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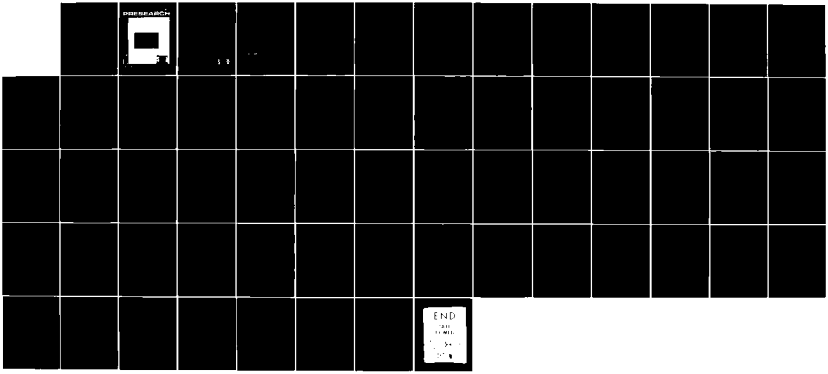

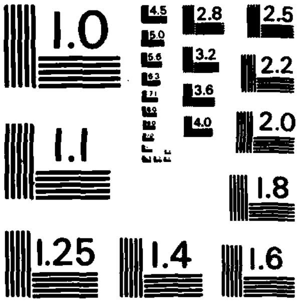
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AD A127205

FLEET MOORING LEG DESIGN PROGRAM DOCUMENTATION

Volume 6

SOURCE LISTINGS: COMPOUND LEG REVERSE SOLUTIONS AND POSTPROCESSOR

FPO-1-82-(37)

December 1982

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FLEET MOORING LEG
DESIGN PROGRAM DOCUMENTATION

Volume 6

SOURCE LISTINGS:
COMPOUND LEG REVERSE SOLUTIONS AND POSTPROCESSOR

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```
et sys final/t2for/csehp for##
      subroutine CSEHP(istart)
**********************************************************************
      implicit integer*2 (#)
      implicit double precision (a-z)

      integer*2 istart

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,sla,wla,cla,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,xla,x2a,x3a,yla,v2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),sla),(za(4),wla),(za(5),cla),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),xla),(za(14),x2a),(za(15),x3a),
     &  (za(16),yla),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,slb,wlb,clb,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,xlb,x2b,x3b,ylb,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),slb),(zb(4),wlb),(zb(5),clb),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),xlb),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),ylb),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)
```

```
      integer*2 nc(2)
      equivalence (nca,nc)

      double precision pi,halfpi,degrad,raddeg,zero,one,half
      integer*2 izero,ione,itwo
      common /VCONST/ pi,halfpi,degrad,raddeg,zero,one,half,
     & izero,ione,itwo

      double precision delyk,twod,halfd,dsq
      common /VANCH/ delyk,twod,halfd,dsq

      integer*2 iscopa,iscopb,itana,itanb,it,is
      double precision epsy,gamma,se
      common /VCMPD/ epsy,gamma,se,iscopa,iscopb,itana,itanb,it,is
      integer*2 iscop(2)
      equivalence (iscopa,iscop)

      integer*2 itold
      double precision ss0,dten0,ss1,dten1,ss2,dten2,slp0,sa0,smin(2)
      common /VEQUAL/ ss0,dten0,ss1,dten1,ss2,dten2,slp0,sa0,smin,
     & itold
      equivalence (smin(1),samin),(smin(2),sbmin)

      double precision sa,sb,ca,cb,vc0a(6),vc0b(6),
     & eex0,eez0,eey0,a0,b0,phia0,phib0
      integer*2 icase
      common /VSPID/ sa,sb,ca,cb,vc0a,vc0b,
     & eex0,eez0,eey0,a0,b0,phia0,phib0,
     & icase

      integer*2 istrt,iscopt,iscops,nit,isec
*********************************************************************
      istrt=istart
      if (z(iscopa) eq sa0-slp0) istrt=0

      z(iscopa)=sa0-slp0
      z(iscopb)=se-z(iscopa)
      call CPREP1
      call CSSHP
      it=1
      if (ta le tb) it=2
      is=3-it
      call FTEN(dten0)
      if (dten0 le zero) goto 2000

      iscopt-iscop(it)
      iscops-iscop(is)
      ssmax-z(iscops)
      ssmin-smin(is)
      if (ssmax eq ssmin) goto 2000

      if (it ne itold  or  ss1 eq ssmin) istrt-0
      if (istrt eq 0) goto 100
      ss0-ss2
      z(iscops)-ss0
      z(iscopt)-se-ss0
      call CPREP1
      call CSSHP
      call FTEN(dten0)
      ss1-0 9999d0*ss0+0 0001d0*ssmax
      goto 150
  100 continue
      ss0-ssmax
      ss1-ssmin
      if (ssmin gt zero) ss1-half*(ssmin+ssmax)
  150 continue
*     write(10,*) it,is,iscop,se,ssmin
*     write(10,*) ss0,ta,tb,gamma,dten0,isol,ibrnch
      z(iscops)-ss1
      z(iscopt)-se-ss1
      call CPREP1
      call CSSHP
      call FTEN(dten1)
*     write(10,*) ss1,ta,tb,gamma,dten1,isol,ibrnch
      if (istrt ne 0) goto 500
      if (ss1 eq ssmin  and  dten1 gt zero) goto 2000

  300 continue
      if (dten1 le zero) goto 500
      ss1-half*(ss1+ssmin)
      z(iscops)-ss1
      z(iscopt)-se-ss1
      call CPREP1
      call CSSHP
      call FTEN(dten1)
*     write(10,*) ss1,ta,tb,gamma,dten1,isol,ibrnch
```

```
      goto 300

  500 continue
      ctot=ca+cb+c3+s4*w4
      epsdt=ctot*1 0d-8
      isec=3*istrt
      nit=1

 1000 continue
      ss2=half*(ss0+ss1)
      if (isec eq 0  and  dten0-dten1 gt ctot) goto 1020
      isec=isec+1
      ss2=ss1-dten1*(ss1-ss0)/(dten1-dten0)
      ssm=ssmin
      if (ssmin gt zero) ssm=half*(ssmin+dmin1(ss0,ss1))
      ss2=dmin1(ssmax,dmax1(ss2,ssm))
 1020 continue
      z(iscops)=ss2
      z(iscopt)=se-ss2
      call CPREP1
      call CSSHP
      call FTEN(dten2)
*     write(10,*) ss2,ta,tb,gamma,dten2,isol,ibrnch
      if (dabs(dten2) lt epsdt) goto 2000
      if (nit eq 30) stop 111
      if (isec gt 3) goto 1250
      if (dten2 lt zero) goto 1260
      ss0=ss2
      dten0=dten2
      goto 1300
 1250 continue
      ss0=ss1
      dten0=dten1
 1260 continue
      ss1=ss2
      dten1=dten2
 1300 continue
      nit=nit+1
      goto 1000

 2000 continue
      slp=sa0-z(iscopa)
      itold=it
      return
      end
*
```

```
et sys final/t2for/ften for##
      subroutine FTEN(delten)
*******************************************************************************
      implicit double precision (a-z)

      double precision delten

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,sla,wla,cla,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,xla,x2a,x3a,yla,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),sla),(za(4),wla),(za(5),cla),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),xla),(za(14),x2a),(za(15),x3a),
     &  (za(16),yla),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,slb,wlb,clb,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,xlb,x2b,x3b,ylb,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),slb),(zb(4),wlb),(zb(5),clb),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),xlb),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),ylb),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)
      double precision tjun(2)
      equivalence (ta,tjun)

      integer*2 iscopa,iscopb,itana,itanb,it,is
      double precision epsy,gamma,se
      common /VCMPD/ epsy,gamma,se,iscopa,iscopb,itana,itanb,it,is
******************************************************************************
      delten=tjun(it)-gamma*tjun(is)
      return
      end
*
```

```
et sys final/t2for/csspr for##
      subroutine CSSPR(ieps)
*******************************************************************
      implicit integer*2 (#)
      implicit double precision (a-z)

      integer*2 ieps

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,sla,wla,cla,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,x1a,x2a,x3a,y1a,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),sla),(za(4),wla),(za(5),cla),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),x1a),(za(14),x2a),(za(15),x3a),
     &  (za(16),y1a),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,slb,wlb,clb,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,x1b,x2b,x3b,y1b,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),slb),(zb(4),wlb),(zb(5),clb),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),x1b),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),y1b),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)
```

