APPENDIX B--EXAMPLE OF A DIAGNOSTIC EDIT

This appendix contains an example (**Figure B0.0-1**) of a diagnostic edit for one time step using the semi-implicit scheme for the case when HELP = 3. As can be seen from the figure, this edit can be quite lengthy. As Section 2 of Volume I of this manual indicates, there are many subroutines called from the main hydrodynamic subroutine HYDRO and the main heat transfer/conduction subroutine HTADV. The diagnostic edit prints out information for most of the subroutines called by these two subroutines In addition, the particular ones printed will vary, depending on whether the time step is repeated, if bad donoring occurs, if the choking model is turned on, whether heat structures are present or not, whether the heat time advancement is different from the hydrodynamic time advancement, etc. For the example presented here, the time step is not a repeated time step, a heat transfer calculation occurs, and a choking diagnostic edit occurs. In order to save space in the appendix, only the first 3 heat structures, the first 3 volumes, and the first 2 junctions are shown.

Each subroutine section of the edit (except heat transfer) begins with a line of pound signs (###...). The next line lists the name of the subroutine, the label DIAGNOSTIC PRINTOUT, the simulated time (TIMEHY), the time step size (DT), the total attempted advancements (NCOUNT), and the value of the variables HLEP, SUCCES, and FAIL. HELP is explained in Section 8 of this manual. SUCCES is a code variable that indicates if a time step is successful (SUCCES=0 means successful, SUCCES=1 or 2 means unsuccessful). FAIL is a code variable that is normally false (F) until the code fails, and then it becomes true (T).

The order of the subroutines in the diagnostic edit printed in **Figure B0.0-1** is as follows:

Heat transfer subroutines (HTRC1 plus appropriate correlation subroutines.)

VOLVEL

PHANTV

PHANTJ

FWDRAG

VEXPLT

JCHOKE

JPROP

PRESEQ

SYSSOL

JPROP

VFINL

EQFINL

STATE

MASS ERR

JPROP

VLVELA

MS ERR T

The particular quantities printed out in each subroutine will not be presented here. Most of the tables are grouped by volumes and junctions, and they usually begin with either the volume number (VOLNO) or the junction number (JUNNO). The definition of many of these volume and junction terms are listed in the comment common blocks VOLDATC and JUNDATC in RELAP5. A copy of these blocks is contained in **Figure B0.0-2** and **Figure B0.0-3** as an aid to understanding this diagnostic edit. Many of the other quantities printed out are calculated only within that particular subroutine, and they are printed because it was felt they were important in debugging that subroutine.

```
o  htrc1 initial :   id =     30001   volno =   3010000   irwt =  0
     tw            htdiam        htsa        p             tsatt         satt          voidg         g             v
     5.016510E+02  7.620002E-02  4.902718E-02  6.405464E+05  4.345595E+02  4.345595E+02  9.451944E-01  2.404556E+01  9.339683E-04
     tempf         tempg
     4.356360E+02  4.341691E+02
 In chfcal
  CHF debug printout, ncount, volno, time         509    3010000 5.00000E-01
  Passed in and calculated quantities, both aqueous and nonaqueous
  p, pm, g, ga, gabs, gab, rf/rg, rfa, rfna
  6.40546E+05 6.40546E-01 2.40456E+01 2.40456E+01 2.40456E+01 2.40456E+01 0.00000E+00 0.00000E+00 0.00000E+00
  rga, rgna, hfga, hfgp, siga, sigma, x, diamv, aqua
  0.00000E+00 0.00000E+00 2.07619E+06 2.07619E+06 4.62893E-02 4.62893E-02 2.27550E-01 7.62000E-02 1.00000E+00
          p,g,x,ip,ig,ix= 0.640546E+06 0.240456E+02 0.227550E+00    6    3   13
               k1,k2,k3,k4,k5,k6,k7,k8=  0.79000      1.0000      1.0000      1.2009      1.0000     0.00000E+00  1.0000      1.0000
    chf =  0.000000E+00     chfmul=  0.000    hfgp,rhf,rhg,sigma,aqua =  0.207619E+07  904.809      3.37673     0.462893E-01  1.00000
     prednb - thconf       viscf         csubpf        sigma         tw-tsatt      rhof          rhog          hfgp
              6.823210E-01  1.674918E-04  4.344334E+03  4.628926E-02  6.709156E+01  9.048091E+02  3.376729E+00  2.076186E+06
     dittus - tf           thcons        viscs         cps
              4.356360E+02  6.823210E-01  1.674918E-04  4.344334E+03
              htcoef        qfluxo        mode     hlam          hnat          hturb
              7.595107E+02  5.013909E+04     2  3.904093E+01  7.595107E+02  2.920891E+02
    prednb    hmac          f             hmic          sf            htcoef        qfluxo        chf
              5.414682E+03  7.129171E+00  8.293794E+04  3.813658E-01  8.835262E+04  5.921886E+06  0.000000E+00
     pstdnb - thcons        viscs         csubpg        rhof          rhog          sigma
              3.372731E-02  1.575588E-05  2.414047E+03  9.048091E+02  3.376729E+00  4.628926E-02
     dittus - tf           thcons        viscs         cps
              4.345595E+02  3.372731E-02  1.575588E-05  2.414047E+03
              htcoef        qfluxo        mode     hlam          hnat          hturb
              3.750358E+01  2.516174E+03     9  1.929804E+00  9.340970E+00  3.750358E+01
     pstdnb -htbf          htbg          qtfbf         qtfbg         hfb           hv            qfbf          qfbg
              0.000000E+00  3.580729E+01  0.000000E+00  2.402367E+03  5.111356E+00  3.750358E+01  3.429289E+02  2.516174E+03
              htcoef        qfluxo          qfb           qtb
              4.261493E+01  2.859102E+03  2.859102E+03  2.402367E+03
   suboil final output :
     gamw        gammul          qffo        peclet         numod         enmin        encrit       sathfp
  8.670467E-03  2.528357E-05  3.429289E+02  1.166607E+04  3.829750E+01  6.817137E+05  6.813481E+05  6.817137E+05
   htrc1 final output :
     mode     chf           htcoef        htcf          htcg          qfluxo        qffo          qfgo
        8     0.000000E+00  4.261493E+01  5.111356E+00  3.750358E+01  2.859102E+03  3.429289E+02  2.516174E+03
              gamw          fstrt          quala          quale          dtsat          sathfp
              8.670467E-03  1.000000E+00  0.000000E+00  2.275499E-01  6.709156E+01  6.817137E+05
o  htrc1 initial :   id =     30002   volno =   3020000   irwt =  0
     tw            htdiam        htsa        p             tsatt         satt          voidg         g             v
     5.011370E+02  7.620002E-02  4.902718E-02  6.404966E+05  4.345564E+02  4.345564E+02  9.317909E-01  7.940285E+01  9.339683E-04
     tempf         tempg
     4.354654E+02  4.342100E+02
 In chfcal
  CHF debug printout, ncount, volno, time         509    3020000 5.00000E-01
  Passed in and calculated quantities, both aqueous and nonaqueous
  p, pm, g, ga, gabs, gab, rf/rg, rfa, rfna
  6.40497E+05 6.40497E-01 7.94029E+01 7.94029E+01 7.94029E+01 7.94029E+01 0.00000E+00 0.00000E+00 0.00000E+00
  rga, rgna, hfga, hfgp, siga, sigma, x, diamv, aqua
  0.00000E+00 0.00000E+00 2.07620E+06 2.07620E+06 4.62899E-02 4.62899E-02 2.18124E-01 7.62000E-02 1.00000E+00
          p,g,x,ip,ig,ix= 0.640497E+06 0.794029E+02 0.218124E+00    6    4   13
               k1,k2,k3,k4,k5,k6,k7,k8=  0.79000      1.0000      1.0000      1.2006      1.0000     0.00000E+00  1.0000      1.0000
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras.

