BIGBOSOR4 RUN STREAM FOR STARTING A CASE FROM SCRATCH

Commands from the user are in **16 pt bold face**. Note: the string, "bush->", is not part of the command typed by the user.

The purpose of this run stream is to generate the valid input file for BIGBOSOR4 called "1.ALL".

The valid input file, 1.ALL, is generated mostly by use of the command, INPUT, by means of which an interactive session is launched in which the user generates a number of files, *.SEG1, *.SEG2, ... in which "*" denotes the user-selected name for the case, which in this case is "1".

bush-> bigbosor4log

BIGBOSOR4 COMMANDS HAVE BEEN ACTIVATED.

The BIGBOSOR4 commands, in the general order in which you would probably use them, are:

```
help4           (get information on BOSOR4.)
input           (you provide segment-by-seg. input)
assemble        (concatenates segment data files)
bigbosorall     (batch run of pre, main, post proc.)
bosorplot       (batch run for generating plot files)
resetup         (input for restart run, same model)
bigrestart           (batch run of main & postprocessors)
cleanup         (delete all except for .DOC file)
getsegs         (generate segment files from .DOC)
modify          (modify a segment file)
```

Please consult the following sources for more information about BOSOR4:

```
1.  help4 file  (type help4)
2.  bosor4.story      (good idea to print this file)
3.  bosor4.news (news of BOSOR4 updates)
4.  Documents listed under HELP4 OVERVIEW DOC
```

bush-> input
Please enter case name: 1

  Do you want to provide data for a new
  structural segment, or to add data to
  that for an existing structural segment?
  (Please answer Y or N) y

Which segment is this?=1
          1
Are you correcting, adding to, or checking an existing file?=n
N
BOSOR4 INPUT DATA, INTERACTIVE MODE

Initial prompts are short, and may contain data names a new
user is not familiar with. Please type H instead of
any datum called for, and you will get more information on that
datum.

Page numbers contained in some of the prompts refer to the
article: "BOSOR4--Program for stress, buckling, and vibration
of complex shells of revolution," STRUCTURAL MECHANICS
SOFTWARE SERIES--VOL. I, (N. Perrone & W. Pilkey, editors),
University Press of Virginia, 1977, pp. 11-143. This is a
user's manual that contains additional discussion and figures.

For many examples of shell buckling, discussions of imperfection
sensitivity, and descriptions of the physics of shell buckling
from an engineer's point of view, please see the book,
COMPUTERIZED BUCKLING ANALYSIS OF SHELLS, by D. Bushnell,
published by Martinus Nijhoff, Kluwer Academic Publishers,
190 Old Derby St., Hingham, MA 02043,or Dordrecht,
The Netherlands, 1985.

 Please provide a title (42 characters or less)...
ALUMINUM FRAME BUCKLING (INDIC=1)
ALUMINUM FRAME BUCKLING (INDIC=1)
 INDIC = analysis type indicator=1
          1
 NPRT = output options (1=minimum, 2=medium, 3=maximum)=1
          1
 ISTRES= output control (0=resultants, 1=sigma, 2=epsilon)=h

 ISTRES = 0 means stress resultants will be output
        = 1 means extreme fiber stresses will be output
            (valid for single-layer isotropic walls only);
        = 2 means strains and curvature changes will be
            output (any shell wall type).

If you want stress output for an orthotropic layered shell,
set ISTRES = 2 and compute the stresses from the strains and
changes in curvature of the reference surface.

If INDIC is different from 0 or 3, ISTRES will be set = 0
by BOSOR4 regardless of what you choose for it.

 ISTRES= output control (0=resultants, 1=sigma, 2=epsilon)=0
          0
 NSEG = number of shell segments (less than 295)=3
          3

