	-2116	1.000000E+00	-
-2118	0.000000E+00	-	-2160	0.000000E+00	-	-2162	0.000000E+00	-	-2704	5.800356E+04	pa	-2706	1.788569E+02	kg/s
-3000	1.000000E+00	m2xsqrt(pa)	-3001	9.910257E-01	m2xsqrt(pa)	-3002	3.406774E+02	m2xsqrt(pa)	-3004	6.722480E-01	-	-3004	6.722480E-01	-
-3005	6.722543E-01	-	-3005	6.722543E-01	-	-3006	-1.522543E-01	-	-3006	-1.522543E-01	-	-3007	-1.000000E-01	s
-3007	-1.000000E-01	s	-3008	-1.622543E-01	-	-3008	-1.622543E-01	-	-3009	1.093900E+02	kg/s	-3009	1.093900E+02	kg/s
-3010	2.650519E-01	-	-3010	2.650519E-01	-	-3011	1.027977E-01	-	-3011	1.027977E-01	-	-3012	1.000000E-01	s
-3012	1.000000E-01	s	-3013	1.000000E-01	-	-3013	1.000000E-01	-	-3014	1.000000E-01	-	-3014	1.000000E-01	-
-3104	2.948387E+03	pa	-3104	2.948387E+03	pa	-3106	7.981907E+01	m2xsqrt(pa)	-3106	4.603420E+01	m2xsqrt(pa)	-3109	4.635234E+02	kg/s
-3110	1.000000E+00	-	-3112	0.000000E+00	-	-3114	1.000000E+00	-	-3116	1.000000E+00	-	-3118	1.000000E+00	-
-3160	0.000000E+00	-	-3162	0.000000E+00	-	-3704	5.800408E+04	pa	-3706	3.540329E+02	kg/s	-4241	5.617200E+06	pa
-4242	1.000000E+00	-	-4243	5.200000E-01	-	-4300	5.593000E+02	k	-4302	3.812800E+06	pa	-4304	5.751000E+02	k
-4310	5.553047E+02	k	-4312	5.553047E+02	k	-4314	5.553047E+02	k	-4316	-3.995253E+00	k	-4318	0.000000E+00	-
-4320	0.000000E+00	-	-4330	5.556849E+02	k	-4332	-1.941506E+01	k	-4334	0.000000E+00	-	-4336	0.000000E+00	-
-4338	0.000000E+00	-	-4340	0.000000E+00	-	-4342	0.000000E+00	-						

** trip set status at time 200.06867 s **

id	set status	id	set status	id	set status	id	set status	id	set status
1	on-forward	10	on-forward	12	on-forward	14	on-forward	16	on-forward
18	on-forward	20	on-forward	21	on-forward	22	off	24	off
26	on-forward	28	on-forward	30	off	32	on-forward	34	on-forward
36	off	38	off	40	off	42	off	44	on-forward
46	on-forward	48	off	50	off	52	off	54	on-forward
56	off	58	off	60	on-forward	100	on-forward	110	off
120	on-forward	200	off	210	off	220	on-forward	300	off
310	off	320	on-forward	-407	off	422	on-reverse	423	off
450	on-reverse	460	on-reverse	520	on-reverse	620	on-reverse	720	on-reverse
1001	off	1002	off	1003	off	1010	on-forward	1020	on-forward
1030	off	1040	off	1050	off	1060	off	1500	on-forward
2010	on-forward	2020	on-forward	2030	off	2040	off	2050	off
2060	off	3010	off	3020	off	3030	off	3040	on-forward
3050	on-forward	3060	off	3500	on-forward	9996	off	9997	off
9998	off	9999	off						

************************************** trip signal values at time 200.06867 s **************************************

id	trp.sig.		id	trp.sig.		id	trp.sig.		id	trp.sig.		id	trp.sig.	
1	2.000687E+02	s	10	2.000000E+00	-	12	4.000000E+00	-	14	2.000000E+00	-	16	1.000000E+00	-
18	1.000000E+00	-	20	1.000000E+00	-	21	1.000000E+00	-	22	0.000000E+00	-	24	1.000000E+00	-
26	2.000000E+00	-	28	1.000000E+00	-	30	0.000000E+00	-	32	1.000000E+00	-	34	2.000000E+00	-
36	0.000000E+00	-	38	0.000000E+00	-	40	0.000000E+00	-	42	0.000000E+00	-	44	1.000000E+00	-
46	2.000000E+00	-	48	0.000000E+00	-	50	0.000000E+00	-	52	6.706776E+07	w	54	1.018525E+07	pa
56	9.167449E-02	-	58	1.018525E+07	pa	60	1.018525E+07	pa	100	1.000000E+00	-	110	4.285755E+03	kg/s
120	5.552428E+02	k	200	1.000000E+00	-	210	4.279069E+03	kg/s	220	5.553047E+02	k	300	1.000000E+00	-
310	4.295268E+03	kg/s	320	5.551858E+02	k	-407	9.167449E-02	-	422	3.000000E+00	-	423	2.000687E+02	s
450	1.018525E+07	pa	460	1.018525E+07	pa	520	-6.063194E+06	m	620	-6.063262E+06	m	720	-6.063100E+06	m
1001	2.067008E+02	pa	1002	4.902343E+02	pa	1003	2.835335E+02	pa	1010	1.863790E-01	-	1020	1.863790E-01	-
1030	1.863790E-01	-	1040	-6.481943E+01	kg/s	1050	2.893313E+02	kg/s	1060	6.448075E+06	pa	1500	3.320791E+00	kg/s

```
  2010   8.318557E-02      2020   8.318557E-02      2030   8.318557E-02      2040  -1.508629E+02      2050   2.809997E+01
                    -                         -                         -                   kg/s                   kg/s
  2060   6.448281E+06      3010   6.722543E-01      3020   6.722543E-01      3030   6.722543E-01      3040   1.093900E+02
                   pa                         -                         -                      -                   kg/s
  3050   4.635234E+02      3060   6.448565E+06      3500  -3.320779E+00      9996   2.000687E+02      9997   2.000687E+02
                 kg/s                        pa                      kg/s                      s                      s
  9998   2.000687E+02      9999   2.000687E+02
                    s                         s

at time    63.8013 s in component number 938 at cell   1, the maximum stanton number is 1.663668E+05
at time     0.0075 s in component number 906 at cell   1, the minimum tld is 6.203117E+02 k
            where tld is the liquid temperature at bubble detachment from a heated surface

-----------------------------------------------------------------------------------------------------------------------
             1                                                                                              1  00000
            11   time is    200.417875 s, time-step size is     0.349204 s, time-step number is  1384      11   0   0
             1                                                                                              1   0   0
             1                              $10$ hot leg 1                                                  1   0   0
           111                                                                                            111  00000
-----------------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is  10, first junction number is  10, and second junction number is  12

                   ncd-gas
     pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas    wf.liq.
cell     pa          pa          -         k         k         k        kg/m3     kg/m3        m/s         m/s         -
 1 1.01841E+07 0.00000E+00 0.000E+00 5.855E+02 5.556E+02 5.855E+02 7.533E+02 5.670E+01  1.334E+01  1.335E+01 7.907E-02
 2 1.01834E+07 0.00000E+00 0.000E+00 5.855E+02 5.556E+02 5.855E+02 7.533E+02 5.670E+01  1.334E+01  1.334E+01 3.113E-03
 3 1.01827E+07 0.00000E+00 0.000E+00 5.855E+02 5.556E+02 5.855E+02 7.534E+02 5.669E+01  1.334E+01  1.334E+01 3.113E-03
 4 1.01820E+07 0.00000E+00 0.000E+00 5.855E+02 5.556E+02 5.855E+02 7.534E+02 5.669E+01  1.334E+01  1.334E+01 3.113E-03
 5 1.01815E+07 0.00000E+00 0.000E+00 5.855E+02 5.556E+02 5.855E+02 7.534E+02 5.669E+01  1.334E+01  1.334E+01 3.113E-03
 6 1.01810E+07 0.00000E+00 0.000E+00 5.855E+02 5.556E+02 5.855E+02 7.534E+02 5.668E+01  1.334E+01  1.334E+01 3.113E-03
 7                                                                                       1.168E+01  1.167E+01 1.771E-01

    idr   liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
cell  -    ----- w/m2/k ------     w/k         w          w          k             k
 1  1.0   3.496E+04 0.000E+00 5.768E+04-5.932E+03 0.000E+00 5.861E+02      555.43
 2  1.0   3.497E+04 0.000E+00 5.768E+04-5.927E+03 0.000E+00 5.861E+02      555.42
 3  1.0   3.497E+04 0.000E+00 5.768E+04-5.924E+03 0.000E+00 5.861E+02      555.42
 4  1.0   3.497E+04 0.000E+00 5.768E+04-5.921E+03 0.000E+00 5.861E+02      555.42
 5  1.0   3.497E+04 0.000E+00 2.827E+04-5.919E+03 0.000E+00 5.861E+02      555.41
 6  1.0   3.298E+04 0.000E+00 5.711E+04-5.981E+03 0.000E+00 5.861E+02      555.40

total power to the component from all heat-transfer surfaces is -9.477621E+04   w
total power to the liquid is -9.477621E+04   w    and total power to the gas is  0.000000E+00   w

total convective energy transported to the fluid from component wall:  1.6390115E+08 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                   inside convective energy error: absolute=  6.64349E+07 w*s     effective=  1.76554E+06 w*s

pipe wall total power loss on the inner surface is  9.09976E+04   w    and on the outer surface is  0.00000E+00   w

pipe  component  total coolant mass is  2.12709E+03 kg , total coolant energy is  2.62505E+09 w*s, and
computed initial total coolant mass is  1.93238E+03 kg

##########  4157 lines deleted here  ##########

-----------------------------------------------------------------------------------------------------------------------
  1   00000 99999                                                                                              77777
 11   0   0 9   9 time is    200.417875 s, time-step size is     0.349204 s, time-step number is  1384             7
  1   0   0 99999                                                                                                7
  1   0   0     9                           $7$ rod guide tube 6 (short)                                        7
111   00000 99999                                                                                              7
-----------------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is   7, first junction number is   7, and second junction number is  99

                   ncd-gas
     pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.    vel.liq.    vel.gas    wf.liq.
cell     pa          pa          -         k         k         k        kg/m3     kg/m3        m/s         m/s         -
 1 1.03012E+07 0.00000E+00 0.000E+00 5.863E+02 5.555E+02 5.863E+02 7.538E+02 5.752E+01  4.340E-01  4.369E-01 2.576E-02
 2 1.02947E+07 0.00000E+00 0.000E+00 5.863E+02 5.554E+02 5.863E+02 7.539E+02 5.747E+01  4.341E-01  4.369E-01 7.745E-03
 3                                                                                       4.341E-01  4.370E-01 3.698E-02

pipe  component  total coolant mass is  2.77726E+01 kg , total coolant energy is  3.42464E+07 w*s, and
computed initial total coolant mass is  2.61042E+01 kg

-----------------------------------------------------------------------------------------------------------------------
  1    1   00000                                                                                                 1
 11   11   0   0 time is    200.417875 s, time-step size is     0.349204 s, time-step number is  1384            11
  1    1   0   0                                                                                                 1
  1    1   0   0                            $1$ reactor vessel                                                   1
111  111   00000                                                                                               111
-----------------------------------------------------------------------------------------------------------------------

the component type is a vessel, the component number is   1, and the junction numbers are     10    20    30    19    29    39
                                                                                               2     3     4     5     6     7
                                                                                              94    95    96    97    98    99

level  1 data

alpn         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -

rovn         5.86219E+01  5.86215E+01  5.86219E+01  5.86215E+01  5.86219E+01  5.86214E+01  5.87668E+01  5.87667E+01
```

5.87667E+01 5.87667E+01 5.87668E+01 5.87667E+01
kg/m3

roln 7.55480E+02 7.55297E+02 7.55307E+02 7.55254E+02 7.55457E+02 7.55583E+02 7.55442E+02 7.55267E+02
7.55278E+02 7.55226E+02 7.55421E+02 7.55540E+02
kg/m3

vvnyt -5.64820E-04 9.98231E-04 -8.99962E-04 5.48279E-04 -1.07829E-03 9.96633E-04 -6.46650E-02 6.62781E-02
-6.55062E-02 6.44019E-02 -6.68592E-02 6.63505E-02
m/s

vvnz 4.53989E+00 4.51548E+00 4.54148E+00 4.51602E+00 4.54017E+00 4.51287E+00 -1.68178E+01 -1.69595E+01
-1.68186E+01 -1.69592E+01 -1.68178E+01 -1.69583E+01
m/s

vvnxr -2.65806E+00 -2.65060E+00 -2.65828E+00 -2.65067E+00 -2.65809E+00 -2.65016E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
m/s

vlnyt -5.90747E-04 1.02473E-03 -9.26168E-04 5.74102E-04 -1.10501E-03 1.02316E-03 -6.46653E-02 6.62783E-02
-6.55065E-02 6.44022E-02 -6.68593E-02 6.63506E-02
m/s

vlnz 4.53570E+00 4.51130E+00 4.53730E+00 4.51185E+00 4.53599E+00 4.50870E+00 -1.68102E+01 -1.69520E+01
-1.68111E+01 -1.69517E+01 -1.68102E+01 -1.69508E+01
m/s

vlnxr -2.65335E+00 -2.64588E+00 -2.65358E+00 -2.64596E+00 -2.65338E+00 -2.64544E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
m/s

tvn 5.87467E+02 5.87467E+02 5.87467E+02 5.87467E+02 5.87467E+02 5.87467E+02 5.87612E+02 5.87612E+02
5.87612E+02 5.87612E+02 5.87612E+02 5.87612E+02
k

tln 5.54747E+02 5.54837E+02 5.54832E+02 5.54858E+02 5.54758E+02 5.54696E+02 5.54780E+02 5.54867E+02
5.54861E+02 5.54887E+02 5.54791E+02 5.54732E+02
k

tsat 5.87467E+02 5.87467E+02 5.87467E+02 5.87467E+02 5.87467E+02 5.87467E+02 5.87612E+02 5.87612E+02
5.87612E+02 5.87612E+02 5.87612E+02 5.87612E+02
k

pn 1.04585E+07 1.04585E+07 1.04585E+07 1.04585E+07 1.04585E+07 1.04585E+07 1.04791E+07 1.04791E+07
1.04791E+07 1.04791E+07 1.04791E+07 1.04791E+07
pa

pan 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
pa

conc 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-

solid 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
kg/m3

level 2 data

alpn 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-

rovn 5.84454E+01 5.84454E+01 5.84454E+01 5.84454E+01 5.84454E+01 5.84454E+01 5.93204E+01 5.93225E+01
5.93204E+01 5.93225E+01 5.93204E+01 5.93225E+01
kg/m3

roln 7.55490E+02 7.55304E+02 7.55313E+02 7.55260E+02 7.55467E+02 7.55597E+02 7.55494E+02 7.55320E+02
7.55331E+02 7.55279E+02 7.55473E+02 7.55591E+02
kg/m3

vvnyt 2.44897E-03 -2.77408E-03 2.69017E-03 -2.42657E-03 2.86364E-03 -2.80207E-03 -6.55396E-02 6.71003E-02
-6.63271E-02 6.52840E-02 -6.76157E-02 6.70983E-02
m/s

########## 625 lines deleted here ##########

pn 1.02946E+07 1.02946E+07 1.02946E+07 1.02946E+07 1.02946E+07 1.02946E+07 1.02946E+07 1.02946E+07
1.02946E+07 1.02946E+07 1.02946E+07 1.02946E+07
pa

pan 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
pa

conc 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-

solid 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
kg/m3

```
level 12 data

alpn      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

rovn      5.74203E+01  5.74203E+01  5.74203E+01  5.74203E+01  5.74203E+01  5.74203E+01  1.01931E+02  1.01931E+02
          1.01931E+02  1.01931E+02  1.01931E+02  1.01931E+02
          kg/m3

roln      7.28961E+02  7.33323E+02  7.29234E+02  7.31973E+02  7.28810E+02  7.32287E+02  7.08582E+02  7.08582E+02
          7.08582E+02  7.08582E+02  7.08582E+02  7.08582E+02
          kg/m3

vvnyt     6.49430E-05  2.57695E-03  3.14203E-03 -1.29364E-03 -1.85027E-03 -1.93392E-03  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

vvnz      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

vvnxr     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

vlnyt     6.49536E-05  2.57694E-03  3.14201E-03 -1.29363E-03 -1.85028E-03 -1.93391E-03  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

vlnz      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

vlnxr     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

tvn       5.86246E+02  5.86246E+02  5.86246E+02  5.86246E+02  5.86246E+02  5.86246E+02  6.17905E+02  6.17905E+02
          6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
          k

tln       5.67118E+02  5.65129E+02  5.66993E+02  5.65746E+02  5.67186E+02  5.65603E+02  5.81000E+02  5.81000E+02
          5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
          k

tsat      5.86246E+02  5.86246E+02  5.86246E+02  5.86246E+02  5.86246E+02  5.86246E+02  6.17905E+02  6.17905E+02
          6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
          k

pn        1.02872E+07  1.02872E+07  1.02872E+07  1.02872E+07  1.02872E+07  1.02872E+07  1.55000E+07  1.55000E+07
          1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
          pa

pan       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          pa

conc      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

solid     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          kg/m3

total power to the vessel coolant from all heat surfaces is  6.69581E+07   w
total power to the liquid is  6.69581E+07   w    and total power to the gas is  0.00000E+00   w

vessel lower plenum
liquid volume is  2.33861E+01 m3 , liquid volume fraction is  1.00000E+00 and liquid mass is  1.76658E+04 kg
volume-averaged liquid temperature is  5.54792E+02 k and volume-averaged saturation temperature is  5.87514E+02 k

vessel reactor core
liquid volume fraction is  1.00000E+00 and liquid mass is  1.12313E+04 kg
volume-averaged liquid temperature is  5.55366E+02 k and volume-averaged saturation temperature is  5.86816E+02 k

vessel reactor core
inlet  liquid mass flow is  1.27426E+04  kg/s  and inlet  gas mass flow is  0.00000E+00  kg/s
outlet liquid mass flow is  1.27439E+04  kg/s  and outlet gas mass flow is  0.00000E+00  kg/s

vessel upper plenum
liquid volume fraction is  1.00000E+00 and liquid mass is  2.69076E+04 kg
volume-averaged liquid temperature is  5.55491E+02 k and volume-averaged saturation temperature is  5.86762E+02 k

vessel downcomer
liquid volume fraction is  0.00000E+00, liquid mass is  0.00000E+00 kg , volume-averaged pressure is  0.00000E+00  pa
volume-averaged liquid temperature is  0.00000E+00 k and volume-averaged saturation temperature is  0.00000E+00 k

vessel component total coolant mass is  7.15196E+04 kg , total coolant energy is  8.86230E+10 w*s, and
computed initial total coolant mass is  6.78684E+04 kg

-----------------------------------------------------------------------------------------------------------------
  1     1     1                                                                             99999 00000 00000
 11    11    11   time is    200.417875 s, time-step size is    0.349204 s, time-step number is  1384 9   9 0   0 0   0
  1     1     1                                                                             99999 0   0 0   0
```

the heat-structure component type is a rod and the component number is 900

reactor-core power is 6.702719E+07 w and neutron multiplication constant keff is 0.966184

rod 1 plane (perpendicular to z direction) coupled to cells 0 (inner) and 1 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6679E+02	5.6644E+02	5.6540E+02	5.6366E+02	5.6124E+02	5.5584E+02	5.5555E+02	5.5529E+02
1002	2	9.1440E-01	5.7556E+02	5.7495E+02	5.7313E+02	5.7010E+02	5.6588E+02	5.5662E+02	5.5612E+02	5.5566E+02
1003	3	1.8288E+00	5.7731E+02	5.7666E+02	5.7470E+02	5.7144E+02	5.6692E+02	5.5699E+02	5.5646E+02	5.5597E+02
1004	4	2.7432E+00	5.7573E+02	5.7513E+02	5.7333E+02	5.7035E+02	5.6619E+02	5.5707E+02	5.5658E+02	5.5613E+02
1005	5	3.6576E+00	5.6786E+02	5.6749E+02	5.6642E+02	5.6462E+02	5.6212E+02	5.5656E+02	5.5627E+02	5.5600E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1868E+04	5.5495E+02	0.0000E+00	5.8705E+02	2.3465E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1880E+04	5.5508E+02	0.0000E+00	5.8705E+02	2.3607E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1892E+04	5.5534E+02	0.0000E+00	5.8689E+02	2.3638E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1909E+04	5.5556E+02	0.0000E+00	5.8674E+02	2.3617E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1932E+04	5.5565E+02	0.0000E+00	5.8658E+02	2.3493E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0724E+04	0.0000E+00	1.0724E+04	2.6512E+06	2.47E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8548E+04	0.0000E+00	1.8548E+04	2.6533E+06	1.43E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.9898E+04	0.0000E+00	1.9898E+04	2.6576E+06	1.34E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8270E+04	0.0000E+00	1.8270E+04	2.6617E+06	1.46E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1058E+04	0.0000E+00	1.1058E+04	2.6636E+06	2.41E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	1.94507E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	2.62831E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	2.94053E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	2.89569E-05	5.86666E+02
1005	0.00000E+00	2.73150E+02	2.07369E-05	5.86666E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7593221E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.25621E+09 w*s effective= -3.85711E+08 w*s

rod 2 plane (perpendicular to z direction) coupled to cells 0 (inner) and 2 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6689E+02	5.6654E+02	5.6550E+02	5.6376E+02	5.6134E+02	5.5593E+02	5.5565E+02	5.5538E+02
1002	2	9.1440E-01	5.7566E+02	5.7505E+02	5.7323E+02	5.7020E+02	5.6598E+02	5.5672E+02	5.5622E+02	5.5576E+02
1003	3	1.8288E+00	5.7741E+02	5.7676E+02	5.7480E+02	5.7154E+02	5.6702E+02	5.5709E+02	5.5656E+02	5.5607E+02
1004	4	2.7432E+00	5.7583E+02	5.7523E+02	5.7343E+02	5.7045E+02	5.6630E+02	5.5717E+02	5.5669E+02	5.5623E+02
1005	5	3.6576E+00	5.6796E+02	5.6760E+02	5.6652E+02	5.6472E+02	5.6222E+02	5.5667E+02	5.5637E+02	5.5610E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1847E+04	5.5504E+02	0.0000E+00	5.8705E+02	2.3469E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1861E+04	5.5518E+02	0.0000E+00	5.8705E+02	2.3610E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1868E+04	5.5544E+02	0.0000E+00	5.8689E+02	2.3642E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1873E+04	5.5566E+02	0.0000E+00	5.8674E+02	2.3620E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1871E+04	5.5575E+02	0.0000E+00	5.8658E+02	2.3496E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0738E+04	0.0000E+00	1.0738E+04	2.6520E+06	2.47E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8561E+04	0.0000E+00	1.8561E+04	2.6542E+06	1.43E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.9909E+04	0.0000E+00	1.9909E+04	2.6586E+06	1.34E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8278E+04	0.0000E+00	1.8278E+04	2.6632E+06	1.46E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1065E+04	0.0000E+00	1.1065E+04	2.6655E+06	2.41E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	1.95457E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	2.63415E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	2.94840E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	2.90551E-05	5.86667E+02
1005	0.00000E+00	2.73150E+02	2.08607E-05	5.86667E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7595644E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.25262E+09 w*s effective= -3.61001E+08 w*s

rod 3 plane (perpendicular to z direction) coupled to cells 0 (inner) and 3 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6690E+02	5.6655E+02	5.6550E+02	5.6376E+02	5.6134E+02	5.5593E+02	5.5564E+02	5.5538E+02
1002	2	9.1440E-01	5.7567E+02	5.7506E+02	5.7323E+02	5.7020E+02	5.6598E+02	5.5671E+02	5.5622E+02	5.5576E+02
1003	3	1.8288E+00	5.7742E+02	5.7676E+02	5.7480E+02	5.7155E+02	5.6702E+02	5.5709E+02	5.5655E+02	5.5606E+02
1004	4	2.7432E+00	5.7583E+02	5.7523E+02	5.7344E+02	5.7045E+02	5.6630E+02	5.5717E+02	5.5668E+02	5.5623E+02
1005	5	3.6576E+00	5.6796E+02	5.6760E+02	5.6652E+02	5.6473E+02	5.6222E+02	5.5666E+02	5.5637E+02	5.5609E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1871E+04	5.5504E+02	0.0000E+00	5.8705E+02	2.3469E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1883E+04	5.5517E+02	0.0000E+00	5.8705E+02	2.3610E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1896E+04	5.5544E+02	0.0000E+00	5.8689E+02	2.3642E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1914E+04	5.5566E+02	0.0000E+00	5.8674E+02	2.3620E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1937E+04	5.5575E+02	0.0000E+00	5.8658E+02	2.3496E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0748E+04	0.0000E+00	1.0748E+04	2.6512E+06	2.47E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8571E+04	0.0000E+00	1.8571E+04	2.6533E+06	1.43E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.9920E+04	0.0000E+00	1.9920E+04	2.6576E+06	1.33E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8289E+04	0.0000E+00	1.8289E+04	2.6616E+06	1.46E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1076E+04	0.0000E+00	1.1076E+04	2.6636E+06	2.40E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	1.95438E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	2.63168E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	2.94510E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	2.90105E-05	5.86666E+02
1005	0.00000E+00	2.73150E+02	2.08274E-05	5.86666E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7595466E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.24114E+09 w*s effective= -3.62772E+08 w*s

rod 4 plane (perpendicular to z direction) coupled to cells 0 (inner) and 4 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6693E+02	5.6658E+02	5.6554E+02	5.6380E+02	5.6137E+02	5.5596E+02	5.5567E+02	5.5540E+02
1002	2	9.1440E-01	5.7570E+02	5.7509E+02	5.7327E+02	5.7024E+02	5.6602E+02	5.5674E+02	5.5624E+02	5.5578E+02
1003	3	1.8288E+00	5.7746E+02	5.7680E+02	5.7484E+02	5.7158E+02	5.6705E+02	5.5712E+02	5.5658E+02	5.5609E+02
1004	4	2.7432E+00	5.7587E+02	5.7527E+02	5.7347E+02	5.7049E+02	5.6633E+02	5.5720E+02	5.5671E+02	5.5626E+02
1005	5	3.6576E+00	5.6800E+02	5.6764E+02	5.6656E+02	5.6476E+02	5.6226E+02	5.5669E+02	5.5640E+02	5.5612E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1848E+04	5.5507E+02	0.0000E+00	5.8705E+02	2.3470E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1862E+04	5.5520E+02	0.0000E+00	5.8705E+02	2.3611E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1869E+04	5.5547E+02	0.0000E+00	5.8689E+02	2.3643E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1874E+04	5.5569E+02	0.0000E+00	5.8674E+02	2.3621E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1873E+04	5.5578E+02	0.0000E+00	5.8658E+02	2.3497E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0757E+04	0.0000E+00	1.0757E+04	2.6520E+06	2.47E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8580E+04	0.0000E+00	1.8580E+04	2.6542E+06	1.43E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.9929E+04	0.0000E+00	1.9929E+04	2.6586E+06	1.33E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8299E+04	0.0000E+00	1.8299E+04	2.6631E+06	1.46E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1086E+04	0.0000E+00	1.1086E+04	2.6654E+06	2.40E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	1.95945E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	2.63594E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	2.95054E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	2.90810E-05	5.86667E+02
1005	0.00000E+00	2.73150E+02	2.09178E-05	5.86667E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7596557E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.24503E+09 w*s effective= -3.51692E+08 w*s

rod 5 plane (perpendicular to z direction) coupled to cells 0 (inner) and 5 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6681E+02	5.6647E+02	5.6542E+02	5.6368E+02	5.6125E+02	5.5585E+02	5.5556E+02	5.5530E+02
1002	2	9.1440E-01	5.7558E+02	5.7497E+02	5.7315E+02	5.7012E+02	5.6590E+02	5.5663E+02	5.5614E+02	5.5568E+02
1003	3	1.8288E+00	5.7734E+02	5.7668E+02	5.7472E+02	5.7146E+02	5.6693E+02	5.5700E+02	5.5647E+02	5.5598E+02
1004	4	2.7432E+00	5.7575E+02	5.7515E+02	5.7335E+02	5.7037E+02	5.6621E+02	5.5709E+02	5.5660E+02	5.5615E+02
1005	5	3.6576E+00	5.6788E+02	5.6752E+02	5.6644E+02	5.6464E+02	5.6214E+02	5.5658E+02	5.5628E+02	5.5601E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k

1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1868E+04	5.5496E+02	0.0000E+00	5.8705E+02	2.3466E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1880E+04	5.5509E+02	0.0000E+00	5.8705E+02	2.3607E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1893E+04	5.5536E+02	0.0000E+00	5.8689E+02	2.3639E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1910E+04	5.5557E+02	0.0000E+00	5.8674E+02	2.3617E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1933E+04	5.5566E+02	0.0000E+00	5.8658E+02	2.3493E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0734E+04	0.0000E+00	1.0734E+04	2.6512E+06	2.47E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8558E+04	0.0000E+00	1.8558E+04	2.6533E+06	1.43E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.9909E+04	0.0000E+00	1.9909E+04	2.6576E+06	1.33E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8281E+04	0.0000E+00	1.8281E+04	2.6616E+06	1.46E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1069E+04	0.0000E+00	1.1069E+04	2.6636E+06	2.41E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	1.94760E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	2.62921E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	2.94162E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	2.89701E-05	5.86666E+02
1005	0.00000E+00	2.73150E+02	2.07662E-05	5.86666E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7593678E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.25024E+09 w*s effective= -3.81056E+08 w*s

rod 6 plane (perpendicular to z direction) coupled to cells 0 (inner) and 6 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6673E+02	5.6638E+02	5.6533E+02	5.6360E+02	5.6117E+02	5.5578E+02	5.5550E+02	5.5523E+02
1002	2	9.1440E-01	5.7549E+02	5.7489E+02	5.7306E+02	5.7003E+02	5.6582E+02	5.5656E+02	5.5607E+02	5.5561E+02
1003	3	1.8288E+00	5.7725E+02	5.7659E+02	5.7463E+02	5.7138E+02	5.6685E+02	5.5693E+02	5.5640E+02	5.5591E+02
1004	4	2.7432E+00	5.7566E+02	5.7506E+02	5.7327E+02	5.7028E+02	5.6613E+02	5.5701E+02	5.5652E+02	5.5607E+02
1005	5	3.6576E+00	5.6779E+02	5.6743E+02	5.6635E+02	5.6456E+02	5.6206E+02	5.5650E+02	5.5621E+02	5.5593E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1842E+04	5.5489E+02	0.0000E+00	5.8705E+02	2.3464E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1856E+04	5.5503E+02	0.0000E+00	5.8705E+02	2.3605E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1863E+04	5.5528E+02	0.0000E+00	5.8689E+02	2.3636E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1867E+04	5.5550E+02	0.0000E+00	5.8674E+02	2.3615E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1864E+04	5.5559E+02	0.0000E+00	5.8658E+02	2.3491E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.0705E+04	0.0000E+00	1.0705E+04	2.6520E+06	2.48E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8529E+04	0.0000E+00	1.8529E+04	2.6542E+06	1.43E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.9881E+04	0.0000E+00	1.9881E+04	2.6586E+06	1.34E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8255E+04	0.0000E+00	1.8255E+04	2.6632E+06	1.46E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.1044E+04	0.0000E+00	1.1044E+04	2.6655E+06	2.41E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	1.94028E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	2.62972E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	2.94212E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	2.89807E-05	5.86667E+02
1005	0.00000E+00	2.73150E+02	2.07287E-05	5.86667E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7591920E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.28491E+09 w*s effective= -3.99029E+08 w*s

rod 7 plane (perpendicular to z direction) coupled to cells 0 (inner) and -1 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7495E+02	5.7435E+02	5.7257E+02	5.6962E+02	5.6550E+02	5.5645E+02	5.5597E+02	5.5552E+02
1002	2	9.1440E-01	5.8962E+02	5.8857E+02	5.8545E+02	5.8029E+02	5.7311E+02	5.5767E+02	5.5683E+02	5.5606E+02
1003	3	1.8288E+00	5.9239E+02	5.9127E+02	5.8791E+02	5.8235E+02	5.7464E+02	5.5812E+02	5.5722E+02	5.5639E+02
1004	4	2.7432E+00	5.8956E+02	5.8854E+02	5.8546E+02	5.8037E+02	5.7331E+02	5.5811E+02	5.5728E+02	5.5652E+02
1005	5	3.6576E+00	5.7624E+02	5.7563E+02	5.7380E+02	5.7075E+02	5.6650E+02	5.5719E+02	5.5669E+02	5.5623E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1868E+04	5.5495E+02	0.0000E+00	5.8705E+02	2.3595E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1880E+04	5.5508E+02	0.0000E+00	5.8705E+02	2.3830E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1892E+04	5.5534E+02	0.0000E+00	5.8689E+02	2.3878E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1909E+04	5.5556E+02	0.0000E+00	5.8674E+02	2.3836E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1932E+04	5.5565E+02	0.0000E+00	5.8658E+02	2.3626E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8112E+04	0.0000E+00	1.8112E+04	2.6512E+06	1.46E+02

1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.1237E+04	0.0000E+00	3.1237E+04	2.6533E+06	8.49E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.3499E+04	0.0000E+00	3.3499E+04	2.6576E+06	7.93E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.0763E+04	0.0000E+00	3.0763E+04	2.6617E+06	8.65E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8659E+04	0.0000E+00	1.8659E+04	2.6636E+06	1.43E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.28519E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	4.95881E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	5.46886E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	5.24075E-05	5.86666E+02
1005	0.00000E+00	2.73150E+02	3.49917E-05	5.86666E+02

rod 8 plane (perpendicular to z direction) coupled to cells 0 (inner) and -2 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7505E+02	5.7445E+02	5.7267E+02	5.6972E+02	5.6560E+02	5.5655E+02	5.5606E+02	5.5561E+02
1002	2	9.1440E-01	5.8972E+02	5.8868E+02	5.8555E+02	5.8038E+02	5.7321E+02	5.5777E+02	5.5693E+02	5.5616E+02
1003	3	1.8288E+00	5.9249E+02	5.9137E+02	5.8801E+02	5.8245E+02	5.7474E+02	5.5821E+02	5.5732E+02	5.5649E+02
1004	4	2.7432E+00	5.8967E+02	5.8864E+02	5.8557E+02	5.8048E+02	5.7341E+02	5.5821E+02	5.5739E+02	5.5663E+02
1005	5	3.6576E+00	5.7635E+02	5.7573E+02	5.7390E+02	5.7085E+02	5.6661E+02	5.5730E+02	5.5680E+02	5.5634E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1847E+04	5.5504E+02	0.0000E+00	5.8705E+02	2.3598E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1861E+04	5.5518E+02	0.0000E+00	5.8705E+02	2.3833E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1868E+04	5.5544E+02	0.0000E+00	5.8689E+02	2.3881E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1873E+04	5.5566E+02	0.0000E+00	5.8674E+02	2.3839E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1871E+04	5.5575E+02	0.0000E+00	5.8658E+02	2.3629E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8126E+04	0.0000E+00	1.8126E+04	2.6520E+06	1.46E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.1250E+04	0.0000E+00	3.1250E+04	2.6542E+06	8.49E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.3509E+04	0.0000E+00	3.3509E+04	2.6586E+06	7.93E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.0771E+04	0.0000E+00	3.0771E+04	2.6632E+06	8.65E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8665E+04	0.0000E+00	1.8665E+04	2.6655E+06	1.43E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.29961E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	4.97328E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	5.48685E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	5.26132E-05	5.86667E+02
1005	0.00000E+00	2.73150E+02	3.51947E-05	5.86667E+02

rod 9 plane (perpendicular to z direction) coupled to cells 0 (inner) and -3 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7505E+02	5.7446E+02	5.7268E+02	5.6972E+02	5.6560E+02	5.5654E+02	5.5606E+02	5.5561E+02
1002	2	9.1440E-01	5.8972E+02	5.8868E+02	5.8556E+02	5.8039E+02	5.7321E+02	5.5776E+02	5.5693E+02	5.5615E+02
1003	3	1.8288E+00	5.9250E+02	5.9137E+02	5.8801E+02	5.8245E+02	5.7474E+02	5.5821E+02	5.5732E+02	5.5649E+02
1004	4	2.7432E+00	5.8967E+02	5.8864E+02	5.8557E+02	5.8048E+02	5.7341E+02	5.5820E+02	5.5738E+02	5.5662E+02
1005	5	3.6576E+00	5.7635E+02	5.7574E+02	5.7390E+02	5.7085E+02	5.6661E+02	5.5729E+02	5.5679E+02	5.5633E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1871E+04	5.5504E+02	0.0000E+00	5.8705E+02	2.3598E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1883E+04	5.5517E+02	0.0000E+00	5.8705E+02	2.3833E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1896E+04	5.5544E+02	0.0000E+00	5.8689E+02	2.3881E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1914E+04	5.5566E+02	0.0000E+00	5.8674E+02	2.3839E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1937E+04	5.5575E+02	0.0000E+00	5.8658E+02	2.3629E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8136E+04	0.0000E+00	1.8136E+04	2.6512E+06	1.46E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.1261E+04	0.0000E+00	3.1261E+04	2.6533E+06	8.49E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.3520E+04	0.0000E+00	3.3520E+04	2.6576E+06	7.93E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.0782E+04	0.0000E+00	3.0782E+04	2.6616E+06	8.65E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8676E+04	0.0000E+00	1.8676E+04	2.6636E+06	1.43E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.29798E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	4.96850E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	5.48056E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	5.25294E-05	5.86666E+02
1005	0.00000E+00	2.73150E+02	3.51235E-05	5.86666E+02

rod 10 plane (perpendicular to z direction) coupled to cells 0 (inner) and -4 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7509E+02	5.7449E+02	5.7271E+02	5.6975E+02	5.6563E+02	5.5657E+02	5.5609E+02	5.5564E+02
1002	2	9.1440E-01	5.8976E+02	5.8872E+02	5.8559E+02	5.8042E+02	5.7324E+02	5.5779E+02	5.5696E+02	5.5618E+02
1003	3	1.8288E+00	5.9253E+02	5.9141E+02	5.8805E+02	5.8249E+02	5.7478E+02	5.5824E+02	5.5735E+02	5.5652E+02
1004	4	2.7432E+00	5.8971E+02	5.8868E+02	5.8561E+02	5.8051E+02	5.7345E+02	5.5823E+02	5.5741E+02	5.5665E+02
1005	5	3.6576E+00	5.7639E+02	5.7578E+02	5.7394E+02	5.7089E+02	5.6664E+02	5.5732E+02	5.5682E+02	5.5636E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1848E+04	5.5507E+02	0.0000E+00	5.8705E+02	2.3599E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1862E+04	5.5520E+02	0.0000E+00	5.8705E+02	2.3834E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1869E+04	5.5547E+02	0.0000E+00	5.8689E+02	2.3882E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1874E+04	5.5569E+02	0.0000E+00	5.8674E+02	2.3840E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1873E+04	5.5578E+02	0.0000E+00	5.8658E+02	2.3630E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8145E+04	0.0000E+00	1.8145E+04	2.6520E+06	1.46E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.1270E+04	0.0000E+00	3.1270E+04	2.6542E+06	8.49E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.3530E+04	0.0000E+00	3.3530E+04	2.6586E+06	7.93E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.0791E+04	0.0000E+00	3.0791E+04	2.6631E+06	8.65E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8686E+04	0.0000E+00	1.8686E+04	2.6654E+06	1.43E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.30537E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	4.97670E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	5.49087E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	5.26575E-05	5.86667E+02
1005	0.00000E+00	2.73150E+02	3.52627E-05	5.86667E+02

rod 11 plane (perpendicular to z direction) coupled to cells 0 (inner) and -5 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7497E+02	5.7437E+02	5.7259E+02	5.6964E+02	5.6552E+02	5.5646E+02	5.5598E+02	5.5553E+02
1002	2	9.1440E-01	5.8964E+02	5.8860E+02	5.8548E+02	5.8030E+02	5.7313E+02	5.5768E+02	5.5685E+02	5.5607E+02
1003	3	1.8288E+00	5.9241E+02	5.9129E+02	5.8793E+02	5.8237E+02	5.7466E+02	5.5813E+02	5.5724E+02	5.5641E+02
1004	4	2.7432E+00	5.8959E+02	5.8856E+02	5.8549E+02	5.8039E+02	5.7333E+02	5.5812E+02	5.5730E+02	5.5654E+02
1005	5	3.6576E+00	5.7627E+02	5.7566E+02	5.7382E+02	5.7077E+02	5.6652E+02	5.5721E+02	5.5671E+02	5.5625E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1868E+04	5.5496E+02	0.0000E+00	5.8705E+02	2.3595E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1880E+04	5.5509E+02	0.0000E+00	5.8705E+02	2.3830E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1893E+04	5.5536E+02	0.0000E+00	5.8689E+02	2.3878E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1910E+04	5.5557E+02	0.0000E+00	5.8674E+02	2.3837E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1933E+04	5.5566E+02	0.0000E+00	5.8658E+02	2.3627E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8122E+04	0.0000E+00	1.8122E+04	2.6512E+06	1.46E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.1247E+04	0.0000E+00	3.1247E+04	2.6533E+06	8.49E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.3509E+04	0.0000E+00	3.3509E+04	2.6576E+06	7.93E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.0773E+04	0.0000E+00	3.0773E+04	2.6616E+06	8.65E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8669E+04	0.0000E+00	1.8669E+04	2.6636E+06	1.43E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.28817E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	4.96055E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	5.47092E-05	5.86821E+02
1004	0.00000E+00	2.73150E+02	5.24303E-05	5.86666E+02
1005	0.00000E+00	2.73150E+02	3.50268E-05	5.86666E+02