```
    chf =  0.000000E+00     chfmul=  0.000    hfgp,rhf,rhg,sigma,aqua =  0.207620E+07  904.978      3.37604     0.462899E-01  1.00000
     prednb - thconf        viscf         csubpf        sigma         tw-tsatt      rhof          rhog          hfgp
              6.823593E-01  1.674952E-04  4.344325E+03  4.628992E-02  6.658064E+01  9.049778E+02  3.376043E+00  2.076196E+06
     dittus - tf            thcons        viscs         cps
              4.354654E+02  6.823593E-01  1.674952E-04  4.344325E+03
              htcoef        qfluxo        mode     hlam          hnat          hturb
              7.685994E+02  5.047516E+04     2  3.904312E+01  7.586511E+02  7.685994E+02
    prednb    hmac          f             hmic          sf            htcoef        qfluxo        chf
              5.257292E+03  6.840094E+00  3.042331E+04  1.414360E-01  3.568060E+04  2.370858E+06  0.000000E+00
     pstdnb - thcons        viscs         csubpg        rhof          rhog          sigma
              3.370634E-02  1.574475E-05  2.414020E+03  9.049778E+02  3.376043E+00  4.628992E-02
     dittus - tf            thcons        viscs         cps
              4.345564E+02  3.370634E-02  1.574475E-05  2.414020E+03
              htcoef        qfluxo        mode     hlam          hnat          hturb
              9.367075E+01  6.236659E+03     9  1.928604E+00  9.322819E+00  9.367075E+01
     pstdnb -htbf          htbg          qtfbf         qtfbg         hfb           hv            qfbf          qfbg
              0.000000E+00  8.553882E+01  0.000000E+00  5.695230E+03  7.895455E+00  9.367075E+01  5.256845E+02  6.236659E+03
              htcoef        qfluxo          qfb           qtb
              1.015662E+02  6.762343E+03  6.762343E+03  5.695230E+03
   suboil final output :
     gamw        gammul          qffo        peclet         numod         enmin        encrit       sathfp
  1.329112E-02  2.528345E-05  5.256845E+02  3.852126E+04  5.870393E+01  6.817004E+05  6.811399E+05  6.817004E+05
   htrc1 final output :
     mode     chf           htcoef        htcf          htcg          qfluxo        qffo          qfgo
        8     0.000000E+00  1.015662E+02  7.895455E+00  9.367075E+01  6.762343E+03  5.256845E+02  6.236659E+03
              gamw          fstrt          quala          quale          dtsat          sathfp
              1.329112E-02  1.000000E+00  0.000000E+00  2.181238E-01  6.658064E+01  6.817004E+05
o  htrc1 initial :   id =     30003   volno =   3030000   irwt =  0
     tw            htdiam        htsa        p             tsatt         satt          voidg         g             v
     4.859351E+02  7.620002E-02  4.902718E-02  6.403597E+05  4.345479E+02  4.345479E+02  9.312849E-01  1.414440E+02  9.339683E-04
     tempf         tempg
     4.351487E+02  4.342624E+02
 In chfcal
  CHF debug printout, ncount, volno, time         509    3030000 5.00000E-01
  Passed in and calculated quantities, both aqueous and nonaqueous
  p, pm, g, ga, gabs, gab, rf/rg, rfa, rfna
  6.40360E+05 6.40360E-01 1.41444E+02 1.41444E+02 1.41444E+02 1.41444E+02 0.00000E+00 0.00000E+00 0.00000E+00
  rga, rgna, hfga, hfgp, siga, sigma, x, diamv, aqua
  0.00000E+00 0.00000E+00 2.07622E+06 2.07622E+06 4.62917E-02 4.62917E-02 2.12822E-01 7.62000E-02 1.00000E+00
          p,g,x,ip,ig,ix= 0.640360E+06 0.141444E+03 0.212822E+00    6    5   13
                k1,k2,k3,k4,k5,k6,k7,k8=  0.79000      1.0000      1.0000      1.2004      1.0000     0.18943      1.0000      1.0000
    chf =   404743.         chfmul=  0.180    hfgp,rhf,rhg,sigma,aqua =  0.207622E+07  905.291      3.37476     0.462917E-01  1.00000
     prednb - thconf        viscf         csubpf        sigma         tw-tsatt      rhof          rhog          hfgp
              6.824303E-01  1.675045E-04  4.344300E+03  4.629173E-02  5.138721E+01  9.052910E+02  3.374755E+00  2.076224E+06
     dittus - tf            thcons        viscs         cps
              4.351487E+02  6.824303E-01  1.675045E-04  4.344300E+03
              htcoef        qfluxo        mode     hlam          hnat          hturb
              1.226662E+03  6.229773E+04     2  3.904718E+01  7.116532E+02  1.226662E+03
    prednb    hmac          f             hmic          sf            htcoef        qfluxo        chf
              8.224450E+03  6.704742E+00  1.422551E+04  9.506101E-02  2.244996E+04  1.148699E+06  4.047429E+05
     pstdnb - thcons        viscs         csubpg        rhof          rhog          sigma
              3.311139E-02  1.541671E-05  2.413948E+03  9.052910E+02  3.374755E+00  4.629173E-02
     dittus - tf            thcons        viscs         cps
              4.345479E+02  3.311139E-02  1.541671E-05  2.413948E+03
              htcoef        qfluxo        mode     hlam          hnat          hturb
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
             1.454092E+02  7.472172E+03     9  1.894562E+00  8.752997E+00  1.454092E+02
     pstdnb -htbf          htbg          qtfbf         qtfbg         hfb           hv            qfbf          qfbg
             1.583266E+03  1.161797E+02  8.135961E+04  5.970149E+03  8.460500E+00  1.454092E+02  4.347615E+02  7.472172E+03
             htcoef        qfluxo          qfb           qtb
             1.699446E+03  8.732976E+04  7.906933E+03  8.732976E+04
   suboil final output :
     gamw        gammul          qffo        peclet         numod         enmin        encrit       sathfp
  2.057025E+00  2.528312E-05  8.135961E+04  6.861217E+04  9.084597E+03  6.816637E+05  5.949248E+05  6.816637E+05
   htrc1 final output :
     mode     chf           htcoef        htcf          htcg          qfluxo        qffo          qfgo
        6     4.047429E+05  1.699446E+03  1.583266E+03  1.161797E+02  8.732976E+04  8.135961E+04  5.970149E+03
              gamw          fstrt          quala          quale          dtsat          sathfp
              2.057025E+00  8.105669E-01  0.000000E+00  2.128222E-01  5.138721E+01  6.816637E+05
0#######################################################################################################################
     volvel Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Volume inlet and outlet terms
 =======================================================================================================================
        volno(i)             invcnt(l)
        avol(i)     iiflag   loop jx    junno(jx)  ivf ajun(jx)     voidfj(jx)   rhofj(jx)    velfjo*ivf   arat(jx)     cvelf(ivr)
                                                     athrot(jx)   voidgj(jx)   rhogj(jx)    velgjo*ivf   arat(jx+1)   cvelg(ivr)
 =======================================================================================================================
        003010000            1
        4.56037E-03
+                   outlet   1          003010000  1   4.56037E-03  5.48056E-02   904.81      0.74716       1.0000      0.00000E+00
                                                      1.0000      0.94519       3.3767       3.4585       1.0000      0.00000E+00
        003020000            2
        4.56037E-03
+                   inlet    1          003010000  1   4.56037E-03  5.48056E-02   904.81      0.74716       1.0000      0.00000E+00
                                                      1.0000      0.94519       3.3767       3.4585       1.0000      0.00000E+00
                    outlet   2          003020000  1   4.56037E-03  6.82091E-02   904.98       1.4113       1.0000      0.00000E+00
                                                      1.0000      0.93179       3.3760       7.5009       1.0000      0.00000E+00
        003030000            2
        4.56037E-03
+                   inlet    1          003020000  1   4.56037E-03  6.82091E-02   904.98       1.4113       1.0000      0.00000E+00
                                                      1.0000      0.93179       3.3760       7.5009       1.0000      0.00000E+00
                    outlet   2          003030000  1   4.56037E-03  6.87151E-02   905.29       2.1800       1.0000      0.00000E+00
                                                      1.0000      0.93128       3.3748       11.633       1.0000      0.00000E+00
0Volume average terms
 =======================================================================================================================
      volno(i)   sumvfx(ix)   difvfx(ix)   vvfx(ix)     vvfx(ix+1)   vfa(ix)      vfa(ix+1)    vrhof(ix)    vrhof(ix+1)  areav(ix)
                 sumvgx(ix)   difvgx(ix)   vvgx(ix)     vvgx(ix+1)   vga(ix)      vga(ix+1)    vrhog(ix)    vrhog(ix+1)  areav(ix+1)
 =======================================================================================================================
      003010000  0.74716      -0.55825      0.00000E+00  0.74716      0.00000E+00  0.16897      0.00000E+00  0.22614      0.00000E+00
                  3.4585       -11.961      0.00000E+00   3.4585      0.00000E+00  5.03391E-02  0.00000E+00  1.45552E-02  4.56037E-03
      003020000   1.1155      -0.41083      0.74716       1.4113      0.16897      0.39729      0.22614      0.28150      4.56037E-03
                  5.4651       -10.966       3.4585       7.5009      5.03391E-02  0.10761      1.45552E-02  1.43459E-02  4.56037E-03
      003030000   1.7971      -0.69333       1.4113       2.1800      0.39729      0.61843      0.28150      0.28369      4.56037E-03
                  9.5662       -19.757       7.5009       11.633      0.10761      0.16674      1.43459E-02  1.43326E-02  4.56037E-03
0#######################################################################################################################
     phantv Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Volume mass transfer terms
 =======================================================================================================================
 i     volno(i)   hif(i)       hifo(i)      hifc         hifc1        dtsf         dtsfm        dtsfsp       dtsfsb       xliqh
       vctrl(i)   hig(i)       higo(i)      higc         higc1        dtsg         higsub       dtsgms       dtsgm        xvaph
       nmap       fluxm        avelf        avelfg       rhocpf       hfg          term         term1        rvcrit(ix)   scrach
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
 ==========================================================================================================================
     1 003010000  6.31082E+07  6.33475E+07  4.91436E+07   1.0000      -1.0766       328.10       1.0000      0.00000E+00  6.86391E+05
               0  8.86346E+06  8.90658E+06  6.43145E+06   1.0000      0.39032      4.38413E+05  0.00000E+00   1.0000      2.75790E+06
               2   48.089      0.74716       2.7113      3.93079E+06  2.07619E+06  3.11365E-02   24.794      0.19410      0.21604
     2 003020000  9.27300E+07  9.31524E+07  6.86744E+07   1.0000     -0.90903       269.57       1.0000      0.00000E+00  6.85650E+05
               0  9.26113E+06  9.30843E+06  6.61368E+06   1.0000      0.34639      3.86389E+05  0.00000E+00   1.0000      2.75790E+06
               2   86.047       1.1155       4.3496      3.93152E+06  2.07620E+06  3.91431E-02   30.864      0.33011      0.20411
     3 003030000  1.38855E+08  1.40346E+08  4.73614E+07   1.0000     -0.60080       169.25       1.0000      0.00000E+00  6.84274E+05
               0  1.12352E+07  1.13291E+07  6.08563E+06   1.0000      0.28548      3.15850E+05  0.00000E+00   1.0000      2.75789E+06
               2  0.58148       1.7971       7.7691      3.93286E+06  2.07622E+06  4.07490E-02   31.104      0.59063      0.18786
0Final volume mass transfer terms
 ==========================================================================================================================
 i     volno      tempf        tempg        tempf-satt   tempg-satt   hif          hig          gammaw       qwf          qwg
 ==========================================================================================================================
     1 003010000   435.64       434.17       1.0766     -0.39032      6.31082E+07  8.86346E+06  8.67051E-03   16.813       123.36
                                                                      4.91436E+07  6.43145E+06
     2 003020000   435.47       434.21      0.90903     -0.34639      9.27300E+07  9.26113E+06  1.32914E-02   25.773       305.77
                                                                      6.86744E+07  6.61368E+06
     3 003030000   435.15       434.26      0.60080     -0.28548      1.38855E+08  1.12352E+07   2.0646       4003.5       293.77
                                                                      6.85443E+07  6.47971E+06
0Other volume terms
 ==========================================================================================================================
 i     volno(i)   viscf(i)     thconf(i)    voidf(i)     fwalf(i)     diamv(i)     costhe(ix)   fidxup(ix)   flomap(ix)   fwfxaf(ix)
       imap(i)    viscg(i)     thcong(i)    voidg(i)     fwalg(i)     dstar(ix)    rvcrit(ix)                pfinrg(ix)   fwfxag(ix)
 ==========================================================================================================================
     1 003010000  1.67492E-04  0.68232      5.48056E-02  5.48056E-02  7.62000E-02 -0.79283      0.00000E+00           12  0.20861
        3162114  1.43039E-05  3.14723E-02  0.94519      0.94519       33.300      0.19410                   0.00000E+00  0.79139
     2 003020000  1.67495E-04  0.68236      6.82091E-02  6.82091E-02  7.62000E-02 -0.75943      0.00000E+00           12  0.22548
        3162114  1.43038E-05  3.14719E-02  0.93179      0.93179       33.303      0.33011                   0.00000E+00  0.77452
     3 003030000  1.67505E-04  0.68243      6.87151E-02  6.87151E-02  7.62000E-02 -0.75821      0.00000E+00           12  0.27787
        3162114  1.43035E-05  3.14708E-02  0.93128      0.93128       33.308      0.59063                   0.00000E+00  0.72213
0##########################################################################################################################
     phantj Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0junction drag terms
 ==========================================================================================================================
       junno(i)   fij(i)       c0j(i)       fxj(i)       sinbt(ix)    diamj(i)     faaj(i)      ireg(ix)     voidj(i)     avkx(ix)
       jc(i)      fijo(i)      c0jo(i)      fxjo(i)      vgjj(i)      athrot(i)    jcex(i)      dpstf(ix)    flompj(i)    avlx(ix)
 ==========================================================================================================================
       003010000  9.90460E-02  1.0000       0.00000E+00  0.00000E+00  7.62000E-02  0.58698                0  0.94519       1.0000
           65536  9.97859E-02  1.0000       0.00000E+00  0.00000E+00   1.0000           1052768 -0.21658           12  1.0000
       003020000  8.99069E-02  1.0000       0.00000E+00  0.00000E+00  7.62000E-02  0.60980                0  0.93179       1.0000
           65536  9.09186E-02  1.0000       0.00000E+00  0.00000E+00   1.0000           1052768 -8.79932E-03           12  1.0000
0##########################################################################################################################
     fwdrag Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Volume terms
 ==================================================================================================
       volno(i)   vctrl(i)              voidf(i)     rhof(i)      viscf(i)     diamv(i)     fwalf(i)
                  imap(i)               voidg(i)     rhog(i)      viscg(i)     roughv(i)    fwalg(i)
                                        fshape(i)    frica(i)     fricb(i)     fricc(i)
 ==================================================================================================
       003010000                     0  5.48056E-02   904.81      1.67492E-04  7.62000E-02   2.6663
                               3162114  0.94519       3.3767      1.43039E-05  1.54581E-05  0.17785
                                         1.0000      0.00000E+00  0.00000E+00  0.00000E+00
       003020000                     0  6.82091E-02   904.98      1.67495E-04  7.62000E-02   3.8532
                               3162114  0.93179       3.3760      1.43038E-05  1.54581E-05  0.24982
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
                                    1.0000      0.00000E+00  0.00000E+00  0.00000E+00
      003030000                   0  6.87151E-02   905.29      1.67505E-04  7.62000E-02   7.2527
                            3162114  0.93128       3.3748      1.43035E-05  1.54581E-05  0.36063
                                    1.0000      0.00000E+00  0.00000E+00  0.00000E+00
0scratch terms, friction factor loop
 ==============================================================================================================
  nd   volno(i)     sumvfx(l)    fwfaf1(l)    reynf1(l)    fwf1(l)      fwfxaf(l)    reynf2(l)    fwf2(l)      pfinrg(l)
                    sumvgx(l)    fwfag1(l)    reyng1(l)    fwg1(l)      fwfxag(l)    reyng2(l)    fwg2(l)