The following input must be provided by you for each

```
shell segment.  See p. 61 for a list of the types of
input data required.

NMESH = number of node points (5 = min.; 98 = max.)(  1)=11
        11
NTYPEH= control integer (1 or 3) for nodal point spacing=h

 NTYPEH = 1 means variable spacing.
 NTYPEH = 3 means constant spacing.
EXAMPLE....
Suppose you have a segment with NMESH = 50, and you wish
to concentrate nodal points at the beginning of the segment.
The following input data could be used...
================================================================
  DATUM      NAME OF DATUM           MEANING
----------------------------------------------------------------
   50           NMESH         number of nodes in segment
    1           NTYPEH        NTYPEH = 1 means variable spacing
    4           NHVALU        number of callouts along the meridian
    1           IHVALU(1)     nodal point number, first callout
   20           IHVALU(2)     nodal point number, second callout
   21           IHVALU(3)     nodal point number, third callout
   49           IHVALU(4)     nodal point number, fourth callout
  0.1           HVALU(1)      spacing between 1st and 2nd nodes
  0.1           HVALU(2)      spacing between 20th and 21st nodes
  1.0           HVALU(3)      spacing between 21st and 22nd nodes
  1.0           HVALU(4)      spacing between 49th and 50th nodes
================================================================
NTYPEH= control integer (1 or 3) for nodal point spacing=3
        3


Geometry of the current segment...
NSHAPE= indicator (1,2 or 4) for geometry of meridian=h

See p.66 for illustrations...
NSHAPE = 1 means cylinder, cone, or plate (straight meridian)
NSHAPE = 2 means spherical, toroidal, or ogival
           (constant meridional curvature)
NSHAPE = 3 not used
NSHAPE = 4 means ellipsoidal or general shape (use with
           caution. If possible build up a complex shape
           with use of NSHAPE = 1 and NSHAPE = 2 segments.

NSHAPE= indicator (1,2 or 4) for geometry of meridian=1
        1
R1     = radius at beginning of segment (see p. 66)=5.218
   5.218000
Z1     = global axial coordinate at beginning of segment=0
         0
R2     = radius at end of segment=5.218
   5.218000
Z2     = global axial coordinate at end of segment=0.453
  0.4530000
IMP    = indicator for imperfection (0=none, 1=some)=h
```

There is no more help. Do your best.
IMP   = indicator for imperfection (0=none, 1=some)=0
        0
NTYPEZ= control (1 or 3) for reference surface location=h

NTYPEZ = 1 means that the distance from the shell wall
leftmost surface to the reference surface varies along
the meridian. By "leftmost" we mean as we face in the
direction of increasing meridional arc length, s. See
the figure at the bottom of p. 66.

NTYPEZ = 3 means that the distance from the leftmost
surface of the wall to the reference surface is const-
ant as we proceed along the meridian, s.

NTYPEZ= control (1 or 3) for reference surface location=3
        3
ZVAL = distance from leftmost surf. to reference surf.=h

See the figures at the bottom of p. 66 and the top of
p. 68.

ZVAL = distance from leftmost surf. to reference surf.=0
        0
Do you want to print out r(s), r'(s), etc. for this segment?=n
N
NRINGS= number (max=20) of discrete rings in this segment=0
        0
K=elastic foundation modulus (e.g. lb/in**3)in this seg.=0
        0

The following input is related to loading of this
segment. Please see pp. 73-77 for discussion and
definitions. Also, you may wish to review pp. 58-60.
There is more discussion in the "pitfalls" section
on pp. 120-123.

There are four classes of loads:
a. mechanical line loads and/or imposed displacement
   components, applied at centroids of discrete rings;
b. thermal line loads at discrete rings;
c. pressure and tractions distributed over the surface;
d. temperature distribution through thickness and over
   surface.

In connection with mechanical line loads and/or imposed
displacement components, the word "load" is used to mean
either an imposed load or an imposed displacement.

LINTYP= indicator (0, 1, 2 or 3) for type of line loads=h

0 means none
1 means mechanical line loads and/or imposed displacements;
2 means thermal line loads only;

3 means both mechanical and thermal line loads.

Note that if LINTYP is greater than 0 there must be
discrete rings on which to "hang" the line loads and/or
imposed displacement components.
Line loads are assumed to act at the centroids of discrete
rings. They are positive as shown on page 74, bottom.
Imposed displacement components also "act" at ring centroids.
They are positive as shown on page 51, bottom (USTAR,WSTAR,CHI).