rod 12 plane (perpendicular to z direction) coupled to cells 0 (inner) and -6 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7488E+02	5.7429E+02	5.7251E+02	5.6955E+02	5.6544E+02	5.5639E+02	5.5591E+02	5.5546E+02
1002	2	9.1440E-01	5.8955E+02	5.8851E+02	5.8539E+02	5.8022E+02	5.7305E+02	5.5761E+02	5.5678E+02	5.5601E+02
1003	3	1.8288E+00	5.9232E+02	5.9120E+02	5.8784E+02	5.8229E+02	5.7458E+02	5.5806E+02	5.5716E+02	5.5634E+02
1004	4	2.7432E+00	5.8950E+02	5.8847E+02	5.8540E+02	5.8031E+02	5.7325E+02	5.5805E+02	5.5723E+02	5.5646E+02
1005	5	3.6576E+00	5.7618E+02	5.7557E+02	5.7373E+02	5.7068E+02	5.6644E+02	5.5713E+02	5.5663E+02	5.5617E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1842E+04	5.5489E+02	0.0000E+00	5.8705E+02	2.3593E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1856E+04	5.5503E+02	0.0000E+00	5.8705E+02	2.3828E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1863E+04	5.5528E+02	0.0000E+00	5.8689E+02	2.3876E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1867E+04	5.5550E+02	0.0000E+00	5.8674E+02	2.3834E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1864E+04	5.5559E+02	0.0000E+00	5.8658E+02	2.3624E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8092E+04	0.0000E+00	1.8092E+04	2.6520E+06	1.47E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.1219E+04	0.0000E+00	3.1219E+04	2.6542E+06	8.50E+01
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.3482E+04	0.0000E+00	3.3482E+04	2.6586E+06	7.94E+01
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	3.0748E+04	0.0000E+00	3.0748E+04	2.6632E+06	8.66E+01
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.8645E+04	0.0000E+00	1.8645E+04	2.6655E+06	1.43E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.27949E-05	5.87130E+02
1002	0.00000E+00	2.73150E+02	4.95827E-05	5.86976E+02
1003	0.00000E+00	2.73150E+02	5.46863E-05	5.86821E+02

```
1004  0.00000E+00  2.73150E+02  5.24248E-05  5.86667E+02
1005  0.00000E+00  2.73150E+02  3.49937E-05  5.86667E+02

inner-surface node-interval thermal conductivity is  5.15828E+00    w/m/k
outer-surface node-interval thermal conductivity is  1.59649E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.84035E+00    w/m/k
which have been axially averaged over all   6 average-power rod s

total inner surface area is  0.00000E+00 m2  and
total outer surface area is  3.96347E+03 m2  of all   6 average-power rod s

total power from the heat-structure inner surface is  0.00000E+00   w    and outer surface is  6.70269E+07   w

average-power rod   4 has the peak surface temperature of  5.56260E+02 k
supplemental  rod  10 has the peak surface temperature of  5.56652E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg

##########  3822 lines deleted here  ##########

-----------------------------------------------------------------------------------------------------------------
  1   33333   1                                                                               99999 33333 88888
 11       3  11   time is    200.417875 s, time-step size is    0.349204 s, time-step number is  1384 9   9     3 8   8
  1   33333   1                                                                               99999 33333 88888
  1       3   1                            $938$ st-gen-1,2,3 sec.dryer                           9     3 8   8
 111  33333  111                                                                              99999 33333 88888
-----------------------------------------------------------------------------------------------------------------


the heat-structure component type is a rod  and the component number is 938

rod   1   plane (perpendicular to z direction) coupled to cells   1 (inner) and   0 (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.5071E+02 5.5179E+02 5.5286E+02
1002   2  5.7542E+00 5.5179E+02 5.5235E+02 5.5289E+02
1003   3  1.1508E+01 5.5318E+02 5.5303E+02 5.5290E+02

 id  idi   hliqi        tliqi       hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k        w/m2/k          k             w/m2/k          k         w/m2/k          k        w/m2/k
1001  2  2.8621E+03  5.4471E+02  9.1441E-01  5.4471E+02  11  7.7433E+01  5.5306E+02  4.4518E+05  5.5290E+02  0.0000E+00
1002 11  2.1084E+03  5.4494E+02  3.6914E+03  5.5337E+02  11  7.3052E+01  5.5306E+02  1.0414E+06  5.5290E+02  0.0000E+00
1003 11  9.3896E+01  5.5273E+02  1.2796E+04  5.5337E+02  11  7.0956E+01  5.5306E+02  3.8359E+05  5.5290E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  1.7158E+04  5.4836E+00  1.7163E+04  5.1120E+05  2.98E+01 -1.5222E+01 -1.7471E+04 -1.7486E+04  4.9532-273  2.83-277
1002  1.4455E+04 -5.7999E+03  8.6555E+03  2.5560E+05  2.95E+01 -1.2122E+01 -8.9530E+03 -8.9651E+03  1.3257-134  1.48-138
1003  4.2239E+01 -2.4646E+03 -2.4224E+03  5.8190E-03  2.40E-06 -1.0800E+01  1.9702E+03  1.9594E+03  2.6514-134  1.35-137

        stanton     liq.temp.     stanton     liq.temp.
         number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  1.58655E+02  5.44710E+02  0.00000E+00  5.53499E+02
1002  0.00000E+00  5.53492E+02  0.00000E+00  5.53499E+02
1003  1.71073E-01  5.53492E+02  0.00000E+00  5.53499E+02

total convective energy to the fluid during hydro solution:
                 inside surface= -3.9176896E+08 w*s      outside surface=  2.2207808E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
          inside convective energy error: absolute=  1.22572E+08 w*s     effective= -1.16975E+08 w*s
         outside convective energy error: absolute=  3.42444E+06 w*s     effective= -9.82063E+05 w*s

rod   2   plane (perpendicular to z direction) coupled to cells   2 (inner) and**** (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.5181E+02 5.5242E+02 5.5302E+02
1002   2  5.7542E+00 5.5262E+02 5.5282E+02 5.5303E+02
1003   3  1.1508E+01 5.5343E+02 5.5340E+02 5.5339E+02

 id  idi   hliqi        tliqi       hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k        w/m2/k          k             w/m2/k          k         w/m2/k          k        w/m2/k
1001  2  1.3277E+03  5.4460E+02  5.7440E-01  5.4460E+02  11  7.8646E+01  5.5315E+02  1.2718E+06  5.5303E+02  0.0000E+00
1002 11  7.5191E+02  5.4504E+02  3.3314E+03  5.5344E+02  11  7.7911E+01  5.5315E+02  7.8610E+05  5.5303E+02  0.0000E+00
1003 11  6.9138E+01  5.5310E+02  8.3063E+04  5.5344E+02  12  1.3728E+00  5.5315E+02  2.4939E+01  5.5303E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  9.5722E+03  4.1407E+00  9.5764E+03  4.8171E+05  5.03E+01 -9.7691E+00 -9.9636E+03 -9.9734E+03  3.0783-273  3.09-277
1002  5.7024E+03 -2.7046E+03  2.9978E+03  2.4085E+05  8.03E+01 -9.4095E+00 -3.4520E+03 -3.4614E+03  2.5000E-01  7.22E-05
1003  2.2705E+01 -5.8614E+02 -5.6344E+02  6.8999E-03  1.22E-05  3.3914E-01  9.0632E+00  9.4024E+00  5.0000E-01  5.32E-02

        stanton     liq.temp.     stanton     liq.temp.
         number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  8.40525E+01  4.15232E+02  0.00000E+00  5.53502E+02
1002  0.00000E+00  5.53495E+02  0.00000E+00  5.53502E+02
1003  6.21196E-02  5.53495E+02  1.94413E-04  5.53502E+02

total convective energy to the fluid during hydro solution:
                 inside surface= -2.9474802E+08 w*s      outside surface=  1.1215128E+08 w*s
```

```
errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  1.27334E+08 w*s      effective= -1.23197E+08 w*s
          outside convective energy error: absolute=  5.54711E+06 w*s      effective= -2.87211E+06 w*s

rod   3   plane (perpendicular to z direction) coupled to cells   3 (inner) and**** (outer)
```

id	row	z(m)	heat-structure temperatures (k)		
1001	1	0.0000E+00	5.4724E+02	5.4727E+02	5.4734E+02
1002	2	5.7542E+00	5.4739E+02	5.4742E+02	5.4748E+02
1003	3	1.1508E+01	5.4768E+02	5.4770E+02	5.4774E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	2	4.7889E+02	5.4676E+02	3.6456E-03	5.4676E+02	12	7.7464E+02	5.4906E+02	0.0000E+00	5.5370E+02	0.0000E+00
1002	12	7.6084E+02	5.4698E+02	6.1874E-03	5.4676E+02	12	7.5271E+02	5.4906E+02	0.0000E+00	5.5370E+02	0.0000E+00
1003	12	2.6072E+02	5.4761E+02	0.0000E+00	5.5355E+02	12	7.0757E+02	5.4906E+02	0.0000E+00	5.5370E+02	0.0000E+00

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	2.3272E+02	1.7532E-03	2.3273E+02	9.5611E+05	4.11E+03	-1.3318E+03	0.0000E+00	-1.3318E+03	1.7887E+06	1.34E+03
1002	3.0907E+02	3.8542E-03	3.0907E+02	8.9162E+05	2.88E+03	-1.1906E+03	0.0000E+00	-1.1906E+03	1.7887E+06	1.50E+03
1003	1.9116E+01	0.0000E+00	1.9116E+01	8.2712E+05	4.33E+04	-9.3212E+02	0.0000E+00	-9.3212E+02	1.7887E+06	1.92E+03

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	3.22889E-01	5.46751E+02	0.00000E+00	5.53690E+02
1002	0.00000E+00	5.53543E+02	0.00000E+00	5.53690E+02
1003	9.15185E-05	5.53543E+02	0.00000E+00	5.53690E+02

```
total convective energy to the fluid during hydro solution:
                      inside surface= -2.9430875E+07 w*s      outside surface=  1.2887835E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  3.14470E+06 w*s      effective=  2.53170E+05 w*s
          outside convective energy error: absolute=  2.57530E+06 w*s      effective=  8.05449E+05 w*s

inner-surface node-interval thermal conductivity is  5.06744E+01    w/m/k
outer-surface node-interval thermal conductivity is  5.06485E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.06616E+01    w/m/k
which have been axially averaged over all   3 average-power rod s

total inner surface area is  6.61197E+02 m2  and
total outer surface area is  6.62564E+02 m2  of all   3 average-power rod s

total power from the heat-structure inner surface is  2.64095E+06   w    and outer surface is -3.03613E+06   w

average-power rod   2 has the peak surface temperature of  5.53430E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg


system results

total power loss by 1-d comp.wall is -5.207577E+06 w*s on the inner surface and  9.520572E+05 w*s on the outer surface

                      system total coolant energy is  9.312153E+18 w*s

                        system total coolant mass is  4.544427E+13 kg

 total coolant mass discharged by break components is -8.335128E+04 kg

    total coolant mass injected by fill components is  8.580691E+03 kg

         system computed initial total coolant mass is  4.544427E+13 kg
```

time s	dtime s	power w	keff -
202.131	3.011	6.683E+07	0.966184
205.133	2.986	6.649E+07	0.966184
207.951	2.795	6.618E+07	0.966184
211.089	3.263	6.584E+07	0.966184
214.520	3.381	6.548E+07	0.966184
217.555	3.064	6.516E+07	0.966184
220.445	2.787	6.487E+07	0.966184
223.209	2.803	6.460E+07	0.966184
226.420	3.258	6.428E+07	0.966184
229.705	3.223	6.397E+07	0.966184
233.056	3.299	6.366E+07	0.966184
235.330	2.308	6.346E+07	0.966184
238.177	2.922	6.320E+07	0.966184
241.385	3.157	6.292E+07	0.966184
244.525	3.147	6.265E+07	0.966184
247.226	2.632	6.242E+07	0.966184
249.896	2.726	6.220E+07	0.966184
252.734	2.838	6.197E+07	0.966184
256.025	3.276	6.171E+07	0.966184
258.790	2.749	6.149E+07	0.966184
261.759	3.096	6.127E+07	0.966184
266.061	4.202	6.094E+07	0.966184
269.147	3.156	6.072E+07	0.966184

$\boxed{11}$

```
 at  270.494125 s, the trip   58 signal crossed setpoint s1 =  9.066600E+06 pa
```

```
at  270.609003 s, the trip   58 signal is  9.064760E+06 pa

at  270.609003 s, trip   58 is reset from  0 to  1 with a set status of on-forward

at  270.950230 s, the trip   22 signal crossed setpoint s2 =  9.000000E-01 -
at  270.988144 s, the trip   22 signal is  1.000000E+00 -

    time   dtime   power     keff
     s       s       w        -
  272.672  3.406 6.046E+07 0.966184
  275.006  2.377 6.030E+07 0.966184
  277.758  2.785 6.011E+07 0.966184
  281.123  3.362 5.988E+07 0.966184
  284.373  3.304 5.966E+07 0.966184
  287.448  2.900 5.946E+07 0.966184
  289.736  2.381 5.931E+07 0.966184
  292.932  3.311 5.910E+07 0.966184
  296.420  3.407 5.889E+07 0.966184
  299.753  3.306 5.868E+07 0.966184
1                                          14
 trac large edit

 problem time is 3.006423E+02 s, time-step size is  3.1107E-01 s, time-step number is  1713, outer-iteration number is  2

 maximum convective power differance has been 0.3176545E+08   w    in component  910 at time 7.7178549E+00 s
 time-step size was limited by component 202 at cell  11 to 1.3429E-02 s
 average outer-iteration count over the last  329 time steps was   2.331
 last minimum number of outer iterations was  2 at time step 1712 (limited by component 410 with fr.error of 1.3930E-05)
 last maximum number of outer iterations was  4 at time step 1685 (limited by component  32 with fr.error of 5.5398E-05)
 total number of times that each component (id#) was the last to converge since the last short edit
    0( 10)     0( 12)     0( 14)     0( 16)     0( 17)     0( 18)     0( 54)     0( 52)     0( 50)     0( 49)     0( 91)     0( 56)
    0( 20)     0( 22)     0( 24)     0( 26)     0( 27)     0( 28)    26(202)     3(200)     1(205)     0(290)     1( 64)     0( 62)
    0( 60)     8(210)     2(220)     8(400)   110(410)     0(420)     0(422)     0(280)     0(270)     0(254)     0(250)     0(350)
    0(212)     2(120)     0(110)     4(105)     0(190)     3(100)     5(320)     0(310)     0(305)     0(390)     1(300)     0(430)
    0(432)     0(150)     0(354)     0(370)     0(380)     0(216)     0(112)     0(180)     0(170)     0(154)     0(312)     0(436)
    0(116)     0(316)     0( 59)     0( 92)     0(424)     0(578)     0( 66)     0(214)     0(434)     0(279)     0(269)     0(576)
    0(218)     0(114)     0(314)     0(438)     0(369)     0(379)     0(118)     0(179)     0(169)     0(318)    67( 30)    66( 32)
    8( 34)     0( 36)     0( 37)     0( 38)    12( 40)     0( 41)     0( 42)     2( 74)     0( 72)     0( 70)     0( 44)     0( 45)
    0( 46)     0( 43)     0( 69)     0( 93)     0( 47)     0( 76)     0( 48)     0(  2)     0(  3)     0(  4)     0(  5)     0(  6)
    0(  7)     0(  1)
 current maximum time-step sizes and limitation counts since the last short edit
     delamx          delcmx          deldmx          delemx          delpmx          delrmx          delvmx          delxmx
   1.0000E+08 s    1.0000E+08 s    1.0000E+08 s    1.0000E+08 s    9.7075E+01 s    1.0000E+08 s    1.3418E+01 s    1.0000E+08 s
       63               0               0               0               0               0               0               0
 further limitation counts on what controls delcmx
      dtlmx           dtvmx           dprmx           dtsms           dtrmx           delt/2
        0               0               0               0               0               0

    cpu execution time of this run is 2.716692E+04 s

 total time steps since time 0.0 s is         2975
   total cpu time since time 0.0 s is 4.558920E+04 s

 ************************************ signal-variable values at time  300.33128 s ************************************

     id      sig.var.          id      sig.var.          id      sig.var.          id      sig.var.          id      sig.var.

      1   3.003313E+02         11   5.864768E+07        101   5.564216E+02        111   6.576169E+06        161   4.259491E+03
               time (s)        core power (w)           liq temp (k)            pressure (pa)           z lq mf (kg/s)
    171   9.341007E+06        181   5.560111E+02        201   5.568045E+02        222   6.576038E+06        261   4.251612E+03
          pressure (pa)           liq temp (k)            liq temp (k)            pressure (pa)           z lq mf (kg/s)
    271   9.341132E+06        281   5.560988E+02        301   5.564589E+02        333   6.576868E+06        361   4.273299E+03
          pressure (pa)           liq temp (k)            liq temp (k)            pressure (pa)           z lq mf (kg/s)
    371   9.341041E+06        381   5.553090E+02        401   8.987783E+06        421   8.983273E+06        501   4.443094E+06
          pressure (pa)           liq temp (k)           pressure (pa)            pressure (pa)            pressure (pa)
    521  -4.865882E+06        601   4.443094E+06        621  -4.865984E+06        701   4.443094E+06        721  -4.865886E+06
          pressure (pa)          pressure (pa)           pressure (pa)            pressure (pa)            pressure (pa)
   1000   1.944725E+01       1051   6.576433E+06       1100  -1.692940E+00       1101   6.576169E+06       1121   6.579200E+06
        z m mfw (kg/s)           pressure (pa)         z m mfw (kg/s)             pressure (pa)            pressure (pa)
   1135  -3.636847E+03       1501   2.775821E+00       1541   0.000000E+00       1700   9.140869E+00       1714   5.919799E+04
          pressure (pa)         z lq mf (kg/s)         valve farea fr           z m mfw (kg/s)             pressure (pa)
   1903   6.584974E+06       1910   6.656048E+06       2000  -8.504910E-01       2020   1.582229E+01       2051   6.576313E+06
          pressure (pa)          pressure (pa)         z m mfw (kg/s)           z m mfw (kg/s)             pressure (pa)
   2100   1.613108E+00       2101   6.576038E+06       2121   6.579071E+06       2135  -3.831944E+03       2541   0.000000E+00
        z m mfw (kg/s)           pressure (pa)           pressure (pa)            pressure (pa)          valve farea fr
   2700   9.140782E+00       2714   5.919793E+04       2903   6.581094E+06       2910   6.651935E+06       3000   3.230951E+02
        z m mfw (kg/s)           pressure (pa)           pressure (pa)            pressure (pa)           z m mfw (kg/s)
   3051   6.599037E+06       3100   7.855343E-01       3101   6.576868E+06       3121   6.579247E+06       3135  -3.001917E+03
          pressure (pa)         z m mfw (kg/s)           pressure (pa)            pressure (pa)            pressure (pa)
   3501  -2.775812E+00       3541   0.000000E+00       3700   9.140561E+00       3714   5.919883E+04       3903   6.624260E+06
        z lq mf (kg/s)         valve farea fr          z m mfw (kg/s)             pressure (pa)            pressure (pa)
   3910   6.694194E+06       4001   6.579908E+06       4220   0.000000E+00       4240   1.000000E+00       9000   5.573131E+02
          pressure (pa)          pressure (pa)         valve farea fr           trp set status           a mx sf tp (k)
   9010   5.576558E+02
        s mx sf tp (k)

 ********************************* control-block output values at time  300.33128 s *********************************

     id      con.blk.          id      con.blk.          id      con.blk.          id      con.blk.          id      con.blk.

     -1   0.000000E+00         -2   0.000000E+00         -3   1.440000E-01         -4   1.551300E+07         -5   1.620300E+07
                     k                        w                        -                       pa                       pa
     -6   1.723700E+07         -7   5.742000E+02         -8   5.000000E-02         -9  -1.379000E+05        -10   4.087000E+05
                    pa                        k                        -                       pa                        w
    -11   2.423000E-03        -12   4.540000E+02        -13   4.330000E+06        -14   5.570000E+02        -15   5.870145E+00
                  s/kg                     kg/s                       pa                        k             sqrt(kg/m3)
```

-16	5.751000E+02	k	-17	1.162000E+00	k	-18	0.000000E+00	k	-19	1.072000E+00	k	-22	0.000000E+00	-
-24	0.000000E+00	-	-26	0.000000E+00	-	-28	0.000000E+00	-	-30	0.000000E+00	-	-32	0.000000E+00	-
-34	0.000000E+00	-	-36	0.000000E+00	-	-38	0.000000E+00	-	-40	0.000000E+00	-	-50	5.564491E+02	k
-55	5.564500E+02	k	-108	5.562164E+02	k	-109	5.562147E+02	k	-110	5.562156E+02	k	-118	4.105289E-01	k
-119	4.083579E-01	k	-120	4.094434E-01	k	-130	-3.518171E-01	k	-132	-3.504156E-01	k	-134	-7.556200E-01	k
-136	1.162000E+00	k	-138	4.063800E-01	k	-140	1.300416E+01	k	-142	0.000000E+00	-	-148	1.000000E+00	-
-149	2.755928E-02	k	-150	2.755928E-02	k	-152	3.850454E-02	k	-154	3.600000E-02	-	-156	1.386164E-03	k
-158	1.070614E+00	k	-160	-1.888444E+01	k	-162	0.000000E+00	-	-164	0.000000E+00	k	-166	1.070614E+00	k
-168	3.425964E+01	k	-170	0.000000E+00	-	-208	5.564516E+02	k	-209	5.564500E+02	k	-210	5.564508E+02	k
-218	7.057033E-01	k	-219	7.051911E-01	k	-220	7.054472E-01	k	-230	-3.474346E-01	k	-232	-3.459584E-01	k
-234	-7.556200E-01	k	-236	1.162000E+00	k	-238	4.063800E-01	k	-240	1.300416E+01	k	-242	0.000000E+00	-
-248	1.000000E+00	-	-249	2.762527E-02	k	-250	2.762527E-02	k	-252	5.126187E-02	k	-254	3.600000E-02	-
-256	1.845427E-03	k	-258	1.070155E+00	k	-260	-1.864920E+01	k	-262	0.000000E+00	-	-264	0.000000E+00	k
-266	1.070155E+00	k	-268	3.424495E+01	k	-270	0.000000E+00	-	-308	5.558839E+02	k	-309	5.558847E+02	k
-310	5.558843E+02	k	-318	1.149809E+00	k	-319	1.142053E+00	k	-320	1.145931E+00	k	-330	-3.579885E-01	k
-332	-3.568301E-01	k	-334	-7.556200E-01	k	-336	1.162000E+00	k	-338	4.063800E-01	k	-340	1.300416E+01	k
-342	0.000000E+00	-	-348	1.000000E+00	-	-349	-1.193334E-02	k	-350	-1.193334E-02	k	-352	3.976816E-02	k
-354	0.000000E+00	-	-356	0.000000E+00	k	-358	1.072000E+00	k	-360	-1.921570E+01	k	-362	0.000000E+00	-
-364	0.000000E+00	k	-366	1.072000E+00	k	-368	3.430400E+01	k	-370	0.000000E+00	-	-406	7.803488E-02	-
-408	4.580000E-01	-	-410	-1.000000E-01	-	-412	-1.000000E-01	-	-414	-1.000000E+00	-	-430	-6.529727E+06	pa
-432	-1.000000E+02	paxs	-434	-6.529735E+06	pa	-436	1.817000E+05	w	-438	1.000000E+00	-	-440	0.000000E+00	-
-442	1.000000E+00	-	-444	4.087000E+05	w	-446	5.904000E+05	w	-448	0.000000E+00	-	-450	0.000000E+00	w
-521	-1.000000E+07	pa	-621	-1.000000E+07	pa	-721	-1.000000E+07	pa	-1000	1.000000E+00	-	-1001	1.000000E-06	-
-1002	1.944725E+07	-	-1004	2.251483E-01	-	-1005	2.248907E-01	-	-1006	2.951093E-01	-	-1007	1.000000E-01	s
-1008	3.051093E-01	-	-1009	-5.835541E+01	kg/s	-1010	-1.413952E-01	-	-1011	1.637142E-01	-	-1012	1.000000E-01	s
-1013	1.000000E-01	-	-1014	1.000000E-01	-	-1104	3.636847E+03	pa	-1106	5.112706E+01	m2xsqrt(pa)	-1109	3.001233E+02	kg/s
-1110	1.000000E+00	-	-1112	0.000000E+00	-	-1114	0.000000E+00	-	-1116	1.000000E+00	-	-1118	0.000000E+00	-
-1160	0.000000E+00	-	-1162	0.000000E+00	-	-1704	5.919799E+04	pa	-1706	3.576579E+02	kg/s	-2000	1.000000E+00	kg/s
-2001	1.613108E+00	kg/s	-2002	-5.272375E-01	kg/s	-2004	1.260641E-01	-	-2005	1.257537E-01	-	-2006	3.942463E-01	-
-2007	1.000000E-01	s	-2008	4.042463E-01	-	-2009	-1.500179E+02	kg/s	-2010	-3.634935E-01	-	-2011	4.075284E-02	-
-2012	1.000000E-01	s	-2013	5.075284E-02	-	-2014	5.075284E-02	-	-2104	3.831944E+03	pa	-2106	5.248049E+00	m2xsqrt(pa)
-2109	3.080681E+01	kg/s	-2110	1.000000E+00	-	-2112	0.000000E+00	-	-2114	0.000000E+00	-	-2116	1.000000E+00	-
-2118	0.000000E+00	-	-2160	0.000000E+00	-	-2162	0.000000E+00	-	-2704	5.919793E+04	pa	-2706	1.806890E+02	kg/s
-3000	1.000000E+00	m2xsqrt(pa)	-3001	7.855343E-01	m2xsqrt(pa)	-3002	4.113062E+02	m2xsqrt(pa)	-3004	6.649372E-01	-	-3004	6.649372E-01	-
-3005	6.650011E-01	-	-3005	6.650011E-01	-	-3006	-1.450011E-01	-	-3006	-1.450011E-01	-	-3007	-1.000000E-01	s
-3007	-1.000000E-01	s	-3008	-1.550011E-01	-	-3008	-1.550011E-01	-	-3009	1.148927E+02	kg/s	-3009	1.148927E+02	kg/s
-3010	2.783850E-01	-	-3010	2.783850E-01	-	-3011	1.233840E-01	-	-3011	1.233840E-01	-	-3012	1.000000E-01	s
-3012	1.000000E-01	s	-3013	1.000000E-01	-	-3013	1.000000E-01	-	-3014	1.000000E-01	-	-3014	1.000000E-01	-
-3104	3.001917E+03	pa	-3104	3.001917E+03	pa	-3106	8.054039E+01	m2xsqrt(pa)	-3106	4.645021E+01	m2xsqrt(pa)	-3109	4.727838E+02	kg/s
-3110	1.000000E+00	-	-3112	0.000000E+00	-	-3114	1.000000E+00	-	-3116	1.000000E+00	-	-3118	1.000000E+00	-
-3160	0.000000E+00	-	-3162	0.000000E+00	-	-3704	5.919883E+04	pa	-3706	3.576605E+02	kg/s	-4241	5.617200E+06	pa
-4242	1.000000E+00	-	-4243	5.200000E-01	-	-4300	5.593000E+02	k	-4302	3.812800E+06	pa	-4304	5.751000E+02	k
-4310	5.564508E+02	k	-4312	5.564508E+02	k	-4314	5.564508E+02	k	-4316	-2.849200E+00	k	-4318	0.000000E+00	-
-4320	0.000000E+00	-	-4330	5.565479E+02	k	-4332	-1.855213E+01	k	-4334	0.000000E+00	-	-4336	0.000000E+00	-
-4338	0.000000E+00	-	-4340	0.000000E+00	-	-4342	0.000000E+00	-						

** trip set status at time 300.33128 s **

id	set status	id	set status	id	set status	id	set status	id	set status
1	on-forward	10	on-forward	12	on-forward	14	on-forward	16	on-forward

```
  18    on-forward      20    on-forward      21    on-forward      22       off         24       off
  26    on-forward      28    on-forward      30       off          32    on-forward     34    on-forward
  36       off          38       off          40       off          42       off         44    on-forward
  46    on-forward      48       off          50       off          52       off         54    on-forward
  56       off          58    on-forward      60    on-forward     100    on-forward    110       off
 120    on-forward     200       off         210       off         220    on-forward    300       off
 310       off         320    on-forward    -407       off         422    on-reverse    423       off
 450    on-reverse     460    on-reverse     520    on-reverse     620    on-reverse    720    on-reverse
1001       off        1002       off        1003       off        1010    on-forward   1020    on-forward
1030       off        1040       off        1050       off        1060       off       1500    on-forward
2010    on-forward    2020    on-forward    2030       off        2040       off       2050       off
2060       off        3010       off        3020       off        3030       off       3040    on-forward
3050    on-forward    3060       off        3500    on-forward    9996       off       9997       off
9998       off        9999       off

************************************** trip signal values at time  300.33128 s **************************************

  id     trp.sig.        id     trp.sig.        id     trp.sig.        id     trp.sig.        id     trp.sig.

   1   3.003313E+02      10   2.000000E+00      12   5.000000E+00      14   2.000000E+00      16   1.000000E+00
                  s                    -                    -                    -                    -
  18   1.000000E+00      20   1.000000E+00      21   1.000000E+00      22   1.000000E+00      24   1.000000E+00
                  -                    -                    -                    -                    -
  26   2.000000E+00      28   1.000000E+00      30   0.000000E+00      32   1.000000E+00      34   2.000000E+00
                  -                    -                    -                    -                    -
  36   0.000000E+00      38   0.000000E+00      40   0.000000E+00      42   0.000000E+00      44   1.000000E+00
                  -                    -                    -                    -                    -
  46   2.000000E+00      48   0.000000E+00      50   0.000000E+00      52   5.864768E+07      54   8.983273E+06
                  -                    -                    -                    w                   pa
  56   7.803488E-02      58   8.983273E+06      60   8.983273E+06     100   1.000000E+00     110   4.259491E+03
                  -                   pa                   pa                    -                 kg/s
 120   5.562156E+02     200   1.000000E+00     210   4.251612E+03     220   5.564508E+02     300   1.000000E+00
                  k                    -                 kg/s                    k                    -
 310   4.273299E+03     320   5.558843E+02    -407   7.803488E-02     422   3.000000E+00     423   3.003313E+02
               kg/s                    k                    -                    -                    s
 450   8.983273E+06     460   8.983273E+06     520  -4.865882E+06     620  -4.865984E+06     720  -4.865886E+06
                 pa                   pa                    m                    m                    m
1001   1.308997E+02    1002   6.992266E+02    1003   8.301263E+02    1010   2.248907E-01    1020   2.248907E-01
                 pa                   pa                   pa                    -                    -
1030   2.248907E-01    1040  -5.835541E+01    1050   3.001233E+02    1060   6.576169E+06    1500   2.775821E+00
                  -                 kg/s                 kg/s                   pa                 kg/s
2010   1.257537E-01    2020   1.257537E-01    2030   1.257537E-01    2040  -1.500179E+02    2050   3.080681E+01
                  -                    -                    -                 kg/s                 kg/s
2060   6.576038E+06    3010   6.650011E-01    3020   6.650011E-01    3030   6.650011E-01    3040   1.148927E+02
                 pa                    -                    -                    -                 kg/s
3050   4.727838E+02    3060   6.576868E+06    3500  -2.775812E+00    9996   3.003313E+02    9997   3.003313E+02
               kg/s                   pa                 kg/s                    s                    s
9998   3.003313E+02    9999   3.003313E+02
                  s                    s

at time    63.8013 s in component number 938 at cell   1, the maximum stanton number is 1.663668E+05
at time     0.0075 s in component number 906 at cell   1, the minimum tld is 6.203117E+02 k
            where tld is the liquid temperature at bubble detachment from a heated surface

------------------------------------------------------------------------------------------------------------
             1                                                                                     1  00000
            11   time is    300.642346 s, time-step size is    0.311067 s, time-step number is  1713    11    0    0
             1                                                                                     1    0    0
             1                            $10$ hot leg 1                                           1    0    0
           111                                                                                   111  00000
------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is  10, first junction number is  10, and second junction number is  12

                  ncd-gas
     pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas   wf.liq.
cell    pa           pa          -        k         k         k        kg/m3     kg/m3       m/s        m/s        -
  1 8.99763E+06 0.00000E+00 0.000E+00 5.765E+02 5.564E+02 5.765E+02 7.498E+02 4.876E+01  1.333E+01  1.334E+01 7.907E-02
  2 8.99693E+06 0.00000E+00 0.000E+00 5.765E+02 5.564E+02 5.765E+02 7.498E+02 4.875E+01  1.333E+01  1.333E+01 3.114E-03
  3 8.99625E+06 0.00000E+00 0.000E+00 5.765E+02 5.564E+02 5.765E+02 7.498E+02 4.875E+01  1.333E+01  1.333E+01 3.114E-03
  4 8.99557E+06 0.00000E+00 0.000E+00 5.765E+02 5.564E+02 5.765E+02 7.498E+02 4.874E+01  1.333E+01  1.333E+01 3.114E-03
  5 8.99507E+06 0.00000E+00 0.000E+00 5.765E+02 5.564E+02 5.765E+02 7.498E+02 4.874E+01  1.333E+01  1.333E+01 3.114E-03
  6 8.99456E+06 0.00000E+00 0.000E+00 5.765E+02 5.564E+02 5.765E+02 7.498E+02 4.874E+01  1.333E+01  1.333E+01 3.114E-03
  7                                                                                      1.166E+01  1.166E+01 1.771E-01

     idr   liq.htc    vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
cell  -    ----- w/m2/k ------     w/k        w          w          k              k
  1  1.0  3.483E+04 0.000E+00 5.495E+04-1.084E+03 0.000E+00 5.770E+02       556.39
  2  1.0  3.483E+04 0.000E+00 5.495E+04-1.080E+03 0.000E+00 5.770E+02       556.39
  3  1.0  3.483E+04 0.000E+00 5.495E+04-1.075E+03 0.000E+00 5.770E+02       556.39
  4  1.0  3.483E+04 0.000E+00 5.495E+04-1.070E+03 0.000E+00 5.770E+02       556.39
  5  1.0  3.483E+04 0.000E+00 2.693E+04-1.067E+03 0.000E+00 5.770E+02       556.39
  6  1.0  3.286E+04 0.000E+00 5.440E+04-1.043E+03 0.000E+00 5.770E+02       556.39

total power to the component from all heat-transfer surfaces is -1.701109E+04   w
total power to the liquid is -1.701109E+04   w    and total power to the gas is  0.000000E+00   w

total convective energy transported to the fluid from component wall:  1.5939968E+08 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                   inside convective energy error: absolute=  7.52788E+07 w*s     effective=  1.60642E+06 w*s

pipe wall total power loss on the inner surface is  1.64065E+04   w    and on the outer surface is  0.00000E+00   w

pipe  component  total coolant mass is  2.11709E+03 kg , total coolant energy is  2.62663E+09 w*s, and
computed initial total coolant mass is  1.93238E+03 kg
```

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##########  4157 lines deleted here  ##########

-------------------------------------------------------------------------------------------------------------------
  1   00000 99999                                                                                           77777
 11   0   0 9   9 time is    300.642346 s, time-step size is    0.311067 s, time-step number is  1713          7
  1   0   0 99999                                                                                              7
  1   0   0     9                          $7$ rod guide tube 6 (short)                                       7
111  00000 99999                                                                                              7
-------------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is   7, first junction number is   7, and second junction number is  99

                     ncd-gas
        pressure     pressure    void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas    wf.liq.
cell       pa           pa           -        k         k         k        kg/m3     kg/m3      m/s        m/s        -
  1 9.11389E+06 0.00000E+00 0.000E+00 5.774E+02 5.561E+02 5.774E+02 7.507E+02 4.951E+01  6.316E-01  6.346E-01 2.522E-02
  2 9.10736E+06 0.00000E+00 0.000E+00 5.774E+02 5.561E+02 5.774E+02 7.507E+02 4.947E+01  6.316E-01  6.346E-01 7.209E-03
  3                                                                                      6.317E-01  6.346E-01 3.645E-02

pipe  component  total coolant mass is  2.76564E+01 kg , total coolant energy is  3.42584E+07 w*s, and
computed initial total coolant mass is  2.61042E+01 kg

-------------------------------------------------------------------------------------------------------------------
  1     1   00000                                                                                               1
 11    11   0   0 time is    300.642346 s, time-step size is    0.311067 s, time-step number is  1713           11
  1     1   0   0                                                                                               1
  1     1   0   0                          $1$ reactor vessel                                                   1
111   111   00000                                                                                             111
-------------------------------------------------------------------------------------------------------------------

the component type is a vessel, the component number is   1, and the junction numbers are   10    20    30    19    29    39
                                                                                              2     3     4     5     6     7
                                                                                             94    95    96    97    98    99

level  1 data

alpn         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -

rovn         5.05344E+01  5.05340E+01  5.05344E+01  5.05340E+01  5.05344E+01  5.05339E+01  5.06687E+01  5.06687E+01
             5.06687E+01  5.06687E+01  5.06687E+01  5.06687E+01
             kg/m3

roln         7.51897E+02  7.51179E+02  7.51093E+02  7.51002E+02  7.51812E+02  7.52609E+02  7.51912E+02  7.51192E+02
             7.51104E+02  7.51012E+02  7.51825E+02  7.52630E+02
             kg/m3

vvnyt        2.65563E-04  1.36490E-03 -1.12229E-03 -3.14375E-04 -1.71745E-03  1.52368E-03 -6.28804E-02  6.68434E-02
            -6.57681E-02  6.25014E-02 -6.85728E-02  6.78769E-02
             m/s

vvnz         4.53904E+00  4.51864E+00  4.54524E+00  4.52016E+00  4.53975E+00  4.50729E+00 -1.68188E+01 -1.69642E+01
            -1.68240E+01 -1.69648E+01 -1.68193E+01 -1.69556E+01
             m/s

vvnxr       -2.65829E+00 -2.65157E+00 -2.65933E+00 -2.65184E+00 -2.65840E+00 -2.64945E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             m/s

vlnyt        2.39499E-04  1.39229E-03 -1.14929E-03 -2.88455E-04 -1.74547E-03  1.55145E-03 -6.28811E-02  6.68435E-02
            -6.57683E-02  6.25022E-02 -6.85725E-02  6.78767E-02
             m/s

vlnz         4.53474E+00  4.51435E+00  4.54094E+00  4.51586E+00  4.53545E+00  4.50301E+00 -1.68111E+01 -1.69564E+01
            -1.68163E+01 -1.69571E+01 -1.68116E+01 -1.69479E+01
             m/s

vlnxr       -2.65346E+00 -2.64673E+00 -2.65450E+00 -2.64700E+00 -2.65357E+00 -2.64462E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             m/s

tvn          5.78651E+02  5.78651E+02  5.78651E+02  5.78651E+02  5.78651E+02  5.78651E+02  5.78810E+02  5.78810E+02
             5.78810E+02  5.78810E+02  5.78810E+02  5.78810E+02
             k

tln          5.55630E+02  5.55977E+02  5.56018E+02  5.56062E+02  5.55671E+02  5.55284E+02  5.55637E+02  5.55986E+02
             5.56028E+02  5.56072E+02  5.55679E+02  5.55289E+02
             k

tsat         5.78651E+02  5.78651E+02  5.78651E+02  5.78651E+02  5.78651E+02  5.78651E+02  5.78810E+02  5.78810E+02
             5.78810E+02  5.78810E+02  5.78810E+02  5.78810E+02
             k

pn           9.27047E+06  9.27040E+06  9.27047E+06  9.27040E+06  9.27047E+06  9.27040E+06  9.29090E+06  9.29090E+06
             9.29090E+06  9.29089E+06  9.29090E+06  9.29090E+06
             pa

pan          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             pa

conc         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -
```

```
solid      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           kg/m3

level  2 data

alpn       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

rovn       5.03708E+01  5.03708E+01  5.03708E+01  5.03708E+01  5.03708E+01  5.03707E+01  5.11821E+01  5.11839E+01
           5.11819E+01  5.11839E+01  5.11821E+01  5.11842E+01
           kg/m3

roln       7.51878E+02  7.51162E+02  7.51076E+02  7.50987E+02  7.51794E+02  7.52585E+02  7.51973E+02  7.51253E+02
           7.51164E+02  7.51073E+02  7.51886E+02  7.52693E+02
           kg/m3

vvnyt      1.86667E-03 -3.02090E-03  2.79963E-03 -1.80428E-03  3.38311E-03 -3.22424E-03 -6.39380E-02  6.76244E-02
          -6.65821E-02  6.35819E-02 -6.91588E-02  6.84730E-02
           m/s

##########  625 lines deleted here  ##########

pn         9.10727E+06  9.10727E+06  9.10727E+06  9.10727E+06  9.10727E+06  9.10727E+06  9.10728E+06  9.10727E+06
           9.10728E+06  9.10727E+06  9.10728E+06  9.10727E+06
           pa

pan        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           pa

conc       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

solid      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           kg/m3

level 12 data

alpn       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

rovn       4.94191E+01  4.94191E+01  4.94191E+01  4.94191E+01  4.94191E+01  4.94191E+01  1.01931E+02  1.01931E+02
           1.01931E+02  1.01931E+02  1.01931E+02  1.01931E+02
           kg/m3

roln       7.39929E+02  7.41588E+02  7.39821E+02  7.41620E+02  7.40066E+02  7.41681E+02  7.08582E+02  7.08582E+02
           7.08582E+02  7.08582E+02  7.08582E+02  7.08582E+02
           kg/m3

vvnyt      1.83985E-02 -2.45641E-02  2.80768E-02 -1.40145E-02  2.17800E-02 -2.93199E-02  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vvnz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vvnxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnyt      1.83985E-02 -2.45640E-02  2.80767E-02 -1.40145E-02  2.17799E-02 -2.93198E-02  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

tvn        5.77314E+02  5.77314E+02  5.77314E+02  5.77314E+02  5.77314E+02  5.77314E+02  6.17905E+02  6.17905E+02
           6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
           k

tln        5.61172E+02  5.60400E+02  5.61222E+02  5.60386E+02  5.61109E+02  5.60357E+02  5.81000E+02  5.81000E+02
           5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
           k

tsat       5.77314E+02  5.77314E+02  5.77314E+02  5.77314E+02  5.77314E+02  5.77314E+02  6.17905E+02  6.17905E+02
           6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
           k

pn         9.09982E+06  9.09982E+06  9.09982E+06  9.09982E+06  9.09982E+06  9.09982E+06  1.55000E+07  1.55000E+07
           1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
           pa

pan        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
```

pa

conc	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	-							
solid	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00				
	kg/m3							

total power to the vessel coolant from all heat surfaces is 5.93698E+07 w
total power to the liquid is 5.93698E+07 w and total power to the gas is 0.00000E+00 w

vessel lower plenum
liquid volume is 2.33861E+01 m3 , liquid volume fraction is 1.00000E+00 and liquid mass is 1.75771E+04 kg
volume-averaged liquid temperature is 5.55776E+02 k and volume-averaged saturation temperature is 5.78703E+02 k

vessel reactor core
liquid volume fraction is 1.00000E+00 and liquid mass is 1.11757E+04 kg
volume-averaged liquid temperature is 5.56308E+02 k and volume-averaged saturation temperature is 5.77940E+02 k

vessel reactor core
inlet liquid mass flow is 1.26791E+04 kg/s and inlet gas mass flow is 0.00000E+00 kg/s
outlet liquid mass flow is 1.26793E+04 kg/s and outlet gas mass flow is 0.00000E+00 kg/s

vessel upper plenum
liquid volume fraction is 1.00000E+00 and liquid mass is 2.67729E+04 kg
volume-averaged liquid temperature is 5.56450E+02 k and volume-averaged saturation temperature is 5.77880E+02 k

vessel downcomer
liquid volume fraction is 0.00000E+00, liquid mass is 0.00000E+00 kg , volume-averaged pressure is 0.00000E+00 pa
volume-averaged liquid temperature is 0.00000E+00 k and volume-averaged saturation temperature is 0.00000E+00 k

vessel component total coolant mass is 7.13036E+04 kg , total coolant energy is 8.86086E+10 w*s, and
computed initial total coolant mass is 6.78684E+04 kg