                    frlmf1(l)    frtrf1(l)    frtbf1(l)    frlmf2(l)    frtrf2(l)    frtbf2(l)
                    frlmg1(l)    frtrg1(l)    frtbg1(l)    frlmg2(l)    frtrg2(l)    frtbg2(l)
 ==============================================================================================================
   0    003010000   0.74716      5.48056E-02  0.00000E+00  0.00000E+00  0.20861       80803.      2.94681E-03  0.00000E+00
                     3.4585      0.94519      0.00000E+00  0.00000E+00  0.79139       74304.      5.26698E-02
                    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00   1.0000      1.89062E-02
                    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00   1.0000      1.92434E-02
   0    003020000    1.1155      6.82091E-02  0.00000E+00  0.00000E+00  0.22548      1.38926E+05  4.25777E-03  0.00000E+00
                     5.4651      0.93179      0.00000E+00  0.00000E+00  0.77452      1.18247E+05  7.39987E-02
                    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00   1.0000      1.69286E-02
                    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00   1.0000      1.74822E-02
   0    003030000    1.7971      6.87151E-02  0.00000E+00  0.00000E+00  0.27787      1.83026E+05  8.01149E-03  0.00000E+00
                     9.5662      0.93128      0.00000E+00  0.00000E+00  0.72213      2.21799E+05  0.10686
                    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00   1.0000      1.60433E-02
                    0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00   1.0000      1.54692E-02
0Wall friction terms, phase apportioning loop
 ==================================================================================
  volno(i)    fwalf(i)                 reynf1(l)    dpdxfx(l)    zambda(l)    tpdpdx(l)
              fwalg(i)     gfwabs(l)   reyng1(l)    dpdxgx(l)    ctermx(l)    ratdpf(l)
              frlmf1(l)    frtrf1(l)   frtbf1(l)    frlmg1(l)    frtrg1(l)    frtbg1(l)
 ==================================================================================
  003010000     31.946                   16856.      4.10283E-02  0.28565       4.7608
                2.1309       48.089      58804.      0.73011       23.052       11.981
               0.00000E+00   1.0000      2.70425E-02  0.00000E+00   1.0000      2.02335E-02
  003020000     52.061                   31325.      0.12210      0.28548       11.661
                3.3754       86.047      91585.       1.6125       22.372       13.511
               0.00000E+00   1.0000      2.33064E-02  0.00000E+00   1.0000      1.84189E-02
  003030000     83.906                   50857.      0.28835      0.28517       29.063
                4.1721       141.86      1.60168E+05   4.4094       21.608       11.569
               0.00000E+00   1.0000      2.08865E-02  0.00000E+00   1.0000      1.64623E-02
0Wall friction terms, heated wall effect
 ==================================================================================
0##############################################################################################################
     vexplt Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Sum and difference terms
 ==============================================================================================================
      junno(i)   sumf         sumg         sumold       diff         difg         difold       avrf         avrg
 ==============================================================================================================
      003010000   11.400      0.65675       10.755      0.34342     -0.34344     -0.93043       55.658       3.1687
      003020000   12.697      0.65277       22.742      0.38092     -0.38094      -2.3173       61.967       3.1443
0volume terms
 ==============================================================================================================
      volno(i)   dl(i)        voidf(i)     rhof(i)      fwalf(i)     velf(i)      difvfx(ix)   sourcf(ix)   sourcm(ix)   gamas(i)
                 hydzc(i)     voidg(i)     rhog(i)      fwalg(i)     velg(i)      difvgx(ix)   sourcg(ix)   sourca(ix)   enths(i)
 ==============================================================================================================
      003010000  0.20480      5.48056E-02   904.81       31.946      0.74716     -0.55825      -83.415      5.81609E-05  0.00000E+00
                 0.00000E+00  0.94519       3.3767       2.1309       3.4585      -11.961       83.556      0.00000E+00  0.00000E+00
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
       003020000  0.20480      6.82091E-02   904.98       52.061       1.1155     -0.41083      -103.79      7.31168E-05  0.00000E+00
                  0.00000E+00  0.93179       3.3760       3.3754       5.4651      -10.966       104.13      0.00000E+00  0.00000E+00
       003030000  0.20480      6.87151E-02   905.29       83.906       1.7971     -0.69333      -103.95      7.61165E-05  0.00000E+00
                  0.00000E+00  0.93128       3.3748       4.1721       9.5662      -19.757       108.25      0.00000E+00  0.00000E+00
0Junction terms
 ==================================================================================================================================
       junno(i)   fij(i)       ajun(i)      arat(i)      fjunf(i)     formfj(i)    velfjo(i)    velgjo(i)    fifj(ix)     vfdpk(ix)
                  fidxup(ix)   athrot(i)    arat(i+1)    fjunr(i)     formgj(i)    velfj(i)     velgj(i)     figj(ix)     vgdpk(ix)
 ==================================================================================================================================
       003010000  9.90460E-02  4.56037E-03   1.0000      0.00000E+00  0.00000E+00  0.74716       3.4585      1.84127E-02  3.61408E-05
                  0.00000E+00   1.0000       1.0000      0.00000E+00  0.00000E+00  0.74449       3.4536      1.84127E-02  8.95301E-04
       003020000  8.99069E-02  4.56037E-03   1.0000      0.00000E+00  0.00000E+00   1.4113       7.5009      3.75312E-02  3.70220E-05
                  0.00000E+00   1.0000       1.0000      0.00000E+00  0.00000E+00   1.4061       7.4892      3.75312E-02  8.11824E-04
0##################################################################################################################################
     jprop Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Junction donored properties, ivrev =  1
 ==================================================================================================================================
       junno(i)   velfj(i)     voidfj(i)    rhofj(i)     qualaj(i)    ufj(i)       jc(i)                     volno(k)   voidgo(k)
                  velgj(i)     voidgj(i)    rhogj(i)     voids        ugj(i)       jcex(i)                   volno(l)   voidgo(l)
 ==================================================================================================================================
       003010000  0.74449      5.48056E-02   904.81      0.00000E+00  6.85683E+05                 65536       003010000  0.94519
                   3.4536      0.94519       3.3767       1.0000      2.56726E+06                1052768       003020000  0.93179
       003020000   1.4061      6.82091E-02   904.98      0.00000E+00  6.84942E+05                 65536       003020000  0.93179
                   7.4892      0.93179       3.3760       1.0000      2.56734E+06                1052768       003030000  0.93128
0##################################################################################################################################
    preseq Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Volume terms
 ==================================================================================================================================
 i     volno      po           ufo          ugo          voidgo       qualao       rhof         rhog         sathf        sathg
                  drfdp        drfduf       drgdp        drgdug       drgdxa       dtfdp        dtfduf       dtgdp        dtgdug
                  dtgdxa       dtdp         dtdug        dtdxa        hif          hig          gammaw       qwf          qwg
 ==================================================================================================================================
     1 003010000  6.40546E+05  6.85683E+05  2.56726E+06  0.94519      0.00000E+00   904.81       3.3767      6.81714E+05  2.75790E+06
                  5.01465E-07 -2.27601E-04  5.24610E-06 -5.37932E-06  0.00000E+00  1.20999E-07  2.30226E-04  3.52149E-05  5.39424E-04
                  0.00000E+00  6.18254E-05  0.00000E+00  0.00000E+00  6.31082E+07  8.86346E+06  8.67051E-03   16.813       123.36
     2 003020000  6.40497E+05  6.84942E+05  2.56734E+06  0.93179      0.00000E+00   904.98       3.3760      6.81700E+05  2.75790E+06
                  5.01690E-07 -2.27682E-04  5.24550E-06 -5.37757E-06  0.00000E+00  1.20950E-07  2.30226E-04  3.52149E-05  5.39430E-04
                  0.00000E+00  6.18292E-05  0.00000E+00  0.00000E+00  9.27300E+07  9.26113E+06  1.32914E-02   25.773       305.77
     3 003030000  6.40360E+05  6.83566E+05  2.56745E+06  0.93128      0.00000E+00   905.29       3.3748      6.81664E+05  2.75789E+06
                  5.02101E-07 -2.27828E-04  5.24469E-06 -5.37466E-06  0.00000E+00  1.20855E-07  2.30228E-04  3.52165E-05  5.39447E-04
                  0.00000E+00  6.18397E-05  0.00000E+00  0.00000E+00  1.38855E+08  1.12352E+07   2.0646       4003.5       293.77
0Junction terms
 ==========================================================================================================================
       junno(i)   ajun(i)      voidfj(i)    rhofj(i)     ufj(i)       velfjo(i)    velgjo(i)          vfdpk(ix)    vfdpl(ix)
                  qualaj(i)    voidgj(i)    rhogj(i)     ugj(i)       velfj(i)     velgj(i)           vgdpk(ix)    vgdpl(ix)
 ==========================================================================================================================
       003010000  4.56037E-03  5.48056E-02   904.81      6.85683E+05  0.74716       3.4585            3.61408E-05  3.61408E-05
                  0.00000E+00  0.94519       3.3767      2.56726E+06  0.74449       3.4536            8.95301E-04  8.95301E-04
       003020000  4.56037E-03  6.82091E-02   904.98      6.84942E+05   1.4113       7.5009            3.70220E-05  3.70220E-05
                  0.00000E+00  0.93179       3.3760      2.56734E+06   1.4061       7.4892            8.11824E-04  8.11824E-04
0Scratch storage volume terms
 ==================================================================================================================================
 i     volno(i)   coefp        sourcf(ix)   sourcm(ix)   a52(ix)      a54(ix)      resoru(ix)   fracal(ix)   fgrw(ix)     fal(ix)
       sourca     sourcp(is)   sourcg(ix)   a51(ix)      a53(ix)      a55(ix)      resorm(ix)   fracag(ix)   a4(ix)       gal(ix)
 ==================================================================================================================================
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
     1 003010000   3.5213      -83.415      5.81609E-05  0.14896     -1.08748E+05  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
        0.00E+00  -5037.1       83.556      0.00000E+00  1.97906E-02 -1.21660E+05  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
     1 003020000   5.3498      -103.79      7.31168E-05  0.13383      -95718.      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
        0.00E+00  -5037.2       104.13      0.00000E+00  2.04082E-02 -1.09098E+05  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
     1 003030000   4.7470      -103.95      7.61165E-05  0.11481      -76670.      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
        0.00E+00  -5037.3       108.25      0.00000E+00  2.41167E-02  -92623.      0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
0#################################################################################################################################
     syssol Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Pressure matrix
 ==================================================================================================================================
 eq.no. volno    el.no.  coefp      el.no.  coefp      el.no.  coefp      el.no.  coefp      el.no.  coefp       dia.dom.term
 ==================================================================================================================================
      1 003010000     1   3.5213         2  -2.5213
+                                                                                                                          1.0000
      2 003020000     1  -2.2958         2   5.3498         3  -2.0540
+                                                                                                                         1.00000
      3 003030000     2  -1.8424         3   4.7470         4  -1.9046
+                                                                                                                         1.00000
      4 003040000     3  -1.7625         4   4.6387         5  -1.8762
+                                                                                                                          1.0000
      5 003050000     4  -1.8671         5   4.8086         6  -1.9415
+                                                                                                                         1.00000
      6 003060000     5  -1.9655         6   5.0072         7  -2.0417
+                                                                                                                          1.0000
      7 003070000     6  -2.0705         7   5.2225         8  -2.1520
+                                                                                                                          1.0000
      8 003080000     7  -2.1856         8   5.4555         9  -2.2699
+                                                                                                                          1.0000
      9 003090000     8  -2.3072         9   5.6968        10  -2.3896
+                                                                                                                         1.00000
     10 003100000     9  -2.4286        10   5.9334        11  -2.5048
+                                                                                                                         1.00000
     11 003110000    10  -2.5434        11   6.1544        12  -2.6110
+                                                                                                                          1.0000
     12 003120000    11  -2.6474        12   6.3530        13  -2.7056
+                                                                                                                         1.00000
     13 003130000    12  -2.7390        13   6.5272        14  -2.7881
+                                                                                                                         1.00000
     14 003140000    13  -2.8182        14   6.6774        15  -2.8592
+                                                                                                                          1.0000
     15 003150000    14  -2.8858        15   6.8057        16  -2.9198
+                                                                                                                          1.0000
     16 003160000    15  -2.9431        16   6.9144        17  -2.9712
+                                                                                                                          1.0000
     17 003170000    16  -2.9912        17   7.0048        18  -3.0136
+                                                                                                                          1.0000
     18 003180000    17  -3.0287        18   7.0786        19  -3.0499
+                                                                                                                          1.0000
     19 003190000    18  -3.0654        19   7.1417        20  -3.0763
+                                                                                                                          1.0000
     20 003200000    19  -3.0709        20   4.1547        21  0.00000E+00
+                                                                                                                          1.0838
     21 005010000    21   1.0000
+                                                                                                                          1.0000
0Solution array
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
 ==========================================================================================================
       sourcp(i)    sourcp(i+1)  sourcp(i+2)  sourcp(i+3)  sourcp(i+4)  sourcp(i+5)  sourcp(i+6)  sourcp(i+7)  sourcp(i+8)
 ==========================================================================================================
       -5036.2      -5035.9      -5034.8      -5032.5      -5027.1      -5020.9      -5012.3      -5000.5      -4985.0