In the following input for line loads or imposed displacements...
 V(K) can mean axial load or imposed axial displacement;
      [note: positive V (load) is in opposite direction from
             positive V (imposed axial displacement USTAR)]
 S(K) can mean circ. load or imposed circ. displacement;
HF(K) can mean radial load or imposed radial displacement;
FM(K) can mean meridional moment or imposed rotation CHI (p.51).
LINTYP= indicator (0, 1, 2 or 3) for type of line loads=0
        0
IDISAB= indicator (0, 1, 2 or 3) for load set A and B=h

0 means no distributed loads (no pressure or thermal loading)
1 means only distributed load set A is present
2 means only distributed load set B is present
3 means both distributed load set A and distributed load set B
  are present

Load set A is considered to be multiplied by the eigenvalue,
whereas load set B is not. Load set B is a fixed preload.

IDISAB= indicator (0, 1, 2 or 3) for load set A and B=1
        1

Next, provide input for distributed loads in load set A.
(loads that are to be multiplied by the eigenvalue)...

SURFACE LOADS FOR LOAD SYSTEM "A"...
NLTYPE=control (0,1,2,3) for type of surface loading=h

NLTYPE= 0 means no pressure, surface traction, or
          temperature distribution on this shell segment.
NLTYPE= 1 means pressure and/or surface traction, but
          no temperature distribution on this segment.
NLTYPE= 2 means temperature distribution, but no pressure
          or surface traction.
NLTYPE= 3 means both pressure and temperature.

NLTYPE=control (0,1,2,3) for type of surface loading=1
        1
NPSTAT= number of meridional callouts for surface loading=h

Minimum value is NPSTAT = 2, corresponding to callout points
at the beginning and at the end of the segment. Maximum

value is NPSTAT = 20

NOTE: The first and last points along the meridian must be
        included as callouts.

NPSTAT= number of meridional callouts for surface loading=2
NLOAD(1)=indicator for meridional traction (0=none, 1=some)=0
          0
NLOAD(2)=indicator for circumferential traction=0
          0
NLOAD(3)=indicator for normal pressure   (0=none, 1=some)=1
          1
PN(i)   = normal pressure (p.74) at ith callout, PN(1)=1.
   1.000000
PN(i)   = normal pressure (p.74) at ith callout, PN(2)=1.
   1.000000
NTYPE = control for meaning of loading callout (2=z, 3=r)=h

See pp. 69 for further discussion and examples.
NTYPE = 2 means callouts for meridional variation of
          surface traction and pressure will be axial
          coordinates;
NTYPE = 3 means callouts will be radial coordinates.

NTYPE = control for meaning of loading callout (2=z, 3=r)=2
          2
Z(I)   = axial coordinate of Ith loading callout, z(1)=0.
   0.000000
Z(I)   = axial coordinate of Ith loading callout, z(2)=0.453
  0.4530000

Wall construction input follows...

NWALL=index (1, 2, 4, 5, 6, 7, 8, 9, 10) for wall construction=h

NWALL = 1 means general C(i,j) (see p.90)
NWALL = 2 means monocoque isotropic
NWALL = 4 means layered, composite layup, constant thickness
NWALL = 5 means layered orthotropic, variable thickness
NWALL = 6 means corrugated (corrugations run axially)
NWALL = 7 means semi-sandwich axially corrugated, that is
          a smooth sheet is fastened to a corrugated sheet
NWALL = 8 means layered orthotropic with temperature-
          dependent material properties, variable thickness
NWALL = 9 means layered, composite layup with some layers
          with thickness that varies along the meridian.
NWALL =10 means monocoque isotropic with added isogrid

Smeared stiffeners may be added to any of these types.
The smeared stiffeners may be either or both rings and
stringers, or, if NWALL = 10, isogrid with members of
rectangular cross section only..

NWALL=index (1, 2, 4, 5, 6, 7, 8, 9, 10) for wall construction=2

Input for monocoque, isotropic wall construction...

E   = Young's modulus for skin=10.8E+06
 0.1080000E+08
U   = Poisson's ratio for skin=.333
 0.3330000
SM =mass density of skin (e.g. alum.=.00025 lb-sec**2/in**4)=0.00025
 0.2500000E-03
ALPHA = coefficient of thermal expansion=0
         0
NRS   = control (0 or 1) for addition of smeared stiffeners=h

NRS   = 0 means no smeared stiffeners;
NRS   = 1 means yes, add smeared stiffeners.

NRS   = control (0 or 1) for addition of smeared stiffeners=0
         0
NSUR   = control for thickness input (0 or 1 or -1)=h

NSUR   = 0 means reference surface is middle surface
           (We will not need to provide thickness, since
            we have already provided ZVAL, the distance
            from the leftmost surface to the ref. surf.)