```
------------------------------------------------------------------------------------------------------------
                                                                                          99999 00000 00000
  1    1    1
 11   11   11   time is   300.642346 s, time-step size is   0.311067 s, time-step number is  1713 9   9 0   0 0   0
  1    1    1                                                                             99999 0   0 0   0
  1    1    1                        $900$ reactor-core fuel rods                             9 0   0 0   0
111  111  111                                                                             99999 00000 00000
------------------------------------------------------------------------------------------------------------
```

the heat-structure component type is a rod and the component number is 900

reactor-core power is 5.862888E+07 w and neutron multiplication constant keff is 0.966184

rod 1 plane (perpendicular to z direction) coupled to cells 0 (inner) and 1 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6624E+02	5.6593E+02	5.6502E+02	5.6349E+02	5.6136E+02	5.5661E+02	5.5636E+02	5.5613E+02
1002	2	9.1440E-01	5.7388E+02	5.7334E+02	5.7175E+02	5.6911E+02	5.6542E+02	5.5730E+02	5.5686E+02	5.5646E+02
1003	3	1.8288E+00	5.7541E+02	5.7483E+02	5.7312E+02	5.7028E+02	5.6633E+02	5.5763E+02	5.5716E+02	5.5673E+02
1004	4	2.7432E+00	5.7403E+02	5.7351E+02	5.7194E+02	5.6933E+02	5.6570E+02	5.5771E+02	5.5728E+02	5.5689E+02
1005	5	3.6576E+00	5.6718E+02	5.6686E+02	5.6592E+02	5.6434E+02	5.6215E+02	5.5727E+02	5.5701E+02	5.5677E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1767E+04	5.5583E+02	0.0000E+00	5.7819E+02	2.3470E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1778E+04	5.5595E+02	0.0000E+00	5.7819E+02	2.3593E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1788E+04	5.5618E+02	0.0000E+00	5.7802E+02	2.3621E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1804E+04	5.5638E+02	0.0000E+00	5.7785E+02	2.3602E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1825E+04	5.5646E+02	0.0000E+00	5.7769E+02	2.3495E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	9.4677E+03	0.0000E+00	9.4677E+03	2.9220E+06	3.09E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6283E+04	0.0000E+00	1.6283E+04	2.9247E+06	1.80E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.7453E+04	0.0000E+00	1.7453E+04	2.9299E+06	1.68E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6028E+04	0.0000E+00	1.6028E+04	2.9350E+06	1.83E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	9.7397E+03	0.0000E+00	9.7397E+03	2.9374E+06	3.02E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.47420E-05	5.78219E+02
1002	0.00000E+00	2.73150E+02	3.31580E-05	5.78051E+02
1003	0.00000E+00	2.73150E+02	3.73183E-05	5.77881E+02
1004	0.00000E+00	2.73150E+02	3.69522E-05	5.77712E+02
1005	0.00000E+00	2.73150E+02	2.67367E-05	5.77712E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7697164E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.26183E+09 w*s effective= -3.90813E+08 w*s

rod 2 plane (perpendicular to z direction) coupled to cells 0 (inner) and 2 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6659E+02	5.6629E+02	5.6537E+02	5.6384E+02	5.6171E+02	5.5696E+02	5.5671E+02	5.5647E+02

1002	2	9.1440E-01	5.7423E+02	5.7370E+02	5.7210E+02	5.6946E+02	5.6577E+02	5.5764E+02	5.5721E+02	5.5681E+02
1003	3	1.8288E+00	5.7576E+02	5.7519E+02	5.7348E+02	5.7063E+02	5.6667E+02	5.5798E+02	5.5751E+02	5.5708E+02
1004	4	2.7432E+00	5.7438E+02	5.7386E+02	5.7229E+02	5.6968E+02	5.6605E+02	5.5806E+02	5.5763E+02	5.5723E+02
1005	5	3.6576E+00	5.6753E+02	5.6722E+02	5.6627E+02	5.6470E+02	5.6250E+02	5.5762E+02	5.5736E+02	5.5712E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1754E+04	5.5617E+02	0.0000E+00	5.7819E+02	2.3481E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1767E+04	5.5629E+02	0.0000E+00	5.7819E+02	2.3604E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1773E+04	5.5653E+02	0.0000E+00	5.7802E+02	2.3632E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1776E+04	5.5673E+02	0.0000E+00	5.7786E+02	2.3613E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1774E+04	5.5681E+02	0.0000E+00	5.7769E+02	2.3505E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	9.4735E+03	0.0000E+00	9.4735E+03	2.9230E+06	3.09E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6289E+04	0.0000E+00	1.6289E+04	2.9256E+06	1.80E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.7461E+04	0.0000E+00	1.7461E+04	2.9310E+06	1.68E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6037E+04	0.0000E+00	1.6037E+04	2.9366E+06	1.83E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	9.7492E+03	0.0000E+00	9.7492E+03	2.9393E+06	3.01E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.51487E-05	5.78219E+02
1002	0.00000E+00	2.73150E+02	3.37034E-05	5.78051E+02
1003	0.00000E+00	2.73150E+02	3.79416E-05	5.77882E+02
1004	0.00000E+00	2.73150E+02	3.75905E-05	5.77712E+02
1005	0.00000E+00	2.73150E+02	2.72475E-05	5.77712E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7699305E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.25937E+09 w*s effective= -3.67712E+08 w*s

rod 3 plane (perpendicular to z direction) coupled to cells 0 (inner) and 3 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6663E+02	5.6632E+02	5.6540E+02	5.6388E+02	5.6174E+02	5.5700E+02	5.5675E+02	5.5651E+02
1002	2	9.1440E-01	5.7426E+02	5.7373E+02	5.7214E+02	5.6949E+02	5.6580E+02	5.5768E+02	5.5725E+02	5.5685E+02
1003	3	1.8288E+00	5.7579E+02	5.7522E+02	5.7351E+02	5.7067E+02	5.6671E+02	5.5802E+02	5.5755E+02	5.5712E+02
1004	4	2.7432E+00	5.7442E+02	5.7389E+02	5.7232E+02	5.6972E+02	5.6608E+02	5.5809E+02	5.5767E+02	5.5727E+02
1005	5	3.6576E+00	5.6756E+02	5.6725E+02	5.6630E+02	5.6473E+02	5.6253E+02	5.5765E+02	5.5739E+02	5.5715E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1780E+04	5.5621E+02	0.0000E+00	5.7819E+02	2.3482E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1791E+04	5.5633E+02	0.0000E+00	5.7819E+02	2.3605E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1802E+04	5.5657E+02	0.0000E+00	5.7802E+02	2.3633E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1818E+04	5.5677E+02	0.0000E+00	5.7785E+02	2.3614E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1839E+04	5.5685E+02	0.0000E+00	5.7768E+02	2.3507E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	9.4668E+03	0.0000E+00	9.4668E+03	2.9221E+06	3.09E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6282E+04	0.0000E+00	1.6282E+04	2.9247E+06	1.80E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.7454E+04	0.0000E+00	1.7454E+04	2.9299E+06	1.68E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6030E+04	0.0000E+00	1.6030E+04	2.9349E+06	1.83E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	9.7428E+03	0.0000E+00	9.7428E+03	2.9374E+06	3.01E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.51500E-05	5.78219E+02
1002	0.00000E+00	2.73150E+02	3.37390E-05	5.78050E+02
1003	0.00000E+00	2.73150E+02	3.79744E-05	5.77881E+02
1004	0.00000E+00	2.73150E+02	3.76033E-05	5.77711E+02
1005	0.00000E+00	2.73150E+02	2.72096E-05	5.77711E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7699082E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.24817E+09 w*s effective= -3.69775E+08 w*s

rod 4 plane (perpendicular to z direction) coupled to cells 0 (inner) and 4 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6667E+02	5.6636E+02	5.6544E+02	5.6392E+02	5.6179E+02	5.5704E+02	5.5679E+02	5.5656E+02
1002	2	9.1440E-01	5.7430E+02	5.7377E+02	5.7218E+02	5.6953E+02	5.6584E+02	5.5773E+02	5.5729E+02	5.5689E+02
1003	3	1.8288E+00	5.7583E+02	5.7526E+02	5.7355E+02	5.7071E+02	5.6675E+02	5.5806E+02	5.5759E+02	5.5716E+02
1004	4	2.7432E+00	5.7446E+02	5.7393E+02	5.7236E+02	5.6976E+02	5.6612E+02	5.5814E+02	5.5771E+02	5.5731E+02
1005	5	3.6576E+00	5.6760E+02	5.6729E+02	5.6634E+02	5.6477E+02	5.6257E+02	5.5770E+02	5.5744E+02	5.5720E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1756E+04	5.5626E+02	0.0000E+00	5.7819E+02	2.3483E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1769E+04	5.5638E+02	0.0000E+00	5.7819E+02	2.3607E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1775E+04	5.5661E+02	0.0000E+00	5.7802E+02	2.3634E+03

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1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1779E+04  5.5681E+02  0.0000E+00  5.7786E+02  2.3615E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1777E+04  5.5689E+02  0.0000E+00  5.7769E+02  2.3508E+03

 heat flux to the hydro cells
 idz    qliqi       qvapi       qtoti       qchfi    qchfi/qtoti   qliqo       qvapo       qtoto       qchfo    qchfo/qtoto
         w/m2        w/m2        w/m2        w/m2         -         w/m2        w/m2        w/m2        w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  9.4624E+03  0.0000E+00  9.4624E+03  2.9230E+06  3.09E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.6278E+04  0.0000E+00  1.6278E+04  2.9257E+06  1.80E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.7450E+04  0.0000E+00  1.7450E+04  2.9311E+06  1.68E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.6026E+04  0.0000E+00  1.6026E+04  2.9366E+06  1.83E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  9.7383E+03  0.0000E+00  9.7383E+03  2.9394E+06  3.02E+02

        stanton      liq.temp.     stanton     liq.temp.
        number      bubble det.    number     bubble det.
 id   inner surf.   inner surf.  outer surf.  outer surf.
           -             k            -            k
1001  0.00000E+00  2.73150E+02  2.52089E-05  5.78219E+02
1002  0.00000E+00  2.73150E+02  3.38310E-05  5.78051E+02
1003  0.00000E+00  2.73150E+02  3.80854E-05  5.77882E+02
1004  0.00000E+00  2.73150E+02  3.77300E-05  5.77712E+02
1005  0.00000E+00  2.73150E+02  2.73167E-05  5.77712E+02

total convective energy to the fluid during hydro solution:
                  inside surface=  0.0000000E+00 w*s        outside surface=  1.7700161E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  0.00000E+00 w*s      effective=  0.00000E+00 w*s
          outside convective energy error: absolute=  1.25214E+09 w*s      effective= -3.58786E+08 w*s

rod    5    plane (perpendicular to z direction) coupled to cells    0 (inner) and    5 (outer), peaking factor is    1.0000

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.6627E+02 5.6597E+02 5.6505E+02 5.6353E+02 5.6140E+02 5.5665E+02 5.5640E+02 5.5617E+02
1002   2  9.1440E-01 5.7391E+02 5.7338E+02 5.7179E+02 5.6914E+02 5.6546E+02 5.5734E+02 5.5690E+02 5.5650E+02
1003   3  1.8288E+00 5.7544E+02 5.7487E+02 5.7316E+02 5.7032E+02 5.6636E+02 5.5767E+02 5.5720E+02 5.5677E+02
1004   4  2.7432E+00 5.7406E+02 5.7354E+02 5.7197E+02 5.6937E+02 5.6574E+02 5.5775E+02 5.5732E+02 5.5692E+02
1005   5  3.6576E+00 5.6721E+02 5.6690E+02 5.6595E+02 5.6438E+02 5.6219E+02 5.5731E+02 5.5705E+02 5.5681E+02

 id  idi   hliqi        tliqi       hvapi       tvapi      ido   hliqo       tliqo       hvapo       tvapo       hgap
          w/m2/k          k        w/m2/k         k                w/m2/k        k         w/m2/k        k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1769E+04  5.5587E+02  0.0000E+00  5.7819E+02  2.3471E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1779E+04  5.5599E+02  0.0000E+00  5.7819E+02  2.3594E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1790E+04  5.5622E+02  0.0000E+00  5.7802E+02  2.3622E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1805E+04  5.5642E+02  0.0000E+00  5.7785E+02  2.3603E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1827E+04  5.5650E+02  0.0000E+00  5.7769E+02  2.3496E+03

 heat flux to the hydro cells
 idz    qliqi       qvapi       qtoti       qchfi    qchfi/qtoti   qliqo       qvapo       qtoto       qchfo    qchfo/qtoto
         w/m2        w/m2        w/m2        w/m2         -         w/m2        w/m2        w/m2        w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  9.4623E+03  0.0000E+00  9.4623E+03  2.9220E+06  3.09E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.6277E+04  0.0000E+00  1.6277E+04  2.9247E+06  1.80E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.7447E+04  0.0000E+00  1.7447E+04  2.9299E+06  1.68E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.6023E+04  0.0000E+00  1.6023E+04  2.9349E+06  1.83E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  9.7344E+03  0.0000E+00  9.7344E+03  2.9374E+06  3.02E+02

        stanton      liq.temp.     stanton     liq.temp.
        number      bubble det.    number     bubble det.
 id   inner surf.   inner surf.  outer surf.  outer surf.
           -             k            -            k
1001  0.00000E+00  2.73150E+02  2.47694E-05  5.78219E+02
1002  0.00000E+00  2.73150E+02  3.32174E-05  5.78051E+02
1003  0.00000E+00  2.73150E+02  3.73850E-05  5.77881E+02
1004  0.00000E+00  2.73150E+02  3.70166E-05  5.77712E+02
1005  0.00000E+00  2.73150E+02  2.67677E-05  5.77712E+02

total convective energy to the fluid during hydro solution:
                  inside surface=  0.0000000E+00 w*s        outside surface=  1.7697594E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  0.00000E+00 w*s      effective=  0.00000E+00 w*s
          outside convective energy error: absolute=  1.25593E+09 w*s      effective= -3.86335E+08 w*s

rod    6    plane (perpendicular to z direction) coupled to cells    0 (inner) and    6 (outer), peaking factor is    1.0000

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.6589E+02 5.6559E+02 5.6467E+02 5.6315E+02 5.6102E+02 5.5627E+02 5.5602E+02 5.5579E+02
1002   2  9.1440E-01 5.7353E+02 5.7300E+02 5.7141E+02 5.6877E+02 5.6508E+02 5.5696E+02 5.5652E+02 5.5612E+02
1003   3  1.8288E+00 5.7506E+02 5.7449E+02 5.7278E+02 5.6994E+02 5.6599E+02 5.5729E+02 5.5683E+02 5.5640E+02
1004   4  2.7432E+00 5.7369E+02 5.7316E+02 5.7160E+02 5.6899E+02 5.6537E+02 5.5737E+02 5.5694E+02 5.5655E+02
1005   5  3.6576E+00 5.6683E+02 5.6652E+02 5.6557E+02 5.6400E+02 5.6181E+02 5.5693E+02 5.5667E+02 5.5643E+02

 id  idi   hliqi        tliqi       hvapi       tvapi      ido   hliqo       tliqo       hvapo       tvapo       hgap
          w/m2/k          k        w/m2/k         k                w/m2/k        k         w/m2/k        k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1735E+04  5.5549E+02  0.0000E+00  5.7819E+02  2.3460E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1746E+04  5.5561E+02  0.0000E+00  5.7819E+02  2.3583E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1751E+04  5.5585E+02  0.0000E+00  5.7802E+02  2.3611E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1752E+04  5.5604E+02  0.0000E+00  5.7786E+02  2.3592E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1747E+04  5.5613E+02  0.0000E+00  5.7769E+02  2.3484E+03

 heat flux to the hydro cells
 idz    qliqi       qvapi       qtoti       qchfi    qchfi/qtoti   qliqo       qvapo       qtoto       qchfo    qchfo/qtoto
         w/m2        w/m2        w/m2        w/m2         -         w/m2        w/m2        w/m2        w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  9.4690E+03  0.0000E+00  9.4690E+03  2.9228E+06  3.09E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.6283E+04  0.0000E+00  1.6283E+04  2.9255E+06  1.80E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.7451E+04  0.0000E+00  1.7451E+04  2.9310E+06  1.68E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.6024E+04  0.0000E+00  1.6024E+04  2.9366E+06  1.83E+02
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1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	9.7347E+03	0.0000E+00	9.7347E+03	2.9394E+06	3.02E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.44146E-05	5.78219E+02
1002	0.00000E+00	2.73150E+02	3.26685E-05	5.78051E+02
1003	0.00000E+00	2.73150E+02	3.67757E-05	5.77882E+02
1004	0.00000E+00	2.73150E+02	3.64337E-05	5.77713E+02
1005	0.00000E+00	2.73150E+02	2.63944E-05	5.77713E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7696178E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.29029E+09 w*s effective= -4.02318E+08 w*s

rod 7 plane (perpendicular to z direction) coupled to cells 0 (inner) and -1 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7334E+02	5.7282E+02	5.7127E+02	5.6868E+02	5.6508E+02	5.5715E+02	5.5672E+02	5.5633E+02
1002	2	9.1440E-01	5.8611E+02	5.8520E+02	5.8249E+02	5.7799E+02	5.7174E+02	5.5821E+02	5.5748E+02	5.5681E+02
1003	3	1.8288E+00	5.8853E+02	5.8755E+02	5.8463E+02	5.7980E+02	5.7309E+02	5.5861E+02	5.5783E+02	5.5711E+02
1004	4	2.7432E+00	5.8607E+02	5.8518E+02	5.8251E+02	5.7808E+02	5.7192E+02	5.5861E+02	5.5789E+02	5.5723E+02
1005	5	3.6576E+00	5.7448E+02	5.7395E+02	5.7234E+02	5.6968E+02	5.6598E+02	5.5782E+02	5.5738E+02	5.5698E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1767E+04	5.5583E+02	0.0000E+00	5.7819E+02	2.3583E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1778E+04	5.5595E+02	0.0000E+00	5.7819E+02	2.3787E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1788E+04	5.5618E+02	0.0000E+00	5.7802E+02	2.3829E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1804E+04	5.5638E+02	0.0000E+00	5.7785E+02	2.3793E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1825E+04	5.5646E+02	0.0000E+00	5.7769E+02	2.3611E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5906E+04	0.0000E+00	1.5906E+04	2.9220E+06	1.84E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.7341E+04	0.0000E+00	2.7341E+04	2.9247E+06	1.07E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.9306E+04	0.0000E+00	2.9306E+04	2.9299E+06	1.00E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6915E+04	0.0000E+00	2.6915E+04	2.9350E+06	1.09E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6364E+04	0.0000E+00	1.6364E+04	2.9374E+06	1.80E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.15751E-05	5.78219E+02
1002	0.00000E+00	2.73150E+02	6.25900E-05	5.78051E+02
1003	0.00000E+00	2.73150E+02	6.94239E-05	5.77881E+02
1004	0.00000E+00	2.73150E+02	6.68774E-05	5.77712E+02
1005	0.00000E+00	2.73150E+02	4.49284E-05	5.77712E+02

rod 8 plane (perpendicular to z direction) coupled to cells 0 (inner) and -2 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7369E+02	5.7317E+02	5.7162E+02	5.6903E+02	5.6543E+02	5.5749E+02	5.5707E+02	5.5668E+02
1002	2	9.1440E-01	5.8646E+02	5.8556E+02	5.8284E+02	5.7834E+02	5.7208E+02	5.5856E+02	5.5783E+02	5.5716E+02
1003	3	1.8288E+00	5.8888E+02	5.8791E+02	5.8499E+02	5.8015E+02	5.7343E+02	5.5896E+02	5.5818E+02	5.5745E+02
1004	4	2.7432E+00	5.8643E+02	5.8554E+02	5.8286E+02	5.7843E+02	5.7227E+02	5.5896E+02	5.5824E+02	5.5757E+02
1005	5	3.6576E+00	5.7484E+02	5.7430E+02	5.7270E+02	5.7003E+02	5.6632E+02	5.5817E+02	5.5773E+02	5.5732E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1754E+04	5.5617E+02	0.0000E+00	5.7819E+02	2.3594E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1767E+04	5.5629E+02	0.0000E+00	5.7819E+02	2.3798E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1773E+04	5.5653E+02	0.0000E+00	5.7802E+02	2.3840E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1776E+04	5.5673E+02	0.0000E+00	5.7786E+02	2.3804E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1774E+04	5.5681E+02	0.0000E+00	5.7769E+02	2.3622E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5911E+04	0.0000E+00	1.5911E+04	2.9230E+06	1.84E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.7348E+04	0.0000E+00	2.7348E+04	2.9256E+06	1.07E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.9314E+04	0.0000E+00	2.9314E+04	2.9310E+06	1.00E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6924E+04	0.0000E+00	2.6924E+04	2.9366E+06	1.09E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6373E+04	0.0000E+00	1.6373E+04	2.9393E+06	1.80E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.22457E-05	5.78219E+02
1002	0.00000E+00	2.73150E+02	6.36028E-05	5.78051E+02
1003	0.00000E+00	2.73150E+02	7.05727E-05	5.77882E+02
1004	0.00000E+00	2.73150E+02	6.80276E-05	5.77712E+02
1005	0.00000E+00	2.73150E+02	4.57670E-05	5.77712E+02

rod 9 plane (perpendicular to z direction) coupled to cells 0 (inner) and -3 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7373E+02	5.7321E+02	5.7165E+02	5.6907E+02	5.6547E+02	5.5753E+02	5.5711E+02	5.5672E+02
1002	2	9.1440E-01	5.8650E+02	5.8559E+02	5.8288E+02	5.7838E+02	5.7212E+02	5.5860E+02	5.5787E+02	5.5719E+02

1003	3	1.8288E+00	5.8891E+02	5.8794E+02	5.8502E+02	5.8018E+02	5.7346E+02	5.5900E+02	5.5822E+02	5.5749E+02
1004	4	2.7432E+00	5.8646E+02	5.8557E+02	5.8289E+02	5.7846E+02	5.7230E+02	5.5899E+02	5.5828E+02	5.5761E+02
1005	5	3.6576E+00	5.7487E+02	5.7433E+02	5.7273E+02	5.7007E+02	5.6636E+02	5.5820E+02	5.5777E+02	5.5736E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1780E+04	5.5621E+02	0.0000E+00	5.7819E+02	2.3595E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1791E+04	5.5633E+02	0.0000E+00	5.7819E+02	2.3799E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1802E+04	5.5657E+02	0.0000E+00	5.7802E+02	2.3841E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1818E+04	5.5677E+02	0.0000E+00	5.7785E+02	2.3805E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1839E+04	5.5685E+02	0.0000E+00	5.7768E+02	2.3623E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5905E+04	0.0000E+00	1.5905E+04	2.9221E+06	1.84E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.7341E+04	0.0000E+00	2.7341E+04	2.9247E+06	1.07E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.9307E+04	0.0000E+00	2.9307E+04	2.9299E+06	1.00E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6918E+04	0.0000E+00	2.6918E+04	2.9349E+06	1.09E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6367E+04	0.0000E+00	1.6367E+04	2.9374E+06	1.79E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.22601E-05	5.78219E+02
1002	0.00000E+00	2.73150E+02	6.36638E-05	5.78050E+02
1003	0.00000E+00	2.73150E+02	7.06273E-05	5.77881E+02
1004	0.00000E+00	2.73150E+02	6.80463E-05	5.77711E+02
1005	0.00000E+00	2.73150E+02	4.57155E-05	5.77711E+02

rod 10 plane (perpendicular to z direction) coupled to cells 0 (inner) and -4 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7377E+02	5.7325E+02	5.7169E+02	5.6911E+02	5.6551E+02	5.5758E+02	5.5715E+02	5.5676E+02
1002	2	9.1440E-01	5.8654E+02	5.8563E+02	5.8292E+02	5.7842E+02	5.7216E+02	5.5864E+02	5.5791E+02	5.5724E+02
1003	3	1.8288E+00	5.8895E+02	5.8798E+02	5.8506E+02	5.8022E+02	5.7350E+02	5.5904E+02	5.5826E+02	5.5753E+02
1004	4	2.7432E+00	5.8650E+02	5.8561E+02	5.8294E+02	5.7850E+02	5.7234E+02	5.5904E+02	5.5832E+02	5.5766E+02
1005	5	3.6576E+00	5.7491E+02	5.7437E+02	5.7277E+02	5.7011E+02	5.6640E+02	5.5825E+02	5.5781E+02	5.5741E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1756E+04	5.5626E+02	0.0000E+00	5.7819E+02	2.3596E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1769E+04	5.5638E+02	0.0000E+00	5.7819E+02	2.3801E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1775E+04	5.5661E+02	0.0000E+00	5.7802E+02	2.3843E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1779E+04	5.5681E+02	0.0000E+00	5.7786E+02	2.3807E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1777E+04	5.5689E+02	0.0000E+00	5.7769E+02	2.3624E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5900E+04	0.0000E+00	1.5900E+04	2.9230E+06	1.84E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.7337E+04	0.0000E+00	2.7337E+04	2.9257E+06	1.07E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.9303E+04	0.0000E+00	2.9303E+04	2.9311E+06	1.00E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6913E+04	0.0000E+00	2.6913E+04	2.9366E+06	1.09E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6362E+04	0.0000E+00	1.6362E+04	2.9394E+06	1.80E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	4.23671E-05	5.78219E+02
1002	0.00000E+00	2.73150E+02	6.38385E-05	5.78051E+02
1003	0.00000E+00	2.73150E+02	7.08355E-05	5.77882E+02
1004	0.00000E+00	2.73150E+02	6.82787E-05	5.77712E+02
1005	0.00000E+00	2.73150E+02	4.59040E-05	5.77712E+02

rod 11 plane (perpendicular to z direction) coupled to cells 0 (inner) and -5 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7337E+02	5.7286E+02	5.7130E+02	5.6872E+02	5.6512E+02	5.5719E+02	5.5676E+02	5.5637E+02
1002	2	9.1440E-01	5.8615E+02	5.8524E+02	5.8253E+02	5.7803E+02	5.7178E+02	5.5825E+02	5.5752E+02	5.5685E+02
1003	3	1.8288E+00	5.8856E+02	5.8759E+02	5.8467E+02	5.7984E+02	5.7312E+02	5.5865E+02	5.5787E+02	5.5715E+02
1004	4	2.7432E+00	5.8611E+02	5.8522E+02	5.8254E+02	5.7812E+02	5.7196E+02	5.5865E+02	5.5793E+02	5.5727E+02
1005	5	3.6576E+00	5.7452E+02	5.7398E+02	5.7238E+02	5.6972E+02	5.6601E+02	5.5786E+02	5.5742E+02	5.5702E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1769E+04	5.5587E+02	0.0000E+00	5.7819E+02	2.3584E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1779E+04	5.5599E+02	0.0000E+00	5.7819E+02	2.3789E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1790E+04	5.5622E+02	0.0000E+00	5.7802E+02	2.3830E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1805E+04	5.5642E+02	0.0000E+00	5.7785E+02	2.3794E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1827E+04	5.5650E+02	0.0000E+00	5.7769E+02	2.3612E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5900E+04	0.0000E+00	1.5900E+04	2.9220E+06	1.84E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.7336E+04	0.0000E+00	2.7336E+04	2.9247E+06	1.07E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.9300E+04	0.0000E+00	2.9300E+04	2.9299E+06	1.00E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6910E+04	0.0000E+00	2.6910E+04	2.9349E+06	1.09E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.6358E+04	0.0000E+00	1.6358E+04	2.9374E+06	1.80E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.

```
           -           k           -           k
1001  0.00000E+00  2.73150E+02  4.16309E-05  5.78219E+02
1002  0.00000E+00  2.73150E+02  6.26994E-05  5.78051E+02
1003  0.00000E+00  2.73150E+02  6.95456E-05  5.77881E+02
1004  0.00000E+00  2.73150E+02  6.69932E-05  5.77712E+02
1005  0.00000E+00  2.73150E+02  4.49904E-05  5.77712E+02

rod  12   plane (perpendicular to z direction) coupled to cells   0 (inner) and  -6 (outer), peaking factor is   1.6780

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.7299E+02 5.7248E+02 5.7092E+02 5.6834E+02 5.6475E+02 5.5681E+02 5.5638E+02 5.5599E+02
1002   2  9.1440E-01 5.8577E+02 5.8486E+02 5.8215E+02 5.7765E+02 5.7141E+02 5.5787E+02 5.5715E+02 5.5647E+02
1003   3  1.8288E+00 5.8818E+02 5.8721E+02 5.8429E+02 5.7946E+02 5.7275E+02 5.5827E+02 5.5749E+02 5.5677E+02
1004   4  2.7432E+00 5.8573E+02 5.8484E+02 5.8217E+02 5.7774E+02 5.7159E+02 5.5827E+02 5.5756E+02 5.5689E+02
1005   5  3.6576E+00 5.7414E+02 5.7360E+02 5.7200E+02 5.6934E+02 5.6564E+02 5.5748E+02 5.5704E+02 5.5664E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k          k         w/m2/k          k               w/m2/k          k          w/m2/k          k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1735E+04  5.5549E+02  0.0000E+00  5.7819E+02  2.3572E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1746E+04  5.5561E+02  0.0000E+00  5.7819E+02  2.3777E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1751E+04  5.5585E+02  0.0000E+00  5.7802E+02  2.3819E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1752E+04  5.5604E+02  0.0000E+00  5.7786E+02  2.3783E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1747E+04  5.5613E+02  0.0000E+00  5.7769E+02  2.3600E+03

 heat flux to the hydro cells
 idz     qliqi       qvapi        qtoti        qchfi     qchfi/qtoti    qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2        w/m2         w/m2         w/m2          -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.5907E+04  0.0000E+00  1.5907E+04  2.9228E+06  1.84E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.7342E+04  0.0000E+00  2.7342E+04  2.9255E+06  1.07E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.9304E+04  0.0000E+00  2.9304E+04  2.9310E+06  1.00E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.6911E+04  0.0000E+00  2.6911E+04  2.9366E+06  1.09E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.6359E+04  0.0000E+00  1.6359E+04  2.9394E+06  1.80E+02

        stanton      liq.temp.     stanton      liq.temp.
         number     bubble det.     number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  2.73150E+02  4.10258E-05  5.78219E+02
1002  0.00000E+00  2.73150E+02  6.17038E-05  5.78051E+02
1003  0.00000E+00  2.73150E+02  6.84481E-05  5.77882E+02
1004  0.00000E+00  2.73150E+02  6.59646E-05  5.77713E+02
1005  0.00000E+00  2.73150E+02  4.43652E-05  5.77713E+02

inner-surface node-interval thermal conductivity is  5.16746E+00    w/m/k
outer-surface node-interval thermal conductivity is  1.59755E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.84767E+00    w/m/k
which have been axially averaged over all   6 average-power rod s

total inner surface area is  0.00000E+00 m2  and
total outer surface area is  3.96347E+03 m2  of all    6 average-power rod s

total power from the heat-structure inner surface is  0.00000E+00   w    and outer surface is  5.88239E+07   w

average-power rod   4 has the peak surface temperature of  5.57314E+02 k
supplemental  rod  10 has the peak surface temperature of  5.57656E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg

##########  3822 lines deleted here  ##########

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  1   33333   1                                                                                        99999 33333 88888
 11       3  11    time is     300.642346 s, time-step size is     0.311067 s, time-step number is  1713 9    9     3 8   8
  1   33333   1                                                                                        99999 33333 88888
  1       3   1                                   $938$ st-gen-1,2,3 sec.dryer                              9     3 8   8
111   33333 111                                                                                        99999 33333 88888
------------------------------------------------------------------------------------------------------------------------


the heat-structure component type is a rod  and the component number is 938

rod   1   plane (perpendicular to z direction) coupled to cells   1 (inner) and   0 (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.5151E+02 5.5282E+02 5.5409E+02
1002   2  5.7542E+00 5.5286E+02 5.5354E+02 5.5421E+02
1003   3  1.1508E+01 5.5452E+02 5.5439E+02 5.5427E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k          k         w/m2/k          k               w/m2/k          k          w/m2/k          k         w/m2/k
1001  2  3.0438E+03  5.4471E+02  1.1689E+00  5.4471E+02   11  6.6046E+01  5.5436E+02  1.2050E+05  5.5427E+02  0.0000E+00
1002 11  2.2206E+03  5.4503E+02  3.7650E+03  5.5466E+02   11  5.5007E+01  5.5436E+02  1.8121E+05  5.5427E+02  0.0000E+00
1003 11  1.2110E+02  5.5396E+02  1.5079E+04  5.5466E+02   11  4.5929E+01  5.5436E+02  3.7333E+05  5.5427E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi       qvapi        qtoti        qchfi     qchfi/qtoti    qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2        w/m2         w/m2         w/m2          -          w/m2         w/m2         w/m2         w/m2         -
1001  2.0693E+04  7.9487E+00  2.0700E+04  5.0320E+05  2.43E+01 -1.7688E+01 -2.0796E+04 -2.0813E+04  0.0000E+00  0.00E+00
1002  1.7403E+04 -6.7569E+03  1.0647E+04  2.5160E+05  2.36E+01 -8.5276E+00 -1.0833E+04 -1.0841E+04  4.9662-210  4.58-214
1003  6.7905E+01 -2.1307E+03 -2.0628E+03  5.8190E-03  2.82E-06 -4.1384E+00  1.9197E+03  1.9155E+03  9.9323-210  5.19-213

        stanton      liq.temp.     stanton      liq.temp.
         number     bubble det.     number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  1.21577E+02  5.44710E+02  0.00000E+00  5.54811E+02
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1002  0.00000E+00  5.54804E+02  0.00000E+00  5.54811E+02
1003  4.46019E-02  5.54804E+02  0.00000E+00  5.54811E+02

total convective energy to the fluid during hydro solution:
                  inside surface= -6.6504436E+08 w*s      outside surface=  4.2461059E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
          inside convective energy error: absolute=  1.85826E+08 w*s     effective= -1.80230E+08 w*s
         outside convective energy error: absolute=  4.01866E+06 w*s     effective= -1.51430E+06 w*s

rod   2   plane (perpendicular to z direction) coupled to cells   2 (inner) and**** (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.5281E+02 5.5359E+02 5.5435E+02
1002   2  5.7542E+00 5.5384E+02 5.5414E+02 5.5443E+02
1003   3  1.1508E+01 5.5474E+02 5.5473E+02 5.5473E+02

 id  idi   hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k          w/m2/k         k               w/m2/k          k          w/m2/k         k         w/m2/k
1001  2  1.4967E+03  5.4460E+02  7.6913E-01  5.4460E+02  11  7.3901E+01  5.5451E+02  1.4373E+05  5.5444E+02  0.0000E+00
1002 11  8.6291E+02  5.4504E+02  3.2431E+03  5.5474E+02  11  5.8495E+01  5.5451E+02  6.4830E+05  5.5444E+02  0.0000E+00
1003 11  6.4607E+01  5.5442E+02  7.6423E+04  5.5474E+02  12  1.1662E+00  5.5451E+02  2.3705E+01  5.5444E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2          -         w/m2         w/m2         w/m2         w/m2          -
1001  1.2292E+04  6.3162E+00  1.2299E+04  4.8274E+05  3.93E+01 -1.1622E+01 -1.2427E+04 -1.2438E+04  0.0000E+00  0.00E+00
1002  7.5923E+03 -2.9161E+03  4.6762E+03  2.4137E+05  5.16E+01 -4.5739E+00 -4.7889E+03 -4.7934E+03  2.5000E-01  5.22E-05
1003  2.0870E+01 -1.7316E+02 -1.5229E+02  6.8999E-03  4.53E-05  2.5745E-01  6.9118E+00  7.1693E+00  5.0000E-01  6.97E-02

        stanton     liq.temp.     stanton     liq.temp.
         number    bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  1.19025E+02  3.61390E+02  0.00000E+00  5.54809E+02
1002  0.00000E+00  5.54802E+02  0.00000E+00  5.54809E+02
1003  3.03228E-02  5.54802E+02  1.99562E-04  5.54809E+02

total convective energy to the fluid during hydro solution:
                  inside surface= -4.6442112E+08 w*s      outside surface=  2.1347622E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
          inside convective energy error: absolute=  1.86184E+08 w*s     effective= -1.82046E+08 w*s
         outside convective energy error: absolute=  7.56474E+06 w*s     effective= -4.88973E+06 w*s

rod   3   plane (perpendicular to z direction) coupled to cells   3 (inner) and**** (outer)

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.4935E+02 5.4963E+02 5.4991E+02
1002   2  5.7542E+00 5.4892E+02 5.4923E+02 5.4954E+02
1003   3  1.1508E+01 5.5179E+02 5.5189E+02 5.5199E+02

 id  idi   hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k          w/m2/k         k               w/m2/k          k          w/m2/k         k         w/m2/k
1001  2  1.7189E+03  5.4676E+02  1.2634E-01  5.4676E+02  12  1.0644E+03  5.5414E+02  0.0000E+00  5.5504E+02  0.0000E+00
1002 12  2.8395E+03  5.4715E+02  1.4551E-01  5.4676E+02  12  1.0946E+03  5.5414E+02  0.0000E+00  5.5504E+02  0.0000E+00
1003 12  7.8045E+02  5.5006E+02  0.0000E+00  5.5490E+02  12  8.4887E+02  5.5414E+02  0.0000E+00  5.5504E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2          -         w/m2         w/m2         w/m2         w/m2          -
1001  4.4575E+03  3.2699E-01  4.4579E+03  9.5797E+05  2.15E+02 -4.5073E+03  0.0000E+00 -4.5073E+03  1.7723E+06  3.93E+02
1002  5.0088E+03  3.1333E-01  5.0091E+03  8.8878E+05  1.77E+02 -5.0379E+03  0.0000E+00 -5.0379E+03  1.7723E+06  3.52E+02
1003  1.3538E+03  0.0000E+00  1.3538E+03  8.1959E+05  6.05E+02 -1.8245E+03  0.0000E+00 -1.8245E+03  1.7723E+06  9.71E+02

        stanton     liq.temp.     stanton     liq.temp.
         number    bubble det.     number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  6.63343E+00  5.46751E+02  0.00000E+00  5.55040E+02
1002  0.00000E+00  5.54896E+02  0.00000E+00  5.55040E+02
1003  1.27831E-02  5.54896E+02  0.00000E+00  5.55040E+02

total convective energy to the fluid during hydro solution:
                  inside surface= -1.0234675E+08 w*s      outside surface=  7.0716778E+07 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
          inside convective energy error: absolute=  3.31677E+06 w*s     effective=  8.10984E+04 w*s
         outside convective energy error: absolute=  2.75180E+06 w*s     effective=  6.29150E+05 w*s

inner-surface node-interval thermal conductivity is  5.05995E+01    w/m/k
outer-surface node-interval thermal conductivity is  5.05600E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.05798E+01    w/m/k
which have been axially averaged over all    3 average-power rod s

total inner surface area is  6.61197E+02 m2  and
total outer surface area is  6.62564E+02 m2  of all    3 average-power rod s

total power from the heat-structure inner surface is  4.25699E+06   w    and outer surface is -4.36222E+06   w

average-power rod   2 has the peak surface temperature of  5.54741E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg


system results
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total power loss by 1-d comp.wall is -6.948410E+06 w*s on the inner surface and  9.426375E+05 w*s on the outer surface

                      system total coolant energy is  9.312153E+18 w*s

                        system total coolant mass is  4.544427E+13 kg

total coolant mass discharged by break components is -8.335128E+04 kg

   total coolant mass injected by fill components is  1.539893E+04 kg

       system computed initial total coolant mass is  4.544427E+13 kg


   time   dtime   power    keff
    s       s       w        -
 302.892  3.223 5.849E+07 0.966184
 306.331  3.444 5.829E+07 0.966184
 309.526  2.982 5.811E+07 0.966184
 311.524  2.098 5.799E+07 0.966184
 314.329  2.840 5.783E+07 0.966184
 317.469  3.199 5.766E+07 0.966184
 320.362  2.718 5.750E+07 0.966184
 322.588  2.338 5.738E+07 0.966184
 325.419  2.807 5.723E+07 0.966184
 328.080  2.712 5.709E+07 0.966184
 331.322  3.231 5.693E+07 0.966184              11
 334.300  2.955 5.678E+07 0.966184
 337.516  3.290 5.662E+07 0.966184
 340.339  2.791 5.648E+07 0.966184
 343.706  3.303 5.632E+07 0.966184
 346.359  2.696 5.619E+07 0.966184
 349.343  3.004 5.605E+07 0.966184
 352.419  3.079 5.591E+07 0.966184
 355.421  3.012 5.577E+07 0.966184
 358.844  3.345 5.562E+07 0.966184
 361.180  2.372 5.552E+07 0.966184
 364.283  3.188 5.538E+07 0.966184
 367.235  2.782 5.526E+07 0.966184
 369.531  2.364 5.516E+07 0.966184
 372.868  3.370 5.502E+07 0.966184
 376.202  3.235 5.489E+07 0.966184
 378.124  1.931 5.481E+07 0.966184
 380.837  2.820 5.470E+07 0.966184
 383.803  2.883 5.458E+07 0.966184
 386.434  2.702 5.448E+07 0.966184
 389.642  3.122 5.436E+07 0.966184
 392.244  2.701 5.426E+07 0.966184
 395.711  3.366 5.413E+07 0.966184
 398.305  2.657 5.404E+07 0.966184

 restart dump generated at problem time   400.081136 s after  2056 time steps         14
1
 trac large edit                               14

 problem time is 4.007157E+02 s, time-step size is  3.1679E-01 s, time-step number is  2058, outer-iteration number is  2

 maximum convective power differance has been 0.3176545E+08   w    in component  910 at time 7.7178549E+00 s
 time-step size was limited by component 200 at cell   1 to 1.3330E-02 s
 average outer-iteration count over the last  345 time steps was   2.081
 last minimum number of outer iterations was  2 at time step 2057 (limited by component 410 with fr.error of 5.0362E-06)
 last maximum number of outer iterations was  4 at time step 1775 (limited by component  30 with fr.error of 3.5408E-07)
 total number of times that each component (id#) was the last to converge since the last short edit
    0( 10)    0( 12)    0( 14)    0( 16)    0( 17)    0( 18)    0( 54)    0( 52)    0( 50)    0( 49)    0( 91)    0( 56)
    0( 20)    0( 22)    0( 24)    0( 26)    0( 27)    0( 28)    0(202)    2(200)    6(205)    1(290)    0( 64)    0( 62)
    0( 60)    7(210)    4(220)   52(400)  204(410)    3(420)    0(422)    0(280)    4(270)    0(254)    0(250)    0(350)
    0(212)    4(120)    4(110)    1(105)    0(190)    2(100)    1(320)    0(310)    2(305)    0(390)    0(300)    0(430)
    0(432)    0(150)    0(354)    6(370)    0(380)    0(216)    0(112)    0(180)    2(170)    0(154)    0(312)    0(436)
    0(116)    0(316)    0( 59)    0( 92)    0(424)    0(578)    0( 66)    0(214)    0(434)    0(279)    0(269)    0(576)
    0(218)    0(114)    0(314)    0(438)    0(369)    0(379)    0(118)    0(179)    0(169)    0(318)   18( 30)   19( 32)
    2( 34)    0( 36)    0( 37)    0( 38)    1( 40)    0( 41)    0( 42)    0( 74)    0( 72)    0( 70)    0( 44)    0( 45)
    0( 46)    0( 43)    0( 69)    0( 93)    0( 47)    0( 76)    0( 48)    0(  2)    0(  3)    0(  4)    0(  5)    0(  6)
    0(  7)    0(  1)
 current maximum time-step sizes and limitation counts since the last short edit
     delamx         delcmx         deldmx         delemx         delpmx         delrmx         delvmx         delxmx
   3.1679E-01 s   1.0000E+08 s   1.0000E+08 s   1.0000E+08 s   1.4967E+02 s   1.0000E+08 s   1.3330E+01 s   1.0000E+08 s
       61             0              0              0              0              0              0              0
 further limitation counts on what controls delcmx
      dtlmx          dtvmx          dprmx          dtsms          dtrmx          delt/2
       0              0              0              0              0              0

    cpu execution time of this run is 3.213858E+04 s

 total time steps since time 0.0 s is        3320
   total cpu time since time 0.0 s is 5.056087E+04 s

************************************ signal-variable values at time  400.39894 s ************************************

     id       sig.var.          id       sig.var.          id       sig.var.          id       sig.var.          id       sig.var.