       -4965.1      -4940.4      -4910.7      -4875.5      -4834.5      -4787.4      -4733.7      -4672.8      -4604.5
       -4529.4      -4443.0      0.00000E+00
0Singularity parameter (if gerr .lt. 0.0, the matrix solution is singular)
 gerr =  1.00000E-12
0#########################################################################################################################
      jprop Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =      509, help =  3, lsuces =  0, fail = F
0Junction donored properties, ivrev =  1
 ==========================================================================================================================
      junno(i)   velfj(i)     voidfj(i)    rhofj(i)     qualaj(i)    ufj(i)       jc(i)                     volno(k)   voidgo(k)
                 velgj(i)     voidgj(i)    rhogj(i)     voids        ugj(i)       jcex(i)                   volno(l)   voidgo(l)
 ==========================================================================================================================
      003010000  0.74448      5.48056E-02   904.81      0.00000E+00  6.85683E+05                 65536       003010000  0.94519
                  3.4533      0.94519       3.3767       1.0000      2.56726E+06               1052768       003020000  0.93179
      003020000   1.4061      6.82091E-02   904.98      0.00000E+00  6.84942E+05                 65536       003020000  0.93179
                  7.4883      0.93179       3.3760       1.0000      2.56734E+06               1052768       003030000  0.93128
0#########################################################################################################################
      vfinl Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =      509, help =  3, lsuces =  0, fail = F
0Final junction velocities and flows
 ==========================================================================================================================
      junno(i)   flag         ajun(i)      voidfj(i)    rhofj(i)     velfj(i)           vfdpk(j)     vgdpk(j)       k   p(k)-po(k)
                              mflowj(i)    voidgj(i)    rhogj(i)     velgj(i)           vfdpl(j)     vgdpl(j)       l   p(l)-po(l)
 ==========================================================================================================================
      003010000               4.56037E-03  5.48056E-02   904.81      0.74448            3.61408E-05  8.95301E-04    1   -5036.2
                              0.21862      0.94519       3.3767       3.4533            3.61408E-05  8.95301E-04    2   -5035.9
      003020000               4.56037E-03  6.82091E-02   904.98       1.4061            3.70220E-05  8.11824E-04    2   -5035.9
                              0.50325      0.93179       3.3760       7.4883            3.70220E-05  8.11824E-04    3   -5034.8
0#########################################################################################################################
     eqfinl Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =      509, help =  3, lsuces =  0, fail = F
0Common junction data
 ==================================================================================================================
 junno         i  ajun(i)      voidfj(i)    rhofj(i)     velfj(i)     ufj(i)       conmf(i)     cond(i)      conm(i)
                  qualaj(i)    voidgj(i)    rhogj(i)     velgj(i)     ugj(i)       conmg(i)
 ==================================================================================================================
 003010000     1  4.56037E-03  5.48056E-02   904.81      0.74448      6.85683E+05  1.68358E-04 -1.18094E-04  2.18621E-04
                  0.00000E+00  0.94519       3.3767       3.4533      2.56726E+06  5.02632E-05
 003020000     2  4.56037E-03  6.82091E-02   904.98       1.4061      6.84942E+05  3.95821E-04 -2.88394E-04  5.03247E-04
                  0.00000E+00  0.93179       3.3760       7.4883      2.56734E+06  1.07427E-04
0From-to contributions to source terms
 ==================================================================================================================
 junno         i            k  scv2(i)      scv3(i)      scv4(i)                l  scv2(i)      scv5(i)      scv6(i)
 ==================================================================================================================
 003010000     1            1  0.00000E+00   138.57       115.56                2  0.00000E+00   138.57       115.56
 003020000     2            2  0.00000E+00   296.18       271.39                3  0.00000E+00   296.18       271.39
0#########################################################################################################################
     eqfinl Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =      509, help =  3, lsuces =  0, fail = F
0Volume data
 ==========================================================================================================================
 volno         i  sourcf(i)    sourcm(i)    sorp(i)      po(i)        ugo(i)       ufo(i)       voidgo(i)    qualao(i)    rhom(i)
                  sourcg(i)    sourca(i)    delxa(i)     p(i)         ug(i)        uf(i)        voidg(i)     quala(i)     dotm(i)
 ==========================================================================================================================
 003010000     1  -198.97      1.76255E-04 -2.18621E-04  6.40546E+05  2.56726E+06  6.85683E+05  0.94519      0.00000E+00   52.546
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
                 -55.018      0.00000E+00  0.00000E+00  6.35510E+05  2.56700E+06  6.84312E+05  0.94545      0.00000E+00   30.998
 003020000     2  -259.63      2.43416E-04 -2.84626E-04  6.40497E+05  2.56734E+06  6.84942E+05  0.93179      0.00000E+00   64.569
                 -53.483      0.00000E+00  0.00000E+00  6.35461E+05  2.56708E+06  6.83576E+05  0.93213      0.00000E+00   39.004
 003030000     3  -253.84      2.37021E-04 -2.78766E-04  6.40360E+05  2.56745E+06  6.83566E+05  0.93128      0.00000E+00   65.052
                 -54.253      0.00000E+00  0.00000E+00  6.35325E+05  2.56719E+06  6.82223E+05  0.93161      0.00000E+00   38.838
0##########################################################################################################################
      state Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Volume mixture properties
 ==========================================================================================================================
       volno      v            p            voidf        quals        dotm         quala        boron        sounde       rho
                  vo           pps          voidg        quale        dotmo        sigma        borono       dsnddp       satt
 ==========================================================================================================================
       003010000  9.33968E-04  6.35510E+05  5.45534E-02  6.03053E-02   30.998      0.00000E+00  0.00000E+00   79.335       52.546
                  9.33968E-04  6.35510E+05  0.94545      6.25989E-02   31.269      4.63559E-02  0.00000E+00  2.75661E+06   434.25
       003020000  9.33968E-04  6.35461E+05  6.78738E-02  4.83754E-02   39.004      0.00000E+00  0.00000E+00   67.194       64.569
                  9.33968E-04  6.35461E+05  0.93213      5.03408E-02   39.358      4.63566E-02  0.00000E+00  2.75672E+06   434.24
       003030000  9.33968E-04  6.35325E+05  6.83870E-02  4.79717E-02   38.838      0.00000E+00  0.00000E+00   66.100       65.052
                  9.33968E-04  6.35325E+05  0.93161      4.92771E-02   39.178      4.63584E-02  0.00000E+00  2.75685E+06   434.24
0Volume phase properties
 ==========================================================================================================================
       volno      rhof         uf           tempf        sathf        betaff       kapaff       csubpf       viscf        thconf
                  rhog         ug           tempg        sathg        betagg       kapagg       csubpg       viscg        thcong
 ==========================================================================================================================
       003010000   905.12      6.84312E+05   435.32      6.80358E+05  1.09072E-03  6.85176E-10   4343.4      1.67836E-04  0.68239
                   3.3517      2.56700E+06   433.86      2.75755E+06  2.95193E-03  1.67015E-06   2411.4      1.42928E-05  3.14311E-02
       003020000   905.29      6.83576E+05   435.15      6.80345E+05  1.09090E-03  6.85288E-10   4343.4      1.67840E-04  0.68243
                   3.3510      2.56708E+06   433.90      2.75755E+06  2.95154E-03  1.67027E-06   2411.4      1.42927E-05  3.14307E-02
       003030000   905.60      6.82223E+05   434.84      6.80308E+05  1.09121E-03  6.85481E-10   4343.4      1.67849E-04  0.68250
                   3.3497      2.56719E+06   433.95      2.75754E+06  2.95098E-03  1.67062E-06   2411.3      1.42924E-05  3.14296E-02
0Derivatives
 ==========================================================================================================================
       volno      drfdp        drfduf       drgdp        drgdug       drgdxa       dtfdp        dtfduf       dtgdp        dtgdug
                  dtgdxa       dtdp         dtdug        dtdxa
 ==========================================================================================================================
       003010000  5.01022E-07 -2.27333E-04  5.24814E-06 -5.34321E-06  0.00000E+00  1.20687E-07  2.30274E-04  3.53392E-05  5.40052E-04
                  0.00000E+00  6.22143E-05  0.00000E+00  0.00000E+00
       003020000  5.01245E-07 -2.27413E-04  5.24754E-06 -5.34148E-06  0.00000E+00  1.20637E-07  2.30274E-04  3.53391E-05  5.40058E-04
                  0.00000E+00  6.22182E-05  0.00000E+00  0.00000E+00
       003030000  5.01647E-07 -2.27556E-04  5.24675E-06 -5.33861E-06  0.00000E+00  1.20545E-07  2.30276E-04  3.53408E-05  5.40075E-04
                  0.00000E+00  6.22287E-05  0.00000E+00  0.00000E+00
0##########################################################################################################################
   mass err Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Volume properties
 ==================================================================================================
       volno      v            rho          rhom         drho/rhof    drho/rho     v*drho
 ==================================================================================================
       003010000  9.33968E-04   52.546       52.546      1.02192E-07  1.76028E-06  8.63885E-08
       003020000  9.33968E-04   64.569       64.569      1.11559E-07  1.56411E-06  9.43242E-08
       003030000  9.33968E-04   65.052       65.052      7.06268E-08  9.83209E-07  5.97360E-08
 --------------------------------------------------------------------------------------------------
 System mass error increment for this time step--------------------------------  1.17019E-07
 Mass + flow in - flow out mass error increment--------------------------------- -1.64825E-03
 Mean mass error increment------------------------------------------------------  6.26460E-06
 Rms mass error increment-------------------------------------------------------  1.73157E-03
 Mean mass error fraction-------------------------------------------------------  1.46810E-07
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
 Rms mass error fraction-------------------------------------------------------  8.75055E-07
 Max. system or overall global mass error tolerance-----------------------------  1.75966E-06
 Controlling errmax-------------------------------------------------------------  1.76028E-06
0#######################################################################################################################
      jprop Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Junction donored properties, ivrev =  0
 =======================================================================================================================
       junno(i)   velfj(i)     voidfj(i)    rhofj(i)     qualaj(i)    ufj(i)       jc(i)                    volno(k)    voidg(k)
                  velgj(i)     voidgj(i)    rhogj(i)     voids        ugj(i)       jcex(i)                  volno(l)    voidg(l)
 =======================================================================================================================
       003010000  0.74448      5.45534E-02   905.12      0.00000E+00  6.84312E+05                 65536       003010000  0.94545
                   3.4533      0.94545       3.3517       1.0000      2.56700E+06               1052768       003020000  0.93213
       003020000   1.4061      6.78738E-02   905.29      0.00000E+00  6.83576E+05                 65536       003020000  0.93213
                   7.4883      0.93213       3.3510       1.0000      2.56708E+06               1052768       003030000  0.93161
0#######################################################################################################################
     vlvela Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, lsuces =  0, fail = F
0Volume inlet and outlet terms
 =======================================================================================================================
        volno(i)            invcnt(l)
        avol(i)     iiflag  loop jx    junno(jx)  ivf ajun(jx)     voidfj(jx)   rhofj(jx)    velfj*ivf    arat(jx)
                                                      athrot(jx)   voidgj(jx)   rhogj(jx)    velgj*ivf    arat(jx+1)
 =======================================================================================================================
        003010000           1
        4.56037E-03
+                   outlet  1          003010000  1   4.56037E-03  5.45534E-02   905.12      0.74448       1.0000
                                                       1.0000      0.94545       3.3517       3.4533       1.0000
        003020000           2
        4.56037E-03
+                   inlet   1          003010000  1   4.56037E-03  5.45534E-02   905.12      0.74448       1.0000
                                                       1.0000      0.94545       3.3517       3.4533       1.0000
                    outlet  2          003020000  1   4.56037E-03  6.78738E-02   905.29       1.4061       1.0000
                                                       1.0000      0.93213       3.3510       7.4883       1.0000
        003030000           2
        4.56037E-03
+                   inlet   1          003020000  1   4.56037E-03  6.78738E-02   905.29       1.4061       1.0000
                                                       1.0000      0.93213       3.3510       7.4883       1.0000
                    outlet  2          003030000  1   4.56037E-03  6.83870E-02   905.60       2.1702       1.0000
                                                       1.0000      0.93161       3.3497       11.607       1.0000
0Volume average terms
 ==============================================================================================
        volno(i)   velf(i)      vvfx(ix)     vvfx(ix+1)   vrhof(ix)    vrhof(ix+1)  areav(ix)
                   velg(i)      vvgx(ix)     vvgx(ix+1)   vrhog(ix)    vrhog(ix+1)  areav(ix+1)
 ==============================================================================================
        003010000  0.74448      0.00000E+00  0.16764      0.00000E+00  0.22518      0.00000E+00
                    3.4533      0.00000E+00  4.99035E-02  0.00000E+00  1.44510E-02  4.56037E-03
        003020000   1.1113      0.16764      0.39401      0.22518      0.28021      4.56037E-03
                    5.4563      4.99035E-02  0.10667      1.44510E-02  1.42445E-02  4.56037E-03
        003030000   1.7897      0.39401      0.61292      0.28021      0.28243      4.56037E-03
                    9.5467      0.10667      0.16518      1.42445E-02  1.42313E-02  4.56037E-03
0#######################################################################################################################
   ms err t Diagnostic printout, timehy =  0.5000000    , dt =  1.0000000E-03, ncount =       509, help =  3, succes =  0, fail = F
 ---------------------------------------------------------------------------------------------
 Total mass error increment for this time step----------------------------------  1.17019E-07
 Mass + flow in - flow out mass error increment---------------------------------- -1.17019E-07
 Mean mass error increment------------------------------------------------------  6.26460E-06
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
Rms mass error increment-------------------------------------------------------  1.73157E-03
Mean mass error fraction------------------------------------------------------  1.46810E-07
Rms mass error fraction-------------------------------------------------------  8.75055E-07
Max. system or overall global mass error tolerance----------------------------  1.75966E-06
Controlling errmax------------------------------------------------------------  1.76028E-06
```

Figure B0.0-1 Diagnostic edit from Edwards pipe problem with extras. (Continued)