NSUR   = 1 means the reference surface is the outer or
           rather the rightmost surface. Again, we do
           not need to provide input for the thickness,
           since ZVAL is the same as the thickness in
           this case.

NSUR   =-1 means that the reference surface is arbitrarily
           located with respect to the leftmost surface (It
           might be the leftmost surface itself). Therefore,
           you will have to provide additional input data
           to establish the wall thickness.

NSUR   = control for thickness input (0 or 1 or -1)=-1
         -1
NTYPET= index (1 or 3) for type of input for thickness=h

NTYPET = 1 means variable thickness. You will have to
           provide callouts along the meridian and values
           for the thickness at these callouts;

NTYPET = 3 means constant thickness. You will have to
           provide a value for this constant thickness.

NTYPET= index (1 or 3) for type of input for thickness=3
         3
TVAL = thickness (constant in this segment)=0.182
 0.1820000
Do you want to print out ref. surf. location and thickness?=n

N
Do you want to print out the C(i,j) at meridional stations?=n
N
Do you want to print out distributed loads along meridian?=n
N

 Want to add more structural segments?y
Which segment is this?=2
        2
INDIC = analysis type indicator=1
        1
Are you correcting, adding to, or checking an existing file?=n
N
NMESH = number of node points (5 = min.; 98 = max.)(2)=10
       10
NTYPEH= control integer (1 or 3) for nodal point spacing=3
        3

Geometry of the current segment...
NSHAPE= indicator (1,2 or 4) for geometry of meridian=1
        1
R1   = radius at beginning of segment (see p. 66)=5.218
  5.218000
Z1   = global axial coordinate at beginning of segment=0.2265
 0.2265000
R2   = radius at end of segment=4.882
  4.882000
Z2   = global axial coordinate at end of segment=0.2265
 0.2265000
IMP   = indicator for imperfection (0=none, 1=some)=0
        0
NTYPEZ= control (1 or 3) for reference surface location=3
        3
ZVAL = distance from leftmost surf. to reference surf.=.0075
 0.7500000E-02
Do you want to print out r(s), r'(s), etc. for this segment?=n
N
NRINGS= number (max=20) of discrete rings in this segment=0
        0
K=elastic foundation modulus (e.g. lb/in**3)in this seg.=0
        0

The following input is related to loading of this
segment. Please see pp. 73-77 for discussion and
definitions. Also, you may wish to review pp. 58-60.
There is more discussion in the "pitfalls" section
on pp. 120-123.

There are four classes of loads:
a. mechanical line loads and/or imposed displacement
   components, applied at centroids of discrete rings;
b. thermal line loads at discrete rings;
c. pressure and tractions distributed over the surface;
d. temperature distribution through thickness and over

surface.

In connection with mechanical line loads and/or imposed
displacement components, the word "load" is used to mean
either an imposed load or an imposed displacement.

LINTYP= indicator (0, 1, 2 or 3) for type of line loads=0
        0
IDISAB= indicator (0, 1, 2 or 3) for load set A and B=0
        0

Wall construction input follows...

NWALL=index (1, 2, 4, 5, 6, 7, 8, 9, 10) for wall construction=2
        2

Input for monocoque, isotropic wall construction...

E   = Young's modulus for skin=10.8E+06
 0.1080000E+08
U   = Poisson's ratio for skin=.333
 0.3330000
SM =mass density of skin (e.g. alum.=.00025 lb-sec**2/in**4)=0.00025
 0.2500000E-03
ALPHA = coefficient of thermal expansion=0
        0
NRS = control (0 or 1) for addition of smeared stiffeners=0
        0
NSUR   = control for thickness input (0 or 1 or -1)=0
        0
Do you want to print out ref. surf. location and thickness?=n
N
Do you want to print out the C(i,j) at meridional stations?=n
N
Do you want to print out distributed loads along meridian?=n
N

 Want to add more structural segments?y
Which segment is this?=3
        3
INDIC = analysis type indicator=1
        1
Are you correcting, adding to, or checking an existing file?=n
N
NMESH = number of node points (5 = min.; 98 = max.)(3)=7
        7
NTYPEH= control integer (1 or 3) for nodal point spacing=3
        3