      1    4.003989E+02         11    5.396170E+07        101    5.570051E+02        111    6.663643E+06        161    4.253017E+03
                time (s)            core power (w)             liq temp (k)             pressure (pa)            z lq mf (kg/s)
    171    9.491596E+06        181    5.566935E+02        201    5.573820E+02        222    6.663161E+06        261    4.244743E+03
           pressure (pa)              liq temp (k)             liq temp (k)             pressure (pa)            z lq mf (kg/s)
    271    9.491719E+06        281    5.568242E+02        301    5.570662E+02        333    6.664027E+06        361    4.266485E+03
           pressure (pa)              liq temp (k)             liq temp (k)             pressure (pa)            z lq mf (kg/s)
```

371	9.491612E+06	pressure (pa)	381	5.560575E+02	liq temp (k)	401	9.130967E+06	pressure (pa)	421	9.126515E+06	pressure (pa)	501	4.443072E+06	pressure (pa)
521	-5.016517E+06	pressure (pa)	601	4.443072E+06	pressure (pa)	621	-5.016643E+06	pressure (pa)	701	4.443072E+06	pressure (pa)	721	-5.016543E+06	pressure (pa)
1000	8.803228E+00	z m mfw (kg/s)	1051	6.663931E+06	pressure (pa)	1100	-1.471660E+00	z m mfw (kg/s)	1101	6.663643E+06	pressure (pa)	1121	6.666376E+06	pressure (pa)
1135	-3.433117E+03	pressure (pa)	1501	2.382282E+00	z lq mf (kg/s)	1541	0.000000E+00	valve farea fr	1700	9.334210E+00	z m mfw (kg/s)	1714	5.957062E+04	pressure (pa)
1903	6.673724E+06	pressure (pa)	1910	6.744801E+06	pressure (pa)	2000	3.979304E+00	z m mfw (kg/s)	2020	1.606313E+01	z m mfw (kg/s)	2051	6.663454E+06	pressure (pa)
2100	1.789989E+00	z m mfw (kg/s)	2101	6.663161E+06	pressure (pa)	2121	6.666224E+06	pressure (pa)	2135	-3.939760E+03	pressure (pa)	2541	0.000000E+00	valve farea fr
2700	9.334281E+00	z m mfw (kg/s)	2714	5.957063E+04	pressure (pa)	2903	6.670159E+06	pressure (pa)	2910	6.741666E+06	pressure (pa)	3000	3.003285E+02	z m mfw (kg/s)
3051	6.688905E+06	pressure (pa)	3100	8.081471E-01	z m mfw (kg/s)	3101	6.664027E+06	pressure (pa)	3121	6.666428E+06	pressure (pa)	3135	-3.044746E+03	pressure (pa)
3501	-2.382275E+00	z lq mf (kg/s)	3541	0.000000E+00	valve farea fr	3700	9.334265E+00	z m mfw (kg/s)	3714	5.957172E+04	pressure (pa)	3903	6.714039E+06	pressure (pa)
3910	6.783635E+06	pressure (pa)	4001	6.667080E+06	pressure (pa)	4220	0.000000E+00	valve farea fr	4240	1.000000E+00	trp set status	9000	5.579040E+02	a mx sf tp (k)
9010	5.582189E+02	s mx sf tp (k)												

********************************* control-block output values at time 400.39894 s *********************************

id	con.blk.	id	con.blk.	id	con.blk.	id	con.blk.	id	con.blk.
-1	0.000000E+00 k	-2	0.000000E+00 w	-3	1.440000E-01 -	-4	1.551300E+07 pa	-5	1.620300E+07 pa
-6	1.723700E+07 pa	-7	5.742000E+02 k	-8	5.000000E-02 -	-9	-1.379000E+05 pa	-10	4.087000E+05 w
-11	2.423000E-03 s/kg	-12	4.540000E+02 kg/s	-13	4.330000E+06 pa	-14	5.570000E+02 k	-15	5.912903E+00 sqrt(kg/m3)
-16	5.751000E+02 k	-17	1.162000E+00 k	-18	0.000000E+00 k	-19	1.072000E+00 k	-22	0.000000E+00 -
-24	0.000000E+00 -	-26	0.000000E+00 -	-28	0.000000E+00 -	-30	0.000000E+00 -	-32	0.000000E+00 -
-34	0.000000E+00 -	-36	0.000000E+00 -	-38	0.000000E+00 -	-40	0.000000E+00 -	-50	5.570935E+02 k
-55	5.570966E+02 k	-108	5.568493E+02 k	-109	5.568432E+02 k	-110	5.568462E+02 k	-118	3.115914E-01 k
-119	3.120239E-01 k	-120	3.118077E-01 k	-130	-3.400678E-01 k	-132	-3.369260E-01 k	-134	-7.390440E-01 k
-136	1.162000E+00 k	-138	4.229560E-01 k	-140	1.353459E+01 k	-142	0.000000E+00 -	-148	1.000000E+00 -
-149	9.531337E-02 k	-150	9.531337E-02 k	-152	9.530515E-02 k	-154	3.600000E-02 -	-156	3.430985E-03 k
-158	1.068569E+00 k	-160	-1.825377E+01 k	-162	0.000000E+00 -	-164	0.000000E+00 k	-166	1.068569E+00 k
-168	3.419421E+01 k	-170	0.000000E+00 -	-208	5.571031E+02 k	-209	5.570966E+02 k	-210	5.570999E+02 k
-218	5.578228E-01 k	-219	5.583301E-01 k	-220	5.580765E-01 k	-230	-3.353421E-01 k	-232	-3.319690E-01 k
-234	-7.390440E-01 k	-236	1.162000E+00 k	-238	4.229560E-01 k	-240	1.353459E+01 k	-242	0.000000E+00 -
-248	1.000000E+00 -	-249	1.020367E-01 k	-250	1.020367E-01 k	-252	1.023720E-01 k	-254	3.600000E-02 -
-256	3.685392E-03 k	-258	1.068315E+00 k	-260	-1.800011E+01 k	-262	0.000000E+00 -	-264	0.000000E+00 k
-266	1.068315E+00 k	-268	3.418607E+01 k	-270	0.000000E+00 -	-308	5.565619E+02 k	-309	5.565556E+02 k
-310	5.565588E+02 k	-318	1.008636E+00 k	-319	1.008963E+00 k	-320	1.008800E+00 k	-330	-3.454234E-01 k
-332	-3.422507E-01 k	-334	-7.390440E-01 k	-336	1.162000E+00 k	-338	4.229560E-01 k	-340	1.353459E+01 k
-342	0.000000E+00 -	-348	1.000000E+00 -	-349	9.787679E-02 k	-350	9.787679E-02 k	-352	9.580714E-02 k
-354	3.600000E-02 -	-356	3.449057E-03 k	-358	1.068551E+00 k	-360	-1.854125E+01 k	-362	0.000000E+00 -
-364	0.000000E+00 k	-366	1.068551E+00 k	-368	3.419363E+01 k	-370	0.000000E+00 -	-406	7.703760E-02 -
-408	4.580000E-01 -	-410	-1.000000E-01 -	-412	-1.000000E-01 -	-414	-1.000000E+00 -	-430	-6.386485E+06 pa
-432	-1.000000E+02 paxs	-434	-6.386493E+06 pa	-436	1.817000E+05 w	-438	1.000000E+00 -	-440	0.000000E+00 -
-442	1.000000E+00 -	-444	4.087000E+05 w	-446	5.904000E+05 w	-448	0.000000E+00 -	-450	0.000000E+00 w
-521	-1.000000E+07 pa	-621	-1.000000E+07 pa	-721	-1.000000E+07 pa	-1000	1.000000E+00 -	-1001	1.000000E-06 -
-1002	8.803228E+06 -	-1004	2.581882E-01 -	-1005	2.579878E-01 -	-1006	2.620122E-01 -	-1007	1.000000E-01 s
-1008	2.720122E-01 -	-1009	-6.473514E+01 kg/s	-1010	-1.568533E-01 -	-1011	1.151590E-01 -	-1012	1.000000E-01 s
-1013	1.000000E-01 -	-1014	1.000000E-01 -	-1104	3.433117E+03 pa	-1106	4.967440E+01 m2xsqrt(pa)	-1109	2.937199E+02 kg/s
-1110	1.000000E+00 -	-1112	0.000000E+00 -	-1114	0.000000E+00 -	-1116	1.000000E+00 -	-1118	0.000000E+00 -
-1160	0.000000E+00 -	-1162	0.000000E+00 -	-1704	5.957062E+04 pa	-1706	3.587818E+02 kg/s	-2000	1.000000E+00 kg/s
-2001	1.789989E+00 kg/s	-2002	2.223089E+00 kg/s	-2004	1.767455E-01 -	-2005	1.763173E-01 -	-2006	3.436827E-01 -
-2007	1.000000E-01 s	-2008	3.536827E-01 -	-2009	-1.499539E+02 kg/s	-2010	-3.633383E-01 -	-2011	-9.655595E-03 -
-2012	-1.000000E-01 s	-2013	-1.965560E-02 -	-2014	0.000000E+00 -	-2104	3.939760E+03 pa	-2106	5.321366E+00 m2xsqrt(pa)
-2109	3.146472E+01	-2110	0.000000E+00	-2112	0.000000E+00	-2114	0.000000E+00	-2116	0.000000E+00

```
            kg/s                        -                          -                          -                          -
-2118   0.000000E+00   -2160   0.000000E+00   -2162   0.000000E+00   -2704   5.957063E+04   -2706   1.812569E+02
                -                          -                          -                         pa                       kg/s
-3000   1.000000E+00   -3001   8.081471E-01   -3002   3.716260E+02   -3004   6.626004E-01   -3004   6.626004E-01
         m2xsqrt(pa)                m2xsqrt(pa)                m2xsqrt(pa)                   -                          -
-3005   6.626057E-01   -3005   6.626057E-01   -3006  -1.426057E-01   -3006  -1.426057E-01   -3007  -1.000000E-01
                -                          -                          -                          -                          s
-3007  -1.000000E-01   -3008  -1.526057E-01   -3008  -1.526057E-01   -3009   1.203087E+02   -3009   1.203087E+02
                s                          -                          -                        kg/s                       kg/s
-3010   2.915081E-01   -3010   2.915081E-01   -3011   1.389024E-01   -3011   1.389024E-01   -3012   1.000000E-01
                -                          -                          -                          -                          s
-3012   1.000000E-01   -3013   1.000000E-01   -3013   1.000000E-01   -3014   1.000000E-01   -3014   1.000000E-01
                s                          -                          -                          -                          -
-3104   3.044746E+03   -3104   3.044746E+03   -3106   8.111290E+01   -3106   4.678039E+01   -3109   4.796127E+02
               pa                         pa                m2xsqrt(pa)                m2xsqrt(pa)                     kg/s
-3110   1.000000E+00   -3112   0.000000E+00   -3114   1.000000E+00   -3116   1.000000E+00   -3118   1.000000E+00
                -                          -                          -                          -                          -
-3160   0.000000E+00   -3162   0.000000E+00   -3704   5.957172E+04   -3706   3.587852E+02   -4241   5.617200E+06
                -                          -                         pa                       kg/s                        pa
-4242   1.000000E+00   -4243   5.200000E-01   -4300   5.593000E+02   -4302   3.812800E+06   -4304   5.751000E+02
                -                          -                          k                         pa                         k
-4310   5.570999E+02   -4312   5.570999E+02   -4314   5.570999E+02   -4316  -2.200115E+00   -4318   0.000000E+00
                k                          k                          k                          k                          -
-4320   0.000000E+00   -4330   5.573116E+02   -4332  -1.778840E+01   -4334   0.000000E+00   -4336   0.000000E+00
                -                          k                          k                          -                          -
-4338   0.000000E+00   -4340   0.000000E+00   -4342   0.000000E+00
                -                          -                          -

****************************************** trip set status at time  400.39894 s ******************************************

   id    set status        id    set status        id    set status        id    set status        id    set status

    1    on-forward        10    on-forward        12    on-forward        14    on-forward        16    on-forward
   18    on-forward        20    on-forward        21    on-forward        22       off            24       off
   26    on-forward        28    on-forward        30       off            32    on-forward        34    on-forward
   36       off            38       off            40       off            42       off            44    on-forward
   46    on-forward        48       off            50       off            52       off            54    on-forward
   56       off            58    on-forward        60    on-forward       100    on-forward       110       off
  120    on-forward       200       off           210       off           220    on-forward       300       off
  310       off           320    on-forward      -407       off           422    on-reverse       423       off
  450    on-reverse       460    on-reverse       520    on-reverse       620    on-reverse       720    on-reverse
 1001       off          1002       off          1003       off          1010    on-forward      1020    on-forward
 1030       off          1040       off          1050       off          1060       off          1500    on-forward
 2010    on-forward      2020    on-forward      2030       off          2040       off          2050       off
 2060       off          3010       off          3020       off          3030       off          3040    on-forward
 3050    on-forward      3060       off          3500    on-forward      9996       off          9997       off
 9998       off          9999       off

**************************************** trip signal values at time  400.39894 s ****************************************

   id     trp.sig.         id     trp.sig.         id     trp.sig.         id     trp.sig.         id     trp.sig.

    1   4.003989E+02       10   2.000000E+00       12   5.000000E+00       14   2.000000E+00       16   1.000000E+00
                   s                  -                  -                  -                  -
   18   1.000000E+00       20   1.000000E+00       21   1.000000E+00       22   1.000000E+00       24   1.000000E+00
                   -                  -                  -                  -                  -
   26   2.000000E+00       28   1.000000E+00       30   0.000000E+00       32   1.000000E+00       34   2.000000E+00
                   -                  -                  -                  -                  -
   36   0.000000E+00       38   0.000000E+00       40   0.000000E+00       42   0.000000E+00       44   1.000000E+00
                   -                  -                  -                  -                  -
   46   2.000000E+00       48   0.000000E+00       50   0.000000E+00       52   5.396170E+07       54   9.126515E+06
                   -                  -                  -                  w                 pa
   56   7.703760E-02       58   9.126515E+06       60   9.126515E+06      100   1.000000E+00      110   4.253017E+03
                   -                 pa                 pa                  -               kg/s
  120   5.568462E+02      200   1.000000E+00      210   4.244743E+03      220   5.570999E+02      300   1.000000E+00
                   k                  -               kg/s                  k                  -
  310   4.266485E+03      320   5.565588E+02     -407   7.703760E-02      422   3.000000E+00      423   4.003989E+02
                kg/s                  k                  -                  -                  s
  450   9.126515E+06      460   9.126515E+06      520  -5.016517E+06      620  -5.016643E+06      720  -5.016543E+06
                  pa                 pa                  m                  m                  m
 1001   4.818885E+02     1002   3.838753E+02     1003   8.657638E+02     1010   2.579878E-01     1020   2.579878E-01
                  pa                 pa                 pa                  -                  -
 1030   2.579878E-01     1040  -6.473514E+01     1050   2.937199E+02     1060   6.663643E+06     1500   2.382282E+00
                   -               kg/s               kg/s                 pa               kg/s
 2010   1.763173E-01     2020   1.763173E-01     2030   1.763173E-01     2040  -1.499539E+02     2050   3.146472E+01
                   -                  -                  -               kg/s               kg/s
 2060   6.663161E+06     3010   6.626057E-01     3020   6.626057E-01     3030   6.626057E-01     3040   1.203087E+02
                  pa                  -                  -                  -               kg/s
 3050   4.796127E+02     3060   6.664027E+06     3500  -2.382275E+00     9996   4.003989E+02     9997   4.003989E+02
                kg/s                 pa               kg/s                  s                  s
 9998   4.003989E+02     9999   4.003989E+02
                   s                  s

at time     63.8013 s in component number 938 at cell    1, the maximum stanton number is 1.663668E+05
at time      0.0075 s in component number 906 at cell    1, the minimum tld is 6.203117E+02 k
             where tld is the liquid temperature at bubble detachment from a heated surface

----------------------------------------------------------------------------------------------------------------------------
            1                                                                                                   1   00000
           11   time is    400.715733 s, time-step size is     0.316792 s, time-step number is  2058           11    0    0
            1                                                                                                   1    0    0
            1                                    $10$ hot leg 1                                                 1    0    0
          111                                                                                                 111   00000
----------------------------------------------------------------------------------------------------------------------------
the component type is a pipe, component number is  10, first junction number is  10, and second junction number is  12
```

```
                    ncd-gas
     pressure       pressure    void fr. temp.sat. temp.liq. temp.gas    den.liq.  den.vap.    vel.liq.    vel.gas   wf.liq.
cell    pa             pa          -         k         k         k        kg/m3     kg/m3        m/s         m/s        -
  1 9.15284E+06 0.00000E+00 0.000E+00 5.777E+02 5.570E+02 5.777E+02 7.489E+02 4.976E+01  1.332E+01  1.333E+01 7.907E-02
  2 9.15214E+06 0.00000E+00 0.000E+00 5.777E+02 5.570E+02 5.777E+02 7.489E+02 4.976E+01  1.333E+01  1.333E+01 3.114E-03
  3 9.15146E+06 0.00000E+00 0.000E+00 5.777E+02 5.570E+02 5.777E+02 7.489E+02 4.976E+01  1.333E+01  1.333E+01 3.114E-03
  4 9.15078E+06 0.00000E+00 0.000E+00 5.777E+02 5.570E+02 5.777E+02 7.489E+02 4.975E+01  1.333E+01  1.333E+01 3.114E-03
  5 9.15028E+06 0.00000E+00 0.000E+00 5.777E+02 5.570E+02 5.777E+02 7.489E+02 4.975E+01  1.333E+01  1.333E+01 3.114E-03
  6 9.14977E+06 0.00000E+00 0.000E+00 5.777E+02 5.570E+02 5.777E+02 7.489E+02 4.974E+01  1.333E+01  1.333E+01 3.114E-03
  7                                                                                        1.166E+01  1.166E+01 1.771E-01

    idr   liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
cell  -    ----- w/m2/k ------    w/k         w          w          k             k
  1  1.0  3.481E+04 0.000E+00 5.543E+04-2.638E+03 0.000E+00 5.782E+02    556.93
  2  1.0  3.481E+04 0.000E+00 5.543E+04-2.635E+03 0.000E+00 5.782E+02    556.93
  3  1.0  3.481E+04 0.000E+00 5.542E+04-2.633E+03 0.000E+00 5.782E+02    556.93
  4  1.0  3.481E+04 0.000E+00 5.542E+04-2.630E+03 0.000E+00 5.782E+02    556.93
  5  1.0  3.481E+04 0.000E+00 2.716E+04-2.629E+03 0.000E+00 5.782E+02    556.93
  6  1.0  3.284E+04 0.000E+00 5.487E+04-2.615E+03 0.000E+00 5.782E+02    556.92

total power to the component from all heat-transfer surfaces is -4.183734E+04   w
total power to the liquid is -4.183734E+04   w    and total power to the gas is  0.000000E+00   w

total convective energy transported to the fluid from component wall:  1.5690567E+08 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                  inside convective energy error: absolute=  8.01808E+07 w*s     effective=  1.52041E+06 w*s

pipe wall total power loss on the inner surface is  4.03252E+04   w    and on the outer surface is  0.00000E+00   w

pipe  component  total coolant mass is  2.11432E+03 kg , total coolant energy is  2.62907E+09 w*s, and
computed initial total coolant mass is  1.93238E+03 kg

##########  4157 lines deleted here  ##########

---------------------------------------------------------------------------------------------------------------------
  1   00000 99999                                                                                                77777
 11    0    0 9   9 time is    400.715733 s, time-step size is    0.316792 s, time-step number is  2058               7
  1    0    0 99999                                                                                                 7
  1    0    0     9                               $7$ rod guide tube 6 (short)                                     7
111  00000 99999                                                                                                  7
---------------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is   7, first junction number is   7, and second junction number is  99

                    ncd-gas
     pressure       pressure    void fr. temp.sat. temp.liq. temp.gas    den.liq.  den.vap.    vel.liq.    vel.gas   wf.liq.
cell    pa             pa          -         k         k         k        kg/m3     kg/m3        m/s         m/s        -
  1 9.26886E+06 0.00000E+00 0.000E+00 5.786E+02 5.567E+02 5.786E+02 7.496E+02 5.052E+01  6.970E-01  7.000E-01 2.509E-02
  2 9.26233E+06 0.00000E+00 0.000E+00 5.786E+02 5.567E+02 5.786E+02 7.496E+02 5.048E+01  6.970E-01  7.000E-01 7.078E-03
  3                                                                                        6.971E-01  7.000E-01 3.632E-02

pipe  component  total coolant mass is  2.76169E+01 kg , total coolant energy is  3.42925E+07 w*s, and
computed initial total coolant mass is  2.61042E+01 kg

---------------------------------------------------------------------------------------------------------------------
  1     1   00000                                                                                                   1
 11    11    0    0 time is    400.715733 s, time-step size is    0.316792 s, time-step number is  2058             11
  1     1    0    0                                                                                                 1
  1     1    0    0                               $1$ reactor vessel                                                1
111   111   00000                                                                                                 111
---------------------------------------------------------------------------------------------------------------------

the component type is a vessel, the component number is   1, and the junction numbers are   10   20   30   19   29   39
                                                                                              2    3    4    5    6    7
                                                                                             94   95   96   97   98   99

level  1 data

alpn       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

rovn       5.15555E+01  5.15550E+01  5.15555E+01  5.15550E+01  5.15555E+01  5.15550E+01  5.16908E+01  5.16907E+01
           5.16907E+01  5.16907E+01  5.16908E+01  5.16908E+01
           kg/m3

roln       7.50694E+02  7.50021E+02  7.49898E+02  7.49752E+02  7.50562E+02  7.51338E+02  7.50695E+02  7.50022E+02
           7.49899E+02  7.49752E+02  7.50562E+02  7.51339E+02
           kg/m3

vvnyt      2.20063E-04  1.40756E-03 -1.04906E-03 -2.92234E-04 -1.73647E-03  1.45006E-03 -6.29893E-02  6.69532E-02
          -6.56007E-02  6.25140E-02 -6.85839E-02  6.77071E-02
           m/s

vvnz       4.53863E+00  4.51791E+00  4.54481E+00  4.52017E+00  4.53969E+00  4.50736E+00 -1.68180E+01 -1.69630E+01
          -1.68231E+01 -1.69643E+01 -1.68187E+01 -1.69552E+01
           m/s

vvnxr     -2.65813E+00 -2.65134E+00 -2.65915E+00 -2.65175E+00 -2.65829E+00 -2.64938E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnyt      1.94136E-04  1.43481E-03 -1.07582E-03 -2.66485E-04 -1.76431E-03  1.47759E-03 -6.29900E-02  6.69533E-02
          -6.56010E-02  6.25147E-02 -6.85836E-02  6.77069E-02
           m/s
```

```
vlnz      4.53436E+00  4.51364E+00  4.54054E+00  4.51590E+00  4.53542E+00  4.50309E+00 -1.68103E+01 -1.69554E+01
         -1.68155E+01 -1.69566E+01 -1.68111E+01 -1.69475E+01
          m/s

vlnxr    -2.65333E+00 -2.64653E+00 -2.65435E+00 -2.64694E+00 -2.65350E+00 -2.64458E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

tvn       5.79848E+02  5.79847E+02  5.79848E+02  5.79847E+02  5.79848E+02  5.79847E+02  5.80004E+02  5.80004E+02
          5.80004E+02  5.80004E+02  5.80004E+02  5.80004E+02
          k

tln       5.56325E+02  5.56649E+02  5.56708E+02  5.56778E+02  5.56388E+02  5.56014E+02  5.56339E+02  5.56663E+02
          5.56723E+02  5.56793E+02  5.56403E+02  5.56028E+02
          k

tsat      5.79848E+02  5.79847E+02  5.79848E+02  5.79847E+02  5.79848E+02  5.79847E+02  5.80004E+02  5.80004E+02
          5.80004E+02  5.80004E+02  5.80004E+02  5.80004E+02
          k

pn        9.42521E+06  9.42515E+06  9.42521E+06  9.42515E+06  9.42521E+06  9.42514E+06  9.44561E+06  9.44560E+06
          9.44561E+06  9.44560E+06  9.44561E+06  9.44561E+06
          pa

pan       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          pa

conc      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

solid     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          kg/m3

level  2 data

alpn      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

rovn      5.13906E+01  5.13906E+01  5.13906E+01  5.13906E+01  5.13906E+01  5.13906E+01  5.22080E+01  5.22099E+01
          5.22078E+01  5.22098E+01  5.22080E+01  5.22101E+01
          kg/m3

roln      7.50682E+02  7.50010E+02  7.49887E+02  7.49742E+02  7.50551E+02  7.51324E+02  7.50753E+02  7.50081E+02
          7.49957E+02  7.49810E+02  7.50621E+02  7.51398E+02
          kg/m3

vvnyt     1.90065E-03 -3.05614E-03  2.74630E-03 -1.81491E-03  3.39388E-03 -3.16986E-03 -6.40245E-02  6.77229E-02
         -6.64377E-02  6.35867E-02 -6.91669E-02  6.83198E-02
          m/s

##########  625 lines deleted here  ##########

pn        9.26226E+06  9.26226E+06  9.26226E+06  9.26226E+06  9.26226E+06  9.26226E+06  9.26227E+06  9.26226E+06
          9.26227E+06  9.26226E+06  9.26227E+06  9.26226E+06
          pa

pan       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          pa

conc      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

solid     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          kg/m3

level 12 data

alpn      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          -

rovn      5.04313E+01  5.04313E+01  5.04314E+01  5.04313E+01  5.04313E+01  5.04313E+01  1.01931E+02  1.01931E+02
          1.01931E+02  1.01931E+02  1.01931E+02  1.01931E+02
          kg/m3

roln      7.44165E+02  7.45138E+02  7.43960E+02  7.45130E+02  7.44156E+02  7.45196E+02  7.08582E+02  7.08582E+02
          7.08582E+02  7.08582E+02  7.08582E+02  7.08582E+02
          kg/m3

vvnyt     3.05397E-03 -2.02638E-02  1.84478E-02 -1.98427E-03  2.13110E-02 -2.00779E-02  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

vvnz      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
          m/s

vvnxr     0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
```

```
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              m/s

vlnyt         3.05397E-03 -2.02637E-02  1.84478E-02 -1.98428E-03  2.13110E-02 -2.00779E-02  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              m/s

vlnz          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              m/s

vlnxr         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              m/s

tvn           5.78529E+02  5.78529E+02  5.78529E+02  5.78529E+02  5.78529E+02  5.78529E+02  6.17905E+02  6.17905E+02
              6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
              k

tln           5.59309E+02  5.58850E+02  5.59406E+02  5.58854E+02  5.59313E+02  5.58823E+02  5.81000E+02  5.81000E+02
              5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
              k

tsat          5.78529E+02  5.78529E+02  5.78529E+02  5.78529E+02  5.78529E+02  5.78529E+02  6.17905E+02  6.17905E+02
              6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
              k

pn            9.25477E+06  9.25477E+06  9.25477E+06  9.25477E+06  9.25477E+06  9.25477E+06  1.55000E+07  1.55000E+07
              1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
              pa

pan           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              pa

conc          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              -

solid         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
              kg/m3

total power to the vessel coolant from all heat surfaces is  5.34273E+07   w
total power to the liquid is  5.34273E+07   w    and total power to the gas is  0.00000E+00   w

vessel lower plenum
liquid volume is  2.33861E+01 m3 , liquid volume fraction is  1.00000E+00 and liquid mass is  1.75485E+04 kg
volume-averaged liquid temperature is  5.56480E+02 k and volume-averaged saturation temperature is  5.79898E+02 k

vessel reactor core
liquid volume fraction is  1.00000E+00 and liquid mass is  1.11593E+04 kg
volume-averaged liquid temperature is  5.56951E+02 k and volume-averaged saturation temperature is  5.79146E+02 k

vessel reactor core
inlet  liquid mass flow is  1.26579E+04  kg/s  and inlet  gas mass flow is  0.00000E+00  kg/s
outlet liquid mass flow is  1.26582E+04  kg/s  and outlet gas mass flow is  0.00000E+00  kg/s

vessel upper plenum
liquid volume fraction is  1.00000E+00 and liquid mass is  2.67356E+04 kg
volume-averaged liquid temperature is  5.57067E+02 k and volume-averaged saturation temperature is  5.79088E+02 k

vessel downcomer
liquid volume fraction is  0.00000E+00, liquid mass is  0.00000E+00 kg , volume-averaged pressure is  0.00000E+00  pa
volume-averaged liquid temperature is  0.00000E+00 k and volume-averaged saturation temperature is  0.00000E+00 k

vessel component total coolant mass is  7.12687E+04 kg , total coolant energy is  8.86564E+10 w*s, and
computed initial total coolant mass is  6.78684E+04 kg

-----------------------------------------------------------------------------------------------------------------
                                                                                                99999 00000 00000
  1     1     1
 11    11    11   time is    400.715733 s, time-step size is    0.316792 s, time-step number is  2058 9   9 0   0 0   0
  1     1     1                                                                                 99999 0   0 0   0
  1     1     1                         $900$ reactor-core fuel rods                                9 0   0 0   0
111   111   111                                                                                 99999 00000 00000
-----------------------------------------------------------------------------------------------------------------


the heat-structure component type is a rod  and the component number is 900

reactor-core power is 5.395027E+07   w    and neutron multiplication constant keff is 0.966184

rod   1   plane (perpendicular to z direction) coupled to cells   0 (inner) and   1 (outer), peaking factor is   1.0000

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.6602E+02 5.6574E+02 5.6490E+02 5.6351E+02 5.6156E+02 5.5721E+02 5.5698E+02 5.5677E+02
1002   2  9.1440E-01 5.7303E+02 5.7255E+02 5.7109E+02 5.6866E+02 5.6529E+02 5.5784E+02 5.5744E+02 5.5707E+02
1003   3  1.8288E+00 5.7443E+02 5.7391E+02 5.7234E+02 5.6974E+02 5.6612E+02 5.5814E+02 5.5772E+02 5.5732E+02
1004   4  2.7432E+00 5.7317E+02 5.7269E+02 5.7125E+02 5.6887E+02 5.6554E+02 5.5821E+02 5.5782E+02 5.5746E+02
1005   5  3.6576E+00 5.6687E+02 5.6658E+02 5.6572E+02 5.6428E+02 5.6227E+02 5.5781E+02 5.5757E+02 5.5735E+02