```
      double precision pi ,halfpi ,degrad ,raddeg ,zero ,one ,half
      integer*2 izero ,ione ,itwo
      common /VCONST/ pi ,halfpi ,degrad ,raddeg ,zero ,one ,half ,
     &  izero ,ione ,itwo

      double precision delyk ,twod ,halfd ,dsq
      common /VANCH/ delyk ,twod ,halfd ,dsq

      double precision snphih ,csphih ,snafh ,csafh ,tnafh ,scafh ,dsnph
      common /VHDIR/ snphih ,csphih ,snafh ,csafh ,tnafh ,scafh ,dsnph

      double precision sa ,sb ,ca ,cb ,vc0a(6) ,vc0b(6) ,
     &  eex0 ,eez0 ,eey0 ,a0 ,b0 ,phia0 ,phib0
      integer*2 icase
      common /VSPID/ sa ,sb ,ca ,cb ,vc0a ,vc0b ,
     &  eex0 ,eez0 ,eey0 ,a0 ,b0 ,phia0 ,phib0 ,
     &  icase
      double precision vc0a1
      equivalence (vc0a(1) ,vc0a1)

      integer*2 ivs
      double precision v0 ,v1 ,v2 ,f0 ,f1 ,f2 ,f ,eps
      common /VSEC/ v0 ,v1 ,v2 ,f0 ,f1 ,f2 ,f ,eps ,ivs

      integer*2 nit ,i ,ifail ,ibis ,isec ,nwaa
      double precision zz(7)
      equivalence (zb(11) ,zz) ,(zb(18) ,scafz ,halfdd ,temp ,s1 ,nwaa) ,
     &  (zb(19) ,csphin ,hddcsp ,rr) ,(zb(20) ,ssa)
*********************************************************************
*     write(10,*) 'CSSPR' ,rtot
      r=rtot
      epsr=r*1 0d-10
      if (ieps eq 1) epsr=r*1 0d-4

      scafz=SECNT(cz)
      csphin=csafh*(snphih+cz*tnafh)/scafz
      halfdd=halfd*scafz
      hddcsp=halfdd*csphin
      temp=hddcsp*hddcsp-halfdd*halfdd
      s1=dmin1(dsqrt(sa*sa+temp)+hddcsp ,dsqrt(sb*sb+temp)-hddcsp)

      do 100 i=1 ,7
```

```
         zz(i)=z(i)
100      continue

      ha=h
      s1a=s1
      w1a=(ca+cb)/s1
      c1a=c3
      s2a=s4
      w2a=w4
      call VCRIT0(2,za,vc0a)
      nwaa=0
      if (w1a .lt. zero .or. w2a .lt. zero) nwaa=1

      ssa=s1a+s2a
      h0=ca+cb+s4*w4
      f=do
      eps=h0*1.0d-10
      ivs=0
      ha=h0*1.0d-5
      call XSECV(2,za,vc0a,ssa,vc0a1,nwaa,ncb,zb,vc0b,
     &  snafh,csafh,tnafh,scafh,2,ifail)
      rr=dmax1(dmin1(r,0.01*xa+0.99*dsqrt(ssa*ssa-do*do)),xa)

      ha=h0
      call XSECV(2,za,vc0a,ssa,vc0a1,nwaa,ncb,zb,vc0b,
     &  snafh,csafh,tnafh,scafh,2,ifail)
      r0=xa
      h1=half*h0
      ha=h1
      call XSECV(2,za,vc0a,ssa,vc0a1,nwaa,ncb,zb,vc0b,
     &  snafh,csafh,tnafh,scafh,2,ifail)
      r1=xa

300   continue
      ha=h1-(r1-rr)*(h1-h0)/(r1-r0)
      if (ha .le. zero) ha=half*h1
      call XSECV(2,za,vc0a,ssa,vc0a1,nwaa,ncb,zb,vc0b,
     &  snafh,csafh,tnafh,scafh,2,ifail)
      h0=h1
      h1=ha
      r0=r1
      r1=xa
      if (dabs(r1-rr) .gt. eps) goto 300
      do 500 i=1,7
            z(i)=zz(i)
  500       continue
      call VCRIT0(nca,za,vc0a)


      h1=0 9d0*h0
*     write(10,*) h0,h1
      h=h0
      call CPREP3
      call CSSHP
      r0=rtot
*     write(10,*) h0,r0
      h=h1
      call CPREP3
      call CSSHP
      r1=rtot
*     write(10,*) h1,r1

      nit=1
      ibis=0
      isec=0
 1000 continue
      if (nit gt 15  and  (r0-r)*(r1-r) lt zero  and  ibis le 6
     &   and  (isec eq 0  or  isec gt 6)) goto 1020
      ibis=0
      isec=isec+1
      h=h1-(r1-r)*(h1-h0)/(r1-r0)
      if (h le zero) h=half*h1
      goto 1100
 1020 continue
      ibis=ibis+1
      isec=0
      h=half*(h0+h1)
 1100 continue
      call CPREP3
      call CSSHP
*     write(10,*) h,rtot
      if (dabs(rtot-r) lt epsr) goto 5000
      if (nit eq 100) stop 110
      if (ibis eq 0) goto 1350
      if ((rtot-r)*(r0-r) lt zero) goto 1370
      h0=h
      r0=rtot
      goto 1400
 1350 continue
      h0=h1
      r0=r1
 1370 continue
      h1=h
      r1=rtot
 1400 continue
      nit=nit+1
      goto 1000

 5000 continue
      return
      end
*
```

```
et sys final/t2for/csepr for##
      subroutine CSEPR(ieps)
*********************************************************************
      implicit integer*2 ($)
      implicit double precision (a-z)

      integer*2 ieps

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &   isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,sla,wla,cla,s2a,w2a,c2a,s3a,w3a,
     &   xa,ya,x1a,x2a,x3a,y1a,y2a,y3a,
     &   tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &   (za(3),sla),(za(4),wla),(za(5),cla),
     &   (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &   (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &   (za(13),x1a),(za(14),x2a),(za(15),x3a),
     &   (za(16),y1a),(za(17),y2a),(za(18),y3a),
     &   (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &   (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,slb,wlb,clb,s2b,w2b,c2b,s3b,w3b,
     &   xb,yb,x1b,x2b,x3b,y1b,y2b,y3b,
     &   tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &   (zb(3),slb),(zb(4),wlb),(zb(5),clb),
     &   (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &   (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &   (zb(13),x1b),(zb(14),x2b),(zb(15),x3b),
     &   (zb(16),y1b),(zb(17),y2b),(zb(18),y3b),
     &   (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &   (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &   h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &   (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &   (z(59),tana7),(z(60),tana8),(z(61),l),
     &   (z(62),h),(z(63),phih),
     &   (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)
```

```
      double precision pi ,halfpi ,degrad ,raddeg ,zero ,one ,half
      integer*2 izero ,ione ,itwo
      common /VCONST/ pi ,halfpi ,degrad ,raddeg ,zero ,one ,half ,
     &  izero ,ione ,itwo

      double precision delyk ,twod ,halfd ,dsq
      common /VANCH/ delyk ,twod ,halfd ,dsq

      integer*2 iscopa ,iscopb ,itana ,itanb ,it ,is
      double precision epsy ,gamma ,se
      common /VCMPD/ epsy ,gamma ,se ,iscopa ,iscopb ,itana ,itanb ,it ,is
      integer*2 iscop(2)
      equivalence (iscopa ,iscop)

      double precision snphih ,csphih ,snafh ,csafh ,tnafh ,scafh ,dsnph
      common /VHDIR/ snphih ,csphih ,snafh ,csafh ,tnafh ,scafh ,dsnph

      double precision sa ,sb ,ca ,cb ,vc0a(6) ,vc0b(6) ,
     &  eex0 ,eez0 ,eey0 ,a0 ,b0 ,phia0 ,phib0
      integer*2 icase
      common /VSPID/ sa ,sb ,ca ,cb ,vc0a ,vc0b ,
     &  eex0 ,eez0 ,eey0 ,a0 ,b0 ,phia0 ,phib0 ,
     &  icase
      double precision vc0al
      equivalence (vc0a(1) ,vc0al)

      integer*2 ivs
      double precision v0 ,v1 ,v2 ,f0 ,f1 ,f2 ,f ,eps
      common /VSEC/ v0 ,v1 ,v2 ,f0 ,f1 ,f2 ,f ,eps ,ivs

      integer*2 nit ,i ,ibis ,isec
************************************************************************
*     write(10,*) 'CSEPR' ,rtot
      r=rtot
      epsr=r*1 0d-10
      if (ieps eq 1) epsr=r*1 0d-4

      call CPREP1
      h1=(ca+cb+c3+s4*w4)*0 2d0
      h0=0 9d0*h1
      h=h0
      call CPREP3
```

```
*     write(10,*)
      call CSEHP(0)
      r0=rtot
*     write(10,*) h0,r0
      h=h1
      call CPREP3
*     write(10,*)
      call CSEHP(1)
      r1=rtot
*     write(10,*) h1,r1

      nit=1
      ibis=0
      isec=0
 1000 continue
      if (nit gt 15  and  (r0-r)*(r1-r) lt zero  and  ibis le 6
     &  and  (isec eq 0  or  isec gt 6)) goto 1020
      ibis=0
      isec=isec+1
      h=h1-(r1-r)*(h1-h0)/(r1-r0)
      if (h le zero) h=half*h1
      goto 1100
 1020 continue
      ibis=ibis+1
      isec=0
      h=half*(h0+h1)
 1100 continue
      call CPREP3
*     write(10,*)
      call CSEHP(1)
*     write(10,*) h,rtot
      if (dabs(rtot-r) lt epsr) goto 5000
      if (nit eq 100) stop 110
      if (ibis eq 0) goto 1350
      if ((rtot-r)*(r0-r) lt zero) goto 1370
      h0=h
      r0=rtot
      goto 1400
 1350 continue
      h0=h1
      r0=r1
 1370 continue
      h1=h
      rl=rtot
 1400 continue
      nit=nit+1
      goto 1000