Geometry of the current segment...
NSHAPE= indicator (1,2 or 4) for geometry of meridian=1
        1
R1   = radius at beginning of segment (see p. 66)=4.882
   4.882000

```
Z1      = global axial coordinate at beginning of segment=0.182
  0.1820000
R2      = radius at end of segment=4.882
   4.882000
Z2      = global axial coordinate at end of segment=0.271
  0.2710000
IMP   = indicator for imperfection (0=none, 1=some)=0
        0
NTYPEZ= control (1 or 3) for reference surface location=3
        3
ZVAL  = distance from leftmost surf. to reference surf.=0.015
  0.1500000E-01
Do you want to print out r(s), r'(s), etc. for this segment?=n
N
NRINGS= number (max=20) of discrete rings in this segment=0
        0
K=elastic foundation modulus (e.g. lb/in**3)in this seg.=0
        0
```

The following input is related to loading of this
segment. Please see pp. 73-77 for discussion and
definitions. Also, you may wish to review pp. 58-60.
There is more discussion in the "pitfalls" section
on pp. 120-123.

There are four classes of loads:
a. mechanical line loads and/or imposed displacement
   components, applied at centroids of discrete rings;
b. thermal line loads at discrete rings;
c. pressure and tractions distributed over the surface;
d. temperature distribution through thickness and over
   surface.

In connection with mechanical line loads and/or imposed
displacement components, the word "load" is used to mean
either an imposed load or an imposed displacement.

```
LINTYP= indicator (0, 1, 2 or 3) for type of line loads=0
        0
IDISAB= indicator (0, 1, 2 or 3) for load set A and B=0
        0
```

Wall construction input follows...

```
NWALL=index (1, 2, 4, 5, 6, 7, 8, 9, 10) for wall construction=2
        2
```

Input for monocoque, isotropic wall construction...

```
E      = Young's modulus for skin=10.8E+06
  0.1080000E+08
U      = Poisson's ratio for skin=.333
  0.3330000
SM =mass density of skin (e.g. alum.=.00025 lb-sec**2/in**4)=.00025
```

```
  0.2500000E-03
ALPHA = coefficient of thermal expansion=0
        0
NRS  = control (0 or 1) for addition of smeared stiffeners=0
        0
NSUR   = control for thickness input (0 or 1 or -1)=1
        1
Do you want to print out the C(i,j) at meridional stations?=n
N
Do you want to print out distributed loads along meridian?=n
N

 Want to add more structural segments?n

 Have you supplied data for all structural
 segments? (Please answer Y or N) y

 Next, give global input and input for
 constraint conditions. Do you want to
 supply these data now (Y or N)? y
How many segments in the structure?=3
        3
INDIC = analysis type indicator=1
        1
Are you correcting, adding to, or checking an existing file?=n
N
NLAST = plot options  (-1=none, 0=geometry, 1=u,v,w)=h

NLAST = -1 means no plotting;
         0 means plots of undeformed and deformed
           geometry only;
         1 means plots of geometry and u,v,w vs arc length.

NLAST = plot options  (-1=none, 0=geometry, 1=u,v,w)=1
        1

Your structure may contain segments that are very short
compared to the whole model being analyzed here. This detail
will not show up well in plots of the entire undeformed and
deformed structure. Therefore you may wish to get expanded
plots of these regions. Please identify these regions by
segment number and give a magnification factor for each region.
Note that the magnification factor must be an integer.
The center of the expanded plot will be at the first point of
the segment so identified. The extent of structure plotted
will of course depend on the magnification factor you choose.

Are there any regions for which you want expanded plots?=n
N
NOB    = starting number of circ. waves (buckling analysis)=h
 There is no more help. Do your best.
NOB    = starting number of circ. waves (buckling analysis)=2
        2
NMINB = minimum number of circ. waves  (buckling analysis)=2
```

```
           2
NMAXB = maximum number of circ. waves  (buckling analysis)=20
        20
INCRB = increment in number of circ. waves (buckling)=2
         2
NVEC  = number of eigenvalues for each wave number=1
         1
```

Next, please provide factors P and DP, TEMP and DTEMP, which
are multipliers for the pressure, surface traction, and
temperature distributions in load system "A". Note that these
multipliers are applied only to load system "A". They are not
applied to load system "B". (Load system "A" represents the
"eigenvalue" load system. Load system "B" is constant
throughout the case.)

```
P       = pressure or surface traction multiplier=h
```

The factor P is applied only to the distributed mechanical
loads in load system "A". For example, if INDIC is less than
three (axisymmetric loading), the normal pressure along Segment
No. i for load system "A" is given in the first load step by:

```
  pressure = P*PN(j)          j = 1, 2, ....NMESH(i)
```

in which PN(j) is the meridional pressure distribution.