```
 .

*comdeck jundatc
c
c  ijskp   junction skip factor.
c  njuns   number of junctions
c  ij1     from volume input code.
c  ij2     to volume input code.
c  jc      choking flag (1 bit); time dependent junction flag (2 bit);
c          reversed from volume connection flag (4 bit); reversed to
c          volume connection flag (8 bit); no choking flag (16 bit);
c          old time choking flag (32 bit); choking test flag for
c          accumulator junction (64 bit); input flag (128 bit); abrupt
c          area change flag (256 bit); two velocity-one velocity flag
c          (512 bit); separator flag (1024 bit); stratified flow flag
c          (2048 bit); from cross flow option (4096 bit); to cross flow
c          option (8192 bit); cross flow flag (16384 bit); accumulator
c          active flag (32768 bit); stratification flag (65536 bit);
c          stratification input data (bit pos. 18-19); jet mixer flags
c          (bit pos. 20-22); separator flags (bit pos. 23-25);
c          unused (bit pos. 26); horiz-vert junction flag (bit pos.27);
c          up-down junction flag (bit pos. 28); valve flag (bit
c          pos. 29); second turbine junction flag (bit pos. 30).
c  ij1vn   from volume ordinal number.
c  ij2vn   to volume ordinal number.
c  junftl(1)  from pointer in output form without sign.
c  junftl(2)  to pointer in output form without sign.
c  ajun    area of junction
c  athrot  ratio of orifice area to junction area
c  arat(1) mixture volumetric flow rate for the junction divided by
c          the total mixture volumetric flow rate on that end of the
c          volume.  mixture is obtained by using sum of absolute value
c          of phasic volumetric flow rates. 1 is for "from" volume.
c  arat(2) same as arat(1), except 2 is for "to" volume.
c  diamj   diameter of junction
c  ******  warning: the ordering of velfj, velfjo, velgj, velgjo, ufj,
c  ******  ugj, voidfj, voidgj, qualaj, rhofj, and rhogj must be
c  ******  maintained since vfinl assumes this order.
c  velfj   liquid velocity
c  velfjo  liquid velocity previous time step
c  velgj   vapor velocity
c  velgjo  vapor velocity previous time step
c  ufj     junction liquid specific internal energy
c  ugj     junction vapor specific internal energy
c  voidfj  junction liquid void fraction
c  voidgj  junction vapor void fraction
c  qualaj  junction noncondensible quality
c  rhofj   junction liquid density
c  rhogj   junction vapor density
c  velfjs  intermediate liquid velocity used when have bad donoring
c  velgjs  intermediate vapor velocity used when have bad donoring
c  fjunf   Constant term for form loss coefficient for irreversible
c          losses, foward.
c  fjunr   Constant term for form loss coefficient for irreversible
c          losses, reverse.
c  fjunfb  Multipler term for form loss coefficient for irreversible
c          losses, foward.
```

Figure B0.0-2 Listing of common block JUNDATC from program RELAP5.