 5000 continue
*     write(10,*) 'END CSEPR'
      return
      end
*
```

```
et sys final/t2for/cssxz1 for##
      subroutine CSSXZ1
************************************************************************
      implicit integer*2 (#)
      implicit double precision (a-z)

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,sla,wla,cla,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,xla,x2a,x3a,yla,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),sla),(za(4),wla),(za(5),cla),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),xla),(za(14),x2a),(za(15),x3a),
     &  (za(16),yla),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,slb,wlb,clb,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,xlb,x2b,x3b,ylb,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),slb),(zb(4),wlb),(zb(5),clb),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),xlb),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),ylb),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)
      double precision xztot(2)
      equivalence (xztot(1),xtot)
      double precision epsxz,xztru(2),xzbas(2),hbas(2),scrat1(10)
      common /VCSSXZ/epsxz,xztru,xzbas,hbas,scrat1
      double precision xtru,ztru,xbas,zbas,hbasx,hbasz
      equivalence (xztru(1),xtru),(xztru(2),ztru),
     &  (xzbas(1),xbas),(xzbas(2),zbas),
     &  (hbas(1),hbasx),(hbas(2),hbasz)
      double precision cospt,sinpt,hhx,hhz,dh0,dt0,dh1,dt1,dh2,dt2
      equivalence (scrat1(1),cospt),(scrat1(2),sinpt),
     &  (scrat1(3),hhx),(scrat1(4),hhz),
     &  (scrat1(5),dh0),(scrat1(6),dt0),
     &  (scrat1(7),dh1),(scrat1(8),dt1),
     &  (scrat1(9),dh2),(scrat1(10),dt2)

      double precision pi,halfpi,degrad,raddeg,zero,one,half
      integer*2 izero,ione,itwo
      common /VCONST/ pi,halfpi,degrad,raddeg,zero,one,half,
     &  izero,ione,itwo

      integer*2 i
***************************************************************************
*     write(10,*) 'CSSXZ1',xztot
      xtru=xtot
      ztru=ztot
      rtot=dsqrt(xtot*xtot+ztot*ztot)
      phih=datan(ztot/xtot)
      cospt= -ztot/rtot
      sinpt= xtot/rtot
      epsxz=rtot*rtot*1.0d-20

      call CPREP2
      call CSSPR(1)
      hhx=h*sinpt
      hhz= -h*cospt
*     write(10,*)
*     write(10,*) hhx,hhz,xztot

      hbasx=hhx
      hbasz=hhz
      xbas=xtot-xtru
      zbas=ztot-ztru
      dh0=zero
      dt0=xbas*cospt+zbas*sinpt
      if (dt0*dt0 .le. epsxz*1.0d12) goto 600

      do 500 i=1,5
           dh2= -h*dt0/rtot
           if (i .gt. 1) dh2=dh1-dt1*(dh1-dh0)/(dt1-dt0)
           hbasx=hhx+dh2*caspt
           hbasz=hhz+dh2*sinpt
           h=dsqrt(hbasx*hbasx+hbasz*hbasz)
           phih=datan(hbasz/hbasx)
           call CPREP2
           call CPREP3
           call CSSHP
*          write(10,*) hbas,xztot
           xbas=xtot-xtru
           zbas=ztot-ztru
           dt2=xbas*caspt+zbas*sinpt
           if (i .eq. 1) goto 300
           if (dt2*dt2 .lt. (xbas*xbas+zbas*zbas)*1.0d-2) goto 600
           dh0=dh1
           dt0=dt1
  300      continue
           dh1=dh2
           dt1=dt2
  500      continue

  600 continue
      return
      end
*
```

```
et sys final/t2for/cssxz2 for##
      subroutine CSSXZ2
**********************************************************************
      implicit integer*2 (#)
      implicit double precision (a-z)

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,a1a,va,s1a,w1a,c1a,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,x1a,x2a,x3a,y1a,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),a1a,va),
     &  (za(3),s1a),(za(4),w1a),(za(5),c1a),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),x1a),(za(14),x2a),(za(15),x3a),
     &  (za(16),y1a),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,a1b,vb,s1b,w1b,c1b,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,x1b,x2b,x3b,y1b,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),a1b,vb),
     &  (zb(3),s1b),(zb(4),w1b),(zb(5),c1b),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),x1b),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),y1b),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)
      double precision xztot(2)
      equivalence (xztot(1),xtot)
      double precision pi ,halfpi ,degrad ,raddeg ,zero ,one ,half
      integer*2 izero ,ione ,itwo
      common /VCONST/ pi ,halfpi ,degrad ,raddeg ,zero ,one ,half ,
     &  izero ,ione ,itwo

      double precision epsxz ,xztru(2) ,xzbas(2) ,hbas(2) ,scratl(10)
      common /VCSSXZ/epsxz ,xztru ,xzbas ,hbas ,scratl
      double precision xtru ,ztru ,xbas ,zbas ,hbasx ,hbasz
      equivalence (xztru(1) ,xtru) ,(xztru(2) ,ztru) ,
     &  (xzbas(1) ,xbas) ,(xzbas(2) ,zbas) ,
     &  (hbas(1) ,hbasx) ,(hbas(2) ,hbasz)
      double precision dhmax ,dhmin ,hist(2) ,histx ,histz
      equivalence (scratl(1) ,dhmax ,hist(1) ,histx) ,(dhmin ,hist(2) ,histz)
      double precision delh(2) ,delhx ,delhz ,dhbx ,dhbz
      equivalence (scratl(3) ,delh(1) ,delhx ,dhbx) ,(delh(2) ,delhz ,dhbz)
      double precision jac(2 ,2) ,j11 ,j12 ,j21 ,j22
      equivalence (scratl(5) ,jac(1 ,1) ,j11) ,(jac(1 ,2) ,j12) ,
     &  (jac(2 ,1) ,j21) ,(jac(2 ,2) ,j22)
      double precision jnew(4)
      equivalence (jac ,jnew)
      double precision temp ,xzsqo ,detj
      equivalence (scratl(9) ,temp ,xzsqo) ,(scratl(10) ,detj)

      double precision jold(4)
      integer*2 i ,j ,k ,nit ,iquit ,ijo
************************************************************************
*     write(10,*)
*     write(10,*) 'CSSXZ2'

      iquit-0
      ijo-0
      nit-1
 1000 continue
*     write(10,*) hbas ,xzbas
      xzsq-xbas*xbas+zbas*zbas
      if (iquit eq 1  or  xzsq le epsxz) goto 5000
      if (nit gt 10  and  xzsq le epsxz*1 0d4) goto 5000
      if (nit gt 5  and  xzsq le epsxz*1 0d8  and  xzsq ge xzsqo*half)
     &  goto 5000

      if (ijo eq 0  or  ijo gt 5) goto 1030
      ijo-ijo+1
      goto 1800
 1030 continue
      ijo=0
      if (nit eq 1) goto 1050
      delhx=(j11*xbas+j12*zbas)*dsqrt(j21*j21+j22*j22)*detj
      delhz=(j21*xbas+j22*zbas)*dsqrt(j11*j11+j12*j12)*detj
***********************************************************************
*     dhmax=h*1 0d-2
*     dhmin=h*1 0d-8
*     do 1020 i=1,2
*          delh(i)=dmax1(dhmin,dmin1(dhmax,delh(i)))
*1020      continue
***********************************************************************
      goto 1100
 1050 continue
      delhx=h*1 0d-2
      delhz=delhx
 1100 continue

      do 1500 j=1,2
           hist(j)=hbas(j)+delh(j)
           k=3-j
           hist(k)=hbas(k)
           h=dsqrt(histx*histx+histz*histz)
           phih=datan(histz/histx)
           call CPREP2
           call CPREP3
           call CSSHP
           do 1400 i=1,2
                jac(i,j)=(xztot(i)-xztru(i)-xzbas(i))/delh(j)
 1400           continue
*          write(10,*) delh(j),xztot
 1500      continue

      if (nit eq 1) goto 1625
      do 1620 i=1,4
           if (dabs(one-jnew(i)/jold(i)) gt 1 0d-2) goto 1625
 1620      continue
      ijo=1
 1625 continue
      do 1630 i=1,4
           jold(i)=jnew(i)
 1630      continue
```

```
      detj=j11*j22-j12*j21
*     write(10,*) jac,detj
*     write(10,*)
      if (nit gt 1  and  detj eq zero  and   xzsq le epsxz*1 0d8)
     &  iquit=1
      if (iquit eq 1) goto 2000
      temp=j11
      j11=j22/detj
      j22=temp/detj
      j12= -j12/detj
      j21= -j21/detj