 id  idi   hliqi        tliqi        hvapi        tvapi     ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k             w/m2/k         k          w/m2/k         k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1750E+04  5.5650E+02  0.0000E+00  5.7940E+02  2.3477E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1760E+04  5.5661E+02  0.0000E+00  5.7940E+02  2.3590E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1770E+04  5.5682E+02  0.0000E+00  5.7923E+02  2.3615E+03
```

1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1784E+04	5.5699E+02	0.0000E+00	5.7906E+02	2.3598E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1804E+04	5.5707E+02	0.0000E+00	5.7890E+02	2.3499E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.6483E+03	0.0000E+00	8.6483E+03	2.8870E+06	3.34E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4909E+04	0.0000E+00	1.4909E+04	2.8896E+06	1.94E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5986E+04	0.0000E+00	1.5986E+04	2.8947E+06	1.81E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4679E+04	0.0000E+00	1.4679E+04	2.8996E+06	1.98E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.9039E+03	0.0000E+00	8.9039E+03	2.9020E+06	3.26E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	2.21022E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	2.97839E-05	5.79225E+02
1003	0.00000E+00	2.73150E+02	3.34575E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	3.30695E-05	5.78891E+02
1005	0.00000E+00	2.73150E+02	2.38011E-05	5.78891E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7790436E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.26569E+09 w*s effective= -3.94502E+08 w*s

rod 2 plane (perpendicular to z direction) coupled to cells 0 (inner) and 2 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6634E+02	5.6606E+02	5.6523E+02	5.6383E+02	5.6188E+02	5.5754E+02	5.5731E+02	5.5709E+02
1002	2	9.1440E-01	5.7335E+02	5.7287E+02	5.7141E+02	5.6899E+02	5.6561E+02	5.5816E+02	5.5777E+02	5.5740E+02
1003	3	1.8288E+00	5.7475E+02	5.7423E+02	5.7267E+02	5.7006E+02	5.6644E+02	5.5847E+02	5.5804E+02	5.5764E+02
1004	4	2.7432E+00	5.7349E+02	5.7301E+02	5.7157E+02	5.6919E+02	5.6586E+02	5.5853E+02	5.5814E+02	5.5778E+02
1005	5	3.6576E+00	5.6720E+02	5.6691E+02	5.6604E+02	5.6460E+02	5.6259E+02	5.5813E+02	5.5789E+02	5.5767E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1737E+04	5.5682E+02	0.0000E+00	5.7940E+02	2.3487E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1748E+04	5.5693E+02	0.0000E+00	5.7940E+02	2.3600E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1753E+04	5.5714E+02	0.0000E+00	5.7923E+02	2.3625E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1756E+04	5.5732E+02	0.0000E+00	5.7906E+02	2.3608E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1753E+04	5.5739E+02	0.0000E+00	5.7890E+02	2.3509E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.6467E+03	0.0000E+00	8.6467E+03	2.8879E+06	3.34E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4907E+04	0.0000E+00	1.4907E+04	2.8905E+06	1.94E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5984E+04	0.0000E+00	1.5984E+04	2.8958E+06	1.81E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4677E+04	0.0000E+00	1.4677E+04	2.9012E+06	1.98E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.9019E+03	0.0000E+00	8.9019E+03	2.9039E+06	3.26E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	2.24158E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	3.02227E-05	5.79225E+02
1003	0.00000E+00	2.73150E+02	3.39624E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	3.35870E-05	5.78891E+02
1005	0.00000E+00	2.73150E+02	2.41890E-05	5.78891E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7792603E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.26296E+09 w*s effective= -3.71284E+08 w*s

rod 3 plane (perpendicular to z direction) coupled to cells 0 (inner) and 3 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6640E+02	5.6612E+02	5.6528E+02	5.6389E+02	5.6194E+02	5.5760E+02	5.5737E+02	5.5715E+02
1002	2	9.1440E-01	5.7341E+02	5.7292E+02	5.7146E+02	5.6904E+02	5.6566E+02	5.5822E+02	5.5782E+02	5.5746E+02
1003	3	1.8288E+00	5.7481E+02	5.7429E+02	5.7272E+02	5.7012E+02	5.6649E+02	5.5852E+02	5.5810E+02	5.5770E+02
1004	4	2.7432E+00	5.7354E+02	5.7306E+02	5.7163E+02	5.6924E+02	5.6591E+02	5.5859E+02	5.5820E+02	5.5784E+02
1005	5	3.6576E+00	5.6725E+02	5.6696E+02	5.6610E+02	5.6466E+02	5.6265E+02	5.5819E+02	5.5795E+02	5.5773E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1763E+04	5.5688E+02	0.0000E+00	5.7940E+02	2.3488E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1772E+04	5.5699E+02	0.0000E+00	5.7940E+02	2.3601E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1783E+04	5.5720E+02	0.0000E+00	5.7923E+02	2.3627E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1798E+04	5.5738E+02	0.0000E+00	5.7906E+02	2.3609E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1818E+04	5.5745E+02	0.0000E+00	5.7890E+02	2.3510E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.6439E+03	0.0000E+00	8.6439E+03	2.8870E+06	3.34E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4904E+04	0.0000E+00	1.4904E+04	2.8896E+06	1.94E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5981E+04	0.0000E+00	1.5981E+04	2.8947E+06	1.81E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4674E+04	0.0000E+00	1.4674E+04	2.8996E+06	1.98E+02

1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.8992E+03	0.0000E+00	8.8992E+03	2.9020E+06	3.26E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.24417E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	3.02758E-05	5.79224E+02
1003	0.00000E+00	2.73150E+02	3.40163E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	3.36241E-05	5.78890E+02
1005	0.00000E+00	2.73150E+02	2.41829E-05	5.78890E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7792357E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.25186E+09 w*s effective= -3.73465E+08 w*s

rod 4 plane (perpendicular to z direction) coupled to cells 0 (inner) and 4 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6647E+02	5.6619E+02	5.6535E+02	5.6395E+02	5.6200E+02	5.5767E+02	5.5743E+02	5.5722E+02
1002	2	9.1440E-01	5.7348E+02	5.7299E+02	5.7153E+02	5.6911E+02	5.6573E+02	5.5829E+02	5.5789E+02	5.5753E+02
1003	3	1.8288E+00	5.7488E+02	5.7435E+02	5.7279E+02	5.7019E+02	5.6656E+02	5.5859E+02	5.5817E+02	5.5777E+02
1004	4	2.7432E+00	5.7361E+02	5.7313E+02	5.7170E+02	5.6931E+02	5.6598E+02	5.5866E+02	5.5827E+02	5.5791E+02
1005	5	3.6576E+00	5.6732E+02	5.6703E+02	5.6616E+02	5.6473E+02	5.6272E+02	5.5826E+02	5.5802E+02	5.5780E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1740E+04	5.5695E+02	0.0000E+00	5.7940E+02	2.3491E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1751E+04	5.5706E+02	0.0000E+00	5.7940E+02	2.3604E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1757E+04	5.5727E+02	0.0000E+00	5.7923E+02	2.3629E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1760E+04	5.5745E+02	0.0000E+00	5.7906E+02	2.3611E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1757E+04	5.5752E+02	0.0000E+00	5.7890E+02	2.3513E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.6410E+03	0.0000E+00	8.6410E+03	2.8879E+06	3.34E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4901E+04	0.0000E+00	1.4901E+04	2.8905E+06	1.94E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5978E+04	0.0000E+00	1.5978E+04	2.8958E+06	1.81E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4671E+04	0.0000E+00	1.4671E+04	2.9012E+06	1.98E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.8964E+03	0.0000E+00	8.8964E+03	2.9039E+06	3.26E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.25215E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	3.03921E-05	5.79225E+02
1003	0.00000E+00	2.73150E+02	3.41540E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	3.37756E-05	5.78891E+02
1005	0.00000E+00	2.73150E+02	2.43084E-05	5.78891E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7793407E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.25601E+09 w*s effective= -3.62639E+08 w*s

rod 5 plane (perpendicular to z direction) coupled to cells 0 (inner) and 5 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6608E+02	5.6580E+02	5.6496E+02	5.6357E+02	5.6162E+02	5.5728E+02	5.5705E+02	5.5683E+02
1002	2	9.1440E-01	5.7309E+02	5.7261E+02	5.7115E+02	5.6873E+02	5.6535E+02	5.5790E+02	5.5751E+02	5.5714E+02
1003	3	1.8288E+00	5.7449E+02	5.7397E+02	5.7240E+02	5.6980E+02	5.6618E+02	5.5820E+02	5.5778E+02	5.5738E+02
1004	4	2.7432E+00	5.7323E+02	5.7275E+02	5.7131E+02	5.6893E+02	5.6560E+02	5.5827E+02	5.5788E+02	5.5752E+02
1005	5	3.6576E+00	5.6693E+02	5.6664E+02	5.6578E+02	5.6434E+02	5.6233E+02	5.5787E+02	5.5763E+02	5.5741E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1753E+04	5.5656E+02	0.0000E+00	5.7940E+02	2.3479E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1762E+04	5.5667E+02	0.0000E+00	5.7940E+02	2.3592E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1772E+04	5.5688E+02	0.0000E+00	5.7923E+02	2.3617E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1786E+04	5.5706E+02	0.0000E+00	5.7906E+02	2.3600E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1807E+04	5.5713E+02	0.0000E+00	5.7890E+02	2.3501E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.6455E+03	0.0000E+00	8.6455E+03	2.8870E+06	3.34E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4906E+04	0.0000E+00	1.4906E+04	2.8896E+06	1.94E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5983E+04	0.0000E+00	1.5983E+04	2.8947E+06	1.81E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4676E+04	0.0000E+00	1.4676E+04	2.8996E+06	1.98E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.9011E+03	0.0000E+00	8.9011E+03	2.9020E+06	3.26E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.21519E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	2.98638E-05	5.79225E+02
1003	0.00000E+00	2.73150E+02	3.35479E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	3.31583E-05	5.78890E+02

1005	0.00000E+00	2.73150E+02	2.38568E-05	5.78890E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7790840E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.25989E+09 w*s effective= -3.90166E+08 w*s

rod 6 plane (perpendicular to z direction) coupled to cells 0 (inner) and 6 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6571E+02	5.6543E+02	5.6460E+02	5.6320E+02	5.6125E+02	5.5691E+02	5.5667E+02	5.5646E+02
1002	2	9.1440E-01	5.7272E+02	5.7224E+02	5.7078E+02	5.6836E+02	5.6498E+02	5.5753E+02	5.5713E+02	5.5677E+02
1003	3	1.8288E+00	5.7413E+02	5.7360E+02	5.7204E+02	5.6944E+02	5.6581E+02	5.5783E+02	5.5741E+02	5.5701E+02
1004	4	2.7432E+00	5.7286E+02	5.7238E+02	5.7095E+02	5.6856E+02	5.6524E+02	5.5790E+02	5.5751E+02	5.5715E+02
1005	5	3.6576E+00	5.6657E+02	5.6628E+02	5.6541E+02	5.6398E+02	5.6197E+02	5.5750E+02	5.5726E+02	5.5704E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1719E+04	5.5619E+02	0.0000E+00	5.7940E+02	2.3467E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1729E+04	5.5630E+02	0.0000E+00	5.7940E+02	2.3580E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1734E+04	5.5651E+02	0.0000E+00	5.7923E+02	2.3606E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1734E+04	5.5669E+02	0.0000E+00	5.7906E+02	2.3588E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1728E+04	5.5676E+02	0.0000E+00	5.7890E+02	2.3489E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.6496E+03	0.0000E+00	8.6496E+03	2.8878E+06	3.34E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4910E+04	0.0000E+00	1.4910E+04	2.8904E+06	1.94E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5987E+04	0.0000E+00	1.5987E+04	2.8957E+06	1.81E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4680E+04	0.0000E+00	1.4680E+04	2.9012E+06	1.98E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.9054E+03	0.0000E+00	8.9054E+03	2.9040E+06	3.26E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.18483E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	2.94180E-05	5.79225E+02
1003	0.00000E+00	2.73150E+02	3.30476E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	3.26781E-05	5.78892E+02
1005	0.00000E+00	2.73150E+02	2.35552E-05	5.78892E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7789419E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.29457E+09 w*s effective= -4.06157E+08 w*s

rod 7 plane (perpendicular to z direction) coupled to cells 0 (inner) and -1 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7254E+02	5.7207E+02	5.7064E+02	5.6828E+02	5.6498E+02	5.5770E+02	5.5732E+02	5.5696E+02
1002	2	9.1440E-01	5.8426E+02	5.8343E+02	5.8095E+02	5.7683E+02	5.7110E+02	5.5868E+02	5.5801E+02	5.5739E+02
1003	3	1.8288E+00	5.8647E+02	5.8558E+02	5.8291E+02	5.7849E+02	5.7234E+02	5.5904E+02	5.5833E+02	5.5766E+02
1004	4	2.7432E+00	5.8422E+02	5.8340E+02	5.8096E+02	5.7690E+02	5.7126E+02	5.5904E+02	5.5838E+02	5.5777E+02
1005	5	3.6576E+00	5.7358E+02	5.7309E+02	5.7162E+02	5.6919E+02	5.6579E+02	5.5831E+02	5.5791E+02	5.5754E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1750E+04	5.5650E+02	0.0000E+00	5.7940E+02	2.3580E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1760E+04	5.5661E+02	0.0000E+00	5.7940E+02	2.3768E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1770E+04	5.5682E+02	0.0000E+00	5.7923E+02	2.3806E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1784E+04	5.5699E+02	0.0000E+00	5.7906E+02	2.3773E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1804E+04	5.5707E+02	0.0000E+00	5.7890E+02	2.3605E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4561E+04	0.0000E+00	1.4561E+04	2.8870E+06	1.98E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5066E+04	0.0000E+00	2.5066E+04	2.8896E+06	1.15E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6872E+04	0.0000E+00	2.6872E+04	2.8947E+06	1.08E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4678E+04	0.0000E+00	2.4678E+04	2.8996E+06	1.17E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4988E+04	0.0000E+00	1.4988E+04	2.9020E+06	1.94E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.72135E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	5.61658E-05	5.79225E+02
1003	0.00000E+00	2.73150E+02	6.21926E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	5.98209E-05	5.78891E+02
1005	0.00000E+00	2.73150E+02	4.00640E-05	5.78891E+02

rod 8 plane (perpendicular to z direction) coupled to cells 0 (inner) and -2 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7286E+02	5.7239E+02	5.7096E+02	5.6860E+02	5.6530E+02	5.5803E+02	5.5764E+02	5.5728E+02
1002	2	9.1440E-01	5.8458E+02	5.8375E+02	5.8127E+02	5.7715E+02	5.7142E+02	5.5901E+02	5.5834E+02	5.5772E+02
1003	3	1.8288E+00	5.8680E+02	5.8590E+02	5.8323E+02	5.7881E+02	5.7265E+02	5.5937E+02	5.5865E+02	5.5799E+02
1004	4	2.7432E+00	5.8454E+02	5.8373E+02	5.8128E+02	5.7722E+02	5.7158E+02	5.5936E+02	5.5870E+02	5.5810E+02
1005	5	3.6576E+00	5.7390E+02	5.7341E+02	5.7195E+02	5.6951E+02	5.6611E+02	5.5863E+02	5.5823E+02	5.5786E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1737E+04	5.5682E+02	0.0000E+00	5.7940E+02	2.3590E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1748E+04	5.5693E+02	0.0000E+00	5.7940E+02	2.3778E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1753E+04	5.5714E+02	0.0000E+00	5.7923E+02	2.3816E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1756E+04	5.5732E+02	0.0000E+00	5.7906E+02	2.3783E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1753E+04	5.5739E+02	0.0000E+00	5.7890E+02	2.3615E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4560E+04	0.0000E+00	1.4560E+04	2.8879E+06	1.98E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5064E+04	0.0000E+00	2.5064E+04	2.8905E+06	1.15E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6870E+04	0.0000E+00	2.6870E+04	2.8958E+06	1.08E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4676E+04	0.0000E+00	2.4676E+04	2.9012E+06	1.18E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4986E+04	0.0000E+00	1.4986E+04	2.9039E+06	1.94E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.77446E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	5.69882E-05	5.79225E+02
1003	0.00000E+00	2.73150E+02	6.31271E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	6.07561E-05	5.78891E+02
1005	0.00000E+00	2.73150E+02	4.07207E-05	5.78891E+02

rod 9 plane (perpendicular to z direction) coupled to cells 0 (inner) and -3 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7292E+02	5.7244E+02	5.7102E+02	5.6865E+02	5.6536E+02	5.5809E+02	5.5770E+02	5.5734E+02
1002	2	9.1440E-01	5.8464E+02	5.8381E+02	5.8133E+02	5.7720E+02	5.7147E+02	5.5906E+02	5.5840E+02	5.5778E+02
1003	3	1.8288E+00	5.8685E+02	5.8596E+02	5.8329E+02	5.7886E+02	5.7271E+02	5.5942E+02	5.5871E+02	5.5804E+02
1004	4	2.7432E+00	5.8460E+02	5.8378E+02	5.8133E+02	5.7728E+02	5.7163E+02	5.5942E+02	5.5876E+02	5.5815E+02
1005	5	3.6576E+00	5.7396E+02	5.7347E+02	5.7200E+02	5.6956E+02	5.6616E+02	5.5869E+02	5.5829E+02	5.5792E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1763E+04	5.5688E+02	0.0000E+00	5.7940E+02	2.3592E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1772E+04	5.5699E+02	0.0000E+00	5.7940E+02	2.3780E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1783E+04	5.5720E+02	0.0000E+00	5.7923E+02	2.3818E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1798E+04	5.5738E+02	0.0000E+00	5.7906E+02	2.3785E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1818E+04	5.5745E+02	0.0000E+00	5.7890E+02	2.3617E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4557E+04	0.0000E+00	1.4557E+04	2.8870E+06	1.98E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5061E+04	0.0000E+00	2.5061E+04	2.8896E+06	1.15E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6868E+04	0.0000E+00	2.6868E+04	2.8947E+06	1.08E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4674E+04	0.0000E+00	2.4674E+04	2.8996E+06	1.18E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4983E+04	0.0000E+00	1.4983E+04	2.9020E+06	1.94E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.77932E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	5.70837E-05	5.79224E+02
1003	0.00000E+00	2.73150E+02	6.32226E-05	5.79058E+02
1004	0.00000E+00	2.73150E+02	6.08198E-05	5.78890E+02
1005	0.00000E+00	2.73150E+02	4.07154E-05	5.78890E+02

rod 10 plane (perpendicular to z direction) coupled to cells 0 (inner) and -4 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7299E+02	5.7251E+02	5.7109E+02	5.6872E+02	5.6542E+02	5.5816E+02	5.5777E+02	5.5741E+02
1002	2	9.1440E-01	5.8471E+02	5.8388E+02	5.8139E+02	5.7727E+02	5.7154E+02	5.5913E+02	5.5847E+02	5.5785E+02
1003	3	1.8288E+00	5.8692E+02	5.8603E+02	5.8336E+02	5.7893E+02	5.7278E+02	5.5949E+02	5.5878E+02	5.5811E+02
1004	4	2.7432E+00	5.8466E+02	5.8385E+02	5.8140E+02	5.7734E+02	5.7170E+02	5.5949E+02	5.5883E+02	5.5822E+02
1005	5	3.6576E+00	5.7402E+02	5.7353E+02	5.7207E+02	5.6963E+02	5.6623E+02	5.5876E+02	5.5836E+02	5.5799E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1740E+04	5.5695E+02	0.0000E+00	5.7940E+02	2.3594E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1751E+04	5.5706E+02	0.0000E+00	5.7940E+02	2.3782E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1757E+04	5.5727E+02	0.0000E+00	5.7923E+02	2.3820E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1760E+04	5.5745E+02	0.0000E+00	5.7906E+02	2.3787E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1757E+04	5.5752E+02	0.0000E+00	5.7890E+02	2.3619E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4554E+04	0.0000E+00	1.4554E+04	2.8879E+06	1.98E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5059E+04	0.0000E+00	2.5059E+04	2.8905E+06	1.15E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.6865E+04	0.0000E+00	2.6865E+04	2.8958E+06	1.08E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4671E+04	0.0000E+00	2.4671E+04	2.9012E+06	1.18E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4980E+04	0.0000E+00	1.4980E+04	2.9039E+06	1.94E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.79327E-05	5.79391E+02
1002	0.00000E+00	2.73150E+02	5.73034E-05	5.79225E+02

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1003  0.00000E+00  2.73150E+02  6.34798E-05  5.79058E+02
1004  0.00000E+00  2.73150E+02  6.10963E-05  5.78891E+02
1005  0.00000E+00  2.73150E+02  4.09320E-05  5.78891E+02

rod  11   plane (perpendicular to z direction) coupled to cells   0 (inner) and  -5 (outer), peaking factor is   1.6780

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.7260E+02 5.7213E+02 5.7070E+02 5.6834E+02 5.6504E+02 5.5777E+02 5.5738E+02 5.5702E+02
1002   2  9.1440E-01 5.8432E+02 5.8349E+02 5.8101E+02 5.7689E+02 5.7116E+02 5.5874E+02 5.5808E+02 5.5746E+02
1003   3  1.8288E+00 5.8653E+02 5.8564E+02 5.8297E+02 5.7855E+02 5.7240E+02 5.5911E+02 5.5839E+02 5.5773E+02
1004   4  2.7432E+00 5.8428E+02 5.8346E+02 5.8102E+02 5.7696E+02 5.7132E+02 5.5910E+02 5.5844E+02 5.5783E+02
1005   5  3.6576E+00 5.7364E+02 5.7315E+02 5.7168E+02 5.6925E+02 5.6585E+02 5.5837E+02 5.5797E+02 5.5760E+02

 id  idi   hliqi        tliqi        hvapi        tvapi       ido   hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k         k          w/m2/k         k               w/m2/k         k          w/m2/k         k          w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1753E+04  5.5656E+02  0.0000E+00  5.7940E+02  2.3582E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1762E+04  5.5667E+02  0.0000E+00  5.7940E+02  2.3770E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1772E+04  5.5688E+02  0.0000E+00  5.7923E+02  2.3808E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1786E+04  5.5706E+02  0.0000E+00  5.7906E+02  2.3775E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1807E+04  5.5713E+02  0.0000E+00  5.7890E+02  2.3607E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2         -         w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4559E+04  0.0000E+00  1.4559E+04  2.8870E+06  1.98E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.5063E+04  0.0000E+00  2.5063E+04  2.8896E+06  1.15E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.6869E+04  0.0000E+00  2.6869E+04  2.8947E+06  1.08E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.4675E+04  0.0000E+00  2.4675E+04  2.8996E+06  1.18E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4985E+04  0.0000E+00  1.4985E+04  2.9020E+06  1.94E+02

        stanton     liq.temp.     stanton     liq.temp.
         number    bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  2.73150E+02  3.73021E-05  5.79391E+02
1002  0.00000E+00  2.73150E+02  5.63144E-05  5.79225E+02
1003  0.00000E+00  2.73150E+02  6.23588E-05  5.79058E+02
1004  0.00000E+00  2.73150E+02  5.99809E-05  5.78890E+02
1005  0.00000E+00  2.73150E+02  4.01628E-05  5.78890E+02

rod  12   plane (perpendicular to z direction) coupled to cells   0 (inner) and  -6 (outer), peaking factor is   1.6780

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.7223E+02 5.7176E+02 5.7034E+02 5.6797E+02 5.6467E+02 5.5740E+02 5.5701E+02 5.5665E+02
1002   2  9.1440E-01 5.8395E+02 5.8312E+02 5.8064E+02 5.7652E+02 5.7080E+02 5.5837E+02 5.5771E+02 5.5709E+02
1003   3  1.8288E+00 5.8617E+02 5.8528E+02 5.8261E+02 5.7818E+02 5.7203E+02 5.5874E+02 5.5802E+02 5.5736E+02
1004   4  2.7432E+00 5.8391E+02 5.8310E+02 5.8065E+02 5.7660E+02 5.7096E+02 5.5873E+02 5.5807E+02 5.5746E+02
1005   5  3.6576E+00 5.7327E+02 5.7279E+02 5.7132E+02 5.6888E+02 5.6549E+02 5.5800E+02 5.5760E+02 5.5723E+02

 id  idi   hliqi        tliqi        hvapi        tvapi       ido   hliqo        tliqo        hvapo        tvapo        hgap
           w/m2/k         k          w/m2/k         k               w/m2/k         k          w/m2/k         k          w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1719E+04  5.5619E+02  0.0000E+00  5.7940E+02  2.3571E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1729E+04  5.5630E+02  0.0000E+00  5.7940E+02  2.3758E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1734E+04  5.5651E+02  0.0000E+00  5.7923E+02  2.3797E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1734E+04  5.5669E+02  0.0000E+00  5.7906E+02  2.3764E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1728E+04  5.5676E+02  0.0000E+00  5.7890E+02  2.3596E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2         -         w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4563E+04  0.0000E+00  1.4563E+04  2.8878E+06  1.98E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.5067E+04  0.0000E+00  2.5067E+04  2.8904E+06  1.15E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.6874E+04  0.0000E+00  2.6874E+04  2.8957E+06  1.08E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.4680E+04  0.0000E+00  2.4680E+04  2.9012E+06  1.18E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4989E+04  0.0000E+00  1.4989E+04  2.9040E+06  1.94E+02

        stanton     liq.temp.     stanton     liq.temp.
         number    bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  0.00000E+00  2.73150E+02  3.67838E-05  5.79391E+02
1002  0.00000E+00  2.73150E+02  5.54858E-05  5.79225E+02
1003  0.00000E+00  2.73150E+02  6.14410E-05  5.79058E+02
1004  0.00000E+00  2.73150E+02  5.91209E-05  5.78892E+02
1005  0.00000E+00  2.73150E+02  3.96471E-05  5.78892E+02

inner-surface node-interval thermal conductivity is  5.17233E+00    w/m/k
outer-surface node-interval thermal conductivity is  1.59826E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.85144E+00    w/m/k
which have been axially averaged over all   6 average-power rod s

total inner surface area is  0.00000E+00 m2  and
total outer surface area is  3.96347E+03 m2  of all   6 average-power rod s

total power from the heat-structure inner surface is  0.00000E+00   w    and outer surface is  5.38429E+07   w

average-power rod   4 has the peak surface temperature of  5.57907E+02 k
supplemental  rod  10 has the peak surface temperature of  5.58222E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg

##########  3822 lines deleted here  ##########

----------------------------------------------------------------------------------------------------------------------------
  1   33333   1                                                                                       99999 33333 88888
 11       3  11   time is    400.715733 s, time-step size is    0.316792 s, time-step number is  2058 9   9     3 8   8
```

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the heat-structure component type is a rod and the component number is 938

rod 1 plane (perpendicular to z direction) coupled to cells 1 (inner) and 0 (outer)

id	row	z(m)	heat-structure temperatures (k)		
1001	1	0.0000E+00	5.5158E+02	5.5321E+02	5.5479E+02
1002	2	5.7542E+00	5.5349E+02	5.5425E+02	5.5499E+02
1003	3	1.1508E+01	5.5535E+02	5.5521E+02	5.5509E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	2	3.7604E+03	5.4471E+02	1.4283E+00	5.4471E+02	11	8.4759E+01	5.5516E+02	8.6129E+04	5.5508E+02	0.0000E+00
1002	11	2.3717E+03	5.4507E+02	3.9128E+03	5.5552E+02	11	6.4925E+01	5.5516E+02	1.3349E+05	5.5508E+02	0.0000E+00
1003	11	1.3892E+02	5.5470E+02	1.3545E+04	5.5553E+02	11	4.9142E+01	5.5516E+02	3.9607E+05	5.5508E+02	0.0000E+00

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	2.5823E+04	9.8112E+00	2.5833E+04	5.1611E+05	2.00E+01	-3.1978E+01	-2.5729E+04	-2.5761E+04	0.0000E+00	0.00E+00
1002	1.9959E+04	-7.9681E+03	1.1991E+04	2.5806E+05	2.15E+01	-1.1017E+01	-1.2165E+04	-1.2176E+04	2.4171-285	1.99-289
1003	9.0415E+01	-2.3517E+03	-2.2613E+03	5.8190E-03	2.57E-06	-3.6158E+00	1.9740E+03	1.9704E+03	4.8342-285	2.45-288

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	5.51986E+02	5.44710E+02	0.00000E+00	5.55695E+02
1002	0.00000E+00	5.55688E+02	0.00000E+00	5.55695E+02
1003	6.06980E-02	5.55688E+02	0.00000E+00	5.55695E+02

total convective energy to the fluid during hydro solution:
inside surface= -9.2818512E+08 w*s outside surface= 6.7343780E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 1.96347E+08 w*s effective= -1.90405E+08 w*s
outside convective energy error: absolute= 4.53403E+06 w*s effective= -1.83531E+06 w*s

rod 2 plane (perpendicular to z direction) coupled to cells 2 (inner) and**** (outer)

id	row	z(m)	heat-structure temperatures (k)		
1001	1	0.0000E+00	5.5342E+02	5.5430E+02	5.5515E+02
1002	2	5.7542E+00	5.5455E+02	5.5490E+02	5.5525E+02
1003	3	1.1508E+01	5.5561E+02	5.5560E+02	5.5559E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	2	1.5663E+03	5.4460E+02	8.4711E-01	5.4460E+02	11	9.0661E+01	5.5533E+02	1.3447E+05	5.5526E+02	0.0000E+00
1002	11	9.2853E+02	5.4505E+02	3.1610E+03	5.5561E+02	11	7.0270E+01	5.5533E+02	7.1812E+05	5.5526E+02	0.0000E+00
1003	11	6.6135E+01	5.5523E+02	8.7300E+04	5.5561E+02	12	1.4826E+00	5.5533E+02	2.5211E+01	5.5526E+02	0.0000E+00

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	1.3814E+04	7.4703E+00	1.3821E+04	5.0438E+05	3.65E+01	-1.6316E+01	-1.4002E+04	-1.4018E+04	0.0000E+00	0.00E+00
1002	8.8199E+03	-3.3496E+03	5.4702E+03	2.5219E+05	4.61E+01	-5.8874E+00	-5.7008E+03	-5.7067E+03	2.5000E-01	4.38E-05
1003	2.5485E+01	-3.0813E+02	-2.8265E+02	6.8999E-03	2.44E-05	3.8442E-01	8.4492E+00	8.8336E+00	5.0000E-01	5.66E-02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	2.69649E+02	3.26486E+02	0.00000E+00	5.55690E+02
1002	0.00000E+00	5.55683E+02	0.00000E+00	5.55690E+02
1003	2.71072E-02	5.55683E+02	4.71424E-04	5.55690E+02

total convective energy to the fluid during hydro solution:
inside surface= -6.2046194E+08 w*s outside surface= 3.4226304E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 2.07661E+08 w*s effective= -2.03435E+08 w*s
outside convective energy error: absolute= 9.05984E+06 w*s effective= -6.24005E+06 w*s

rod 3 plane (perpendicular to z direction) coupled to cells 3 (inner) and**** (outer)

id	row	z(m)	heat-structure temperatures (k)		
1001	1	0.0000E+00	5.4941E+02	5.4970E+02	5.4998E+02
1002	2	5.7542E+00	5.4901E+02	5.4933E+02	5.4964E+02
1003	3	1.1508E+01	5.5281E+02	5.5287E+02	5.5293E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	2	1.7420E+03	5.4676E+02	1.3176E-01	5.4676E+02	12	1.0725E+03	5.5431E+02	0.0000E+00	5.5595E+02	0.0000E+00
1002	12	3.2381E+03	5.4743E+02	1.7155E-01	5.4676E+02	12	1.1000E+03	5.5431E+02	0.0000E+00	5.5595E+02	0.0000E+00
1003	12	6.9263E+02	5.5161E+02	0.0000E+00	5.5581E+02	12	7.3272E+02	5.5431E+02	0.0000E+00	5.5595E+02	0.0000E+00

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	4.6156E+03	3.4845E-01	4.6160E+03	9.5436E+05	2.07E+02	-4.6418E+03	0.0000E+00	-4.6418E+03	1.7607E+06	3.79E+02
1002	5.1007E+03	3.8493E-01	5.1011E+03	1.2914E+06	2.53E+02	-5.1355E+03	0.0000E+00	-5.1355E+03	1.7607E+06	3.43E+02

```
1003  8.2957E+02  0.0000E+00  8.2957E+02  1.6284E+06  1.96E+03 -1.0147E+03  0.0000E+00 -1.0147E+03  1.7607E+06  1.74E+03

       stanton     liq.temp.     stanton     liq.temp.
       number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -           k           -           k
1001  7.36228E+00  5.46751E+02  0.00000E+00  5.55946E+02
1002  0.00000E+00  5.55804E+02  0.00000E+00  5.55946E+02
1003  9.99172E-03  5.55804E+02  0.00000E+00  5.55946E+02

total convective energy to the fluid during hydro solution:
                    inside surface= -1.9058685E+08 w*s      outside surface=  1.5713110E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  3.33419E+06 w*s     effective=  6.36781E+04 w*s
          outside convective energy error: absolute=  2.77703E+06 w*s     effective=  6.05762E+05 w*s

inner-surface node-interval thermal conductivity is  5.05740E+01    w/m/k
outer-surface node-interval thermal conductivity is  5.05293E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.05517E+01    w/m/k
which have been axially averaged over all   3 average-power rod s

total inner surface area is  6.61197E+02 m2  and
total outer surface area is  6.62564E+02 m2  of all   3 average-power rod s

total power from the heat-structure inner surface is  4.83114E+06   w    and outer surface is -4.94115E+06   w

average-power rod   2 has the peak surface temperature of  5.55611E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg


system results

total power loss by 1-d comp.wall is -5.241252E+06 w*s on the inner surface and  9.327871E+05 w*s on the outer surface

                      system total coolant energy is  9.312153E+18 w*s

                        system total coolant mass is  4.544427E+13 kg

total coolant mass discharged by break components is -8.335128E+04 kg

   total coolant mass injected by fill components is  2.268939E+04 kg

       system computed initial total coolant mass is  4.544427E+13 kg


   time    dtime    power     keff
     s       s        w        -
  401.398  3.073 5.393E+07 0.966184
  404.188  2.793 5.383E+07 0.966184
  406.600  2.418 5.374E+07 0.966184
  409.636  3.082 5.364E+07 0.966184
  412.686  2.985 5.353E+07 0.966184
  415.445  2.811 5.344E+07 0.966184
  418.869  3.291 5.332E+07 0.966184
  420.762  1.927 5.326E+07 0.966184
  423.168  2.469 5.318E+07 0.966184
  426.606  3.321 5.307E+07 0.966184
  428.348  1.775 5.301E+07 0.966184
  430.740  2.511 5.294E+07 0.966184          <------------ 11
  433.966  3.175 5.284E+07 0.966184
  436.042  1.991 5.277E+07 0.966184
  436.331  0.303 5.277E+07 0.966184
  436.802  0.494 5.275E+07 0.966184
  437.568  0.805 5.273E+07 0.966184
  438.816  1.311 5.269E+07 0.966184
  440.850  2.135 5.263E+07 0.966184
  444.162  3.478 5.253E+07 0.966184
  447.191  2.908 5.244E+07 0.966184
  450.660  3.601 5.234E+07 0.966184
  452.793  1.877 5.228E+07 0.966184
  455.040  2.329 5.221E+07 0.966184
  458.189  3.231 5.212E+07 0.966184
  461.057  2.730 5.204E+07 0.966184
  463.259  2.243 5.198E+07 0.966184
  466.412  3.311 5.190E+07 0.966184
  468.875  2.314 5.183E+07 0.966184
  471.725  2.861 5.176E+07 0.966184
  474.412  2.733 5.168E+07 0.966184
  477.465  3.099 5.161E+07 0.966184
  480.501  2.880 5.153E+07 0.966184
  482.906  2.502 5.147E+07 0.966184
  486.217  3.417 5.138E+07 0.966184
  489.679  3.294 5.130E+07 0.966184
  492.252  2.635 5.123E+07 0.966184
  495.485  3.267 5.115E+07 0.966184
  498.943  3.549 5.107E+07 0.966184
1
 trac large edit                      14

 problem time is 5.007272E+02 s, time-step size is  1.5974E-01 s, time-step number is  2449, outer-iteration number is  2

 maximum convective power differance has been 0.3176545E+08    w     in component  910 at time 7.7178549E+00 s
 time-step size was limited by component 200 at cell   1 to 1.3246E-02 s
 average outer-iteration count over the last  394 time steps was    2.043
```

```
last minimum number of outer iterations was  1 at time step 2447 (limited by component 200 with fr.error of 5.3681E-05)
last maximum number of outer iterations was  4 at time step 2403 (limited by component 210 with fr.error of 1.2542E-07)
total number of times that each component (id#) was the last to converge since the last short edit
  0( 10)    0( 12)    0( 14)    0( 16)    0( 17)    0( 18)    0( 54)    0( 52)    0( 50)    0( 49)    0( 91)    0( 56)
  0( 20)    0( 22)    0( 24)    0( 26)    0( 27)    0( 28)    0(202)    6(200)    5(205)    4(290)    0( 64)    0( 62)
  0( 60)   27(210)    9(220)   52(400)  238(410)    2(420)    0(422)    0(280)    1(270)    0(254)    0(250)    0(350)
  0(212)    0(120)    3(110)   11(105)    0(190)    7(100)    1(320)    2(310)    0(305)    0(390)    0(300)    0(430)
  2(432)    0(150)    0(354)   10(370)    0(380)    0(216)    0(112)   10(180)    1(170)    3(154)    0(312)    0(436)
  0(116)    0(316)    0( 59)    0( 92)    0(424)    0(578)    0( 66)    0(214)    0(434)    0(279)    0(269)    0(576)
  0(218)    0(114)    0(314)    0(438)    0(369)    0(379)    0(118)    0(179)    0(169)    0(318)    0( 30)    0( 32)
  0( 34)    0( 36)    0( 37)    0( 38)    0( 40)    0( 41)    0( 42)    0( 74)    0( 72)    0( 70)    0( 44)    0( 45)
  0( 46)    0( 43)    0( 69)    0( 93)    0( 47)    0( 76)    0( 48)    0(  2)    0(  3)    0(  4)    0(  5)    0(  6)
  0(  7)    0(  1)
current maximum time-step sizes and limitation counts since the last short edit
    delamx          delcmx          deldmx          delemx          delpmx          delrmx          delvmx          delxmx
  1.0000E+08 s    1.0000E+08 s    1.0000E+08 s    1.0000E+08 s    2.1501E+02 s    1.0000E+08 s    1.3241E+01 s    1.0000E+08 s
      53               1               0               0               0               0               0               0
further limitation counts on what controls delcmx
    dtlmx           dtvmx           dprmx           dtsms           dtrmx          delt/2
      1               0               0               0               0               0

   cpu execution time of this run is 3.775962E+04 s

total time steps since time 0.0 s is         3711
  total cpu time since time 0.0 s is 5.618190E+04 s
```

************************************ signal-variable values at time 500.56746 s ************************************

id	sig.var.	id	sig.var.	id	sig.var.	id	sig.var.	id	sig.var.
1	5.005675E+02 time (s)	11	5.103192E+07 core power (w)	101	5.575882E+02 liq temp (k)	111	6.717942E+06 pressure (pa)	161	4.246990E+03 z lq mf (kg/s)
171	9.572686E+06 pressure (pa)	181	5.572890E+02 liq temp (k)	201	5.579107E+02 liq temp (k)	222	6.716632E+06 pressure (pa)	261	4.239316E+03 z lq mf (kg/s)
271	9.572801E+06 pressure (pa)	281	5.573802E+02 liq temp (k)	301	5.576274E+02 liq temp (k)	333	6.717877E+06 pressure (pa)	361	4.260124E+03 z lq mf (kg/s)
371	9.572696E+06 pressure (pa)	381	5.567031E+02 liq temp (k)	401	9.212736E+06 pressure (pa)	421	9.208302E+06 pressure (pa)	501	4.443091E+06 pressure (pa)
521	-5.097512E+06 pressure (pa)	601	4.443091E+06 pressure (pa)	621	-5.097632E+06 pressure (pa)	701	4.443091E+06 pressure (pa)	721	-5.097534E+06 pressure (pa)
1000	-2.238831E+00 z m mfw (kg/s)	1051	6.718298E+06 pressure (pa)	1100	-1.130359E+00 z m mfw (kg/s)	1101	6.717942E+06 pressure (pa)	1121	6.720385E+06 pressure (pa)
1135	-3.378216E+03 pressure (pa)	1501	2.084214E+00 z lq mf (kg/s)	1541	0.000000E+00 valve farea fr	1700	9.412425E+00 z m mfw (kg/s)	1714	5.970001E+04 pressure (pa)
1903	6.729565E+06 pressure (pa)	1910	6.800392E+06 pressure (pa)	2000	-6.359933E+00 z m mfw (kg/s)	2020	1.615172E+01 z m mfw (kg/s)	2051	6.716825E+06 pressure (pa)
2100	9.166713E-01 z m mfw (kg/s)	2101	6.716632E+06 pressure (pa)	2121	6.719839E+06 pressure (pa)	2135	-3.925184E+03 pressure (pa)	2541	0.000000E+00 valve farea fr
2700	9.410837E+00 z m mfw (kg/s)	2714	5.969973E+04 pressure (pa)	2903	6.726126E+06 pressure (pa)	2910	6.797623E+06 pressure (pa)	3000	3.061484E+02 z m mfw (kg/s)
3051	6.744520E+06 pressure (pa)	3100	8.930719E-01 z m mfw (kg/s)	3101	6.717877E+06 pressure (pa)	3121	6.720331E+06 pressure (pa)	3135	-3.159606E+03 pressure (pa)
3501	-2.084208E+00 z lq mf (kg/s)	3541	0.000000E+00 valve farea fr	3700	9.413655E+00 z m mfw (kg/s)	3714	5.970205E+04 pressure (pa)	3903	6.769627E+06 pressure (pa)
3910	6.839119E+06 pressure (pa)	4001	6.720909E+06 pressure (pa)	4220	0.000000E+00 valve farea fr	4240	1.000000E+00 trp set status	9000	5.583970E+02 a mx sf tp (k)
9010	5.586947E+02 s mx sf tp (k)								

********************************* control-block output values at time 500.56746 s *********************************

id	con.blk.	id	con.blk.	id	con.blk.	id	con.blk.	id	con.blk.
-1	0.000000E+00 k	-2	0.000000E+00 w	-3	1.440000E-01 -	-4	1.551300E+07 pa	-5	1.620300E+07 pa
-6	1.723700E+07 pa	-7	5.742000E+02 k	-8	5.000000E-02 -	-9	-1.379000E+05 pa	-10	4.087000E+05 w
-11	2.423000E-03 s/kg	-12	4.540000E+02 kg/s	-13	4.330000E+06 pa	-14	5.570000E+02 k	-15	5.939306E+00 sqrt(kg/m3)
-16	5.751000E+02 k	-17	1.162000E+00 k	-18	0.000000E+00 k	-19	1.072000E+00 k	-22	0.000000E+00 -
-24	0.000000E+00 -	-26	0.000000E+00 -	-28	0.000000E+00 -	-30	0.000000E+00 -	-32	0.000000E+00 -
-34	0.000000E+00 -	-36	0.000000E+00 -	-38	0.000000E+00 -	-40	0.000000E+00 -	-50	5.576404E+02 k
-55	5.576422E+02 k	-108	5.574386E+02 k	-109	5.574359E+02 k	-110	5.574372E+02 k	-118	2.991697E-01 k
-119	2.998991E-01 k	-120	2.995344E-01 k	-130	-3.290577E-01 k	-132	-3.266880E-01 k	-134	-7.295797E-01 k
-136	1.162000E+00 k	-138	4.324203E-01 k	-140	1.383745E+01 k	-142	0.000000E+00 -	-148	1.000000E+00 -
-149	8.935161E-02 k	-150	8.935161E-02 k	-152	6.316805E-02 k	-154	3.600000E-02 -	-156	2.274050E-03 k
-158	1.069726E+00 k	-160	-1.766278E+01 k	-162	0.000000E+00 -	-164	0.000000E+00 k	-166	1.069726E+00 k
-168	3.423123E+01 k	-170	0.000000E+00 -	-208	5.576455E+02 k	-209	5.576422E+02 k	-210	5.576438E+02 k
-218	5.305109E-01 k	-219	5.307821E-01 k	-220	5.306465E-01 k	-230	-3.252086E-01 k	-232	-3.223044E-01 k
-234	-7.295797E-01 k	-236	1.162000E+00 k	-238	4.324203E-01 k	-240	1.383745E+01 k	-242	0.000000E+00 -
-248	1.000000E+00 -	-249	1.084699E-01 k	-250	1.084699E-01 k	-252	7.760535E-02 k	-254	3.600000E-02 -
-256	2.793793E-03 k	-258	1.069206E+00 k	-260	-1.745618E+01 k	-262	0.000000E+00 -	-264	0.000000E+00 k
-266	1.069206E+00	-268	3.421460E+01	-270	0.000000E+00	-308	5.571653E+02	-309	5.571629E+02

		k			k			-			k			k
-310	5.571641E+02	k	-318	9.242207E-01	k	-319	9.234208E-01	k	-320	9.238208E-01	k	-330	-3.341460E-01	k
-332	-3.321220E-01	k	-334	-7.295797E-01	k	-336	1.162000E+00	k	-338	4.324203E-01	k	-340	1.383745E+01	k
-342	0.000000E+00	-	-348	1.000000E+00	-	-349	7.615330E-02	k	-350	7.615330E-02	k	-352	5.582993E-02	k
-354	3.600000E-02	-	-356	2.009878E-03	k	-358	1.069990E+00	k	-360	-1.793591E+01	k	-362	0.000000E+00	-
-364	0.000000E+00	k	-366	1.069990E+00	k	-368	3.423968E+01	k	-370	0.000000E+00	-	-406	7.672560E-02	-
-408	4.580000E-01	-	-410	-1.000000E-01	-	-412	-1.000000E-01	-	-414	-1.000000E+00	-	-430	-6.304698E+06	pa
-432	-1.000000E+02	paxs	-434	-6.304707E+06	pa	-436	1.817000E+05	w	-438	1.000000E+00	-	-440	0.000000E+00	-
-442	1.000000E+00	-	-444	4.087000E+05	w	-446	5.904000E+05	w	-448	0.000000E+00	-	-450	0.000000E+00	w
-521	-1.000000E+07	pa	-621	-1.000000E+07	pa	-721	-1.000000E+07	pa	-1000	1.000000E+00	-	-1001	1.000000E-06	-
-1002	-2.238831E+06	-	-1004	2.970252E-01	-	-1005	2.962545E-01	-	-1006	2.237455E-01	-	-1007	1.000000E-01	s
-1008	2.337455E-01	-	-1009	-6.548786E+01	kg/s	-1010	-1.586771E-01	-	-1011	7.506839E-02	-	-1012	1.000000E-01	s
-1013	8.506839E-02	-	-1014	8.506839E-02	-	-1104	3.378216E+03	pa	-1106	4.927561E+01	m2xsqrt(pa)	-1109	2.926629E+02	kg/s
-1110	0.000000E+00	-	-1112	0.000000E+00	-	-1114	0.000000E+00	-	-1116	0.000000E+00	-	-1118	0.000000E+00	-
-1160	0.000000E+00	-	-1162	0.000000E+00	-	-1704	5.970001E+04	pa	-1706	3.591712E+02	kg/s	-2000	1.000000E+00	kg/s
-2001	9.166713E-01	kg/s	-2002	-6.938073E+00	kg/s	-2004	2.452212E-01	-	-2005	2.443743E-01	-	-2006	2.756257E-01	-
-2007	1.000000E-01	s	-2008	2.856257E-01	-	-2009	-1.493651E+02	kg/s	-2010	-3.619115E-01	-	-2011	-7.628583E-02	-
-2012	-1.000000E-01	s	-2013	-8.628583E-02	-	-2014	0.000000E+00	-	-2104	3.925184E+03	pa	-2106	5.311513E+00	m2xsqrt(pa)
-2109	3.154670E+01	kg/s	-2110	0.000000E+00	-	-2112	0.000000E+00	-	-2114	0.000000E+00	-	-2116	0.000000E+00	-
-2118	0.000000E+00	-	-2160	0.000000E+00	-	-2162	0.000000E+00	-	-2704	5.969973E+04	pa	-2706	1.814532E+02	kg/s
-3000	1.000000E+00	m2xsqrt(pa)	-3001	8.930719E-01	m2xsqrt(pa)	-3002	3.428037E+02	m2xsqrt(pa)	-3004	6.619027E-01	-	-3004	6.619027E-01	-
-3005	6.619114E-01	-	-3005	6.619114E-01	-	-3006	-1.419114E-01	-	-3006	-1.419114E-01	-	-3007	-1.000000E-01	s
-3007	-1.000000E-01	s	-3008	-1.519114E-01	-	-3008	-1.519114E-01	-	-3009	1.303317E+02	kg/s	-3009	1.303317E+02	kg/s
-3010	3.157937E-01	-	-3010	3.157937E-01	-	-3011	1.638822E-01	-	-3011	1.638822E-01	-	-3012	1.000000E-01	s
-3012	1.000000E-01	s	-3013	1.000000E-01	-	-3013	1.000000E-01	-	-3014	1.000000E-01	-	-3014	1.000000E-01	-
-3104	3.159606E+03	pa	-3104	3.159606E+03	pa	-3106	8.262869E+01	m2xsqrt(pa)	-3106	4.765460E+01	m2xsqrt(pa)	-3109	4.907571E+02	kg/s
-3110	0.000000E+00	-	-3112	0.000000E+00	-	-3114	1.000000E+00	-	-3116	0.000000E+00	-	-3118	0.000000E+00	-
-3160	0.000000E+00	-	-3162	0.000000E+00	-	-3704	5.970205E+04	pa	-3706	3.591774E+02	kg/s	-4241	5.617200E+06	pa
-4242	1.000000E+00	-	-4243	5.200000E-01	-	-4300	5.593000E+02	k	-4302	3.812800E+06	pa	-4304	5.751000E+02	k
-4310	5.576438E+02	k	-4312	5.576438E+02	k	-4314	5.576438E+02	k	-4316	-1.656178E+00	k	-4318	0.000000E+00	-
-4320	0.000000E+00	-	-4330	5.578164E+02	k	-4332	-1.728364E+01	k	-4334	0.000000E+00	-	-4336	0.000000E+00	-
-4338	0.000000E+00	-	-4340	0.000000E+00	-	-4342	0.000000E+00	-						

** trip set status at time 500.56746 s **

id	set status	id	set status	id	set status	id	set status	id	set status
1	on-forward	10	on-forward	12	on-forward	14	on-forward	16	on-forward
18	on-forward	20	on-forward	21	on-forward	22	off	24	off
26	on-forward	28	on-forward	30	off	32	on-forward	34	on-forward
36	off	38	off	40	off	42	off	44	off
46	on-forward	48	off	50	off	52	off	54	on-forward
56	off	58	on-forward	60	on-forward	100	on-forward	110	off
120	on-forward	200	off	210	off	220	on-forward	300	off
310	off	320	on-forward	-407	off	422	on-reverse	423	off
450	on-reverse	460	on-reverse	520	on-reverse	620	on-reverse	720	on-reverse
1001	off	1002	off	1003	off	1010	on-forward	1020	on-forward
1030	off	1040	off	1050	off	1060	off	1500	on-forward
2010	on-forward	2020	on-forward	2030	off	2040	off	2050	off
2060	off	3010	off	3020	off	3030	off	3040	on-forward
3050	on-forward	3060	off	3500	on-forward	9996	off	9997	off
9998	off	9999	off						