```
.
c  fjunfc  Exponent term for form loss coefficient for irreversible
c          losses, foward.
c  fjunrb  Multipler term for form loss coefficient for irreversible
c          losses, reverse.
c  fjunrc  Exponent term for form loss coefficient for irreversible
c          losses, reverse.
c  formfj  liquid form loss term
c  formgj  vapor form loss term
c  mflowj  mass flow rate
c  faaj    virtual mass
c  fij     interphase friction
c  fijo    interphase friction previous time step
c  jcatn   density correction factor (sqrt of rhot/rhoj) applied to
c          the junction convective term in choking
c  jacto   density correction factor applied to the junction convective
c          term in choking previous time step
c  qualnj(1)  first noncondensible junction mass fraction
c  qualnj(2)  second noncondensible junction mass fraction
c  qualnj(3)  third noncondensible junction mass fraction
c  qualnj(4)  fourth noncondensible junction mass fraction
c  qualnj(5)  fifth noncondensible junction mass fraction
c  ij1nx   from volume index.
c  ij2nx   to volume index.
c  jcnx1   index to scratch space for "from" volume.  next word is
c          same for "to" volume.
c  jcnx2   index to diagonal matrix element for "from" volume.  next
c          word is same for "to" volume.
c  jcnx3   index to off-diagonal matrix element for "from" volume. next
c          word is same for "to" volume.
c  jcnxd(1)  diagonal index for sum momentum equation
c  jcnxd(2)  diagonal index for difference momentum equation
c  jcnxs   index to scratch space for junction.
c  junno   junction number for output editing
c  jdissc  subcooled discharge coefficient.
c  jdistp  two phase discharge coefficient.
c  jcex    unused (bit pos. 1); ccfl flag (bit pos. 2);
c          input ccfl flag (bit pos. 3); junction flow regime number
c          (bit pos. 4-9); to face-1 bits (bit pos. 10-12); from face-1
c          bits (bit pos. 13-15); input donor pressure flag
c          (bit pos. 16); water packer junction flag (bit pos. 17);
c          stretch junction flag (bit pos. 18); eccmix flags (bit
c          pos. 19-20); debug print flag (bit pos. 21),
c          water packing flag(bit pos. 22).
c  betacc  form of ccfl correlation (0 = wallis, 1 = kutateladze)
c  constc  gas intercept for ccfl correlation
c  constm  slope for ccfl correlation
c  c0j     junction distribution coefficient
c  c0jo    junction distribution coefficient previous time step
c  xej     junction equilibrium quality
c          based on extrapolated pressure & internal energy from jchoke
c  sonicj  junction sound speed
c          divided by the junction density ratio (jcatn)
c  vodfjo  junction liquid void fraction previous timestep
c  vodgjo  junction vapour void fraction previous timestep
c  vdfjoo  junction liquid void fraction previous timestep but one
```

Figure B0.0-2 Listing of common block JUNDATC from program RELAP5. (Continued)