 1800 continue
      dhbx=j11*xbas+j12*zbas
      dhbz=j21*xbas+j22*zbas
      temp=one
      if (dhbx+dhbx gt hbasx) temp=hbasx/(dhbx+dhb
      hbasx=hbasx-temp*dhbx
      hbasz=hbasz-temp*dhbz

 2000 continue
      h=dsqrt(hbasx*hbasx+hbasz*hbasz)
      phih=datan(hbasz/hbasx)
      call CPREP2
      call CPREP3
      call CSSHP
      xbas=xtot-xtru
      zbas=ztot-ztru
      xzsqo=xzsq
      nit=nit+1
      goto 1000

 5000 continue
      return
      end
*
```

```
et sys final/t2for/csexz1 for##
      subroutine CSEXZ1
**********************************************************************
      implicit integer*2 (#)
      implicit double precision (a-z)

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,s1a,w1a,c1a,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,x1a,x2a,x3a,y1a,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),s1a),(za(4),w1a),(za(5),c1a),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),x1a),(za(14),x2a),(za(15),x3a),
     &  (za(16),y1a),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,s1b,w1b,c1b,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,x1b,x2b,x3b,y1b,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),s1b),(zb(4),w1b),(zb(5),c1b),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),x1b),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),y1b),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)
      double precision xztot(2)
      equivalence (xztot(1),xtot)
      double precision epsxz ,xztru(2) ,xzbas(2) ,hbas(2) ,scrat1(10)
      common /VCSSXZ/epsxz ,xztru ,xzbas ,hbas ,scrat1
      double precision xtru ,ztru ,xbas ,zbas ,hbasx ,hbasz
      equivalence (xztru(1) ,xtru) ,(xztru(2) ,ztru) ,
     &  (xzbas(1) ,xbas) ,(xzbas(2) ,zbas) ,
     &  (hbas(1) ,hbasx) ,(hbas(2) ,hbasz)
      double precision cospt ,sinpt ,hhx ,hhz ,dh0 ,di0 ,dh1 ,di1 ,dh2 ,di2
      equivalence (scrat1(1) ,cospt) ,(scrat1(2) ,sinpt) ,
     &  (scrat1(3) ,hhx) ,(scrat1(4) ,hhz) ,
     &  (scrat1(5) ,dh0) ,(scrat1(6) ,di0) ,
     &  (scrat1(7) ,dh1) ,(scrat1(8) ,di1) ,
     &  (scrat1(9) ,dh2) ,(scrat1(10) ,di2)

      double precision pi ,halfpi ,degrad ,raddeg ,zero ,one ,half
      integer*2 izero ,ione ,itwo
      common /VCONST/ pi ,halfpi ,degrad ,raddeg ,zero ,one ,half ,
     &  izero ,ione ,itwo

      integer*2 i
*************************************************************************
*     write(10,*) 'CSEXZ1' ,xztot
      xtru=xtot
      ztru=ztot
      rtot=dsqrt(xtot*xtot+ztot*ztot)
      phih=datan(ztot/xtot)
      cospt= -ztot/rtot
      sinpt= xtot/rtot
      epsxz=rtot*rtot*1 0d-20

      call CPREP2
      call CSEPR(1)
      hhx=h*sinpt
      hhz= -h*cospt
*     write(10,*)
*     write(10,*) hhx ,hhz ,xztot

      hbasx=hhx
      hbasz=hhz
      xbas=xtot-xtru
      zbas=ztot-ztru
      dh0=zero
      di0=xbas*cospt+zbas*sinpt
      if (dt0*dt0 le epsxz*1 0d12) goto 600

      do 500 i=1,5
          dh2= -h*dt0/rtot
          if (i gt 1) dh2=dh1-dt1*(dh1-dh0)/(dt1-dt0)
          hbasx=hhx+dh2*cospt
          hbasz=hhz+dh2*sinpt
          h=dsqrt(hbasx*hbasx+hbasz*hbasz)
          phih=datan(hbasz/hbasx)
          call CPREP2
          call CPREP3
*         write(10,*)
          call CSEHP(1)
*         write(10,*) hbas,xztot
          xbas=xtot-xtru
          zbas=ztot-ztru
          dt2=xbas*cospt+zbas*sinpt
          if (i eq 1) goto 300
          if (dt2*dt2 lt (xbas*xbas+zbas*zbas)*1 0d-2) goto 600
          dh0=dh1
          dt0=dt1
  300     continue
          dh1=dh2
          dt1=dt2
  500     continue

  600 continue
      return
      end
*
```

```
et sys final/t2for/csexz2 for##
      subroutine CSEXZ2
******************************************************************************
      implicit integer*2 (#)
      implicit double precision (a-z)

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,s1a,w1a,c1a,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,x1a,x2a,x3a,y1a,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),s1a),(za(4),w1a),(za(5),c1a),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),x1a),(za(14),x2a),(za(15),x3a),
     &  (za(16),y1a),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,s1b,w1b,c1b,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,x1b,x2b,x3b,y1b,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),s1b),(zb(4),w1b),(zb(5),c1b),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),x1b),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),y1b),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)
      double precision xztot(2)
      equivalence (xztot(1),xtot)
      double precision pi ,halfpi ,degrad ,raddeg ,zero ,one ,half
      integer*2 izero ,ione ,itwo
      common /VCONST/ pi ,halfpi ,degrad ,raddeg ,zero ,one ,half ,
     &  izero ,ione ,itwo

      double precision epsxz ,xztru(2) ,xzbas(2) ,hbas(2) ,scrat1(10)
      common /VCSSXZ/epsxz ,xztru ,xzbas ,hbas ,scrat1
      double precision xtru ,ztru ,xbas ,zbas ,hbasx ,hbasz
      equivalence (xztru(1) ,xtru) ,(xztru(2) ,ztru) ,
     &  (xzbas(1) ,xbas) ,(xzbas(2) ,zbas) ,
     &  (hbas(1) ,hbasx) ,(hbas(2) ,hbasz)
      double precision dhmax ,dhmin ,hist(2) ,histx ,histz
      equivalence (scrat1(1) ,dhmax ,hist(1) ,histx) ,(dhmin ,hist(2) ,histz)
      double precision delh(2) ,delhx ,delhz ,dhbx ,dhbz
      equivalence (scrat1(3) ,delh(1) ,delhx ,dhbx) ,(delh(2) ,delhz ,dhbz)
      double precision jac(2 ,2) ,j11 ,j12 ,j21 ,j22
      equivalence (scrat1(5) ,jac(1 ,1) ,j11) ,(jac(1 ,2) ,j12) ,
     &  (jac(2 ,1) ,j21) ,(jac(2 ,2) ,j22)
      double precision jnew(4)
      equivalence (jac ,jnew)
      double precision temp ,xzsqo ,detj
      equivalence (scrat1(9) ,temp ,xzsqo) ,(scrat1(10) ,detj)

      double precision jold(4)
      integer*2 i ,j ,k ,nit ,iquit ,ijo
***********************************************************************
*     write(10 ,*)
*     write(10 ,*) 'CSEXZ2'

      iquit-0
      ijo-0
      nit-1
 1000 continue
*     write(10 ,*)
*     write(10 ,*) 'ITER' ,nit
*     write(10 ,*) hbas ,xzbas
      xzsq-xbas*xbas+zbas*zbas
      if (iquit eq 1  or  xzsq le epsxz) goto 5000
      if (nit gt 10  and  xzsq le epsxz*1 0d4) goto 5000
      if (nit gt 5  and  xzsq le epsxz*1 0d8  and  xzsq ge xzsqo*half)
     &  goto 5000
```

```
      if (ijo eq 0  or  ijo gt 5) goto 1030
      ijo=ijo+1
      goto 1800
 1030 continue
      ijo=0
      if (nit eq 1) goto 1050
      delhx=(j11*xbas+j12*zbas)*dsqrt(j21*j21+j22*j22)*detj
      delhz=(j21*xbas+j22*zbas)*dsqrt(j11*j11+j12*j12)*detj
************************************************************************
*     dhmax=h*1 0d-2
*     dhmin=h*1 0d-8
*     do 1020 i=1,2
*          delh(i)=dmax1(dhmin,dmin1(dhmax,delh(i)))
*1020      continue
************************************************************************
      goto 1100
 1050 continue
      delhx=h*1 0d-2
      delhz=delhx
 1100 continue

      do 1500 j=1,2
           hst(j)=hbas(j)+delh(j)
           k=3-j
           hst(k)=hbas(k)
           h=dsqrt(hstx*hstx+hstz*hstz)
           phih=datan(hstz/hstx)
           call CPREP2
           call CPREP3
*          write(10,*)
           call CSEHP(1)
           do 1400 i=1,2
                jac(i,j)=(xztot(i)-xztru(i)-xzbas(i))/delh(j)
 1400           continue
*          write(10,*) delh(j),xztot
 1500      continue

      if (nit eq 1) goto 1625
      do 1620 i=1,4
           if (dabs(one-jnew(i)/jold(i)) gt 1 0d-2) goto 1625
 1620      continue
      ijo=1
 1625 continue
```