*************************************** trip signal values at time 500.56746 s ***************************************

id	trp.sig.		id	trp.sig.		id	trp.sig.		id	trp.sig.		id	trp.sig.	
1	5.005675E+02	s	10	2.000000E+00	-	12	5.000000E+00	-	14	2.000000E+00	-	16	1.000000E+00	-
18	1.000000E+00	-	20	1.000000E+00	-	21	1.000000E+00	-	22	1.000000E+00	-	24	0.000000E+00	-
26	2.000000E+00	-	28	1.000000E+00	-	30	0.000000E+00	-	32	1.000000E+00	-	34	2.000000E+00	-
36	0.000000E+00	-	38	0.000000E+00	-	40	0.000000E+00	-	42	0.000000E+00	-	44	0.000000E+00	-

```
  46   2.000000E+00      48   0.000000E+00      50   0.000000E+00      52   5.103192E+07      54   9.208302E+06
                  -                    -                    -                    w                   pa
  56   7.672560E-02      58   9.208302E+06      60   9.208302E+06     100   1.000000E+00     110   4.246990E+03
                  -                   pa                   pa                    -                 kg/s
 120   5.574372E+02     200   1.000000E+00     210   4.239316E+03     220   5.576438E+02     300   1.000000E+00
                  k                    -                 kg/s                    k                    -
 310   4.260124E+03     320   5.571641E+02    -407   7.672560E-02     422   3.000000E+00     423   5.005675E+02
               kg/s                    k                    -                    -                    s
 450   9.208302E+06     460   9.208302E+06     520  -5.097512E+06     620  -5.097632E+06     720  -5.097534E+06
                 pa                   pa                    m                    m                    m
1001   1.310519E+03    1002   6.470412E+01    1003   1.245815E+03    1010   2.962545E-01    1020   2.962545E-01
                 pa                   pa                   pa                    -                    -
1030   2.962545E-01    1040  -6.548786E+01    1050   2.926629E+02    1060   6.717942E+06    1500   2.084214E+00
                  -                 kg/s                 kg/s                   pa                 kg/s
2010   2.443743E-01    2020   2.443743E-01    2030   2.443743E-01    2040  -1.493651E+02    2050   3.154670E+01
                  -                    -                    -                 kg/s                 kg/s
2060   6.716632E+06    3010   6.619114E-01    3020   6.619114E-01    3030   6.619114E-01    3040   1.303317E+02
                 pa                    -                    -                    -                 kg/s
3050   4.907571E+02    3060   6.717877E+06    3500  -2.084208E+00    9996   5.005675E+02    9997   5.005675E+02
               kg/s                   pa                 kg/s                    s                    s
9998   5.005675E+02    9999   5.005675E+02
                  s                    s

at time    63.8013 s in component number 938 at cell   1, the maximum stanton number is 1.663668E+05
at time     0.0075 s in component number 906 at cell   1, the minimum tld is 6.203117E+02 k
            where tld is the liquid temperature at bubble detachment from a heated surface

--------------------------------------------------------------------------------------------------------------
          1                                                                                         1  00000
         11  time is     500.727197 s, time-step size is     0.159738 s, time-step number is  2449     11   0   0
          1                                                                                         1   0   0
          1                               $10$ hot leg 1                                            1   0   0
        111                                                                                       111  00000
--------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is  10, first junction number is  10, and second junction number is  12

                ncd-gas
     pressure   pressure   void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas  wf.liq.
cell    pa         pa         -         k         k         k       kg/m3     kg/m3       m/s        m/s       -
  1 9.23400E+06 0.00000E+00 0.000E+00 5.784E+02 5.576E+02 5.784E+02 7.478E+02 5.030E+01  1.332E+01  1.333E+01 7.907E-02
  2 9.23330E+06 0.00000E+00 0.000E+00 5.784E+02 5.576E+02 5.784E+02 7.478E+02 5.029E+01  1.333E+01  1.333E+01 3.113E-03
  3 9.23263E+06 0.00000E+00 0.000E+00 5.784E+02 5.576E+02 5.784E+02 7.478E+02 5.029E+01  1.333E+01  1.333E+01 3.113E-03
  4 9.23195E+06 0.00000E+00 0.000E+00 5.784E+02 5.576E+02 5.784E+02 7.478E+02 5.028E+01  1.333E+01  1.333E+01 3.113E-03
  5 9.23145E+06 0.00000E+00 0.000E+00 5.783E+02 5.576E+02 5.783E+02 7.478E+02 5.028E+01  1.333E+01  1.333E+01 3.113E-03
  6 9.23094E+06 0.00000E+00 0.000E+00 5.783E+02 5.576E+02 5.783E+02 7.478E+02 5.028E+01  1.333E+01  1.333E+01 3.113E-03
  7                                                                                      1.166E+01  1.166E+01 1.771E-01

     idr   liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
cell  -    ----- w/m2/k ------     w/k         w          w          k              k
  1  1.0  3.479E+04 0.000E+00 5.567E+04-1.536E+03 0.000E+00 5.789E+02    557.55
  2  1.0  3.479E+04 0.000E+00 5.567E+04-1.530E+03 0.000E+00 5.789E+02    557.54
  3  1.0  3.479E+04 0.000E+00 5.566E+04-1.524E+03 0.000E+00 5.789E+02    557.54
  4  1.0  3.479E+04 0.000E+00 5.566E+04-1.519E+03 0.000E+00 5.788E+02    557.54
  5  1.0  3.479E+04 0.000E+00 2.728E+04-1.516E+03 0.000E+00 5.788E+02    557.54
  6  1.0  3.282E+04 0.000E+00 5.510E+04-1.505E+03 0.000E+00 5.788E+02    557.54

total power to the component from all heat-transfer surfaces is -2.377945E+04   w
total power to the liquid is -2.377945E+04   w    and total power to the gas is  0.000000E+00   w

total convective energy transported to the fluid from component wall:  1.5407190E+08 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                      inside convective energy error: absolute=  8.57558E+07 w*s     effective=  1.42787E+06 w*s

pipe wall total power loss on the inner surface is  2.33384E+04   w     and on the outer surface is  0.00000E+00   w

pipe  component  total coolant mass is  2.11122E+03 kg , total coolant energy is  2.63138E+09 w*s, and
computed initial total coolant mass is  1.93238E+03 kg

##########  4157 lines deleted here  ##########

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  1   00000 99999                                                                                        77777
 11   0    0 9    9 time is     500.727197 s, time-step size is     0.159738 s, time-step number is  2449      7
  1   0    0 99999                                                                                           7
  1   0    0     9                        $7$ rod guide tube 6 (short)                                       7
111   00000 99999                                                                                            7
--------------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is   7, first junction number is   7, and second junction number is  99

                ncd-gas
     pressure   pressure   void fr. temp.sat. temp.liq. temp.gas   den.liq.  den.vap.   vel.liq.   vel.gas  wf.liq.
cell    pa         pa         -         k         k         k       kg/m3     kg/m3       m/s        m/s       -
  1 9.34984E+06 0.00000E+00 0.000E+00 5.793E+02 5.573E+02 5.793E+02 7.485E+02 5.106E+01  7.333E-01  7.363E-01 2.503E-02
  2 9.34332E+06 0.00000E+00 0.000E+00 5.792E+02 5.573E+02 5.792E+02 7.485E+02 5.101E+01  7.333E-01  7.363E-01 7.011E-03
  3                                                                                      7.333E-01  7.363E-01 3.626E-02

pipe  component  total coolant mass is  2.75731E+01 kg , total coolant energy is  3.43251E+07 w*s, and
computed initial total coolant mass is  2.61042E+01 kg

--------------------------------------------------------------------------------------------------------------
  1     1   00000                                                                                            1
 11    11   0    0 time is     500.727197 s, time-step size is     0.159738 s, time-step number is  2449     11
  1     1   0    0                                                                                           1
  1     1   0    0                        $1$ reactor vessel                                                 1
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the component type is a vessel, the component number is   1, and the junction numbers are   10    20    30    19    29    39
                                                                                              2     3     4     5     6     7
                                                                                             94    95    96    97    98    99

level  1 data

alpn         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -

rovn         5.20921E+01  5.20917E+01  5.20921E+01  5.20917E+01  5.20921E+01  5.20917E+01  5.22279E+01  5.22278E+01
             5.22279E+01  5.22278E+01  5.22279E+01  5.22279E+01
             kg/m3

roln         7.49522E+02  7.48906E+02  7.48825E+02  7.48720E+02  7.49431E+02  7.50114E+02  7.49526E+02  7.48909E+02
             7.48826E+02  7.48721E+02  7.49435E+02  7.50121E+02
             kg/m3

vvnyt        1.10504E-04  1.31648E-03 -1.06081E-03 -1.61941E-04 -1.61800E-03  1.41373E-03 -6.32027E-02  6.67903E-02
            -6.56813E-02  6.28130E-02 -6.83131E-02  6.75942E-02
             m/s

vvnz         4.53905E+00  4.51788E+00  4.54447E+00  4.51948E+00  4.53980E+00  4.50822E+00 -1.68185E+01 -1.69632E+01
            -1.68230E+01 -1.69640E+01 -1.68190E+01 -1.69561E+01
             m/s

vvnxr       -2.65821E+00 -2.65135E+00 -2.65911E+00 -2.65163E+00 -2.65833E+00 -2.64955E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             m/s

vlnyt        8.45932E-05  1.34358E-03 -1.08752E-03 -1.36178E-04 -1.64565E-03  1.44113E-03 -6.32034E-02  6.67904E-02
            -6.56816E-02  6.28137E-02 -6.83128E-02  6.75940E-02
             m/s

vlnz         4.53480E+00  4.51362E+00  4.54021E+00  4.51522E+00  4.53555E+00  4.50397E+00 -1.68109E+01 -1.69556E+01
            -1.68154E+01 -1.69563E+01 -1.68114E+01 -1.69484E+01
             m/s

vlnxr       -2.65343E+00 -2.64655E+00 -2.65433E+00 -2.64684E+00 -2.65354E+00 -2.64476E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             m/s

tvn          5.80466E+02  5.80465E+02  5.80466E+02  5.80465E+02  5.80466E+02  5.80465E+02  5.80621E+02  5.80621E+02
             5.80621E+02  5.80621E+02  5.80621E+02  5.80621E+02
             k

tln          5.56948E+02  5.57244E+02  5.57283E+02  5.57333E+02  5.56992E+02  5.56664E+02  5.56961E+02  5.57258E+02
             5.57297E+02  5.57348E+02  5.57005E+02  5.56675E+02
             k

tsat         5.80466E+02  5.80465E+02  5.80466E+02  5.80465E+02  5.80466E+02  5.80465E+02  5.80621E+02  5.80621E+02
             5.80621E+02  5.80621E+02  5.80621E+02  5.80621E+02
             k

pn           9.50598E+06  9.50591E+06  9.50598E+06  9.50591E+06  9.50598E+06  9.50591E+06  9.52635E+06  9.52634E+06
             9.52634E+06  9.52634E+06  9.52635E+06  9.52635E+06
             pa

pan          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             pa

conc         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -

solid        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             kg/m3

level  2 data

alpn         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -

rovn         5.19267E+01  5.19267E+01  5.19268E+01  5.19267E+01  5.19267E+01  5.19267E+01  5.27469E+01  5.27487E+01
             5.27467E+01  5.27487E+01  5.27468E+01  5.27489E+01
             kg/m3

roln         7.49508E+02  7.48895E+02  7.48813E+02  7.48710E+02  7.49419E+02  7.50097E+02  7.49585E+02  7.48968E+02
             7.48885E+02  7.48780E+02  7.49494E+02  7.50181E+02
             kg/m3

vvnyt        1.95962E-03 -3.00310E-03  2.76850E-03 -1.89532E-03  3.31774E-03 -3.14751E-03 -6.42093E-02  6.75770E-02
            -6.65074E-02  6.38450E-02 -6.89334E-02  6.82284E-02
             m/s

##########  625 lines deleted here  ##########

pn           9.34326E+06  9.34326E+06  9.34326E+06  9.34326E+06  9.34326E+06  9.34326E+06  9.34327E+06  9.34326E+06
             9.34327E+06  9.34326E+06  9.34327E+06  9.34326E+06
             pa
```

```
pan        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           pa

conc       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

solid      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           kg/m3

level 12 data

alpn       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

rovn       5.09640E+01  5.09640E+01  5.09640E+01  5.09640E+01  5.09640E+01  5.09640E+01  1.01931E+02  1.01931E+02
           1.01931E+02  1.01931E+02  1.01931E+02  1.01931E+02
           kg/m3

roln       7.46135E+02  7.46383E+02  7.45875E+02  7.46413E+02  7.46146E+02  7.46642E+02  7.08582E+02  7.08582E+02
           7.08582E+02  7.08582E+02  7.08582E+02  7.08582E+02
           kg/m3

vvnyt     -2.06282E-02 -1.38107E-02  8.01584E-03  2.19008E-02  1.98319E-02 -1.64385E-02  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vvnz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vvnxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnyt     -2.06282E-02 -1.38107E-02  8.01583E-03  2.19008E-02  1.98320E-02 -1.64385E-02  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

tvn        5.79158E+02  5.79158E+02  5.79158E+02  5.79158E+02  5.79158E+02  5.79158E+02  6.17905E+02  6.17905E+02
           6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
           k

tln        5.58439E+02  5.58321E+02  5.58562E+02  5.58307E+02  5.58433E+02  5.58198E+02  5.81000E+02  5.81000E+02
           5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
           k

tsat       5.79158E+02  5.79158E+02  5.79158E+02  5.79158E+02  5.79158E+02  5.79158E+02  6.17905E+02  6.17905E+02
           6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
           k

pn         9.33575E+06  9.33575E+06  9.33575E+06  9.33575E+06  9.33575E+06  9.33575E+06  1.55000E+07  1.55000E+07
           1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
           pa

pan        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           pa

conc       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

solid      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           kg/m3

total power to the vessel coolant from all heat surfaces is  5.06226E+07   w
total power to the liquid is  5.06226E+07   w   and total power to the gas is  0.00000E+00   w

vessel lower plenum
liquid volume is  2.33861E+01 m3 , liquid volume fraction is  1.00000E+00 and liquid mass is  1.75222E+04 kg
volume-averaged liquid temperature is  5.57080E+02 k and volume-averaged saturation temperature is  5.80516E+02 k

vessel reactor core
liquid volume fraction is  1.00000E+00 and liquid mass is  1.11433E+04 kg
volume-averaged liquid temperature is  5.57527E+02 k and volume-averaged saturation temperature is  5.79770E+02 k

vessel reactor core
inlet  liquid mass flow is  1.26391E+04  kg/s  and inlet  gas mass flow is  0.00000E+00  kg/s
outlet liquid mass flow is  1.26393E+04  kg/s  and outlet gas mass flow is  0.00000E+00  kg/s

vessel upper plenum
liquid volume fraction is  1.00000E+00 and liquid mass is  2.66978E+04 kg
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volume-averaged liquid temperature is  5.57633E+02 k and volume-averaged saturation temperature is  5.79712E+02 k

vessel downcomer
liquid volume fraction is  0.00000E+00, liquid mass is  0.00000E+00 kg , volume-averaged pressure is  0.00000E+00  pa
volume-averaged liquid temperature is  0.00000E+00 k and volume-averaged saturation temperature is  0.00000E+00 k

vessel component total coolant mass is  7.12051E+04 kg , total coolant energy is  8.87096E+10 w*s, and
computed initial total coolant mass is  6.78684E+04 kg

----------------------------------------------------------------------------------------------------------------------
  1    1    1                                                                                   99999 00000 00000
 11   11   11   time is    500.727197 s, time-step size is     0.159738 s, time-step number is  2449 9   9 0   0 0   0
  1    1    1                                                                                   99999 0   0 0   0
  1    1    1                               $900$ reactor-core fuel rods                            9 0   0 0   0
111  111  111                                                                                   99999 00000 00000
----------------------------------------------------------------------------------------------------------------------


the heat-structure component type is a rod  and the component number is 900

reactor-core power is 5.102813E+07   w    and neutron multiplication constant keff is 0.966184

rod   1   plane (perpendicular to z direction) coupled to cells   0 (inner) and   1 (outer), peaking factor is   1.0000

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.6613E+02 5.6587E+02 5.6507E+02 5.6375E+02 5.6190E+02 5.5779E+02 5.5757E+02 5.5737E+02
1002   2  9.1440E-01 5.7275E+02 5.7229E+02 5.7091E+02 5.6862E+02 5.6543E+02 5.5838E+02 5.5801E+02 5.5766E+02
1003   3  1.8288E+00 5.7408E+02 5.7358E+02 5.7210E+02 5.6964E+02 5.6621E+02 5.5867E+02 5.5827E+02 5.5789E+02
1004   4  2.7432E+00 5.7288E+02 5.7243E+02 5.7107E+02 5.6881E+02 5.6567E+02 5.5873E+02 5.5836E+02 5.5802E+02
1005   5  3.6576E+00 5.6694E+02 5.6666E+02 5.6584E+02 5.6448E+02 5.6258E+02 5.5835E+02 5.5813E+02 5.5792E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k          w/m2/k          k                w/m2/k          k          w/m2/k          k          w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1735E+04  5.5711E+02  0.0000E+00  5.8002E+02  2.3488E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1744E+04  5.5721E+02  0.0000E+00  5.8002E+02  2.3594E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1753E+04  5.5742E+02  0.0000E+00  5.7985E+02  2.3618E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1767E+04  5.5758E+02  0.0000E+00  5.7969E+02  2.3602E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1786E+04  5.5765E+02  0.0000E+00  5.7952E+02  2.3509E+03

 heat flux to the hydro cells
 idz     qliqi       qvapi        qtoti        qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo   qchfo/qtoto
          w/m2        w/m2         w/m2         w/m2         -           w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.1920E+03  0.0000E+00  8.1920E+03  2.8690E+06  3.50E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4107E+04  0.0000E+00  1.4107E+04  2.8716E+06  2.04E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.5124E+04  0.0000E+00  1.5124E+04  2.8766E+06  1.90E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3888E+04  0.0000E+00  1.3888E+04  2.8814E+06  2.07E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.4317E+03  0.0000E+00  8.4317E+03  2.8838E+06  3.42E+02

       stanton     liq.temp.    stanton     liq.temp.
        number    bubble det.    number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
          -            k            -            k
1001  0.00000E+00  2.73150E+02  2.09181E-05  5.80016E+02
1002  0.00000E+00  2.73150E+02  2.81294E-05  5.79851E+02
1003  0.00000E+00  2.73150E+02  3.15822E-05  5.79686E+02
1004  0.00000E+00  2.73150E+02  3.12063E-05  5.79520E+02
1005  0.00000E+00  2.73150E+02  2.24878E-05  5.79520E+02

total convective energy to the fluid during hydro solution:
                  inside surface=  0.0000000E+00 w*s      outside surface=  1.7877361E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s
          outside convective energy error: absolute=  1.26911E+09 w*s     effective= -3.97929E+08 w*s

rod   2   plane (perpendicular to z direction) coupled to cells   0 (inner) and   2 (outer), peaking factor is   1.0000

 id   row    z(m)    heat-structure temperatures (k)
1001   1  0.0000E+00 5.6642E+02 5.6615E+02 5.6536E+02 5.6404E+02 5.6219E+02 5.5808E+02 5.5787E+02 5.5766E+02
1002   2  9.1440E-01 5.7304E+02 5.7258E+02 5.7120E+02 5.6891E+02 5.6571E+02 5.5868E+02 5.5830E+02 5.5795E+02
1003   3  1.8288E+00 5.7436E+02 5.7387E+02 5.7239E+02 5.6993E+02 5.6650E+02 5.5896E+02 5.5856E+02 5.5819E+02
1004   4  2.7432E+00 5.7317E+02 5.7271E+02 5.7136E+02 5.6910E+02 5.6595E+02 5.5903E+02 5.5866E+02 5.5831E+02
1005   5  3.6576E+00 5.6722E+02 5.6695E+02 5.6613E+02 5.6477E+02 5.6287E+02 5.5864E+02 5.5842E+02 5.5821E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k          w/m2/k          k                w/m2/k          k          w/m2/k          k          w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1720E+04  5.5741E+02  0.0000E+00  5.8002E+02  2.3497E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1731E+04  5.5751E+02  0.0000E+00  5.8002E+02  2.3603E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1736E+04  5.5771E+02  0.0000E+00  5.7985E+02  2.3627E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1738E+04  5.5788E+02  0.0000E+00  5.7969E+02  2.3611E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1734E+04  5.5794E+02  0.0000E+00  5.7952E+02  2.3518E+03

 heat flux to the hydro cells
 idz     qliqi       qvapi        qtoti        qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo   qchfo/qtoto
          w/m2        w/m2         w/m2         w/m2         -           w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.1823E+03  0.0000E+00  8.1823E+03  2.8699E+06  3.51E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4097E+04  0.0000E+00  1.4097E+04  2.8725E+06  2.04E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.5114E+04  0.0000E+00  1.5114E+04  2.8777E+06  1.90E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3879E+04  0.0000E+00  1.3879E+04  2.8830E+06  2.08E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.4225E+03  0.0000E+00  8.4225E+03  2.8857E+06  3.43E+02

       stanton     liq.temp.    stanton     liq.temp.
        number    bubble det.    number    bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
          -            k            -            k
1001  0.00000E+00  2.73150E+02  2.11671E-05  5.80016E+02
```

```
1002  0.00000E+00  2.73150E+02  2.85105E-05  5.79851E+02
1003  0.00000E+00  2.73150E+02  3.20193E-05  5.79686E+02
1004  0.00000E+00  2.73150E+02  3.16526E-05  5.79521E+02
1005  0.00000E+00  2.73150E+02  2.28024E-05  5.79521E+02

total convective energy to the fluid during hydro solution:
                inside surface=  0.0000000E+00 w*s      outside surface=  1.7879562E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
         inside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s
        outside convective energy error: absolute=  1.26622E+09 w*s     effective= -3.74538E+08 w*s

rod   3   plane (perpendicular to z direction) coupled to cells   0 (inner) and   3 (outer), peaking factor is   1.0000

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.6645E+02 5.6619E+02 5.6539E+02 5.6407E+02 5.6223E+02 5.5812E+02 5.5790E+02 5.5770E+02
1002   2  9.1440E-01 5.7307E+02 5.7261E+02 5.7123E+02 5.6894E+02 5.6575E+02 5.5871E+02 5.5834E+02 5.5799E+02
1003   3  1.8288E+00 5.7439E+02 5.7390E+02 5.7242E+02 5.6996E+02 5.6653E+02 5.5900E+02 5.5860E+02 5.5822E+02
1004   4  2.7432E+00 5.7320E+02 5.7274E+02 5.7139E+02 5.6913E+02 5.6599E+02 5.5906E+02 5.5869E+02 5.5835E+02
1005   5  3.6576E+00 5.6725E+02 5.6698E+02 5.6616E+02 5.6480E+02 5.6290E+02 5.5868E+02 5.5845E+02 5.5825E+02

 id  idi   hliqi        tliqi        hvapi        tvapi     ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k               w/m2/k          k         w/m2/k          k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1745E+04  5.5744E+02  0.0000E+00  5.8002E+02  2.3498E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1754E+04  5.5755E+02  0.0000E+00  5.8002E+02  2.3604E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1764E+04  5.5775E+02  0.0000E+00  5.7985E+02  2.3628E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1778E+04  5.5791E+02  0.0000E+00  5.7969E+02  2.3612E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1799E+04  5.5798E+02  0.0000E+00  5.7952E+02  2.3519E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi     qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2          -           w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.1770E+03  0.0000E+00  8.1770E+03  2.8691E+06  3.51E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4092E+04  0.0000E+00  1.4092E+04  2.8716E+06  2.04E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.5109E+04  0.0000E+00  1.5109E+04  2.8766E+06  1.90E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3873E+04  0.0000E+00  1.3873E+04  2.8814E+06  2.08E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.4168E+03  0.0000E+00  8.4168E+03  2.8838E+06  3.43E+02

        stanton      liq.temp.     stanton     liq.temp.
         number     bubble det.     number    bubble det.
 id    inner surf.  inner surf.  outer surf.  outer surf.
            -            k            -            k
1001  0.00000E+00  2.73150E+02  2.11668E-05  5.80016E+02
1002  0.00000E+00  2.73150E+02  2.85327E-05  5.79851E+02
1003  0.00000E+00  2.73150E+02  3.20391E-05  5.79686E+02
1004  0.00000E+00  2.73150E+02  3.16562E-05  5.79520E+02
1005  0.00000E+00  2.73150E+02  2.27675E-05  5.79520E+02

total convective energy to the fluid during hydro solution:
                inside surface=  0.0000000E+00 w*s      outside surface=  1.7879337E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
         inside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s
        outside convective energy error: absolute=  1.25501E+09 w*s     effective= -3.76614E+08 w*s

rod   4   plane (perpendicular to z direction) coupled to cells   0 (inner) and   4 (outer), peaking factor is   1.0000

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.6649E+02 5.6623E+02 5.6544E+02 5.6411E+02 5.6227E+02 5.5817E+02 5.5795E+02 5.5775E+02
1002   2  9.1440E-01 5.7311E+02 5.7265E+02 5.7128E+02 5.6899E+02 5.6579E+02 5.5876E+02 5.5839E+02 5.5804E+02
1003   3  1.8288E+00 5.7444E+02 5.7394E+02 5.7246E+02 5.7000E+02 5.6658E+02 5.5905E+02 5.5864E+02 5.5827E+02
1004   4  2.7432E+00 5.7324E+02 5.7279E+02 5.7143E+02 5.6917E+02 5.6603E+02 5.5911E+02 5.5874E+02 5.5840E+02
1005   5  3.6576E+00 5.6730E+02 5.6702E+02 5.6620E+02 5.6484E+02 5.6294E+02 5.5873E+02 5.5850E+02 5.5830E+02

 id  idi   hliqi        tliqi        hvapi        tvapi     ido   hliqo        tliqo        hvapo        tvapo        hgap
          w/m2/k          k         w/m2/k          k               w/m2/k          k         w/m2/k          k         w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1722E+04  5.5749E+02  0.0000E+00  5.8002E+02  2.3499E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1733E+04  5.5760E+02  0.0000E+00  5.8002E+02  2.3606E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1738E+04  5.5780E+02  0.0000E+00  5.7985E+02  2.3630E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1740E+04  5.5796E+02  0.0000E+00  5.7969E+02  2.3613E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02    1  3.1737E+04  5.5803E+02  0.0000E+00  5.7952E+02  2.3520E+03

 heat flux to the hydro cells
 idz    qliqi        qvapi        qtoti        qchfi     qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
         w/m2         w/m2         w/m2         w/m2          -           w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.1696E+03  0.0000E+00  8.1696E+03  2.8700E+06  3.51E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4084E+04  0.0000E+00  1.4084E+04  2.8725E+06  2.04E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.5101E+04  0.0000E+00  1.5101E+04  2.8777E+06  1.91E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3865E+04  0.0000E+00  1.3865E+04  2.8830E+06  2.08E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.4085E+03  0.0000E+00  8.4085E+03  2.8857E+06  3.43E+02

        stanton      liq.temp.     stanton     liq.temp.
         number     bubble det.     number    bubble det.
 id    inner surf.  inner surf.  outer surf.  outer surf.
            -            k            -            k
1001  0.00000E+00  2.73150E+02  2.12111E-05  5.80016E+02
1002  0.00000E+00  2.73150E+02  2.86130E-05  5.79851E+02
1003  0.00000E+00  2.73150E+02  3.21363E-05  5.79686E+02
1004  0.00000E+00  2.73150E+02  3.17656E-05  5.79521E+02
1005  0.00000E+00  2.73150E+02  2.28489E-05  5.79521E+02

total convective energy to the fluid during hydro solution:
                inside surface=  0.0000000E+00 w*s      outside surface=  1.7880410E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
         inside convective energy error: absolute=  0.00000E+00 w*s     effective=  0.00000E+00 w*s
```

outside convective energy error: absolute= 1.25906E+09 w*s effective= -3.65670E+08 w*s

rod 5 plane (perpendicular to z direction) coupled to cells 0 (inner) and 5 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6617E+02	5.6590E+02	5.6511E+02	5.6379E+02	5.6194E+02	5.5783E+02	5.5762E+02	5.5741E+02
1002	2	9.1440E-01	5.7279E+02	5.7233E+02	5.7095E+02	5.6866E+02	5.6547E+02	5.5843E+02	5.5805E+02	5.5770E+02
1003	3	1.8288E+00	5.7411E+02	5.7362E+02	5.7214E+02	5.6968E+02	5.6625E+02	5.5871E+02	5.5831E+02	5.5793E+02
1004	4	2.7432E+00	5.7292E+02	5.7246E+02	5.7111E+02	5.6885E+02	5.6570E+02	5.5878E+02	5.5841E+02	5.5806E+02
1005	5	3.6576E+00	5.6697E+02	5.6670E+02	5.6588E+02	5.6452E+02	5.6262E+02	5.5839E+02	5.5817E+02	5.5796E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1736E+04	5.5715E+02	0.0000E+00	5.8002E+02	2.3489E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1745E+04	5.5726E+02	0.0000E+00	5.8002E+02	2.3596E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1755E+04	5.5746E+02	0.0000E+00	5.7985E+02	2.3620E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1768E+04	5.5763E+02	0.0000E+00	5.7969E+02	2.3603E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1788E+04	5.5769E+02	0.0000E+00	5.7952E+02	2.3510E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.1856E+03	0.0000E+00	8.1856E+03	2.8690E+06	3.50E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4100E+04	0.0000E+00	1.4100E+04	2.8716E+06	2.04E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5117E+04	0.0000E+00	1.5117E+04	2.8766E+06	1.90E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3881E+04	0.0000E+00	1.3881E+04	2.8814E+06	2.08E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.4247E+03	0.0000E+00	8.4247E+03	2.8838E+06	3.42E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	2.09377E-05	5.80016E+02
1002	0.00000E+00	2.73150E+02	2.81779E-05	5.79851E+02
1003	0.00000E+00	2.73150E+02	3.16374E-05	5.79686E+02
1004	0.00000E+00	2.73150E+02	3.12594E-05	5.79520E+02
1005	0.00000E+00	2.73150E+02	2.25083E-05	5.79520E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7877787E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.26321E+09 w*s effective= -3.93483E+08 w*s

rod 6 plane (perpendicular to z direction) coupled to cells 0 (inner) and 6 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6586E+02	5.6559E+02	5.6480E+02	5.6347E+02	5.6163E+02	5.5751E+02	5.5729E+02	5.5709E+02
1002	2	9.1440E-01	5.7248E+02	5.7202E+02	5.7064E+02	5.6835E+02	5.6515E+02	5.5810E+02	5.5773E+02	5.5738E+02
1003	3	1.8288E+00	5.7380E+02	5.7331E+02	5.7183E+02	5.6937E+02	5.6594E+02	5.5839E+02	5.5799E+02	5.5761E+02
1004	4	2.7432E+00	5.7261E+02	5.7215E+02	5.7080E+02	5.6854E+02	5.6539E+02	5.5846E+02	5.5809E+02	5.5774E+02
1005	5	3.6576E+00	5.6666E+02	5.6639E+02	5.6557E+02	5.6421E+02	5.6231E+02	5.5807E+02	5.5785E+02	5.5764E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1704E+04	5.5683E+02	0.0000E+00	5.8002E+02	2.3479E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1714E+04	5.5693E+02	0.0000E+00	5.8002E+02	2.3586E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1718E+04	5.5714E+02	0.0000E+00	5.7985E+02	2.3610E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1718E+04	5.5730E+02	0.0000E+00	5.7969E+02	2.3594E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1712E+04	5.5737E+02	0.0000E+00	5.7952E+02	2.3500E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.2001E+03	0.0000E+00	8.2001E+03	2.8698E+06	3.50E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4115E+04	0.0000E+00	1.4115E+04	2.8724E+06	2.04E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.5131E+04	0.0000E+00	1.5131E+04	2.8776E+06	1.90E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3896E+04	0.0000E+00	1.3896E+04	2.8830E+06	2.07E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.4391E+03	0.0000E+00	8.4391E+03	2.8858E+06	3.42E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	2.07183E-05	5.80016E+02
1002	0.00000E+00	2.73150E+02	2.78125E-05	5.79852E+02
1003	0.00000E+00	2.73150E+02	3.12292E-05	5.79686E+02
1004	0.00000E+00	2.73150E+02	3.08731E-05	5.79521E+02
1005	0.00000E+00	2.73150E+02	2.22980E-05	5.79521E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7876314E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s

outside convective energy error: absolute= 1.29815E+09 w*s effective= -4.09734E+08 w*s

rod 7 plane (perpendicular to z direction) coupled to cells 0 (inner) and -1 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7229E+02	5.7184E+02	5.7049E+02	5.6826E+02	5.6514E+02	5.5825E+02	5.5789E+02	5.5755E+02
1002	2	9.1440E-01	5.8336E+02	5.8257E+02	5.8023E+02	5.7634E+02	5.7092E+02	5.5918E+02	5.5855E+02	5.5796E+02
1003	3	1.8288E+00	5.8545E+02	5.8461E+02	5.8209E+02	5.7791E+02	5.7209E+02	5.5952E+02	5.5884E+02	5.5822E+02
1004	4	2.7432E+00	5.8332E+02	5.8255E+02	5.8024E+02	5.7641E+02	5.7108E+02	5.5952E+02	5.5890E+02	5.5832E+02
1005	5	3.6576E+00	5.7327E+02	5.7281E+02	5.7142E+02	5.6912E+02	5.6590E+02	5.5883E+02	5.5845E+02	5.5810E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1735E+04	5.5711E+02	0.0000E+00	5.8002E+02	2.3586E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1744E+04	5.5721E+02	0.0000E+00	5.8002E+02	2.3763E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1753E+04	5.5742E+02	0.0000E+00	5.7985E+02	2.3799E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1767E+04	5.5758E+02	0.0000E+00	5.7969E+02	2.3768E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1786E+04	5.5765E+02	0.0000E+00	5.7952E+02	2.3609E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3779E+04	0.0000E+00	1.3779E+04	2.8690E+06	2.08E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3704E+04	0.0000E+00	2.3704E+04	2.8716E+06	1.21E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5410E+04	0.0000E+00	2.5410E+04	2.8766E+06	1.13E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3336E+04	0.0000E+00	2.3336E+04	2.8814E+06	1.23E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4180E+04	0.0000E+00	1.4180E+04	2.8838E+06	2.03E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.51842E-05	5.80016E+02
1002	0.00000E+00	2.73150E+02	5.30222E-05	5.79851E+02
1003	0.00000E+00	2.73150E+02	5.86807E-05	5.79686E+02
1004	0.00000E+00	2.73150E+02	5.64239E-05	5.79520E+02
1005	0.00000E+00	2.73150E+02	3.78185E-05	5.79520E+02

rod 8 plane (perpendicular to z direction) coupled to cells 0 (inner) and -2 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7257E+02	5.7212E+02	5.7078E+02	5.6854E+02	5.6542E+02	5.5855E+02	5.5818E+02	5.5784E+02
1002	2	9.1440E-01	5.8364E+02	5.8286E+02	5.8052E+02	5.7662E+02	5.7121E+02	5.5947E+02	5.5884E+02	5.5825E+02
1003	3	1.8288E+00	5.8573E+02	5.8489E+02	5.8237E+02	5.7819E+02	5.7238E+02	5.5981E+02	5.5914E+02	5.5851E+02
1004	4	2.7432E+00	5.8361E+02	5.8283E+02	5.8053E+02	5.7669E+02	5.7136E+02	5.5981E+02	5.5919E+02	5.5861E+02
1005	5	3.6576E+00	5.7356E+02	5.7309E+02	5.7171E+02	5.6940E+02	5.6619E+02	5.5912E+02	5.5874E+02	5.5839E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1720E+04	5.5741E+02	0.0000E+00	5.8002E+02	2.3594E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1731E+04	5.5751E+02	0.0000E+00	5.8002E+02	2.3772E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1736E+04	5.5771E+02	0.0000E+00	5.7985E+02	2.3808E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1738E+04	5.5788E+02	0.0000E+00	5.7969E+02	2.3777E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1734E+04	5.5794E+02	0.0000E+00	5.7952E+02	2.3618E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3769E+04	0.0000E+00	1.3769E+04	2.8699E+06	2.08E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3694E+04	0.0000E+00	2.3694E+04	2.8725E+06	1.21E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5400E+04	0.0000E+00	2.5400E+04	2.8777E+06	1.13E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3327E+04	0.0000E+00	2.3327E+04	2.8830E+06	1.24E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4171E+04	0.0000E+00	1.4171E+04	2.8857E+06	2.04E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.56200E-05	5.80016E+02
1002	0.00000E+00	2.73150E+02	5.37316E-05	5.79851E+02
1003	0.00000E+00	2.73150E+02	5.94849E-05	5.79686E+02
1004	0.00000E+00	2.73150E+02	5.72272E-05	5.79521E+02
1005	0.00000E+00	2.73150E+02	3.83642E-05	5.79521E+02

rod 9 plane (perpendicular to z direction) coupled to cells 0 (inner) and -3 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7261E+02	5.7216E+02	5.7081E+02	5.6858E+02	5.6546E+02	5.5858E+02	5.5822E+02	5.5788E+02
1002	2	9.1440E-01	5.8368E+02	5.8289E+02	5.8055E+02	5.7666E+02	5.7124E+02	5.5951E+02	5.5888E+02	5.5829E+02
1003	3	1.8288E+00	5.8577E+02	5.8492E+02	5.8240E+02	5.7822E+02	5.7241E+02	5.5985E+02	5.5917E+02	5.5855E+02
1004	4	2.7432E+00	5.8364E+02	5.8287E+02	5.8056E+02	5.7673E+02	5.7140E+02	5.5984E+02	5.5922E+02	5.5865E+02
1005	5	3.6576E+00	5.7359E+02	5.7313E+02	5.7174E+02	5.6943E+02	5.6622E+02	5.5915E+02	5.5878E+02	5.5843E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1745E+04	5.5744E+02	0.0000E+00	5.8002E+02	2.3596E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1754E+04	5.5755E+02	0.0000E+00	5.8002E+02	2.3773E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1764E+04	5.5775E+02	0.0000E+00	5.7985E+02	2.3809E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1778E+04	5.5791E+02	0.0000E+00	5.7969E+02	2.3778E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1799E+04	5.5798E+02	0.0000E+00	5.7952E+02	2.3619E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3764E+04	0.0000E+00	1.3764E+04	2.8691E+06	2.08E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3689E+04	0.0000E+00	2.3689E+04	2.8716E+06	1.21E+02

1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5395E+04	0.0000E+00	2.5395E+04	2.8766E+06	1.13E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3321E+04	0.0000E+00	2.3321E+04	2.8814E+06	1.24E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4165E+04	0.0000E+00	1.4165E+04	2.8838E+06	2.04E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.56290E-05	5.80016E+02
1002	0.00000E+00	2.73150E+02	5.37723E-05	5.79851E+02
1003	0.00000E+00	2.73150E+02	5.95199E-05	5.79686E+02
1004	0.00000E+00	2.73150E+02	5.72330E-05	5.79520E+02
1005	0.00000E+00	2.73150E+02	3.83162E-05	5.79520E+02

rod 10 plane (perpendicular to z direction) coupled to cells 0 (inner) and -4 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7265E+02	5.7220E+02	5.7086E+02	5.6862E+02	5.6550E+02	5.5863E+02	5.5827E+02	5.5793E+02
1002	2	9.1440E-01	5.8372E+02	5.8294E+02	5.8059E+02	5.7670E+02	5.7129E+02	5.5956E+02	5.5893E+02	5.5834E+02
1003	3	1.8288E+00	5.8581E+02	5.8497E+02	5.8245E+02	5.7827E+02	5.7246E+02	5.5990E+02	5.5922E+02	5.5860E+02
1004	4	2.7432E+00	5.8368E+02	5.8291E+02	5.8060E+02	5.7677E+02	5.7144E+02	5.5989E+02	5.5927E+02	5.5870E+02
1005	5	3.6576E+00	5.7363E+02	5.7317E+02	5.7178E+02	5.6948E+02	5.6627E+02	5.5920E+02	5.5883E+02	5.5848E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1722E+04	5.5749E+02	0.0000E+00	5.8002E+02	2.3597E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1733E+04	5.5760E+02	0.0000E+00	5.8002E+02	2.3774E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1738E+04	5.5780E+02	0.0000E+00	5.7985E+02	2.3810E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1740E+04	5.5796E+02	0.0000E+00	5.7969E+02	2.3779E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1737E+04	5.5803E+02	0.0000E+00	5.7952E+02	2.3621E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3757E+04	0.0000E+00	1.3757E+04	2.8700E+06	2.09E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3681E+04	0.0000E+00	2.3681E+04	2.8725E+06	1.21E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5387E+04	0.0000E+00	2.5387E+04	2.8777E+06	1.13E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3313E+04	0.0000E+00	2.3313E+04	2.8830E+06	1.24E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4157E+04	0.0000E+00	1.4157E+04	2.8857E+06	2.04E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.57170E-05	5.80016E+02
1002	0.00000E+00	2.73150E+02	5.39272E-05	5.79851E+02
1003	0.00000E+00	2.73150E+02	5.97039E-05	5.79686E+02
1004	0.00000E+00	2.73150E+02	5.74357E-05	5.79521E+02
1005	0.00000E+00	2.73150E+02	3.84687E-05	5.79521E+02

rod 11 plane (perpendicular to z direction) coupled to cells 0 (inner) and -5 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7232E+02	5.7188E+02	5.7053E+02	5.6829E+02	5.6517E+02	5.5830E+02	5.5793E+02	5.5759E+02
1002	2	9.1440E-01	5.8339E+02	5.8261E+02	5.8027E+02	5.7638E+02	5.7096E+02	5.5922E+02	5.5859E+02	5.5800E+02
1003	3	1.8288E+00	5.8548E+02	5.8464E+02	5.8212E+02	5.7794E+02	5.7213E+02	5.5956E+02	5.5889E+02	5.5826E+02
1004	4	2.7432E+00	5.8336E+02	5.8258E+02	5.8028E+02	5.7645E+02	5.7112E+02	5.5956E+02	5.5894E+02	5.5836E+02
1005	5	3.6576E+00	5.7331E+02	5.7284E+02	5.7146E+02	5.6915E+02	5.6594E+02	5.5887E+02	5.5849E+02	5.5814E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap
		w/m2/k	k	w/m2/k	k		w/m2/k	k	w/m2/k	k	w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1736E+04	5.5715E+02	0.0000E+00	5.8002E+02	2.3587E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1745E+04	5.5726E+02	0.0000E+00	5.8002E+02	2.3764E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1755E+04	5.5746E+02	0.0000E+00	5.7985E+02	2.3800E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1768E+04	5.5763E+02	0.0000E+00	5.7969E+02	2.3769E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1788E+04	5.5769E+02	0.0000E+00	5.7952E+02	2.3610E+03

heat flux to the hydro cells

idz	qliqi	qvapi	qtoti	qchfi	qchfi/qtoti	qliqo	qvapo	qtoto	qchfo	qchfo/qtoto
	w/m2	w/m2	w/m2	w/m2	-	w/m2	w/m2	w/m2	w/m2	-
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3773E+04	0.0000E+00	1.3773E+04	2.8690E+06	2.08E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3697E+04	0.0000E+00	2.3697E+04	2.8716E+06	1.21E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.5403E+04	0.0000E+00	2.5403E+04	2.8766E+06	1.13E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.3329E+04	0.0000E+00	2.3329E+04	2.8814E+06	1.24E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4173E+04	0.0000E+00	1.4173E+04	2.8838E+06	2.03E+02

id	stanton number inner surf.	liq.temp. bubble det. inner surf.	stanton number outer surf.	liq.temp. bubble det. outer surf.
	-	k	-	k
1001	0.00000E+00	2.73150E+02	3.52286E-05	5.80016E+02
1002	0.00000E+00	2.73150E+02	5.31142E-05	5.79851E+02
1003	0.00000E+00	2.73150E+02	5.87835E-05	5.79686E+02
1004	0.00000E+00	2.73150E+02	5.65214E-05	5.79520E+02
1005	0.00000E+00	2.73150E+02	3.78658E-05	5.79520E+02

rod 12 plane (perpendicular to z direction) coupled to cells 0 (inner) and -6 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7201E+02	5.7156E+02	5.7022E+02	5.6798E+02	5.6486E+02	5.5797E+02	5.5761E+02	5.5727E+02
1002	2	9.1440E-01	5.8308E+02	5.8230E+02	5.7996E+02	5.7606E+02	5.7065E+02	5.5890E+02	5.5827E+02	5.5768E+02
1003	3	1.8288E+00	5.8517E+02	5.8433E+02	5.8181E+02	5.7763E+02	5.7182E+02	5.5924E+02	5.5857E+02	5.5794E+02
1004	4	2.7432E+00	5.8305E+02	5.8228E+02	5.7997E+02	5.7614E+02	5.7081E+02	5.5924E+02	5.5862E+02	5.5804E+02
1005	5	3.6576E+00	5.7300E+02	5.7254E+02	5.7115E+02	5.6884E+02	5.6563E+02	5.5855E+02	5.5817E+02	5.5782E+02

id	idi	hliqi	tliqi	hvapi	tvapi	ido	hliqo	tliqo	hvapo	tvapo	hgap

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             w/m2/k          k          w/m2/k          k              w/m2/k          k          w/m2/k          k          w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1704E+04  5.5683E+02  0.0000E+00  5.8002E+02  2.3577E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1714E+04  5.5693E+02  0.0000E+00  5.8002E+02  2.3754E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1718E+04  5.5714E+02  0.0000E+00  5.7985E+02  2.3790E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1718E+04  5.5730E+02  0.0000E+00  5.7969E+02  2.3759E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1712E+04  5.5737E+02  0.0000E+00  5.7952E+02  2.3601E+03