See pp. 58-60 for further discussion of loading parameters.

```
P       = pressure or surface traction multiplier=0
         0
DP      = pressure or surface traction multiplier increment=h
 There is no more help. Do your best.
DP      = pressure or surface traction multiplier increment=-1.
 -1.000000
TEMP    = temperature rise multiplier=0
         0
DTEMP   = temperature rise multiplier increment=0
         0
OMEGA   = angular vel. about axis of revolution (rad/sec)=0
         0
DOMEGA = angular velocity increment (rad/sec)=0
         0
How many segments in the structure?=3
         3
```

Four kinds of constraint conditions exist in BOSOR4:

 1. constraints to ground (e.g. boundary condtions)
 2. juncture compatibility conditions
 3. regularity conditions at poles (where radius r = 0)
 4. constraints to prevent rigid body displacements

See the fig. on p. 54, for example. There is a constraint to

ground (boundary condition) at Segment 8, Point 8; there are
several juncture conditions (e.g. Seg. 2, Pt. 1 is connected
to Seg. 1, Pt. 9); there are several poles (e.g. Seg. 1,
Pt. 1). Note that if a shell is not anywhere attached to
ground, such as is the case for the example shown on p. 57,
the user must choose a node at which to prevent rigid body
motion. This node is to be chosen in the section below where
the user is asked about constraints to ground. In a section
following the "constraints-to-ground" section, the user will
be asked to provide specific data for preventing rigid body
motion. Types of rigid body motion are shown on p. 56. An
example of appropriate input data is listed on p. 57, bottom.

 CONSTRAINT CONDITIONS FOR SEGMENT NO. ISEG = 1
Number of poles (places where r=0) in SEGMENT=0
        0
At how many stations is this segment constrained to ground?=1
        1
INODE = nodal point number of constraint to ground, INODE(1)=1
        1
IUSTAR=axial displacement constraint (0 or 1 or 2)=h

The nature of the constraint condition is governed by four
integers which, in the case of a connection to ground,
indicate whether USTAR, VSTAR, WSTAR, and CHI are free
or constrained to be zero or forced to have certain finite
values. For example, IUSTAR may be 0 or 1 or 2 :
    IUSTAR = 0 means that USTAR is free at the node INODE
    IUSTAR = 1 means that USTAR   = 0 at the node INODE
    IUSTAR = 2 means that USTAR is imposed at node INODE
For example, simple support at the node INODE on a cylindrical
shell is indicated by:
    IUSTAR = 0 (axial displacement USTAR is free)
    IVSTAR = 1 (circumferential displacement VSTAR is zero)
    IWSTAR = 1 (radial displacement WSTAR is zero)
    ICHI   = 0 (meridional rotation CHI is free)
An example of imposed axial displacement is:
    IUSTAR = 2 (axial displacement USTAR is imposed)
    IVSTAR = 0 (circumferential displacement VSTAR is free)
    IWSTAR = 0 (radial displacement WSTAR is free)
    ICHI   = 1 (meridional rotation CHI is zero)
Note that the constraints are applied in an (axial,radial)
sense, not in a (meridional,normal) sense. At the bottom of
p. 51 the directions of displacement components USTAR and
WSTAR are shown, as well as CHI and V. VSTAR is the same as V.