```
      do 1630 i-1,4
           jold(i)-jnew(i)
 1630      continue

      detj-j11*j22-j12*j21
*     write(10,*)
*     write(10,*) jac,detj
      if (nit gt 1  and  detj eq zero  and   xzsq le epsxz*1 0d8)
     &  iquit-1
      if (iquit eq 1) goto 2000
      temp-j11
      j11-j22/detj
      j22-temp/detj
      j12- -j12/detj
      j21- -j21/detj

 1800 continue
      dhbx-j11*xbas+j12*zbas
      dhbz-j21*xbas+j22*zbas
      temp-one
      if (dhbx+dhbx gt hbasx) temp-hbasx/(dhbx+dhbx)
      hbasx-hbasx-temp*dhbx
      hbasz-hbasz-temp*dhbz

 2000 continue
      h-dsqrt(hbasx*hbasx+hbasz*hbasz)
      phih-datan(hbasz/hbasx)
      call CPREP2
      call CPREP3
*     write(10,*)
      call CSEHP(1)
      xbas-xtot-xtru
      zbas-ztot-ztru
      xzsqo-xzsq
      nit-nit+1
      goto 1000

 5000 continue
      return
      end
*
```

```
et sys final/t2for/cepslv for##
      subroutine CEPSLV
***********************************************************************
      implicit integer*2 (*)
      implicit double precision (a-z)

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,s1a,w1a,c1a,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,x1a,x2a,x3a,y1a,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),s1a),(za(4),w1a),(za(5),c1a),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),x1a),(za(14),x2a),(za(15),x3a),
     &  (za(16),y1a),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,s1b,w1b,c1b,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,x1b,x2b,x3b,y1b,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),s1b),(zb(4),w1b),(zb(5),c1b),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),x1b),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),y1b),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)

      double precision pi,halfpi,degrad,raddeg,zero,one,half
      integer*2 izero ,ione ,itwo
      common /VCONST/ pi ,halfpi ,degrad ,raddeg ,zero ,one ,half ,
     &  izero ,ione ,itwo

      double precision tnaf ,phif
      common /VOFLR/ tnaf ,phif

      double precision delyk ,twod ,halfd ,dsq
      common /VANCH/ delyk ,twod ,halfd ,dsq

      integer*1 ctitle(114)
      common /TITLES/ ctitle

      integer*1 cdatim(16)
      common /DATIME/ cdatim

      integer*1 cvarin(172)
      common /VARIN/ cvarin

      real lla ,llb ,ll ,hha ,hhb ,hh ,
     &  xx1a ,xx3a ,xx5a ,xx1b ,xx3b ,xx5b ,xx7 ,xx8 ,
     &  yy1a ,yy3a ,yy5a ,yy1b ,yy3b ,yy5b ,yy7 ,yy8 ,
     &  zz1a ,zz3a ,zz5a ,zz1b ,zz3b ,zz5b ,zz7 ,zz8 ,
     &  aa1a ,aa2a ,aa3a ,aa4a ,aa5a ,aa6a ,
     &  aa1b ,aa2b ,aa3b ,aa4b ,aa5b ,aa6b ,aa7 ,aa8 ,
     &  vv1a ,vv2a ,vv3a ,vv4a ,vv5a ,vv6a ,
     &  vv1b ,vv2b ,vv3b ,vv4b ,vv5b ,vv6b ,vv7 ,vv8 ,
     &  tt1a ,tt2a ,tt3a ,tt4a ,tt5a ,tt6a ,
     &  tt1b ,tt2b ,tt3b ,tt4b ,tt5b ,tt6b ,tt7 ,tt8 ,
     &  ddo ,dda ,ddb ,
     &  af ,afdir ,afa ,adir ,afb ,bdir ,
     &  sslp ,coila ,coilb
      integer*2 iisol ,iibrn
      common /VAROUT/ lla ,llb ,ll ,hha ,hhb ,hh ,
     &  xx1a ,xx3a ,xx5a ,xx1b ,xx3b ,xx5b ,xx7 ,xx8 ,
     &  yy1a ,yy3a ,yy5a ,yy1b ,yy3b ,yy5b ,yy7 ,yy8 ,
     &  zz1a ,zz3a ,zz5a ,zz1b ,zz3b ,zz5b ,zz7 ,zz8 ,
     &  aa1a ,aa2a ,aa3a ,aa4a ,aa5a ,aa6a ,
     &  aa1b ,aa2b ,aa3b ,aa4b ,aa5b ,aa6b ,aa7 ,aa8 ,
     &  vv1a ,vv2a ,vv3a ,vv4a ,vv5a ,vv6a ,
     &  vv1b ,vv2b ,vv3b ,vv4b ,vv5b ,vv6b ,vv7 ,vv8 ,
     &  tt1a ,tt2a ,tt3a ,tt4a ,tt5a ,tt6a ,
     &  tt1b ,tt2b ,tt3b ,tt4b ,tt5b ,tt6b ,tt7 ,tt8 ,
     &  ddo,dda,ddb,
     &  af,afdir,afa,adir,afb,bdir,
     &  sslp,coila,coilb,
     &  iisol,iibrn
      real parout(84)
      equivalence (lla,parout)

      integer*1 cvarg(240)
      common /VARG/ cvarg

      integer*1 cunkno(12)
      common /UNKNOW/ cunkno

      integer*1 cgropt(44)
      common /GROPT/ cgropt

      integer*1 cgrp21(218),cgrp22(82)
      common /GRP2CN/ cgrp21,cgrp22

      integer*2 i,nc,ioff,is,iy,ic,il,ip,iv
      dimension vc0(6,2),vc0a(6),vc0b(6),ang(6),ten(6),vten(6),yy(4)
      equivalence (vc0(1,1),vc0a),(vc0(1,2),vc0b)
************************************************************************
* BEGIN EXECUTABLE CODE
************************************************************************
* Read common blocks
************************************************************************
      call RWCOM1(1)

************************************************************************
      uz(3)=0
      call SUMSC(nca,za,sa,ca)
      call SUMSC(ncb,zb,sb,cb)
      call VCRIT0(nca,za,vc0a)
      call VCRIT0(ncb,zb,vc0b)

      csphih=dcos(phih)
      snphih=dsin(phih)
      tnafh=dcos(phih-phif)*tnaf
      scafh=SECNT(tnafh)
      snafh=tnafh/scafh
      csafh=one/scafh
```

```
************************************************************************
* Initialize members of /VAROUT/ to 9999 99
************************************************************************
      do 50 i=1,84
            parout(i)=9999 99
   50       continue

************************************************************************
* Set branch index to zero if both branches are under tension
* Read branch index and solution type to /VAROUT/
************************************************************************
      if (isol ne 1  and  isol ne 4) goto 60
      ibrnch=0
   60 continue
      iisol=isol
      iibrn=ibrnch


************************************************************************
* Compute depths at anchors
* Read depths at origin and anchors to /VAROUT/
************************************************************************
      da=do-half*delyk
      db=da+delyk
      ddo=do
      dda=da
      ddb=db

************************************************************************
* Adjust slack lengths as necessary
************************************************************************
      do 80 i=1,2
            if ( not  (isol eq 4  or  (isol eq 3  and  ibrnch eq i)))
     &        goto 80
            ioff=25*(i-1)
            il=ioff+24
            ip=il+1
            if (isol eq 4) goto 72
            z(ip)=phih
   72       continue
            hinf=h*dcos(z(ip)-phif)*inaf
            nc=(2-i)*nca+(i-1)*ncb
```

```
          lmax=zero
          is=ioff
          v=z(ioff+2)
          do 75 ic=1,nc
               is=is+3
               iv=is-ic
               lmax=lmax+z(is)
               if (v lt vc0(iv,i)+hinf  or  v ge vc0(iv-1,i)+hinf)
   &             goto 75
               z(i1)=dmin1(z(i1),lmax)
  75           continue
  80      continue

******************************************************************************
* Compute coil length, slack lengths, branch directions,
* and branch loads as necessary
* Compute effective ocean floor slopes for each branch
******************************************************************************
      if (isol ne 2  and  isol ne 3) goto 140
      if (ibrnch ne 1) goto 105
      ut=one
      st=sa
      sc=sb
      goto 110
  105 continue
      ut= -one
      st=sb
      sc=sa
  110 continue
      zkt=ut*halfd
      ykt=cz*zkt
      if (isol ne 2) goto 115
      kte=st*csafh
      goto 120
  115 continue
      i=11+25*(ibrnch-1)
      kte=z(i)
  120 continue
      kcesq=(kte*csphih)**2+(zkt+zkt+kte*snphih)**2
      lc=dsqrt(kcesq+(ykt+ykt+kte*tnafh)**2)
      if (isol ne 2) goto 130
      coil=sc-lc
  130 continue
```