```
.
c  vdgjoo  junction vapour void fraction previous timestep but one
c  fxj     wall friction interpolating factor
c  fxjo    wall friction interpolation factor previous time step
c  vgjj    vapor drift velocity
c  florgj  junction flow regime number in real format
c  iregj   vertical bubbly/slug flow junction flow regime number in
c          real format
c  voidj   junction vapor void fraction used in the interphase drag
c  jdissh  superheated discharge coefficient
c  ijflg   Junction direction flag (0 = 1D/1D or 1D/3D or 3D/1D,
c          1 = 3D/3D direction 1, 2 = 3D/3D direction 2, 3 = 3D/3D
c          direction 3).
c  flenth  Total enthalpy flow in junction (includes both phases and
c          noncondensibles).
$if def,selap,2
c  ajuno   Old ajun.
c  diamjo  Old diamj.
```

Figure B0.0-2 Listing of common block JUNDATC from program RELAP5. (Continued)

```
 .

*comdeck voldatc
c
c  ivskp   volume skip factor.
c  nvols   number of volumes.
c  vctrl   time dependent volume flag (bit pos. 1); equilibrium flag
c          (bit pos. 2); thermal front flag (bit pos. 3); input flag
c          (bit pos. 4); vapor disappearance flag (bit pos. 5);
c          accumulator flag (bit pos. 6); pump flag (bit pos. 7);
c          input water packer flag (bit pos. 8); new status flags,
c          initialization type during input (bit pos. 9-19);
c          old status flags (bit pos. 20-30); input bundle flag
c          (bit pos. 31).
c          Status flags: negative pressure (bits 9, 20); mass error
c          (bits 10, 21); extrapolation error (bits 11, 22); quality
c          overrun (bits 12, 23); largest mass error (bits 13, 24);
c          error in vapor phase (bits 14, 25); error in liquid phase
c          (bits 15, 26); error in two phase call (bits 16, 27); non-
c          convergence in iterations (bits 17, 28); negative sonic
c          velocity (bits 18, 29); negative derived quantities (bits 19,
c          30).
c  vctrlx  Status flags; debug print flag (bit pos. 1), air appearance
c          repeat(bit pos. 2), pressure change repeat on air appearance
c          (bit pos. 3 ), water packing statistics flag( bit pos. 4).
c  volmat  Fluid type in volume.
c  volno   Volume number for editing.
c  imap    Map, regime, and flags.  Three quantities, one per
c          coordinate.  Flow regime map infomation (bit pos. 1-6);
c          non-condensable gas appearance flag (bit pos. 7);
c          horizontal stratification flag (bit pos. 8);
c          (bit pos. 8); stretch flag (bit pos. 9); input vertical
c          stratification flag (bit pos. 10); vertical stratification
c          flags (bit pos. 11-12); experimental friction being used
c          (bit pos. 13); wall friction input flag (bit pos. 14); flag
c          that coordinate direction is being used (bit pos. 15); water
c          packer input flag (bit pos. 16); bundle input flag
c          (bit pos. 17); volume in multid component (bit pos. 18);
c          flow  regime number (bit pos. 19-24); metal appearance flags
c          (bit pos. 25-26); laminar friction factor, 64 if 0, 96 if 1
c          (bit pos. 27); ans input flag (bit pos. 28); level tracking
c          input flag (bit pos. 29);  reflood flag (bit pos. 30);
c          water packer  volume flag (bit pos. 31).
c  v       Volume.
c  recipv  Reciprocal of volume (v), zero if v is zero.
c  avol    Area of volume, three quantities, one per coordinate.
c  dl      Volume length, three quantities, one per coordinate.
c  diamv    Equivalent flow diameter, three quantities, one per
c           coordinate.
c  roughv    Wall roughness factor for direction 1.  As input
c            reset in icmpn1 to colebrook full turb friction fac.
c  recrit     Critical reynolds number, three quantities, one per
c             coordinate.  Fric fac = const; see roughv.
c  p       Average pressure.
c  po      Average pressure previous time step.
c  uf      Liquid specific internal energy.
c  ufo     Liquid specific internal energy previous time step.
```

Figure B0.0-3 Listing of common block VOLDATC from program RELAP5.

```
     .
c  ug      vapor specific internal energy.
c  ugo     vapor specific internal energy previous time step.
c  voidf   liquid void fraction.
c  voidg   vapor void fraction.
c  voidgo  vapor void fraction previous time step (n).
c  vodgoo  vapor void fraction at old old time step (n-1).
c  quala   noncondensible quality..
c  qualao  noncondensible quality previous time step.
c  boron   boron density (mass of boron per cell volume).
c  borono  boron density previous time step.
c  quals   static quality.
c  quale   equilibrium quality.
c  rho     total density.
c  rhom    total density for mass error check.
c  rhoo    total density previous time step.
c  ******  warning: the ordering of rhof and rhog must be maintained
c  ******  since fidis assumes this order.
c  rhof    liquid density.
c  rhog    vapor density.
c  satt    saturation temperature based on the steam partial pressure.
c  temp    used in r level subroutines and is usually the same as satt.
c  tempf   liquid temperature.
c  tempg   vapor temperature.
c  velf(1) Average liquid velocity in a volume, three quantities, one
c          per coordinate.
c  velg    Average vapor velocity in a volume, three quantities, one per
c          coordinate.
c  sounde  homogeneous equilibrium sound speed. also, used for scratch
c          in hydro.
c  dsnddp  partial derivative of sounde w/r to pressure. also, used for
c          scratch in hydro.
c  sathf   liquid specific enthalpy at saturation conditions.
c  sathg   vapor specific enthalpy at saturation conditions.
c  betaff  Liquid isobaric coefficient of thermal expansion at bulk
c          conditions.
c  betagg  Vapor isobaric coefficient of thermal expansion at bulk
c          conditions.
c  csubpf  Liquid specific heat capacity at constant pressure at bulk
c          conditions.
c  csubpg  Vapor specific heat capacity at constant pressure at bulk
c          conditions.
c  viscf   Liquid viscosity.
c  viscg   Vapor viscosity.
c  sigma   Surface tension.
c  thconf  Liquid thermal conductivity.
c  thcong  Vapor thermal conductivity.
c  pps     Vapor partial pressure.
c  dotm    Vapor generation rate per unit volume.
c  dotmo   Vapor generation rate per unit volume previous time step.
c  hif     Liquid side interfacial heat transfer coefficient per unit
c          volume.
c  hig     Vapor side interfacial heat transfer coefficient per unit
c          volume.
c  gammaw  Vapor generation rate at the wall per unit volume.
c  q       total heat transfer rate from wall to fluid.
```

Figure B0.0-3 Listing of common block VOLDATC from program RELAP5. (Continued)