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti       qchfi    qchfi/qtoti    qliqo       qvapo       qtoto       qchfo    qchfo/qtoto
          w/m2         w/m2         w/m2        w/m2         -          w/m2        w/m2        w/m2        w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3787E+04  0.0000E+00  1.3787E+04  2.8698E+06  2.08E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.3712E+04  0.0000E+00  2.3712E+04  2.8724E+06  1.21E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.5417E+04  0.0000E+00  2.5417E+04  2.8776E+06  1.13E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  2.3344E+04  0.0000E+00  2.3344E+04  2.8830E+06  1.24E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4187E+04  0.0000E+00  1.4187E+04  2.8858E+06  2.03E+02

        stanton     liq.temp.     stanton     liq.temp.
         number    bubble det.     number    bubble det.
 id    inner surf.  inner surf.  outer surf.  outer surf.
            -            k            -            k
1001  0.00000E+00  2.73150E+02  3.48343E-05  5.80016E+02
1002  0.00000E+00  2.73150E+02  5.24377E-05  5.79852E+02
1003  0.00000E+00  2.73150E+02  5.80380E-05  5.79686E+02
1004  0.00000E+00  2.73150E+02  5.58307E-05  5.79521E+02
1005  0.00000E+00  2.73150E+02  3.74861E-05  5.79521E+02

inner-surface node-interval thermal conductivity is  5.17391E+00    w/m/k
outer-surface node-interval thermal conductivity is  1.59892E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.85230E+00    w/m/k
which have been axially averaged over all   6 average-power rod s

total inner surface area is  0.00000E+00 m2  and
total outer surface area is  3.96347E+03 m2  of all    6 average-power rod s

total power from the heat-structure inner surface is  0.00000E+00   w    and outer surface is  5.09302E+07   w

average-power rod   4 has the peak surface temperature of  5.58399E+02 k
supplemental  rod  10 has the peak surface temperature of  5.58696E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg

##########  3822 lines deleted here  ##########

------------------------------------------------------------------------------------------------------------------------
  1   33333   1                                                                                              99999 33333 88888
 11       3  11    time is    500.727197 s, time-step size is    0.159738 s, time-step number is  2449 9    9      3 8   8
  1   33333   1                                                                                              99999 33333 88888
  1       3   1                           $938$ st-gen-1,2,3 sec.dryer                                           9      3 8   8
111   33333 111                                                                                              99999 33333 88888
------------------------------------------------------------------------------------------------------------------------


the heat-structure component type is a rod  and the component number is 938

rod   1   plane (perpendicular to z direction) coupled to cells   1 (inner) and   0 (outer)

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.5174E+02 5.5351E+02 5.5524E+02
1002   2  5.7542E+00 5.5388E+02 5.5470E+02 5.5549E+02
1003   3  1.1508E+01 5.5587E+02 5.5573E+02 5.5561E+02

 id  idi   hliqi        tliqi        hvapi        tvapi      ido   hliqo       tliqo       hvapo       tvapo        hgap
           w/m2/k         k          w/m2/k         k               w/m2/k        k          w/m2/k        k          w/m2/k
1001  2  3.9695E+03  5.4471E+02  1.5490E+00  5.4471E+02  11  9.1171E+01  5.5566E+02  7.7194E+04  5.5560E+02  0.0000E+00
1002 11  2.4964E+03  5.4510E+02  3.9398E+03  5.5605E+02  11  6.7641E+01  5.5566E+02  1.1269E+05  5.5560E+02  0.0000E+00
1003 11  1.5393E+02  5.5516E+02  1.2611E+04  5.5606E+02  11  4.5789E+01  5.5566E+02  4.0569E+05  5.5560E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti       qchfi    qchfi/qtoti    qliqo       qvapo       qtoto       qchfo    qchfo/qtoto
          w/m2         w/m2         w/m2        w/m2         -          w/m2        w/m2        w/m2        w/m2         -
1001  2.7919E+04  1.0898E+01  2.7930E+04  5.1813E+05  1.86E+01 -3.8442E+01 -2.8077E+04 -2.8116E+04  0.0000E+00  0.00E+00
1002  2.1913E+04 -8.5702E+03  1.3343E+04  2.5907E+05  1.94E+01 -1.1662E+01 -1.2902E+04 -1.2913E+04  0.0000E+00  0.00E+00
1003  1.0953E+02 -2.4010E+03 -2.2914E+03  5.8190E-03  2.54E-06 -2.4396E+00  1.8837E+03  1.8812E+03  0.0000E+00  0.00E+00

        stanton     liq.temp.     stanton     liq.temp.
         number    bubble det.     number    bubble det.
 id    inner surf.  inner surf.  outer surf.  outer surf.
            -            k            -            k
1001  1.58917E+03  5.44710E+02  0.00000E+00  5.56240E+02
1002  0.00000E+00  5.56233E+02  0.00000E+00  5.56240E+02
1003  8.45243E-02  5.56233E+02  0.00000E+00  5.56240E+02

total convective energy to the fluid during hydro solution:
                         inside surface= -1.2087357E+09 w*s      outside surface=  9.4604207E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  2.02679E+08 w*s     effective= -1.95672E+08 w*s
          outside convective energy error: absolute=  5.07689E+06 w*s     effective= -2.01393E+06 w*s

rod   2   plane (perpendicular to z direction) coupled to cells   2 (inner) and**** (outer)

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.5369E+02 5.5470E+02 5.5568E+02
1002   2  5.7542E+00 5.5499E+02 5.5536E+02 5.5574E+02
1003   3  1.1508E+01 5.5614E+02 5.5612E+02 5.5611E+02
```

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	2	1.7623E+03	5.4460E+02	9.6813E-01	5.4460E+02	11	6.0430E+01	5.5589E+02	2.2663E+05	5.5575E+02	0.0000E+00
1002	11	9.5884E+02	5.4506E+02	3.3223E+03	5.5614E+02	11	5.3757E+01	5.5589E+02	8.7432E+05	5.5575E+02	0.0000E+00
1003	11	6.6108E+01	5.5571E+02	9.6300E+04	5.5614E+02	12	8.7181E-01	5.5589E+02	2.6185E+01	5.5575E+02	0.0000E+00

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	1.6015E+04	8.7972E+00	1.6024E+04	5.1706E+05	3.23E+01	-1.2861E+01	-1.6048E+04	-1.6061E+04	0.0000E+00	0.00E+00
1002	9.5273E+03	-3.8096E+03	5.7177E+03	2.5853E+05	4.52E+01	-8.0186E+00	-6.2596E+03	-6.2676E+03	2.5000E-01	3.99E-05
1003	2.8107E+01	-4.5736E+02	-4.2925E+02	6.8999E-03	1.61E-05	1.9174E-01	9.4775E+00	9.6692E+00	5.0000E-01	5.17E-02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	8.88858E+02	2.91625E+02	0.00000E+00	5.56225E+02
1002	0.00000E+00	5.56218E+02	0.00000E+00	5.56225E+02
1003	4.63742E-02	5.56218E+02	1.16240E-03	5.56225E+02

total convective energy to the fluid during hydro solution:
inside surface= -7.5088350E+08 w*s   outside surface= 4.5994938E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 2.18228E+08 w*s   effective= -2.12369E+08 w*s
outside convective energy error: absolute= 1.07877E+07 w*s   effective= -7.34354E+06 w*s

rod 3 plane (perpendicular to z direction) coupled to cells 3 (inner) and**** (outer)

id	row	z(m)	heat-structure temperatures (k)		
1001	1	0.0000E+00	5.4960E+02	5.4993E+02	5.5025E+02
1002	2	5.7542E+00	5.4918E+02	5.4955E+02	5.4991E+02
1003	3	1.1508E+01	5.5356E+02	5.5361E+02	5.5367E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	2	1.8562E+03	5.4676E+02	1.5385E-01	5.4676E+02	12	1.1119E+03	5.5505E+02	0.0000E+00	5.5650E+02	0.0000E+00
1002	12	3.4946E+03	5.4754E+02	2.0495E-01	5.4676E+02	12	1.1383E+03	5.5505E+02	0.0000E+00	5.5650E+02	0.0000E+00
1003	12	6.8608E+02	5.5240E+02	0.0000E+00	5.5636E+02	12	7.3253E+02	5.5505E+02	0.0000E+00	5.5650E+02	0.0000E+00

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	5.2678E+03	4.3584E-01	5.2682E+03	1.0946E+06	2.08E+02	-5.3341E+03	0.0000E+00	-5.3341E+03	1.7532E+06	3.29E+02
1002	5.7535E+03	4.9635E-01	5.7539E+03	1.3581E+06	2.36E+02	-5.8550E+03	0.0000E+00	-5.8550E+03	1.7532E+06	2.99E+02
1003	7.9470E+02	0.0000E+00	7.9470E+02	1.6215E+06	2.04E+03	-1.0092E+03	0.0000E+00	-1.0092E+03	1.7532E+06	1.74E+03

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	8.22637E+00	5.46751E+02	0.00000E+00	5.56502E+02
1002	0.00000E+00	5.56361E+02	0.00000E+00	5.56502E+02
1003	1.01597E-02	5.56361E+02	0.00000E+00	5.56502E+02

total convective energy to the fluid during hydro solution:
inside surface= -2.8342464E+08 w*s   outside surface= 2.4786191E+08 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 3.35702E+06 w*s   effective= 4.08467E+04 w*s
outside convective energy error: absolute= 2.81550E+06 w*s   effective= 5.73554E+05 w*s

inner-surface node-interval thermal conductivity is 5.05560E+01 w/m/k
outer-surface node-interval thermal conductivity is 5.05069E+01 w/m/k
effective r-direction wall thermal conductivity is 5.05315E+01 w/m/k
which have been axially averaged over all 3 average-power rod s

total inner surface area is 6.61197E+02 m2 and
total outer surface area is 6.62564E+02 m2 of all 3 average-power rod s

total power from the heat-structure inner surface is 5.34050E+06 w and outer surface is -5.44967E+06 w

average-power rod 2 has the peak surface temperature of 5.56136E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is 0.00000E+00 kg

system results

total power loss by 1-d comp.wall is -4.433009E+06 w*s on the inner surface and 9.229305E+05 w*s on the outer surface

system total coolant energy is 9.312153E+18 w*s

system total coolant mass is 4.544427E+13 kg

total coolant mass discharged by break components is -8.335128E+04 kg

total coolant mass injected by fill components is 2.979064E+04 kg

system computed initial total coolant mass is 4.544427E+13 kg

time s	dtime s	power w	keff -
500.895	1.700	5.102E+07	0.966184

```
503.096  2.297 5.097E+07 0.966184
505.828  2.785 5.091E+07 0.966184
508.621  2.719 5.084E+07 0.966184
511.442  2.921 5.078E+07 0.966184
514.817  3.195 5.070E+07 0.966184
516.966  2.256 5.065E+07 0.966184
519.657  2.684 5.059E+07 0.966184
522.893  3.222 5.052E+07 0.966184
525.456  2.608 5.047E+07 0.966184
528.387  2.935 5.040E+07 0.966184          11
531.433  2.950 5.034E+07 0.966184
533.834  2.443 5.029E+07 0.966184
537.000  3.191 5.022E+07 0.966184
539.890  2.907 5.016E+07 0.966184
542.679  2.643 5.010E+07 0.966184
543.631  1.000 5.008E+07 0.966184
545.182  1.628 5.005E+07 0.966184
547.708  2.652 5.000E+07 0.966184
550.919  3.182 4.994E+07 0.966184
553.715  2.832 4.988E+07 0.966184
556.478  2.720 4.983E+07 0.966184
559.656  3.182 4.977E+07 0.966184
562.337  2.669 4.971E+07 0.966184
565.629  3.289 4.965E+07 0.966184
568.778  3.262 4.959E+07 0.966184
571.828  2.917 4.953E+07 0.966184
574.520  2.673 4.948E+07 0.966184
577.253  2.807 4.943E+07 0.966184
580.333  3.074 4.938E+07 0.966184
583.566  3.259 4.932E+07 0.966184
586.848  3.177 4.926E+07 0.966184
589.001  2.163 4.922E+07 0.966184
592.009  3.158 4.917E+07 0.966184
594.651  2.474 4.912E+07 0.966184
597.231  2.578 4.908E+07 0.966184

  endflag =-1.0000E+00

restart dump generated at problem time   600.000977 s after  2810 time steps     14
1
trac large edit          14

problem time is 6.000010E+02 s, time-step size is  3.4165E-01 s, time-step number is  2810, outer-iteration number is  2

maximum convective power differance has been 0.3176545E+08   w    in component  910 at time 7.7178549E+00 s
time-step size was limited by component 200 at cell   1 to 1.3376E-02 s
average outer-iteration count over the last  362 time steps was   2.039
last minimum number of outer iterations was  1 at time step 2613 (limited by component 200 with fr.error of 3.3585E-05)
last maximum number of outer iterations was  4 at time step 2686 (limited by component 190 with fr.error of 3.9531E-07)
total number of times that each component (id#) was the last to converge since the last short edit
    0( 10)    0( 12)    0( 14)    0( 16)    0( 17)    0( 18)    0( 54)    0( 52)    0( 50)    0( 49)    0( 91)    0( 56)
    0( 20)    0( 22)    0( 24)    0( 26)    0( 27)    0( 28)    1(202)    3(200)    6(205)    2(290)    0( 64)    0( 62)
    0( 60)   26(210)    3(220)   74(400)  226(410)    1(420)    0(422)    4(280)    0(270)    1(254)    0(250)    0(350)
    0(212)    1(120)    0(110)    2(105)    4(190)    2(100)    3(320)    0(310)    0(305)    0(390)    0(300)    1(430)
    0(432)    0(150)    0(354)    2(370)    0(380)    0(216)    0(112)    0(180)    0(170)    0(154)    0(312)    0(436)
    0(116)    0(316)    0( 59)    0( 92)    0(424)    0(578)    0( 66)    0(214)    0(434)    0(279)    0(269)    0(576)
    0(218)    0(114)    0(314)    0(438)    0(369)    0(379)    0(118)    0(179)    0(169)    0(318)    0( 30)    0( 32)
    0( 34)    0( 36)    0( 37)    0( 38)    0( 40)    0( 41)    0( 42)    0( 74)    0( 72)    0( 70)    0( 44)    0( 45)
    0( 46)    0( 43)    0( 69)    0( 93)    0( 47)    0( 76)    0( 48)    0(  2)    0(  3)    0(  4)    0(  5)    0(  6)
    0(  7)    0(  1)
current maximum time-step sizes and limitation counts since the last short edit
    delamx        delcmx        deldmx        delemx        delpmx        delrmx        delvmx        delxmx
  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  1.0000E+08 s  2.8500E+02 s  1.0000E+08 s  1.3374E+01 s  1.0000E+08 s
     54             2             0             0             0             0             0             0
further limitation counts on what controls delcmx
    dtlmx         dtvmx         dprmx         dtsms         dtrmx         delt/2
     1              0             0             0             0             1

   cpu execution time of this run is 4.291977E+04 s

total time steps since time 0.0 s is         4072
  total cpu time since time 0.0 s is 6.134205E+04 s

************************************* signal-variable values at time  599.65933 s *************************************

   id      sig.var.          id      sig.var.          id      sig.var.          id      sig.var.          id      sig.var.

    1   5.996593E+02         11   4.903494E+07        101   5.583408E+02        111   6.810581E+06        161   4.237872E+03
             time (s)           core power (w)            liq temp (k)            pressure (pa)           z lq mf (kg/s)
  171   9.633451E+06        181   5.581259E+02        201   5.587492E+02        222   6.809879E+06        261   4.229185E+03
        pressure (pa)             liq temp (k)            liq temp (k)            pressure (pa)           z lq mf (kg/s)
  271   9.633570E+06        281   5.582928E+02        301   5.584229E+02        333   6.810810E+06        361   4.252156E+03
        pressure (pa)             liq temp (k)            liq temp (k)            pressure (pa)           z lq mf (kg/s)
  371   9.633444E+06        381   5.574644E+02        401   9.273945E+06        421   9.269506E+06        501   4.443071E+06
        pressure (pa)             liq temp (k)           pressure (pa)            pressure (pa)            pressure (pa)
  521  -5.158360E+06        601   4.443071E+06        621  -5.158485E+06        701   4.443071E+06        721  -5.158363E+06
        pressure (pa)            pressure (pa)           pressure (pa)            pressure (pa)            pressure (pa)
 1000   1.181522E+01       1051   6.810879E+06       1100  -2.372994E+00       1101   6.810581E+06       1121   6.813416E+06
       z m mfw (kg/s)            pressure (pa)          z m mfw (kg/s)            pressure (pa)            pressure (pa)
 1135  -3.539894E+03       1501   1.853228E+00       1541   0.000000E+00       1700   9.441552E+00       1714   5.975260E+04
        pressure (pa)           z lq mf (kg/s)          valve farea fr          z m mfw (kg/s)            pressure (pa)
 1903   6.823603E+06       1910   6.894374E+06       2000   2.488472E+01       2020   1.602301E+01       2051   6.810374E+06
        pressure (pa)            pressure (pa)          z m mfw (kg/s)          z m mfw (kg/s)            pressure (pa)
 2100   2.492649E+00       2101   6.809879E+06       2121   6.813303E+06       2135  -4.231226E+03       2541   0.000000E+00
       z m mfw (kg/s)            pressure (pa)           pressure (pa)            pressure (pa)          valve farea fr
```

2700	9.441288E+00 z m mfw (kg/s)	2714	5.975260E+04 pressure (pa)	2903	6.821890E+06 pressure (pa)	2910	6.893298E+06 pressure (pa)	3000	3.093059E+02 z m mfw (kg/s)
3051	6.839176E+06 pressure (pa)	3100	8.731494E-01 z m mfw (kg/s)	3101	6.810810E+06 pressure (pa)	3121	6.813457E+06 pressure (pa)	3135	-3.299102E+03 pressure (pa)
3501	-1.853224E+00 z lq mf (kg/s)	3541	0.000000E+00 valve farea fr	3700	9.441566E+00 z m mfw (kg/s)	3714	5.975356E+04 pressure (pa)	3903	6.864250E+06 pressure (pa)
3910	6.933665E+06 pressure (pa)	4001	6.814123E+06 pressure (pa)	4220	0.000000E+00 valve farea fr	4240	1.000000E+00 trp set status	9000	5.592677E+02 a mx sf tp (k)
9010	5.595538E+02 s mx sf tp (k)								

******************************** control-block output values at time 599.65933 s ********************************

id	con.blk.	id	con.blk.	id	con.blk.	id	con.blk.	id	con.blk.
-1	0.000000E+00 k	-2	0.000000E+00 w	-3	1.440000E-01 -	-4	1.551300E+07 pa	-5	1.620300E+07 pa
-6	1.723700E+07 pa	-7	5.742000E+02 k	-8	5.000000E-02 -	-9	-1.379000E+05 pa	-10	4.087000E+05 w
-11	2.423000E-03 s/kg	-12	4.540000E+02 kg/s	-13	4.330000E+06 pa	-14	5.570000E+02 k	-15	5.985027E+00 sqrt(kg/m3)
-16	5.751000E+02 k	-17	1.162000E+00 k	-18	0.000000E+00 k	-19	1.072000E+00 k	-22	0.000000E+00 -
-24	0.000000E+00	-26	0.000000E+00 -	-28	0.000000E+00 -	-30	0.000000E+00 -	-32	0.000000E+00 -
-34	0.000000E+00 -	-36	0.000000E+00 -	-38	0.000000E+00 -	-40	0.000000E+00 -	-50	5.585135E+02 k
-55	5.585159E+02 k	-108	5.582334E+02 k	-109	5.582283E+02 k	-110	5.582308E+02 k	-118	2.148242E-01 k
-119	2.152179E-01 k	-120	2.150210E-01 k	-130	-3.142724E-01 k	-132	-3.116745E-01 k	-134	-7.224972E-01 k
-136	1.162000E+00 k	-138	4.395028E-01 k	-140	1.406409E+01 k	-142	0.000000E+00 -	-148	1.000000E+00 -
-149	7.716616E-02 k	-150	7.716616E-02 k	-152	8.241731E-02 k	-154	3.600000E-02 -	-156	2.967023E-03 k
-158	1.069033E+00 k	-160	-1.686916E+01 k	-162	0.000000E+00 -	-164	0.000000E+00 k	-166	1.069033E+00 k
-168	3.420906E+01 k	-170	0.000000E+00 -	-208	5.585210E+02 k	-209	5.585159E+02 k	-210	5.585184E+02 k
-218	4.564138E-01 k	-219	4.565230E-01 k	-220	4.564684E-01 k	-230	-3.089146E-01 k	-232	-3.063040E-01 k
-234	-7.224972E-01 k	-236	1.162000E+00 k	-238	4.395028E-01 k	-240	1.406409E+01 k	-242	0.000000E+00 -
-248	1.000000E+00 -	-249	7.792354E-02 k	-250	7.792354E-02 k	-252	8.411877E-02 k	-254	3.600000E-02 -
-256	3.028276E-03 k	-258	1.068972E+00 k	-260	-1.658157E+01 k	-262	0.000000E+00 -	-264	0.000000E+00 k
-266	1.068972E+00 k	-268	3.420710E+01 k	-270	0.000000E+00 -	-308	5.579436E+02 k	-309	5.579388E+02 k
-310	5.579412E+02 k	-318	9.584519E-01 k	-319	9.585577E-01 k	-320	9.585048E-01 k	-330	-3.196676E-01 k
-332	-3.172116E-01 k	-334	-7.224972E-01 k	-336	1.162000E+00 k	-338	4.395028E-01 k	-340	1.406409E+01 k
-342	0.000000E+00 -	-348	1.000000E+00 -	-349	7.370597E-02 k	-350	7.370597E-02 k	-352	7.823177E-02 k
-354	3.600000E-02 -	-356	2.816344E-03 k	-358	1.069184E+00 k	-360	-1.715875E+01 k	-362	0.000000E+00 -
-364	0.000000E+00 k	-366	1.069184E+00 k	-368	3.421388E+01 k	-370	0.000000E+00 -	-406	7.682419E-02 -
-408	4.580000E-01 -	-410	-1.000000E-01 -	-412	-1.000000E-01 -	-414	-1.000000E+00 -	-430	-6.243494E+06 pa
-432	-1.000000E+02 paxs	-434	-6.243503E+06 pa	-436	1.817000E+05 w	-438	1.000000E+00 -	-440	0.000000E+00 -
-442	1.000000E+00 -	-444	4.087000E+05 w	-446	5.904000E+05 w	-448	0.000000E+00 -	-450	0.000000E+00 w
-521	-1.000000E+07 pa	-621	-1.000000E+07 pa	-721	-1.000000E+07 pa	-1000	1.000000E+00 -	-1001	1.000000E-06 -
-1002	1.181522E+07 -	-1004	3.354227E-01 -	-1005	3.351562E-01 -	-1006	1.848438E-01 -	-1007	1.000000E-01 s
-1008	1.948438E-01 -	-1009	-5.758951E+01 kg/s	-1010	-1.395394E-01 -	-1011	5.530440E-02 -	-1012	1.000000E-01 s
-1013	6.530440E-02 -	-1014	6.530440E-02 -	-1104	3.539894E+03 pa	-1106	5.044097E+01 m2xsqrt(pa)	-1109	3.018905E+02 kg/s
-1110	0.000000E+00 -	-1112	0.000000E+00 -	-1114	0.000000E+00 -	-1116	0.000000E+00 -	-1118	0.000000E+00 -
-1160	0.000000E+00 -	-1162	0.000000E+00 -	-1704	5.975260E+04 pa	-1706	3.593294E+02 kg/s	-2000	1.000000E+00 kg/s
-2001	2.492649E+00 kg/s	-2002	9.983243E+00 kg/s	-2004	3.035969E-01 -	-2005	3.031382E-01 -	-2006	2.168618E-01 -
-2007	1.000000E-01 s	-2008	2.268618E-01 -	-2009	-1.481399E+02 kg/s	-2010	-3.589430E-01 -	-2011	-1.320812E-01 -
-2012	-1.000000E-01 s	-2013	-1.000000E-01 -	-2014	0.000000E+00 -	-2104	4.231226E+03 pa	-2106	5.514694E+00 m2xsqrt(pa)
-2109	3.300559E+01 kg/s	-2110	0.000000E+00 -	-2112	0.000000E+00 -	-2114	0.000000E+00 -	-2116	0.000000E+00 -
-2118	0.000000E+00 -	-2160	0.000000E+00 -	-2162	0.000000E+00 -	-2704	5.975260E+04 pa	-2706	1.815335E+02 kg/s
-3000	1.000000E+00 m2xsqrt(pa)	-3001	8.731494E-01 m2xsqrt(pa)	-3002	3.542417E+02 m2xsqrt(pa)	-3004	6.610163E-01 -	-3004	6.610163E-01 -
-3005	6.610232E-01 -	-3005	6.610232E-01 -	-3006	-1.410232E-01 -	-3006	-1.410232E-01 -	-3007	-1.000000E-01 s
-3007	-1.000000E-01 s	-3008	-1.510232E-01 -	-3008	-1.510232E-01 -	-3009	1.455341E+02 kg/s	-3009	1.455341E+02 kg/s
-3010	3.526292E-01 -	-3010	3.526292E-01 -	-3011	2.016060E-01 -	-3011	2.016060E-01 -	-3012	1.000000E-01 s
-3012	1.000000E-01	-3013	1.000000E-01	-3013	1.000000E-01	-3014	1.000000E-01	-3014	1.000000E-01

id	value	unit	id	value	unit	id	value	unit	id	value	unit	id	value	unit
		s			-			-			-			-
-3104	3.299102E+03	pa	-3104	3.299102E+03	pa	-3106	8.443301E+01	m2xsqrt(pa)	-3106	4.869520E+01	m2xsqrt(pa)	-3109	5.053339E+02	kg/s
-3110	0.000000E+00	-	-3112	0.000000E+00	-	-3114	1.000000E+00	-	-3116	0.000000E+00	-	-3118	0.000000E+00	-
-3160	0.000000E+00	-	-3162	0.000000E+00	-	-3704	5.975356E+04	pa	-3706	3.593323E+02	kg/s	-4241	5.617200E+06	pa
-4242	1.000000E+00	-	-4243	5.200000E-01	-	-4300	5.593000E+02	k	-4302	3.812800E+06	pa	-4304	5.751000E+02	k
-4310	5.585184E+02	k	-4312	5.585184E+02	k	-4314	5.585184E+02	k	-4316	-7.815662E-01	k	-4318	0.000000E+00	-
-4320	0.000000E+00	-	-4330	5.586849E+02	k	-4332	-1.641506E+01	k	-4334	0.000000E+00	-	-4336	0.000000E+00	-
-4338	0.000000E+00	-	-4340	0.000000E+00	-	-4342	0.000000E+00	-						

** trip set status at time 599.65933 s **

id	set status	id	set status	id	set status	id	set status	id	set status
1	on-forward	10	on-forward	12	on-forward	14	on-forward	16	on-forward
18	on-forward	20	on-forward	21	on-forward	22	off	24	off
26	on-forward	28	on-forward	30	off	32	on-forward	34	on-forward
36	off	38	off	40	off	42	off	44	off
46	on-forward	48	off	50	off	52	off	54	on-forward
56	off	58	on-forward	60	on-forward	100	on-forward	110	off
120	on-forward	200	off	210	off	220	on-forward	300	off
310	off	320	on-forward	-407	off	422	on-reverse	423	off
450	on-reverse	460	on-reverse	520	on-reverse	620	on-reverse	720	on-reverse
1001	off	1002	off	1003	off	1010	on-forward	1020	on-forward
1030	off	1040	off	1050	off	1060	off	1500	on-forward
2010	on-forward	2020	on-forward	2030	off	2040	off	2050	off
2060	off	3010	off	3020	off	3030	off	3040	on-forward
3050	on-forward	3060	off	3500	on-forward	9996	off	9997	off
9998	off	9999	off						

*************************************** trip signal values at time 599.65933 s **************************************

id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit	id	trp.sig.	unit
1	5.996593E+02	s	10	2.000000E+00	-	12	5.000000E+00	-	14	2.000000E+00	-	16	1.000000E+00	-
18	1.000000E+00	-	20	1.000000E+00	-	21	1.000000E+00	-	22	1.000000E+00	-	24	0.000000E+00	-
26	2.000000E+00	-	28	1.000000E+00	-	30	0.000000E+00	-	32	1.000000E+00	-	34	2.000000E+00	-
36	0.000000E+00	-	38	0.000000E+00	-	40	0.000000E+00	-	42	0.000000E+00	-	44	0.000000E+00	-
46	2.000000E+00	-	48	0.000000E+00	-	50	0.000000E+00	-	52	4.903494E+07	w	54	9.269506E+06	pa
56	7.682419E-02	-	58	9.269506E+06	pa	60	9.269506E+06	pa	100	1.000000E+00	-	110	4.237872E+03	kg/s
120	5.582308E+02	k	200	1.000000E+00	-	210	4.229185E+03	kg/s	220	5.585184E+02	k	300	1.000000E+00	-
310	4.252156E+03	kg/s	320	5.579412E+02	k	-407	7.682419E-02	-	422	3.000000E+00	-	423	5.996593E+02	s
450	9.269506E+06	pa	460	9.269506E+06	pa	520	-5.158360E+06	m	620	-5.158485E+06	m	720	-5.158363E+06	m
1001	7.021124E+02	pa	1002	2.291051E+02	pa	1003	9.312175E+02	pa	1010	3.351562E-01	-	1020	3.351562E-01	-
1030	3.351562E-01	-	1040	-5.758951E+01	kg/s	1050	3.018905E+02	kg/s	1060	6.810581E+06	pa	1500	1.853228E+00	kg/s
2010	3.031382E-01	-	2020	3.031382E-01	-	2030	3.031382E-01	-	2040	-1.481399E+02	kg/s	2050	3.300559E+01	kg/s
2060	6.809879E+06	pa	3010	6.610232E-01	-	3020	6.610232E-01	-	3030	6.610232E-01	-	3040	1.455341E+02	kg/s
3050	5.053339E+02	kg/s	3060	6.810810E+06	pa	3500	-1.853224E+00	kg/s	9996	5.996593E+02	s	9997	5.996593E+02	s
9998	5.996593E+02	s	9999	5.996593E+02	s									

at time 63.8013 s in component number 938 at cell 1, the maximum stanton number is 1.663668E+05
at time 0.0075 s in component number 906 at cell 1, the minimum tld is 6.203117E+02 k
where tld is the liquid temperature at bubble detachment from a heated surface

---

```
 1                                                                                    1  00000
11  time is   600.000977 s, time-step size is   0.341651 s, time-step number is  2810  11   0   0
 1                                                                                    1   0   0
 1                              $10$ hot leg 1                                        1   0   0
111                                                                                 111  00000
```

---

the component type is a pipe, component number is 10, first junction number is 10, and second junction number is 12

cell	pressure pa	ncd-gas pressure pa	void fr. -	temp.sat. k	temp.liq. k	temp.gas k	den.liq. kg/m3	den.vap. kg/m3	vel.liq. m/s	vel.gas m/s	wf.liq. -
1	9.29545E+06	0.00000E+00	0.000E+00	5.788E+02	5.583E+02	5.788E+02	7.463E+02	5.070E+01	1.332E+01	1.333E+01	7.907E-02
2	9.29475E+06	0.00000E+00	0.000E+00	5.788E+02	5.583E+02	5.788E+02	7.463E+02	5.069E+01	1.332E+01	1.333E+01	3.113E-03
3	9.29408E+06	0.00000E+00	0.000E+00	5.788E+02	5.583E+02	5.788E+02	7.463E+02	5.069E+01	1.332E+01	1.333E+01	3.113E-03
4	9.29340E+06	0.00000E+00	0.000E+00	5.788E+02	5.583E+02	5.788E+02	7.463E+02	5.069E+01	1.332E+01	1.333E+01	3.113E-03
5	9.29290E+06	0.00000E+00	0.000E+00	5.788E+02	5.583E+02	5.788E+02	7.463E+02	5.068E+01	1.332E+01	1.333E+01	3.113E-03
6	9.29239E+06	0.00000E+00	0.000E+00	5.788E+02	5.583E+02	5.788E+02	7.463E+02	5.068E+01	1.332E+01	1.333E+01	3.113E-03
7									1.166E+01	1.165E+01	1.770E-01

```
    idr   liq.htc   vap.htc    if.htc*a   liq.htfx   vap.htfx   temp.chf   node-wise wall temperatures
cell  -   ----- w/m2/k ------      w/k        w          w          k           k
  1  1.0  3.476E+04 0.000E+00 5.582E+04-2.290E+03 0.000E+00 5.793E+02     558.28
  2  1.0  3.476E+04 0.000E+00 5.582E+04-2.290E+03 0.000E+00 5.793E+02     558.28
  3  1.0  3.476E+04 0.000E+00 5.582E+04-2.290E+03 0.000E+00 5.793E+02     558.28
  4  1.0  3.476E+04 0.000E+00 5.582E+04-2.291E+03 0.000E+00 5.793E+02     558.27
  5  1.0  3.476E+04 0.000E+00 2.736E+04-2.291E+03 0.000E+00 5.793E+02     558.27
  6  1.0  3.279E+04 0.000E+00 5.526E+04-2.289E+03 0.000E+00 5.793E+02     558.27

total power to the component from all heat-transfer surfaces is -3.652561E+04   w
total power to the liquid is -3.652561E+04   w    and total power to the gas is  0.000000E+00   w

total convective energy transported to the fluid from component wall:  1.5069567E+08 w*s
total energy input into the component wall=  0.0000000E+00 w*s
                 inside convective energy error: absolute=  9.23964E+07 w*s     effective=  1.31603E+06 w*s

pipe wall total power loss on the inner surface is  3.51082E+04   w    and on the outer surface is  0.00000E+00   w

pipe  component  total coolant mass is  2.10703E+03 kg , total coolant energy is  2.63427E+09 w*s, and
computed initial total coolant mass is  1.93238E+03 kg

##########  4157 lines deleted here  ##########

-----------------------------------------------------------------------------------------------------------
  1   00000 99999                                                                                      77777
 11   0   0 9   9 time is    600.000977 s, time-step size is    0.341651 s, time-step number is  2810       7
  1   0   0 99999                                                                                      7
  1   0   0     9                            $7$ rod guide tube 6 (short)                              7
111  00000 99999                                                                                      7
-----------------------------------------------------------------------------------------------------------

the component type is a pipe, component number is   7, first junction number is   7, and second junction number is  99

                  ncd-gas
      pressure    pressure   void fr. temp.sat. temp.liq. temp.gas  den.liq.  den.vap.   vel.liq.   vel.gas   wf.liq.
cell     pa          pa         -         k         k         k       kg/m3     kg/m3       m/s        m/s        -
  1 9.41101E+06 0.00000E+00 0.000E+00 5.797E+02 5.581E+02 5.797E+02 7.471E+02 5.146E+01  7.498E-01  7.527E-01 2.500E-02
  2 9.40450E+06 0.00000E+00 0.000E+00 5.797E+02 5.580E+02 5.797E+02 7.471E+02 5.142E+01  7.498E-01  7.527E-01 6.981E-03
  3                                                                                     7.498E-01  7.527E-01 3.623E-02

pipe  component  total coolant mass is  2.75218E+01 kg , total coolant energy is  3.43609E+07 w*s, and
computed initial total coolant mass is  2.61042E+01 kg

-----------------------------------------------------------------------------------------------------------
  1     1   00000                                                                                      1
 11    11   0   0 time is    600.000977 s, time-step size is    0.341651 s, time-step number is  2810    11
  1     1   0   0                                                                                      1
  1     1   0   0                            $1$ reactor vessel                                        1
111   111   00000                                                                                    111
-----------------------------------------------------------------------------------------------------------

the component type is a vessel, the component number is   1, and the junction numbers are   10   20   30   19   29   39
                                                                                              2    3    4    5    6    7
                                                                                             94   95   96   97   98   99

level  1 data

alpn         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -

rovn         5.24981E+01  5.24976E+01  5.24981E+01  5.24976E+01  5.24981E+01  5.24976E+01  5.26340E+01  5.26340E+01
             5.26340E+01  5.26340E+01  5.26340E+01  5.26340E+01
             kg/m3

roln         7.47954E+02  7.47248E+02  7.47085E+02  7.46897E+02  7.47782E+02  7.48629E+02  7.47956E+02  7.47251E+02
             7.47088E+02  7.46900E+02  7.47784E+02  7.48633E+02
             kg/m3

vvnyt        2.91339E-04  1.48780E-03 -1.02369E-03 -3.84712E-04 -1.83315E-03  1.46232E-03 -6.28542E-02  6.71240E-02
            -6.55139E-02  6.22893E-02 -6.88267E-02  6.77818E-02
             m/s

vvnz         4.53843E+00  4.51797E+00  4.54519E+00  4.52089E+00  4.53981E+00  4.50688E+00 -1.68181E+01 -1.69634E+01
            -1.68238E+01 -1.69652E+01 -1.68192E+01 -1.69552E+01
             m/s

vvnxr       -2.65812E+00 -2.65138E+00 -2.65925E+00 -2.65191E+00 -2.65834E+00 -2.64932E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             m/s

vlnyt        2.65591E-04  1.51496E-03 -1.05028E-03 -3.59173E-04 -1.86091E-03  1.48973E-03 -6.28549E-02  6.71240E-02
            -6.55142E-02  6.22901E-02 -6.88264E-02  6.77816E-02
             m/s

vlnz         4.53419E+00  4.51373E+00  4.54094E+00  4.51665E+00  4.53557E+00  4.50265E+00 -1.68105E+01 -1.69558E+01
            -1.68162E+01 -1.69576E+01 -1.68115E+01 -1.69475E+01
             m/s

vlnxr       -2.65335E+00 -2.64659E+00 -2.65447E+00 -2.64712E+00 -2.65357E+00 -2.64454E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             m/s

tvn          5.80929E+02  5.80928E+02  5.80929E+02  5.80928E+02  5.80929E+02  5.80928E+02  5.81083E+02  5.81083E+02
             5.81083E+02  5.81083E+02  5.81083E+02  5.81083E+02
             k
```

```
           5.58173E+02  5.58262E+02  5.57841E+02  5.57435E+02
           k

tsat       5.80929E+02  5.80928E+02  5.80929E+02  5.80928E+02  5.80929E+02  5.80928E+02  5.81083E+02  5.81083E+02
           5.81083E+02  5.81083E+02  5.81083E+02  5.81083E+02
           k

pn         9.56681E+06  9.56675E+06  9.56681E+06  9.56675E+06  9.56681E+06  9.56674E+06  9.58714E+06  9.58713E+06
           9.58713E+06  9.58713E+06  9.58714E+06  9.58714E+06
           pa

pan        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           pa

conc       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

solid      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           kg/m3

level  2 data

alpn       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

rovn       5.23324E+01  5.23324E+01  5.23325E+01  5.23324E+01  5.23324E+01  5.23324E+01  5.31538E+01  5.31556E+01
           5.31536E+01  5.31556E+01  5.31537E+01  5.31559E+01
           kg/m3

roln       7.47941E+02  7.47236E+02  7.47073E+02  7.46886E+02  7.47769E+02  7.48614E+02  7.48015E+02  7.47310E+02
           7.47147E+02  7.46960E+02  7.47843E+02  7.48692E+02
           kg/m3

vvnyt      1.85485E-03 -3.11129E-03  2.72312E-03 -1.74782E-03  3.46571E-03 -3.18465E-03 -6.39004E-02  6.78747E-02
          -6.63649E-02  6.33872E-02 -6.93836E-02  6.83873E-02
           m/s