```
      phic=ut*(halfpi-dacos((dsq+kcesq-kte**2)/(twod*dsqrt(kcesq))))
      if (ibrnch ne 1) goto 135
      phia=phih
      if ( not  (isol eq 2  or  (isol eq 3  and  tb eq zero))) goto 132
      la=sa
  132 continue
      phib=phic
      lb=lc
      hb=zero
      goto 140
  135 continue
      phib=phih
      if ( not  (isol eq 2  or  (isol eq 3  and  ta eq zero))) goto 137
      lb=sb
  137 continue
      phia=phic
      la=lc
      ha=zero
  140 continue
      tnafa=dcos(phia-phif)*tnaf
      tnafb=dcos(phib-phif)*tnaf
      if ( not  (isol eq 1  or  (isol eq 2  and  ibrnch eq 1))) goto 145
      ha=ta/SECNT(tnafa)
  145 continue
      if ( not  (isol eq 1  or  (isol eq 2  and  ibrnch eq 2))) goto 150
      hb=tb/SECNT(tnafb)
  150 continue
      htnafa=ha*tnafa
      htnafb=hb*tnafb
      if (isol ne 1) goto 160
      la=sa
      lb=sb
  160 continue
      if (isol ne 3  and  isol ne 4) goto 170
      l=zero
  170 continue

**********************************************************************
* Read slack lengths, loads, ocean floor angles, equalizer slippage
* and coil length to /VAROUT/
**********************************************************************
      lla=la
      llb=lb
      ll-l
      hha-ha*1 0d-3
      hhb-hb*1 0d-3
      hh-h*1 0d-3
      af-datan(tnaf)*raddeg
      afdir-phif*raddeg
      afa-datan(tnafa)*raddeg
      adir-phia*raddeg
      afb-datan(tnafb)*raddeg
      bdir-phib*raddeg
      sslp-slp
      coila-0 0
      coilb-0 0
      if (isol ne 2  and  isol ne 3) goto 190
      if (ibrnch ne 1) goto 185
      coilb-coil
      goto 190
  185 continue
      coila-coil
  190 continue


************************************************************************
* Compute branch component displacements and slopes as necessary
************************************************************************
      if (isol ne 1  and  isol ne 2) goto 220
      call FNOD(nca,za,la,tnafa)
      call FNOD(ncb,zb,lb,tnafb)
      goto 290
  220 continue
      if (isol ne 3) goto 250
      if (ibrnch ne 1) goto 225
      if (tb ne zero) goto 222
      call FNOD(nca,za,la,tnafa)
      goto 223
  222 continue
      za(2)-tnafa+dmax1(zero,(za(2)-vc0a(1)-htnafa)/ha)
  223 continue
      call FNOD(ncb,zb,lb,tnafb)
      lh-LENH(tb,ncb,zb)
      nc-ncb
      goto 230
  225 continue
```

```
      if (ta ne zero) goto 227
      call FNOD(ncb,zb,lb,tnafb)
      goto 228
  227 continue
      zb(2)=tnafb+dmax1(zero,(zb(2)-vc0b(1)-htnafb)/hb)
  228 continue
      call FNOD(nca,za,la,tnafa)
      lh=LENH(ta,nca,za)
      nc=nca
  230 continue
      ioff=25*(2-ibrnch)
      iy=ioff+16
      yy(1)= -ykt
      do 235 ic=1,nc
            yy(ic+1)=yy(ic)+z(iy)
            iy=iy+1
  235       continue
      ssum=zero
      is=ioff+3*nc
      iy=nc+1
      do 240 ic=1,nc
            yy(iy)=yy(iy)+dmax1(zero,lh-ssum)
            ssum=ssum+z(is)
            iy=iy-1
            is=is-3
  240       continue
      iy=ioff+16
      do 245 ic=1,nc
            z(iy)=yy(ic+1)-yy(ic)
            iy=iy+1
  245       continue
      goto 290
  250 continue
      za(2)=tnafa+dmax1(zero,(za(2)-vc0a(1)-htnafa)/ha)
      zb(2)=tnafb+dmax1(zero,(zb(2)-vc0b(1)-htnafb)/hb)
  290 continue

*************************************************************************
* Compute node coordinates and read into /VAROUT/
*************************************************************************
      snphia=dsin(phia)
      snphib=dsin(phib)
      csphia=dcos(phia)
      csphib=dcos(phib)
      hdelyk=half*delyk

      xx1a=0 0
      if (nca eq 1) goto 310
      xx3a=x1a*csphia
      if (nca eq 2) goto 310
      xx5a=(x1a+x2a)*csphia
 310  continue
      xx1b=0 0
      temp=x1b*csphib
      if (ncb eq 1) goto 315
      xx3b=temp
      temp=temp+x2b*csphib
      if (ncb eq 2) goto 315
      xx5b=temp
      temp=temp+x3b*csphib
 315  continue
      xx7=temp
      xx8=temp+x4*csphih

      zz1a=halfd
      if (nca eq 1) goto 320
      zz3a=halfd+x1a*snphia
      if (nca eq 2) goto 320
      zz5a=halfd+(x1a+x2a)*snphia
 320  continue
      zz1b= -halfd
      temp= -halfd+x1b*snphib
      if (ncb eq 1) goto 325
      zz3b=temp
      temp=temp+x2b*snphib
      if (ncb eq 2) goto 325
      zz5b=temp
      temp=temp+x3b*snphib
 325  continue
      zz7=temp
      zz8=temp+x4*snphih

      yy1a=hdelyk
      if (nca eq 1) goto 330
      yy3a=hdelyk+y1a
      if (nca eq 2) goto 330
      yy5a=hdelyk+(y1a+y2a)
  330 continue
      yy1b= -hdelyk
      temp= -hdelyk+y1b
      if (ncb eq 1) goto 335
      yy3b=temp
      temp=temp+y2b
      if (ncb eq 2) goto 335
      yy5b=temp
      temp=temp+y3b
  335 continue
      yy7=temp
      yy8=temp+y4

************************************************************************
* Compute node angles and tensions and read into /VAROUT/
************************************************************************
      if (isol eq 3  and  ibrnch eq 2) goto 410
      call CTEN3(nca,za,tnafa,ta,ang,ten,vten)
      goto 415
  410 continue
      call CTEN2(nca,za,vc0a,ta,tnafa,ang,ten,vten)
  415 continue
      aa1a=ang(1)
      tt1a=ten(1)
      vv1a=vten(1)
      aa2a=ang(2)
      tt2a=ten(2)
      vv2a=vten(2)
      if (nca eq 1) goto 420
      aa3a=ang(3)
      tt3a=ten(3)
      vv3a=vten(3)
      aa4a=ang(4)
      tt4a=ten(4)
      vv4a=vten(4)
      if (nca eq 2) goto 420
      aa5a=ang(5)
      tt5a=ten(5)
      vv5a=vten(5)
      aa6a=ang(6)
      tt6a=ten(6)
      vv6a=vten(6)
```

```
420 continue

     if (isol eq 3  and  ibrnch eq 1) goto 430
     call CTEN3(ncb,zb,tnafb,tb,ang,ten,vten)
     goto 435
430  continue
     call CTEN2(ncb,zb,vc0b,tb,tnafb,ang,ten,vten)
435  continue
     aa1b-ang(1)
     tt1b-ten(1)
     vv1b-vten(1)
     aa2b-ang(2)
     tt2b-ten(2)
     vv2b-vten(2)
     if (ncb eq 1) goto 440
     aa3b-ang(3)
     tt3b-ten(3)
     vv3b-vten(3)
     aa4b-ang(4)
     tt4b-ten(4)
     vv4b-vten(4)
     if (ncb eq 2) goto 440
     aa5b-ang(5)
     tt5b-ten(5)
     vv5b-vten(5)
     aa6b-ang(6)
     tt6b-ten(6)
     vv6b-vten(6)
440  continue

     ang7-datan(tana7)
     ang8-datan(tana8)
     if (l eq zero) goto 450
     ten7-(h*scafh-w4*l*snafh)*1 0d-3
     goto 455
450  continue
     ten7-h*SECNT(tana7)*1 0d-3
455  continue
     ten8-h*SECNT(tana8)*1 0d-3
     aa7-ang7*raddeg
     aa8-ang8*raddeg
     tt7-ten7
     tt8-ten8
```

```
      vv7=ten7*dsin(ang7)
      vv8=ten8*dsin(ang8)

**********************************************************************
* Compute elevation view parameters
**********************************************************************
      call ELV2(phih,tnafa,tnafb,tnafh,scafh,snafh,csafh)

**********************************************************************
* Read solutions for unknown input parameters to /VARIN/
**********************************************************************
      call CRDBAK(tnafa,tnafb)