```
c  qwg     heat transfer rate from wall to vapor.
c  drfdp   partial derivative of rhof w/r to pressure.
c  drfduf  partial derivative of rhof w/r to liquid specific internal
c          energy.
c  drgdp   partial derivative of rhog w/r to pressure.
c  drgdug  partial derivative of rhog w/r to vapor specific internal
c          energy.
c  drgdxa  partial derivative of rhog w/r to noncondensible quality.
c  dtfdp   partial derivative of tempf w/r to pressure.
c  dtfduf  partial derivative of tempf w/r to liquid specific internal
c          energy.
c  dtgdp   partial derivative of tempg w/r to pressure.
c  dtgdug  partial derivative of tempg w/r to vapor specific internal
c          energy.
c  dtgdxa  partial derivative of tempg w/r to noncondensible quality.
c  dtdp    partial derivative of satt w/r to pressure.
c  dtdug   partial derivative of satt w/r to vapor specific internal
c          energy.
c  dtdxa   partial derivative of satt w/r to noncondensible quality.
c  floreg  flow regime number in real format, three quantities, one per
c          coordinate.
c  hifo    liquid side interfacial heat transfer coefficient per unit
c          volume previous timestep.
c  higo    vapor side interfacial heat transfer coefficient per unit
c          volume previous timestep.
c  qualan  Noncondensible mass fraction, five quantities, one per
c          species.
c  gaman   Noncondensible generation rate per unit volume,
c          five quantities, one per species.
c  enthn   Enthalpy of noncondensible source, five quantities, one per
c          species.
c  gamas   solute generation rate per unit volume.
c  enths   enthalpy of the solute source.
c  vo      volume previous time step.
c  qualno  Noncondensible mass fraction previous time step, five
c          quantities, one per species.
c  rhogo   vapor density previous time step.
c  ppso    vapor partial pressure (old-time).
c  ustm    vapor specific internal energy at pps and tempg with non-
c          condensable present.
c  ustmo   vapor specific internal energy at pps and tempg with non-
c          condensable present (old-time).
c  ggas    Cell centered gas mass flux, three quantities, one per
c          coordinate.
c  gliq    Cell centered liquid mass flux, three quantities, one per
c          coordinate.
c  velfo   Volume average liquid velocity previous timestep, three
c          quantities, one per coordinate.
c  velgo   Volume average vapor velocity previous timestep, three
c          quantities, one per coordinate.
c  fstrt   horizontal stratification interpolating factor, three
c          quantities, one per coordinate.
c  fwalf   liquid wall friction coefficient, three quantities, one per
c          coordinate.
c  fwalg   vapor wall friction coefficient, three quantities, one per
```

Figure B0.0-3 Listing of common block VOLDATC from program RELAP5. (Continued)

```
      .
c          coordinate.
c  vctrln  position of volume in volume block.
c  vctrld  index to diagonal matrix element.
c  vctrls  index to volume scratch space.
c  sth2xv  index data for sth2x water property subroutines.
c  invfnd  index to inverted junction table.
c  sinb    sine function of volume vertical angle, three quantities, one
c          per coordinate.
c  hvmix   volume mixture enthalpy.
c  ptans   pitch between fuel plates (ans).
c  span    length of fuel plates  (ans).
c  pecltv  Volume Peclet number, three quantities, one per coordinate.
c  tsatt   saturation temperature based on the total pressure.
c  fshape  Wall friction shape factor (one per coordinate).
c  fmurex  Viscosity ratio for wall friction (one per coordinate).
c  hgf     Direct heating heat transfer coefficient per unit volume.
c  frica   Constant term in experimental friction correlation (one per
c          coordinate).
c  fricb   Multiplier term in experimental friction correlation (one per
c          coordinate).
c  fricc   Power term in experimental friction correlation (one per
c          coordinate).
c  invhtf  index to inverted heat structure table.
c  hydxc(1)  Change along inertial x axis due to moving from face 1
c            to center of volume along local x coordinate.
c  hydxc(2)  Change along inertial x axis due to moving from center of
c            volume to face 2 along local x coordinate.
c  hydxc(3)  Change along inertial x axis due to moving from face 3
c            to center of volume along local y coordinate.
c  hydxc(4)  Change along inertial x axis due to moving from center of
c            volume to face 4 along local y coordinate.
c  hydxc(5)  Change along inertial x axis due to moving from face 5
c            to center of volume along local z coordinate.
c  hydxc(6)  Change along inertial x axis due to moving from center of
c            volume to face 6 along local z coordinate.
c  hydyc(1)  Change along inertial y axis due to moving from face 1
c            to center of volume along local x coordinate.
c  hydyc(2)  Change along inertial y axis due to moving from center of
c            volume to face 2 along local x coordinate.
c  hydyc(3)  Change along inertial y axis due to moving from face 3
c            to center of volume along local y coordinate.
c  hydyc(4)  Change along inertial y axis due to moving from center of
c            volume to face 4 along local y coordinate.
c  hydyc(5)  Change along inertial y axis due to moving from face 5
c            to center of volume along local z coordinate.
c  hydyc(6)  Change along inertial y axis due to moving from center of
c            volume to face 6 along local z coordinate.
c  hydzc(1)  Change along inertial z axis due to moving from face 1
c            to center of volume along local x coordinate.
c  hydzc(2)  Change along inertial z axis due to moving from center of
c            volume to face 2 along local x coordinate.
c  hydzc(3)  Change along inertial z axis due to moving from face 3
c            to center of volume along local y coordinate.
c  hydzc(4)  Change along inertial z axis due to moving from center of
c            volume to face 4 along local y coordinate.
```

Figure B0.0-3 Listing of common block VOLDATC from program RELAP5. (Continued)

```
   .
c  hydzc(5)  Change along inertial z axis due to moving from face 5
c            to center of volume along local z coordinate.
c  hydzc(6)  Change along inertial z axis due to moving from center of
c            volume to face 6 along local z coordinate.
c  hyposv(1)  Coordinate along x inertial axis of vector from center
c             of rotation to center of volume.
c  hyposv(2)  Coordinate along y inertial axis of vector from center
c             of rotation to center of volume.
c  hyposv(3)  Coordinate along z inertial axis of vector from center
c             of rotation to center of volume.
c  gravv(1)  Coordinate of gravity along inertial x coordinate.
c  gravv(2)  Coordinate of gravity along inertial y coordinate.
c  gravv(3)  Coordinate of gravity along inertial z coordinate.
c  tintf     Interface temperature when noncondensible is presentR,
c            saturation temperature at total pressure otherwise.
c  htsens    Heat transfer coefficient for sensible heat transfer
c            between vapor/gas mixture and liquid.
c  tmassv    Total mass (includes both phases and noncondensibles) in
c            volume.
c  tiengv    Total internal energy (of both phases and noncondensibles)
c            in volume.
$if def,selap
c  idbvol  indicator of whether l-th index of relap5 volume contains
c          debris region; 0 = no, 1 = yes.
c  mdbvol  value for l-th relap5 volume index of index m for
c          referencing arrays in common block debcom.
c  ndbvol  value for l-th relap5 volume index of index n for
c          referencing arrays in common block debcom.
$if def,athena
c  bfield  strength of magnetic field acting on volume.
c  econdw  electrical conductivity of duct wall.
c  fwfmhd  equivalent wall friction coefficient due to mhd effects.
c  hwidth  duct half-width.
c  wthick  thickness of duct wall.
c  igmhd   duct geometry type; 1=circular, 2=rectangular.
$endif
c  avolo   Old value of avol.
c  diamvo  Old value of diamv.
$endif
c  dlev    location of two-phase mixture level
c  dlevo   location of two-phase mixture level (old time)
c  vlev    velocity of two-phase level movement
c  vollev  Position of level within volume.
c  voidla  void fraction above the mixture level
c  voidao  void fraction above the mixture level (old time)
c  voidlb  void fraction below the mixture level
c  voidbo  void fraction below the mixture level (old time)
c  dfront    location of thermal front
c  dfrnto   location of thermal front (old time)
c  vfront    velocity of thermal front
c  ufla  liquid internal energy above the thermal front
c  ufao  liquid internal energy aaove the thermal front (old time)
c  uflb  liquid internal energy below the thermal front
c  ufbo  liquid internal energy below the thermal front (old time)
```

Figure B0.0-3 Listing of common block VOLDATC from program RELAP5. (Continued)