##########  625 lines deleted here  ##########

pn         9.40445E+06  9.40444E+06  9.40444E+06  9.40444E+06  9.40445E+06  9.40444E+06  9.40445E+06  9.40444E+06
           9.40445E+06  9.40444E+06  9.40445E+06  9.40444E+06
           pa

pan        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           pa

conc       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

solid      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           kg/m3

level 12 data

alpn       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           -

rovn       5.13682E+01  5.13682E+01  5.13682E+01  5.13682E+01  5.13682E+01  5.13682E+01  1.01931E+02  1.01931E+02
           1.01931E+02  1.01931E+02  1.01931E+02  1.01931E+02
           kg/m3

roln       7.46404E+02  7.46244E+02  7.46446E+02  7.46161E+02  7.46415E+02  7.46698E+02  7.08582E+02  7.08582E+02
           7.08582E+02  7.08582E+02  7.08582E+02  7.08582E+02
           kg/m3

vvnyt     -2.87475E-02 -1.80975E-03 -1.05136E-02  2.63640E-02  1.44616E-02 -9.53884E-03  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vvnz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vvnxr      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnyt     -2.87475E-02 -1.80976E-03 -1.05136E-02  2.63639E-02  1.44616E-02 -9.53886E-03  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s

vlnz       0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
           m/s
```

```
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             m/s

tvn          5.79630E+02  5.79630E+02  5.79630E+02  5.79630E+02  5.79630E+02  5.79630E+02  6.17905E+02  6.17905E+02
             6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
             k

tln          5.58357E+02  5.58432E+02  5.58337E+02  5.58472E+02  5.58351E+02  5.58217E+02  5.81000E+02  5.81000E+02
             5.81000E+02  5.81000E+02  5.81000E+02  5.81000E+02
             k

tsat         5.79630E+02  5.79630E+02  5.79630E+02  5.79630E+02  5.79630E+02  5.79630E+02  6.17905E+02  6.17905E+02
             6.17905E+02  6.17905E+02  6.17905E+02  6.17905E+02
             k

pn           9.39694E+06  9.39694E+06  9.39694E+06  9.39694E+06  9.39694E+06  9.39694E+06  1.55000E+07  1.55000E+07
             1.55000E+07  1.55000E+07  1.55000E+07  1.55000E+07
             pa

pan          0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             pa

conc         0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             -

solid        0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
             kg/m3

total power to the vessel coolant from all heat surfaces is  4.82041E+07   w
total power to the liquid is  4.82041E+07   w    and total power to the gas is  0.00000E+00   w

vessel lower plenum
liquid volume is  2.33861E+01 m3 , liquid volume fraction is  1.00000E+00 and liquid mass is  1.74835E+04 kg
volume-averaged liquid temperature is  5.57916E+02 k and volume-averaged saturation temperature is  5.80979E+02 k

vessel reactor core
liquid volume fraction is  1.00000E+00 and liquid mass is  1.11193E+04 kg
volume-averaged liquid temperature is  5.58341E+02 k and volume-averaged saturation temperature is  5.80238E+02 k

vessel reactor core
inlet  liquid mass flow is  1.26114E+04  kg/s  and inlet  gas mass flow is  0.00000E+00  kg/s
outlet liquid mass flow is  1.26116E+04  kg/s  and outlet gas mass flow is  0.00000E+00  kg/s

vessel upper plenum
liquid volume fraction is  1.00000E+00 and liquid mass is  2.66405E+04 kg
volume-averaged liquid temperature is  5.58442E+02 k and volume-averaged saturation temperature is  5.80181E+02 k

vessel downcomer
liquid volume fraction is  0.00000E+00, liquid mass is  0.00000E+00 kg , volume-averaged pressure is  0.00000E+00  pa
volume-averaged liquid temperature is  0.00000E+00 k and volume-averaged saturation temperature is  0.00000E+00 k

vessel component total coolant mass is  7.10800E+04 kg , total coolant energy is  8.87973E+10 w*s, and
computed initial total coolant mass is  6.78684E+04 kg

--------------------------------------------------------------------------------------------------------------------
  1     1     1                                                                                    99999 00000 00000
 11    11    11    time is    600.000977 s, time-step size is    0.341651 s, time-step number is  2810 9   9 0   0 0   0
  1     1     1                                                                                    99999 0   0 0   0
  1     1     1                               $900$ reactor-core fuel rods                             9 0   0 0   0
111   111   111                                                                                    99999 00000 00000
--------------------------------------------------------------------------------------------------------------------


the heat-structure component type is a rod  and the component number is 900

reactor-core power is 4.902906E+07   w    and neutron multiplication constant keff is 0.966184

rod   1   plane (perpendicular to z direction) coupled to cells   0 (inner) and   1 (outer), peaking factor is   1.0000

 id   row    z(m)     heat-structure temperatures (k)
1001   1  0.0000E+00 5.6655E+02 5.6629E+02 5.6553E+02 5.6426E+02 5.6249E+02 5.5855E+02 5.5834E+02 5.5815E+02
1002   2  9.1440E-01 5.7290E+02 5.7246E+02 5.7114E+02 5.6894E+02 5.6587E+02 5.5912E+02 5.5876E+02 5.5842E+02
1003   3  1.8288E+00 5.7417E+02 5.7370E+02 5.7228E+02 5.6992E+02 5.6662E+02 5.5939E+02 5.5900E+02 5.5865E+02
1004   4  2.7432E+00 5.7302E+02 5.7259E+02 5.7128E+02 5.6912E+02 5.6610E+02 5.5945E+02 5.5910E+02 5.5877E+02
1005   5  3.6576E+00 5.6731E+02 5.6705E+02 5.6627E+02 5.6496E+02 5.6313E+02 5.5908E+02 5.5887E+02 5.5867E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
            w/m2/k         k          w/m2/k         k              w/m2/k         k          w/m2/k         k          w/m2/k
1001  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1706E+04  5.5790E+02  0.0000E+00  5.8048E+02  2.3506E+03
1002  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1715E+04  5.5800E+02  0.0000E+00  5.8048E+02  2.3609E+03
1003  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1724E+04  5.5819E+02  0.0000E+00  5.8032E+02  2.3632E+03
1004  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1737E+04  5.5835E+02  0.0000E+00  5.8016E+02  2.3616E+03
1005  0  0.0000E+00  2.7315E+02  0.0000E+00  2.7315E+02   1  3.1756E+04  5.5841E+02  0.0000E+00  5.7999E+02  2.3526E+03

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti        qchfi    qchfi/qtoti   qliqo        qvapo        qtoto        qchfo    qchfo/qtoto
          w/m2         w/m2         w/m2         w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  7.8539E+03  0.0000E+00  7.8539E+03  2.8567E+06  3.64E+02
1002  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3534E+04  0.0000E+00  1.3534E+04  2.8592E+06  2.11E+02
1003  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.4510E+04  0.0000E+00  1.4510E+04  2.8642E+06  1.97E+02
1004  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  1.3324E+04  0.0000E+00  1.3324E+04  2.8690E+06  2.15E+02
1005  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.00E+00  8.0847E+03  0.0000E+00  8.0847E+03  2.8713E+06  3.55E+02
```

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.03346E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	2.74207E-05	5.80319E+02
1003	0.00000E+00	2.73150E+02	3.07707E-05	5.80155E+02
1004	0.00000E+00	2.73150E+02	3.03884E-05	5.79991E+02
1005	0.00000E+00	2.73150E+02	2.18493E-05	5.79991E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7959387E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.27367E+09 w*s effective= -4.02491E+08 w*s

rod 2 plane (perpendicular to z direction) coupled to cells 0 (inner) and 2 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6688E+02	5.6662E+02	5.6586E+02	5.6459E+02	5.6282E+02	5.5889E+02	5.5868E+02	5.5848E+02
1002	2	9.1440E-01	5.7323E+02	5.7279E+02	5.7147E+02	5.6927E+02	5.6620E+02	5.5945E+02	5.5909E+02	5.5876E+02
1003	3	1.8288E+00	5.7450E+02	5.7403E+02	5.7261E+02	5.7025E+02	5.6695E+02	5.5973E+02	5.5934E+02	5.5898E+02
1004	4	2.7432E+00	5.7335E+02	5.7292E+02	5.7162E+02	5.6945E+02	5.6643E+02	5.5979E+02	5.5943E+02	5.5910E+02
1005	5	3.6576E+00	5.6765E+02	5.6738E+02	5.6660E+02	5.6529E+02	5.6347E+02	5.5942E+02	5.5920E+02	5.5900E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1693E+04	5.5823E+02	0.0000E+00	5.8048E+02	2.3516E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1703E+04	5.5833E+02	0.0000E+00	5.8048E+02	2.3619E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1708E+04	5.5852E+02	0.0000E+00	5.8032E+02	2.3642E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1710E+04	5.5868E+02	0.0000E+00	5.8016E+02	2.3626E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1706E+04	5.5875E+02	0.0000E+00	5.7999E+02	2.3536E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	7.8505E+03	0.0000E+00	7.8505E+03	2.8576E+06	3.64E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3530E+04	0.0000E+00	1.3530E+04	2.8601E+06	2.11E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4507E+04	0.0000E+00	1.4507E+04	2.8653E+06	1.98E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3321E+04	0.0000E+00	1.3321E+04	2.8705E+06	2.15E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.0813E+03	0.0000E+00	8.0813E+03	2.8732E+06	3.56E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.06325E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	2.78466E-05	5.80320E+02
1003	0.00000E+00	2.73150E+02	3.12586E-05	5.80156E+02
1004	0.00000E+00	2.73150E+02	3.08860E-05	5.79991E+02
1005	0.00000E+00	2.73150E+02	2.22157E-05	5.79991E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7961539E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.27103E+09 w*s effective= -3.79355E+08 w*s

rod 3 plane (perpendicular to z direction) coupled to cells 0 (inner) and 3 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6696E+02	5.6670E+02	5.6594E+02	5.6467E+02	5.6290E+02	5.5896E+02	5.5875E+02	5.5856E+02
1002	2	9.1440E-01	5.7331E+02	5.7287E+02	5.7155E+02	5.6935E+02	5.6628E+02	5.5953E+02	5.5917E+02	5.5884E+02
1003	3	1.8288E+00	5.7458E+02	5.7411E+02	5.7269E+02	5.7032E+02	5.6703E+02	5.5980E+02	5.5942E+02	5.5906E+02
1004	4	2.7432E+00	5.7343E+02	5.7300E+02	5.7169E+02	5.6953E+02	5.6651E+02	5.5986E+02	5.5951E+02	5.5918E+02
1005	5	3.6576E+00	5.6772E+02	5.6746E+02	5.6668E+02	5.6537E+02	5.6354E+02	5.5950E+02	5.5928E+02	5.5908E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1720E+04	5.5831E+02	0.0000E+00	5.8048E+02	2.3519E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1728E+04	5.5841E+02	0.0000E+00	5.8048E+02	2.3621E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1738E+04	5.5860E+02	0.0000E+00	5.8032E+02	2.3644E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1752E+04	5.5876E+02	0.0000E+00	5.8016E+02	2.3628E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1772E+04	5.5883E+02	0.0000E+00	5.7999E+02	2.3539E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	7.8514E+03	0.0000E+00	7.8514E+03	2.8567E+06	3.64E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3531E+04	0.0000E+00	1.3531E+04	2.8593E+06	2.11E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4508E+04	0.0000E+00	1.4508E+04	2.8642E+06	1.97E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3322E+04	0.0000E+00	1.3322E+04	2.8690E+06	2.15E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.0821E+03	0.0000E+00	8.0821E+03	2.8713E+06	3.55E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.06830E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	2.79188E-05	5.80319E+02
1003	0.00000E+00	2.73150E+02	3.13354E-05	5.80155E+02
1004	0.00000E+00	2.73150E+02	3.09486E-05	5.79990E+02
1005	0.00000E+00	2.73150E+02	2.22395E-05	5.79990E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7961270E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.26007E+09 w*s effective= -3.81674E+08 w*s

rod 4 plane (perpendicular to z direction) coupled to cells 0 (inner) and 4 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6705E+02	5.6679E+02	5.6603E+02	5.6476E+02	5.6299E+02	5.5905E+02	5.5884E+02	5.5865E+02
1002	2	9.1440E-01	5.7340E+02	5.7296E+02	5.7164E+02	5.6944E+02	5.6637E+02	5.5962E+02	5.5926E+02	5.5893E+02
1003	3	1.8288E+00	5.7467E+02	5.7420E+02	5.7278E+02	5.7041E+02	5.6712E+02	5.5989E+02	5.5951E+02	5.5915E+02
1004	4	2.7432E+00	5.7352E+02	5.7309E+02	5.7178E+02	5.6962E+02	5.6660E+02	5.5995E+02	5.5960E+02	5.5927E+02
1005	5	3.6576E+00	5.6781E+02	5.6755E+02	5.6677E+02	5.6546E+02	5.6363E+02	5.5959E+02	5.5937E+02	5.5917E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1697E+04	5.5840E+02	0.0000E+00	5.8048E+02	2.3522E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1708E+04	5.5850E+02	0.0000E+00	5.8048E+02	2.3624E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1713E+04	5.5869E+02	0.0000E+00	5.8032E+02	2.3647E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1715E+04	5.5885E+02	0.0000E+00	5.8016E+02	2.3631E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1712E+04	5.5892E+02	0.0000E+00	5.7999E+02	2.3542E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	7.8524E+03	0.0000E+00	7.8524E+03	2.8576E+06	3.64E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3532E+04	0.0000E+00	1.3532E+04	2.8602E+06	2.11E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4509E+04	0.0000E+00	1.4509E+04	2.8653E+06	1.97E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3323E+04	0.0000E+00	1.3323E+04	2.8706E+06	2.15E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.0829E+03	0.0000E+00	8.0829E+03	2.8732E+06	3.55E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.07841E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	2.80516E-05	5.80320E+02
1003	0.00000E+00	2.73150E+02	3.14918E-05	5.80155E+02
1004	0.00000E+00	2.73150E+02	3.11184E-05	5.79991E+02
1005	0.00000E+00	2.73150E+02	2.23848E-05	5.79991E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7962297E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.26436E+09 w*s effective= -3.70966E+08 w*s

rod 5 plane (perpendicular to z direction) coupled to cells 0 (inner) and 5 (outer), peaking factor is 1.0000

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.6663E+02	5.6637E+02	5.6561E+02	5.6434E+02	5.6257E+02	5.5863E+02	5.5842E+02	5.5823E+02
1002	2	9.1440E-01	5.7298E+02	5.7254E+02	5.7122E+02	5.6902E+02	5.6595E+02	5.5920E+02	5.5884E+02	5.5851E+02
1003	3	1.8288E+00	5.7425E+02	5.7378E+02	5.7236E+02	5.7000E+02	5.6671E+02	5.5947E+02	5.5909E+02	5.5873E+02
1004	4	2.7432E+00	5.7310E+02	5.7267E+02	5.7137E+02	5.6920E+02	5.6618E+02	5.5953E+02	5.5918E+02	5.5885E+02
1005	5	3.6576E+00	5.6740E+02	5.6713E+02	5.6635E+02	5.6504E+02	5.6322E+02	5.5917E+02	5.5895E+02	5.5875E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1709E+04	5.5798E+02	0.0000E+00	5.8048E+02	2.3509E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1718E+04	5.5808E+02	0.0000E+00	5.8048E+02	2.3611E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1727E+04	5.5827E+02	0.0000E+00	5.8032E+02	2.3634E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1740E+04	5.5843E+02	0.0000E+00	5.8016E+02	2.3618E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1760E+04	5.5850E+02	0.0000E+00	5.7999E+02	2.3529E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	7.8547E+03	0.0000E+00	7.8547E+03	2.8567E+06	3.64E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3535E+04	0.0000E+00	1.3535E+04	2.8592E+06	2.11E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4511E+04	0.0000E+00	1.4511E+04	2.8642E+06	1.97E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3325E+04	0.0000E+00	1.3325E+04	2.8690E+06	2.15E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.0854E+03	0.0000E+00	8.0854E+03	2.8713E+06	3.55E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.04064E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	2.75181E-05	5.80319E+02
1003	0.00000E+00	2.73150E+02	3.08814E-05	5.80155E+02
1004	0.00000E+00	2.73150E+02	3.04987E-05	5.79991E+02
1005	0.00000E+00	2.73150E+02	2.19290E-05	5.79991E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7959767E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.26801E+09 w*s effective= -3.98285E+08 w*s

rod 6 plane (perpendicular to z direction) coupled to cells 0 (inner) and 6 (outer), peaking factor is 1.0000

id row z(m) heat-structure temperatures (k)

1001	1	0.0000E+00	5.6623E+02	5.6597E+02	5.6521E+02	5.6394E+02	5.6217E+02	5.5823E+02	5.5802E+02	5.5783E+02
1002	2	9.1440E-01	5.7258E+02	5.7214E+02	5.7082E+02	5.6862E+02	5.6556E+02	5.5880E+02	5.5844E+02	5.5810E+02
1003	3	1.8288E+00	5.7385E+02	5.7338E+02	5.7196E+02	5.6960E+02	5.6631E+02	5.5907E+02	5.5868E+02	5.5833E+02
1004	4	2.7432E+00	5.7271E+02	5.7227E+02	5.7097E+02	5.6880E+02	5.6578E+02	5.5913E+02	5.5878E+02	5.5845E+02
1005	5	3.6576E+00	5.6700E+02	5.6674E+02	5.6595E+02	5.6464E+02	5.6282E+02	5.5877E+02	5.5855E+02	5.5835E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1675E+04	5.5758E+02	0.0000E+00	5.8048E+02	2.3496E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1685E+04	5.5768E+02	0.0000E+00	5.8048E+02	2.3599E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1688E+04	5.5787E+02	0.0000E+00	5.8032E+02	2.3622E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1687E+04	5.5803E+02	0.0000E+00	5.8016E+02	2.3606E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1680E+04	5.5810E+02	0.0000E+00	5.7999E+02	2.3516E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	7.8570E+03	0.0000E+00	7.8570E+03	2.8575E+06	3.64E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3537E+04	0.0000E+00	1.3537E+04	2.8600E+06	2.11E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.4514E+04	0.0000E+00	1.4514E+04	2.8652E+06	1.97E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3327E+04	0.0000E+00	1.3327E+04	2.8706E+06	2.15E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	8.0878E+03	0.0000E+00	8.0878E+03	2.8733E+06	3.55E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	2.00933E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	2.70648E-05	5.80320E+02
1003	0.00000E+00	2.73150E+02	3.03730E-05	5.80156E+02
1004	0.00000E+00	2.73150E+02	3.00092E-05	5.79992E+02
1005	0.00000E+00	2.73150E+02	2.16148E-05	5.79992E+02

total convective energy to the fluid during hydro solution:
inside surface= 0.0000000E+00 w*s outside surface= 1.7958384E+11 w*s

errors in conservation of convective energy at the wall between hydro and conduction solutions:
inside convective energy error: absolute= 0.00000E+00 w*s effective= 0.00000E+00 w*s
outside convective energy error: absolute= 1.30247E+09 w*s effective= -4.14054E+08 w*s

rod 7 plane (perpendicular to z direction) coupled to cells 0 (inner) and -1 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7246E+02	5.7203E+02	5.7073E+02	5.6859E+02	5.6559E+02	5.5899E+02	5.5864E+02	5.5832E+02
1002	2	9.1440E-01	5.8308E+02	5.8233E+02	5.8008E+02	5.7635E+02	5.7115E+02	5.5988E+02	5.5928E+02	5.5871E+02
1003	3	1.8288E+00	5.8509E+02	5.8428E+02	5.8186E+02	5.7785E+02	5.7227E+02	5.6021E+02	5.5956E+02	5.5896E+02
1004	4	2.7432E+00	5.8304E+02	5.8230E+02	5.8009E+02	5.7641E+02	5.7130E+02	5.6020E+02	5.5961E+02	5.5905E+02
1005	5	3.6576E+00	5.7340E+02	5.7295E+02	5.7162E+02	5.6941E+02	5.6632E+02	5.5954E+02	5.5918E+02	5.5884E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1706E+04	5.5790E+02	0.0000E+00	5.8048E+02	2.3600E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1715E+04	5.5800E+02	0.0000E+00	5.8048E+02	2.3770E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1724E+04	5.5819E+02	0.0000E+00	5.8032E+02	2.3805E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1737E+04	5.5835E+02	0.0000E+00	5.8016E+02	2.3775E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1756E+04	5.5841E+02	0.0000E+00	5.7999E+02	2.3623E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3219E+04	0.0000E+00	1.3219E+04	2.8567E+06	2.16E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2749E+04	0.0000E+00	2.2749E+04	2.8592E+06	1.26E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4388E+04	0.0000E+00	2.4388E+04	2.8642E+06	1.17E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2397E+04	0.0000E+00	2.2397E+04	2.8690E+06	1.28E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3605E+04	0.0000E+00	1.3605E+04	2.8713E+06	2.11E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.42253E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	5.16527E-05	5.80319E+02
1003	0.00000E+00	2.73150E+02	5.71438E-05	5.80155E+02
1004	0.00000E+00	2.73150E+02	5.49273E-05	5.79991E+02
1005	0.00000E+00	2.73150E+02	3.67676E-05	5.79991E+02

rod 8 plane (perpendicular to z direction) coupled to cells 0 (inner) and -2 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7279E+02	5.7236E+02	5.7107E+02	5.6892E+02	5.6592E+02	5.5933E+02	5.5898E+02	5.5865E+02
1002	2	9.1440E-01	5.8341E+02	5.8266E+02	5.8041E+02	5.7668E+02	5.7148E+02	5.6022E+02	5.5961E+02	5.5905E+02
1003	3	1.8288E+00	5.8542E+02	5.8461E+02	5.8219E+02	5.7818E+02	5.7260E+02	5.6054E+02	5.5989E+02	5.5929E+02
1004	4	2.7432E+00	5.8338E+02	5.8264E+02	5.8042E+02	5.7674E+02	5.7163E+02	5.6054E+02	5.5994E+02	5.5939E+02
1005	5	3.6576E+00	5.7373E+02	5.7328E+02	5.7195E+02	5.6974E+02	5.6666E+02	5.5988E+02	5.5951E+02	5.5918E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1693E+04	5.5823E+02	0.0000E+00	5.8048E+02	2.3610E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1703E+04	5.5833E+02	0.0000E+00	5.8048E+02	2.3781E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1708E+04	5.5852E+02	0.0000E+00	5.8032E+02	2.3815E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1710E+04	5.5868E+02	0.0000E+00	5.8016E+02	2.3785E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1706E+04	5.5875E+02	0.0000E+00	5.7999E+02	2.3633E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -

1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3215E+04	0.0000E+00	1.3215E+04	2.8576E+06	2.16E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2746E+04	0.0000E+00	2.2746E+04	2.8601E+06	1.26E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4384E+04	0.0000E+00	2.4384E+04	2.8653E+06	1.18E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2393E+04	0.0000E+00	2.2393E+04	2.8705E+06	1.28E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3601E+04	0.0000E+00	1.3601E+04	2.8732E+06	2.11E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.47327E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	5.24475E-05	5.80320E+02
1003	0.00000E+00	2.73150E+02	5.80439E-05	5.80156E+02
1004	0.00000E+00	2.73150E+02	5.58245E-05	5.79991E+02
1005	0.00000E+00	2.73150E+02	3.73905E-05	5.79991E+02

rod 9 plane (perpendicular to z direction) coupled to cells 0 (inner) and -3 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7287E+02	5.7244E+02	5.7114E+02	5.6900E+02	5.6600E+02	5.5941E+02	5.5906E+02	5.5873E+02
1002	2	9.1440E-01	5.8349E+02	5.8274E+02	5.8049E+02	5.7676E+02	5.7156E+02	5.6029E+02	5.5969E+02	5.5913E+02
1003	3	1.8288E+00	5.8550E+02	5.8469E+02	5.8227E+02	5.7826E+02	5.7268E+02	5.6062E+02	5.5997E+02	5.5937E+02
1004	4	2.7432E+00	5.8345E+02	5.8271E+02	5.8050E+02	5.7682E+02	5.7170E+02	5.6061E+02	5.6002E+02	5.5947E+02
1005	5	3.6576E+00	5.7381E+02	5.7336E+02	5.7203E+02	5.6982E+02	5.6673E+02	5.5995E+02	5.5959E+02	5.5925E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1720E+04	5.5831E+02	0.0000E+00	5.8048E+02	2.3613E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1728E+04	5.5841E+02	0.0000E+00	5.8048E+02	2.3783E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1738E+04	5.5860E+02	0.0000E+00	5.8032E+02	2.3818E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1752E+04	5.5876E+02	0.0000E+00	5.8016E+02	2.3788E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1772E+04	5.5883E+02	0.0000E+00	5.7999E+02	2.3635E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3216E+04	0.0000E+00	1.3216E+04	2.8567E+06	2.16E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2747E+04	0.0000E+00	2.2747E+04	2.8593E+06	1.26E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4385E+04	0.0000E+00	2.4385E+04	2.8642E+06	1.17E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2394E+04	0.0000E+00	2.2394E+04	2.8690E+06	1.28E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3602E+04	0.0000E+00	1.3602E+04	2.8713E+06	2.11E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.48161E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	5.25803E-05	5.80319E+02
1003	0.00000E+00	2.73150E+02	5.81831E-05	5.80155E+02
1004	0.00000E+00	2.73150E+02	5.59345E-05	5.79990E+02
1005	0.00000E+00	2.73150E+02	3.74291E-05	5.79990E+02

rod 10 plane (perpendicular to z direction) coupled to cells 0 (inner) and -4 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7296E+02	5.7253E+02	5.7123E+02	5.6909E+02	5.6609E+02	5.5950E+02	5.5914E+02	5.5882E+02
1002	2	9.1440E-01	5.8358E+02	5.8283E+02	5.8058E+02	5.7684E+02	5.7165E+02	5.6038E+02	5.5978E+02	5.5922E+02
1003	3	1.8288E+00	5.8559E+02	5.8478E+02	5.8236E+02	5.7835E+02	5.7277E+02	5.6071E+02	5.6006E+02	5.5946E+02
1004	4	2.7432E+00	5.8354E+02	5.8280E+02	5.8059E+02	5.7691E+02	5.7179E+02	5.6070E+02	5.6011E+02	5.5956E+02
1005	5	3.6576E+00	5.7390E+02	5.7345E+02	5.7212E+02	5.6991E+02	5.6682E+02	5.6004E+02	5.5968E+02	5.5934E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1697E+04	5.5840E+02	0.0000E+00	5.8048E+02	2.3616E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1708E+04	5.5850E+02	0.0000E+00	5.8048E+02	2.3786E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1713E+04	5.5869E+02	0.0000E+00	5.8032E+02	2.3820E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1715E+04	5.5885E+02	0.0000E+00	5.8016E+02	2.3790E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1712E+04	5.5892E+02	0.0000E+00	5.7999E+02	2.3638E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3217E+04	0.0000E+00	1.3217E+04	2.8576E+06	2.16E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2748E+04	0.0000E+00	2.2748E+04	2.8602E+06	1.26E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4386E+04	0.0000E+00	2.4386E+04	2.8653E+06	1.17E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2395E+04	0.0000E+00	2.2395E+04	2.8706E+06	1.28E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3603E+04	0.0000E+00	1.3603E+04	2.8732E+06	2.11E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.49845E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	5.28306E-05	5.80320E+02
1003	0.00000E+00	2.73150E+02	5.84739E-05	5.80155E+02
1004	0.00000E+00	2.73150E+02	5.62425E-05	5.79991E+02
1005	0.00000E+00	2.73150E+02	3.76722E-05	5.79991E+02

rod 11 plane (perpendicular to z direction) coupled to cells 0 (inner) and -5 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7254E+02	5.7211E+02	5.7082E+02	5.6867E+02	5.6567E+02	5.5908E+02	5.5872E+02	5.5840E+02
1002	2	9.1440E-01	5.8316E+02	5.8241E+02	5.8016E+02	5.7643E+02	5.7123E+02	5.5996E+02	5.5936E+02	5.5880E+02
1003	3	1.8288E+00	5.8517E+02	5.8436E+02	5.8194E+02	5.7793E+02	5.7235E+02	5.6029E+02	5.5964E+02	5.5904E+02
1004	4	2.7432E+00	5.8313E+02	5.8239E+02	5.8017E+02	5.7649E+02	5.7138E+02	5.6029E+02	5.5969E+02	5.5914E+02
1005	5	3.6576E+00	5.7348E+02	5.7303E+02	5.7170E+02	5.6949E+02	5.6641E+02	5.5962E+02	5.5926E+02	5.5892E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1709E+04	5.5798E+02	0.0000E+00	5.8048E+02	2.3603E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1718E+04	5.5808E+02	0.0000E+00	5.8048E+02	2.3773E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1727E+04	5.5827E+02	0.0000E+00	5.8032E+02	2.3807E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1740E+04	5.5843E+02	0.0000E+00	5.8016E+02	2.3777E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1760E+04	5.5850E+02	0.0000E+00	5.7999E+02	2.3625E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3220E+04	0.0000E+00	1.3220E+04	2.8567E+06	2.16E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2750E+04	0.0000E+00	2.2750E+04	2.8592E+06	1.26E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4389E+04	0.0000E+00	2.4389E+04	2.8642E+06	1.17E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2397E+04	0.0000E+00	2.2397E+04	2.8690E+06	1.28E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3605E+04	0.0000E+00	1.3605E+04	2.8713E+06	2.11E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.43446E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	5.18343E-05	5.80319E+02
1003	0.00000E+00	2.73150E+02	5.73476E-05	5.80155E+02
1004	0.00000E+00	2.73150E+02	5.51252E-05	5.79991E+02
1005	0.00000E+00	2.73150E+02	3.69004E-05	5.79991E+02

rod 12 plane (perpendicular to z direction) coupled to cells 0 (inner) and -6 (outer), peaking factor is 1.6780

id	row	z(m)	heat-structure temperatures (k)							
1001	1	0.0000E+00	5.7214E+02	5.7171E+02	5.7042E+02	5.6827E+02	5.6528E+02	5.5867E+02	5.5832E+02	5.5799E+02
1002	2	9.1440E-01	5.8276E+02	5.8201E+02	5.7977E+02	5.7603E+02	5.7084E+02	5.5956E+02	5.5896E+02	5.5839E+02
1003	3	1.8288E+00	5.8477E+02	5.8396E+02	5.8155E+02	5.7754E+02	5.7196E+02	5.5989E+02	5.5924E+02	5.5864E+02
1004	4	2.7432E+00	5.8273E+02	5.8199E+02	5.7977E+02	5.7610E+02	5.7098E+02	5.5989E+02	5.5929E+02	5.5874E+02
1005	5	3.6576E+00	5.7308E+02	5.7264E+02	5.7131E+02	5.6910E+02	5.6601E+02	5.5922E+02	5.5886E+02	5.5852E+02

id	idi	hliqi w/m2/k	tliqi k	hvapi w/m2/k	tvapi k	ido	hliqo w/m2/k	tliqo k	hvapo w/m2/k	tvapo k	hgap w/m2/k
1001	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1675E+04	5.5758E+02	0.0000E+00	5.8048E+02	2.3590E+03
1002	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1685E+04	5.5768E+02	0.0000E+00	5.8048E+02	2.3760E+03
1003	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1688E+04	5.5787E+02	0.0000E+00	5.8032E+02	2.3795E+03
1004	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1687E+04	5.5803E+02	0.0000E+00	5.8016E+02	2.3765E+03
1005	0	0.0000E+00	2.7315E+02	0.0000E+00	2.7315E+02	1	3.1680E+04	5.5810E+02	0.0000E+00	5.7999E+02	2.3613E+03

heat flux to the hydro cells

idz	qliqi w/m2	qvapi w/m2	qtoti w/m2	qchfi w/m2	qchfi/qtoti -	qliqo w/m2	qvapo w/m2	qtoto w/m2	qchfo w/m2	qchfo/qtoto -
1001	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3222E+04	0.0000E+00	1.3222E+04	2.8575E+06	2.16E+02
1002	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2752E+04	0.0000E+00	2.2752E+04	2.8600E+06	1.26E+02
1003	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.4391E+04	0.0000E+00	2.4391E+04	2.8652E+06	1.17E+02
1004	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	2.2400E+04	0.0000E+00	2.2400E+04	2.8706E+06	1.28E+02
1005	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.00E+00	1.3608E+04	0.0000E+00	1.3608E+04	2.8733E+06	2.11E+02

id	stanton number inner surf. -	liq.temp. bubble det. inner surf. k	stanton number outer surf. -	liq.temp. bubble det. outer surf. k
1001	0.00000E+00	2.73150E+02	3.38135E-05	5.80483E+02
1002	0.00000E+00	2.73150E+02	5.09931E-05	5.80320E+02
1003	0.00000E+00	2.73150E+02	5.64162E-05	5.80156E+02
1004	0.00000E+00	2.73150E+02	5.42499E-05	5.79992E+02
1005	0.00000E+00	2.73150E+02	3.63671E-05	5.79992E+02

inner-surface node-interval thermal conductivity is 5.17229E+00 w/m/k
outer-surface node-interval thermal conductivity is 1.59987E+01 w/m/k
effective r-direction wall thermal conductivity is 5.85008E+00 w/m/k
which have been axially averaged over all 6 average-power rod s

total inner surface area is 0.00000E+00 m2 and
total outer surface area is 3.96347E+03 m2 of all 6 average-power rod s

total power from the heat-structure inner surface is 0.00000E+00 w and outer surface is 4.88848E+07 w

average-power rod 4 has the peak surface temperature of 5.59270E+02 k
supplemental rod 10 has the peak surface temperature of 5.59556E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is 0.00000E+00 kg

########## 3822 lines deleted here ##########

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------------------------------------------------------------------------------------------------------
                                                                                   99999 33333 88888
  1  33333   1                                                                     
 11      3  11   time is    600.000977 s, time-step size is    0.341651 s, time-step number is  2810 9   9     3 8   8
                                                                                   99999 33333 88888
  1  33333   1                                                                         9     3 8   8
  1      3   1                        $938$ st-gen-1,2,3 sec.dryer                 99999 33333 88888
111  33333 111
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the heat-structure component type is a rod and the component number is 938

rod 1 plane (perpendicular to z direction) coupled to cells 1 (inner) and 0 (outer)

id	row	z(m)	heat-structure temperatures (k)		
1001	1	0.0000E+00	5.5188E+02	5.5395E+02	5.5597E+02

```
1002    2  5.7542E+00 5.5464E+02 5.5550E+02 5.5634E+02
1003    3  1.1508E+01 5.5678E+02 5.5663E+02 5.5649E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
            w/m2/k         k          w/m2/k         k                w/m2/k         k          w/m2/k         k          w/m2/k
1001  2  4.5654E+03  5.4471E+02  1.8332E+00  5.4471E+02  11  1.0669E+02  5.5654E+02  6.3493E+04  5.5648E+02  0.0000E+00
1002 11  2.4659E+03  5.4513E+02  4.2038E+03  5.5696E+02  11  7.4144E+01  5.5654E+02  9.8164E+04  5.5648E+02  0.0000E+00
1003 11  1.4268E+02  5.5607E+02  1.3931E+04  5.5696E+02  11  4.6407E+01  5.5654E+02  4.1629E+05  5.5648E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti       qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo   qchfo/qtoto
          w/m2         w/m2         w/m2        w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  3.2726E+04  1.3144E+01  3.2739E+04  5.1643E+05  1.58E+01 -6.0659E+01 -3.2778E+04 -3.2839E+04  0.0000E+00  0.00E+00
1002  2.3452E+04 -9.7520E+03  1.3700E+04  2.5821E+05  1.88E+01 -1.4208E+01 -1.3677E+04 -1.3691E+04  0.0000E+00  0.00E+00
1003  1.0103E+02 -2.5284E+03 -2.4274E+03  5.8190E-03  2.40E-06 -2.1777E+00  2.2386E+03  2.2364E+03  0.0000E+00  0.00E+00

       stanton     liq.temp.     stanton     liq.temp.
        number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  8.73601E+02  5.44710E+02  0.00000E+00  5.57160E+02
1002  0.00000E+00  5.57153E+02  0.00000E+00  5.57160E+02
1003  3.65603E-02  5.57153E+02  0.00000E+00  5.57160E+02

 total convective energy to the fluid during hydro solution:
                     inside surface= -1.5173306E+09 w*s      outside surface=  1.2403073E+09 w*s

 errors in conservation of convective energy at the wall between hydro and conduction solutions:
            inside convective energy error: absolute=  2.12593E+08 w*s      effective= -2.05303E+08 w*s
           outside convective energy error: absolute=  5.55621E+06 w*s      effective= -2.40795E+06 w*s

 rod    2    plane (perpendicular to z direction) coupled to cells    2 (inner) and**** (outer)

 id    row     z(m)     heat-structure temperatures (k)
1001    1  0.0000E+00 5.5030E+02 5.5066E+02 5.5094E+02
1002    2  5.7542E+00 5.5488E+02 5.5488E+02 5.5488E+02
1003    3  1.1508E+01 5.5695E+02 5.5685E+02 5.5675E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
            w/m2/k         k          w/m2/k         k                w/m2/k         k          w/m2/k         k          w/m2/k
1001  2  1.0703E+03  5.4460E+02  3.1740E-01  5.4460E+02  12  1.0348E+03  5.5483E+02  0.0000E+00  5.5750E+02  0.0000E+00
1002 11  9.9379E+02  5.4517E+02  4.6474E+03  5.5696E+02   1  4.1916E+02  5.5483E+02  0.0000E+00  5.5750E+02  0.0000E+00
1003 11  6.2423E+01  5.5650E+02  1.8140E+05  5.5696E+02  12  8.1424E+02  5.5483E+02  0.0000E+00  5.5750E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti       qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo   qchfo/qtoto
          w/m2         w/m2         w/m2        w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  6.1082E+03  1.8112E+00  6.1100E+03  5.1804E+05  8.48E+01 -4.0326E+03  0.0000E+00 -4.0326E+03  0.0000E+00  0.00E+00
1002  9.6499E+03 -9.6472E+03  2.6536E+00  2.5902E+05  9.76E+04  2.0614E+01  0.0000E+00  2.0614E+01  1.3024E-12  6.32E-14
1003  2.7935E+01 -1.7460E+03 -1.7180E+03  6.8999E-03  4.02E-06  1.5583E+03  0.0000E+00  1.5583E+03  2.6048E-12  1.67E-15

       stanton     liq.temp.     stanton     liq.temp.
        number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  2.32357E+01  5.08842E+02  0.00000E+00  5.57155E+02
1002  0.00000E+00  5.57146E+02  4.54508E-04  5.57155E+02
1003  1.54342E-02  5.57146E+02  4.01615E-02  5.57155E+02

 total convective energy to the fluid during hydro solution:
                     inside surface= -9.0669794E+08 w*s      outside surface=  6.0281109E+08 w*s

 errors in conservation of convective energy at the wall between hydro and conduction solutions:
            inside convective energy error: absolute=  2.37826E+08 w*s      effective= -2.30391E+08 w*s
           outside convective energy error: absolute=  1.22461E+07 w*s      effective= -8.51105E+06 w*s

 rod    3    plane (perpendicular to z direction) coupled to cells    3 (inner) and**** (outer)

 id    row     z(m)     heat-structure temperatures (k)
1001    1  0.0000E+00 5.4975E+02 5.5011E+02 5.5047E+02
1002    2  5.7542E+00 5.4934E+02 5.4974E+02 5.5013E+02
1003    3  1.1508E+01 5.5419E+02 5.5425E+02 5.5430E+02

 id  idi    hliqi        tliqi        hvapi        tvapi      ido   hliqo        tliqo        hvapo        tvapo        hgap
            w/m2/k         k          w/m2/k         k                w/m2/k         k          w/m2/k         k          w/m2/k
1001  2  1.9470E+03  5.4676E+02  1.7289E-01  5.4676E+02  12  1.1390E+03  5.5561E+02  0.0000E+00  5.5744E+02  0.0000E+00
1002 12  3.6897E+03  5.4762E+02  2.3521E-01  5.4676E+02  12  1.1640E+03  5.5561E+02  0.0000E+00  5.5744E+02  0.0000E+00
1003 12  6.8850E+02  5.5303E+02  0.0000E+00  5.5730E+02  12  7.2056E+02  5.5561E+02  0.0000E+00  5.5744E+02  0.0000E+00

 heat flux to the hydro cells
 idz     qliqi        qvapi        qtoti       qchfi    qchfi/qtoti    qliqo        qvapo        qtoto        qchfo   qchfo/qtoto
          w/m2         w/m2         w/m2        w/m2         -          w/m2         w/m2         w/m2         w/m2         -
1001  5.8189E+03  5.1583E-01  5.8195E+03  9.5437E+05  1.64E+02 -5.8520E+03  0.0000E+00 -5.8520E+03  1.7402E+06  2.97E+02
1002  6.3473E+03  6.0584E-01  6.3479E+03  1.2820E+06  2.02E+02 -6.3793E+03  0.0000E+00 -6.3793E+03  1.7402E+06  2.73E+02
1003  8.0255E+02  0.0000E+00  8.0255E+02  1.6096E+06  2.01E+03 -9.4197E+02  0.0000E+00 -9.4197E+02  1.7402E+06  1.85E+03

       stanton     liq.temp.     stanton     liq.temp.
        number     bubble det.    number     bubble det.
 id   inner surf.  inner surf.  outer surf.  outer surf.
           -            k            -            k
1001  8.97609E+00  5.46751E+02  0.00000E+00  5.57439E+02
1002  0.00000E+00  5.57300E+02  0.00000E+00  5.57439E+02
1003  9.43424E-03  5.57300E+02  0.00000E+00  5.57439E+02

 total convective energy to the fluid during hydro solution:
                     inside surface= -3.8689436E+08 w*s      outside surface=  3.4957199E+08 w*s
```

```
errors in conservation of convective energy at the wall between hydro and conduction solutions:
           inside convective energy error: absolute=  3.37628E+06 w*s     effective=  2.15886E+04 w*s
          outside convective energy error: absolute=  2.84561E+06 w*s     effective=  5.44516E+05 w*s

inner-surface node-interval thermal conductivity is  5.05525E+01    w/m/k
outer-surface node-interval thermal conductivity is  5.05117E+01    w/m/k
effective  r-direction wall thermal conductivity is  5.05320E+01    w/m/k
which have been axially averaged over all   3 average-power rod s

total inner surface area is  6.61197E+02 m2  and
total outer surface area is  6.62564E+02 m2  of all   3 average-power rod s

total power from the heat-structure inner surface is  4.48662E+06   w    and outer surface is -4.41542E+06   w

average-power rod   2 has the peak surface temperature of  5.56951E+02 k

total mass of hydrogen (based on the average temperature of all average-power rod s) is  0.00000E+00 kg


system results

total power loss by 1-d comp.wall is -3.483347E+06 w*s on the inner surface and  9.135330E+05 w*s on the outer surface

                      system total coolant energy is  9.312153E+18 w*s

                        system total coolant mass is  4.544427E+13 kg

total coolant mass discharged by break components is -8.335128E+04 kg

   total coolant mass injected by fill components is  3.672824E+04 kg

       system computed initial total coolant mass is  4.544427E+13 kg

                             end of problem

computative timing statistics
cpu time is 4.2924E+04 s
```