**********************************************************************
* Write to common blocks /VAROUT/ and /VARC/
**********************************************************************
      call RWCOM1(2)

      return
      end
*
```

```
et sys final/t2for/crdbak for##
      subroutine CRDBAK(tnafa,tnafb)
*************************************************************************
      implicit double precision (a-z)

      double precision tnafa,tnafb

      integer*2 iileg,iist
      integer*4 nnca,nncb
      real angla,anglb,
     &  scop1a,scop1b,wgt1a,wgt1b,clmp1a,clmp1b,
     &  scop2a,scop2b,wgt2a,wgt2b,clmp2a,clmp2b,
     &  scop3a,scop3b,wgt3a,wgt3b,slip,frict,clmp3,scop4,wgt4,anksep,
     &  p1x,p1z,p1d,p2x,p2z,p2d,p3x,p3z,p3d,
     &  hload,hdir,rbuoy,xbuoy,zbuoy,deptho,pdir
      common /VARIN/ iileg,iist,nnca,nncb,angla,anglb,
     &  scop1a,scop1b,wgt1a,wgt1b,clmp1a,clmp1b,
     &  scop2a,scop2b,wgt2a,wgt2b,clmp2a,clmp2b,
     &  scop3a,scop3b,wgt3a,wgt3b,slip,frict,clmp3,scop4,wgt4,anksep,
     &  p1x,p1z,p1d,p2x,p2z,p2d,p3x,p3z,p3d,
     &  hload,hdir,rbuoy,xbuoy,zbuoy,deptho,pdir
      real parin(40)
      equivalence (angla,parin(1))

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,s1a,w1a,c1a,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,x1a,x2a,x3a,y1a,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),s1a),(za(4),w1a),(za(5),c1a),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),x1a),(za(14),x2a),(za(15),x3a),
     &  (za(16),y1a),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,s1b,w1b,c1b,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,x1b,x2b,x3b,y1b,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),slb),(zb(4),wlb),(zb(5),clb),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),xlb),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),ylb),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)

      double precision pi,halfpi,degrad,raddeg,zero,one,half
      integer*2 izero,ione,itwo
      common /VCONST/ pi,halfpi,degrad,raddeg,zero,one,half,
     &  izero,ione,itwo

      integer*2 i,i0,iz,itab,icon,commap,contyp,numax,u(5)
**********************************************************************
      numax-5
      i0-1
      do 20 i-1,numax
      u(i)-uz(i)
      if (u(i) ne 0) i0-i0+1
   20 continue
      if (ist ne 2) goto 50
      u(i0)-2
      u(i0+1)-27
   50 continue
      do 200 i-1,numax
      iz-u(i)
      if (iz eq 0) goto 200
      itab-COMMAP(iz)
      icon-CONTYP(iz)
      goto (110,120,130,140,150),icon
  110 continue
      parin(itab)-z(iz)
      goto 200
  120 continue
      parin(itab)=z(iz)*1 0d-3
      goto 200
  130 continue
      parin(itab)=(datan(z(iz))-datan(inafa))*raddeg
      goto 200
  140 continue
      parin(itab)=(datan(z(iz))-datan(inafb))*raddeg
      goto 200
  150 continue
      parin(itab)=z(iz)*raddeg
  200 continue
      xbuoy=xtot
      zbuoy=ztot
      deptho=do

      return
      end
*
```

```
et sys final/i2for/commap for!!
      function COMMAP(iz)
************************************************************************
      integer*2 commap,iz
************************************************************************
      if (iz lt 2  or  iz gt 10) goto 20
      commap=2*iz-3
      goto 100
   20 continue
      if (iz lt 27  or  iz gt 35) goto 30
      commap=2*iz-52
      goto 100
   30 continue
      if (iz lt 52  or  iz gt 56) goto 40
      commap=iz-33
      goto 100
   40 continue
      if (iz lt 62  or  iz gt 67) goto 100
      commap=iz-28
  100 continue

      return
      end
*
```

```
et sys final/t2for/contyp for##
      function CONTYP(iz)
********************************************************************************
      integer*2 contyp,iz
********************************************************************************
      iiz=iz
      i1=(iiz-5)*(iiz-8)*(iiz-30)
      i2=(iiz-33)*(iiz-54)*(iiz-62)
      if (i1 ne 0  and  i2 ne 0) goto 30
      contyp=2
      goto 100
   30 continue
      if (iz ne 2) goto 40
      contyp=3
      goto 100
   40 continue
      if (iz ne 27) goto 50
      contyp=4
      goto 100
   50 continue
      if (iz ne 63) goto 60
      contyp=5
      goto 100
   60 continue
      contyp=1
  100 continue

      return
      end
*
```

```
et sys final/t2for/fnod for##
      subroutine FNOD(nc,z,l,tanaf)
************************************************************************
* Compute node displacements and angles for single branch
* with junction on ocean floor
************************************************************************
      implicit double precision (a-z)

      integer*2 nc
      double precision z(25),l,tanaf

      double precision pi,halfpi,degrad,raddeg,zero,one,half
      integer*2 izero,ione,itwo
      common /VCONST/ pi,halfpi,degrad,raddeg,zero,one,half,
     &  izero,ione,itwo

      integer*2 ic,ia,is,ix,iy
************************************************************************
      cosaf=one/SECNT(tanaf)
      ssum=zero
      do 100 ic=1,nc
      ia=16+2*ic
      if (ic eq 1) ia=2
      z(ia)=tanaf
      is=3*ic
      s=dmax1(zero,dmin1(z(is),l-ssum))
      ix=12+ic
      z(ix)=s*cosaf
      iy=15+ic
      z(iy)=z(ix)*tanaf
      ia=17+2*ic
      z(ia)=tanaf
      ssum=ssum+z(is)
  100 continue
      return
      end
*
```

```
et sys final/t2for/lenh for##
      function LENH(ce,nc,z)
************************************************************************
      implicit double precision (a-z)

      integer*2 nc
      double precision lenh,ce,z(25)

      integer*2 is
************************************************************************
      is=3*nc
      wgt=z(is)*z(is+1)
      if (nc gt 1  and  ce gt wgt) goto 10
      lenh=ce/z(is+1)
      goto 100
   10 continue
      lenh=z(is)
      wgt=wgt+z(is-1)
      if (ce le wgt) goto 100
      if (nc gt 2  and  ce gt wgt+z(6)*z(7)) goto 30
      lenh=lenh+(ce-wgt)/z(is-2)
      goto 100
   30 continue
      lenh=lenh+z(6)
      wgt=wgt+z(6)*z(7)+z(5)
      if (ce le wgt) goto 100
      lenh=lenh+(ce-wgt)/z(4)
  100 continue
      return
      end
*
```

```
et sys final/t2for/elv2 for##
      subroutine ELV2(phip,tnafa,tnafb,tnafh,scafh,snafh,csafh)
***********************************************************************
      implicit integer*2 (#)
      implicit double precision (a-z)

      double precision phip,tnafa,tnafb,tnafh,scafh,snafh,csafh

      double precision lla,llb,ll,tana,tanb,tanr,
     &  xx1a,xx3a,xx5a,xx3b,xx5b,xx7,xx8,
     &  ga11,ga12,ga21,ga22,ga31,ga32,
     &  gb11,gb12,gb21,gb22,gb31,gb32,
     &  g1,g2,xfa,xfb,xf
      common /VARG/ lla,llb,ll,tana,tanb,tanr,
     &  xx1a,xx3a,xx5a,xx3b,xx5b,xx7,xx8,
     &  ga11,ga12,ga21,ga22,ga31,ga32,
     &  gb11,gb12,gb21,gb22,gb31,gb32,
     &  g1,g2,xfa,xfb,xf

      integer*2 ileg,ist,nca,ncb,nwa,nwb,isol,ibrnch,uz(5)
      double precision z(67),cz,cx,d,ta,tb
      common /VGLOB/ ileg,ist,nca,ncb,z,cz,cx,d,ta,tb,nwa,nwb,
     &  isol,ibrnch,uz
      double precision za(25),zb(25)
      equivalence (z(1),za(1)),(z(26),zb(1))
      double precision ha,ala,va,s1a,w1a,c1a,s2a,w2a,c2a,s3a,w3a,
     &  xa,ya,x1a,x2a,x3a,y1a,y2a,y3a,
     &  tana2a,tana3a,tana4a,tana5a,tana6a,la,phia
      equivalence (za(1),ha),(za(2),ala,va),
     &  (za(3),s1a),(za(4),w1a),(za(5),c1a),
     &  (za(6),s2a),(za(7),w2a),(za(8),c2a),
     &  (za(9),s3a),(za(10),w3a),(za(11),xa),(za(12),ya),
     &  (za(13),x1a),(za(14),x2a),(za(15),x3a),
     &  (za(16),y1a),(za(17),y2a),(za(18),y3a),
     &  (za(19),tana2a),(za(20),tana3a),(za(21),tana4a),
     &  (za(22),tana5a),(za(23),tana6a),(za(24),la),(za(25),phia)
      double precision hb,alb,vb,s1b,w1b,c1b,s2b,w2b,c2b,s3b,w3b,
     &  xb,yb,x1b,x2b,x3b,y1b,y2b,y3b,
     &  tana2b,tana3b,tana4b,tana5b,tana6b,lb,phib
      equivalence (zb(1),hb),(zb(2),alb,vb),
     &  (zb(3),s1b),(zb(4),w1b),(zb(5),c1b),
     &  (zb(6),s2b),(zb(7),w2b),(zb(8),c2b),
     &  (zb(9),s3b),(zb(10),w3b),(zb(11),xb),(zb(12),yb),
     &  (zb(13),x1b),(zb(14),x2b),(zb(15),x3b),
     &  (zb(16),y1b),(zb(17),y2b),(zb(18),y3b),
     &  (zb(19),tana2b),(zb(20),tana3b),(zb(21),tana4b),
     &  (zb(22),tana5b),(zb(23),tana6b),(zb(24),lb),(zb(25),phib)
      double precision coil,slp,frct,c3,s4,w4,x4,y4,tana7,tana8,l,
     &  h,phih,rtot,xtot,ztot,do
      equivalence (z(51),coil),(z(52),slp),(z(53),frct),(z(54),c3),
     &  (z(55),s4),(z(56),w4),(z(57),x4),(z(58),y4),
     &  (z(59),tana7),(z(60),tana8),(z(61),l),
     &  (z(62),h),(z(63),phih),
     &  (z(64),rtot),(z(65),xtot),(z(66),ztot),(z(67),do)

      double precision pi,halfpi,degrad,raddeg,zero,one,half
      integer*2 izero,ione,itwo
      common /VCONST/ pi,halfpi,degrad,raddeg,zero,one,half,
     &  izero,ione,itwo

      double precision delyk,twod,halfd,dsq
      common /VANCH/ delyk,twod,halfd,dsq
************************************************************************
      cosdp=dcos(phia-phip)
      if ( not ((isol eq 3  and  ibrnch eq 1)  or  isol eq 4)) goto 510
      call GCOEFF(nca,za,tnafa,ga11,ga12,ga21,ga22,ga31,ga32,2)
      xfa=one/cosdp
  510 continue
      tana=tnafa/cosdp
      lla=la*dsqrt(cosdp*cosdp+tnafa*tnafa)/SECNT(tnafa)
      xx1a=halfd*dsin(phip)
      temp=xx1a+x1a*cosdp
      yy7=half*delyk+y1a
      if (nca eq 1) goto 520
      xx3a=temp
      temp=temp+x2a*cosdp
      yy7=yy7+y2a
      if (nca eq 2) goto 520
      xx5a=temp
      temp=temp+x3a*cosdp
      yy7=yy7+y3a
  520 continue
      xx7=temp

      cosdp=dcos(phib-phip)
      if ( not ((isol eq 3  and  ibrnch eq 2)  or  isol eq 4)) goto 530
      call GCOEFF(ncb,zb,tnafb,gb11,gb12,gb21,gb22,gb31,gb32,2)
      xfb=one/cosdp
  530 continue
      tanb=tnafb/cosdp
      llb=lb*dsqrt(cosdp*cosdp+tnafb*tnafb)/SECNT(tnafb)
      if (ncb eq 1) goto 540
      xx3b= -xx1a+x1b*cosdp
      if (ncb eq 2) goto 540
      xx5b=xx3b+x2b*cosdp
  540 continue

      yy7=zero
      cosdp=dcos(phih-phip)
      if (l gt zero) goto 550
      tna=tana7
      x=zero
      y=yy7
      goto 555
  550 continue
      tna=tnafh
      x=l*csafh
      y=yy7+l*snafh
  555 continue
      x=zero
      sca=SECNT(tna)
      g1=(tna+sca)*dexp(-w4*x/h)
      g2=y-(h*sca/w4)
      xf=one/cosdp
      tanr=tnafh/cosdp
      ll=l*dsqrt(cosdp*cosdp+tnafh*tnafh)/scafh
      xx8=xx7+x4*cosdp

      return
      end
*
```

```
et sys final/t2for/cten2 for
      subroutine CTEN2(nc,z,vc0,th,tanb,ang,ten,vten)
************************************************************************
      implicit double precision (a-z)

      integer*2 nc
      double precision z(25),vc0(6),th,tanb,ang(6),ten(6),vten(6)

      double precision pi,halfpi,degrad,raddeg,zero,one,half
      integer*2 izero,ione,itwo
      common /VCONST/ pi,halfpi,degrad,raddeg,zero,one,half,
     &  izero,ione,itwo

      integer*2 ic,in,j
************************************************************************
      sinb=tanb/SECNT(tanb)
      bdeg=datan(tanb)*raddeg

      do 100 ic=1,nc
      do 100 j=1,2
      in=2*(ic-1)+j
      t=(vc0(in)-th)*1 0d-3
      if (t lt zero) goto 20
      ten(in)= -t*sinb
      vten(in)=sinb*ten(in)
      ang(in)=bdeg
      goto 50
   20 continue
      ten(in)= -t
      vten(in)= -t
      ang(in)=90 0
   50 continue
  100 continue

      return
      end
*
```

```
et sys final/t2for/cten3 for##
      subroutine CTEN3(nc ,z ,tanb ,tx ,ang ,ten ,vten)
**********************************************************************
      implicit double precision (a-z)

      integer*2 nc
      double precision z(25) ,tanb ,tx ,ang(6) ,ten(6) ,vten(6)

      double precision pi ,halfpi ,degrad ,raddeg ,zero ,one ,half
      integer*2 izero ,ione ,itwo
      common /VCONST/ pi ,halfpi ,degrad ,raddeg ,zero ,one ,half ,
     &  izero ,ione ,itwo

      integer*2 ic ,in ,j
**********************************************************************
      ten1(w)-hsecb-w*sinb

      h-z(1)
      s1-z(3)
      w1-z(4)
      c1-z(5)
      s2-z(6)
      w2-z(7)
      c2-z(8)
      s3-z(9)
      w3-z(10)
      l-z(24)

      secb-SECNT(tanb)
      sinb-tanb/secb
      b-datan(tanb)
      hsecb-h*secb

      ang(1)-datan(z(2))
      ang(2)-datan(z(19))
      if (nc eq 1) goto 1000
      ang(3)-datan(z(20))
      ang(4)-datan(z(21))
      if (nc eq 2) goto 1000
      ang(5)-datan(z(22))
      ang(6)-datan(z(23))
 1000 continue
```

```
      if (l eq 0 0d0) goto 1810
      if (l ge s1) goto 1300
      ten(1)=tenl(w1*l)
      goto 1820

 1300 continue
      if (l gt s1) goto 1400
      if (nc eq 1) goto 1320
      tf3=h*SECNT(z(20))*dcos(ang(3)-b)
      ten(1)=tf3-(w1*s1+c1)*sinb
      ten(2)=tf3-c1*sinb
      goto 1350
 1320 continue
      ten(1)=tx-w1*s1*sinb
      ten(2)=tx
 1350 continue
      goto 1830

 1400 continue
      if (l ge s1+s2) goto 1500
      wgt2=w2*(l-s1)
      ten(1)=tenl(w1*s1+c1+wgt2)
      ten(2)=tenl(c1+wgt2)
      ten(3)=tenl(wgt2)
      goto 1840

 1500 continue
      if (l gt s1+s2) goto 1600
      if (nc eq 2) goto 1520
      wgt2=w2*s2+c2
      tf5=h*SECNT(z(22))*dcos(ang(5)-b)
      ten(1)=tf5-(w1*s1+c1+wgt2)*sinb
      ten(2)=tf5-(c1+wgt2)*sinb
      ten(3)=tf5-wgt2*sinb
      ten(4)=tf5-c2*sinb
      goto 1550
 1520 continue
      wgt2=w2*s2
      ten(1)=tx-(w1*s1+c1+wgt2)*sinb
      ten(2)=tx-(c1+wgt2)*sinb
      ten(3)=tx-wgt2*sinb
      ten(4)=tx
 1550 continue
```

```
      goto 1850

 1600 continue
      if (l.ge.s1+s2+s3) goto 1700
      wgt3-w3*(l-s1-s2)
      wgt2-c1+w2*s2+c2+wgt3
      ten(1)-ten1(w1*s1+wgt2)
      ten(2)-ten1(wgt2)
      ten(3)-ten1(wgt2-c1)
      ten(4)-ten1(c2+wgt3)
      ten(5)-ten1(wgt3)
      goto 1860

 1700 continue
      wgt3-w3*s3
      wgt2-c1+w2*s2+c2+wgt3
      ten(1)-tx-(w1*s1+wgt2)*sinb
      ten(2)-tx-wgt2*sinb
      ten(3)-tx-(wgt2-c1)*sinb
      ten(4)-tx-(c2+wgt3)*sinb
      ten(5)-tx-wgt3*sinb
      ten(6)-tx
      goto 1890

 1810 continue
      ten(1)-h*SECNT(z(2))
 1820 continue
      ten(2)-h*SECNT(z(19))
 1830 continue
      if (nc.eq.1) goto 1890
      ten(3)-h*SECNT(z(20))
 1840 continue
      ten(4)-h*SECNT(z(21))
 1850 continue
      if (nc.eq.2) goto 1890
      ten(5)-h*SECNT(z(22))
 1860 continue
      ten(6)-h*SECNT(z(23))
 1890 continue

      do 2010 ic-1,3
      do 2010 j-1,2
      in-2*(ic-1)+j
      ten(in)=ten(in)*1.0d-3
      vten(in)=ten(in)*dsin(ang(in))
      ang(in)=ang(in)*raddeg
 2010 continue
      return
      end
*
```

END

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