IUSTAR=axial displacement constraint (0 or 1 or 2)=1
        1
IVSTAR=circumferential displacement(0=free,1=0,2=imposed)=0
        0
IWSTAR=radial displacement(0=free,1=constrained,2=imposed)=0
        0
ICHI=meridional rotation (0=free,1=constrained,2=imposed)=0
        0

```
D1      = radial component of offset of ground support=0
          0
D2      = axial component of offset of ground support=0
          0
Is this constraint the same for both prebuckling and buckling?=h

Different conditions may exist in the prebuckling phase from
those in the buckling or vibration phase.  The most common
case involves antisymmetric buckling or vibration at a
symmetry plane.  A common oversight is the failure to run
a case in which buckling and vibration modes are sought
which are antisymmetric with respect to a structural plane
of symmetry.  The user should check for modes both symmetrical
and antisymmetrical at symmetry planes.

If IUSTAR or IWSTAR or ICHI were 2 (imposed displacement), you
must reset them in the bifurcation buckling analysis to either
0 or 1  (probably 1, as an imposed displacement in the pre-
buckling analysis implies no freedom of motion during buckling
deformations).

Is this constraint the same for both prebuckling and buckling?=y
Y
Is this segment joined to any lower-numbered segments?=h

The segments are numbered 1, 2, . . .NSEG, in the order
in which input data were provided for them.  We are
concerned here only with those segments joined to the
current segment and haviong preceeded it in the segment-
by-segment input phase.

Is this segment joined to any lower-numbered segments?=n
N
 CONSTRAINT CONDITIONS FOR SEGMENT NO. ISEG = 2
Number of poles (places where r=0) in SEGMENT=0
          0
At how many stations is this segment constrained to ground?=0
          0
Is this segment joined to any lower-numbered segments?=y
Y
At how may stations is this segment joined to previous segs.?=1
          1
INODE = node in current segment (ISEG) of junction, INODE(  1)=1
          1
JSEG  = segment no. of lowest segment involved in junction=1
          1
JNODE = node in lowest segmnt (JSEG) of junction=6
          6
IUSTAR= axial displacement (0=not slaved, 1=slaved)=1
          1
IVSTAR= circumferential displacement (0=not slaved, 1=slaved)=1
          1
IWSTAR= radial displacement (0=not slaved, 1=slaved)=1
          1
```

ICHI = meridional rotation (0=not slaved, 1=slaved)=1
        1
D1   = radial component of juncture gap=0
        0
D2   = axial component of juncture gap=0
        0
Is this constraint the same for both prebuckling and buckling?=y
Y
 CONSTRAINT CONDITIONS FOR SEGMENT NO. ISEG = 3
Number of poles (places where r=0) in SEGMENT=0
        0
At how many stations is this segment constrained to ground?=0
        0
Is this segment joined to any lower-numbered segments?=y
Y
At how may stations is this segment joined to previous segs.?=1
        1
INODE = node in current segment (ISEG) of junction, INODE(1)=4
        4
JSEG = segment no. of lowest segment involved in junction=2
        2
JNODE = node in lowest segmnt (JSEG) of junction=10
       10
IUSTAR= axial displacement (0=not slaved, 1=slaved)=1
        1
IVSTAR= circumferential displacement (0=not slaved, 1=slaved)=1
        1
IWSTAR= radial displacement (0=not slaved, 1=slaved)=1
        1
ICHI = meridional rotation (0=not slaved, 1=slaved)=1
        1
D1   = radial component of juncture gap=0
        0
D2   = axial component of juncture gap=0
        0
Is this constraint the same for both prebuckling and buckling?=y
Y

It may be necessary to provide additional constraint to
ground in order to prevent rigid body motion. All possible
types of rigid body motion are shown on p. 56. Rigid body
motion corresponds to n = 0 or n = 1 circumferential waves.
There is no rigid body component for any harmonic with n
greater than or equal to 2. For modal vibration problems rigid
body motion need be prevented only if the structure is loaded.

Given existing constraints, are rigid body modes possible?=h

Whether n=0 and/or n = 1 rigid body modes are possible
or not depends on the constraints to ground that you have
already supplied. Please read p. 56 for examples of
rigid body motion.

Given existing constraints, are rigid body modes possible?=n

```
 N
 Do you want to list output for segment(  1)=y
 Y
 Do you want to list output for segment(  2)=y
 Y
 Do you want to list output for segment(  3)=y
 Y
 Do you want to list forces in the discrete rings, if any?=y
 Y


  If you have completed input for all structural
  segments and for the constraint conditions,
  next give the command ASSEMBLE  .

--------------- END OF INTERACTIVE "INPUT" SESSION -----------------

There now exist in the working directory the following files:

-rw-r--r--   1 bush bush 3548 Feb 18 08:25 1.SEG1
-rw-r--r--   1 bush bush 2293 Feb 18 08:37 1.SEG2
-rw-r--r--   1 bush bush 2215 Feb 18 08:43 1.SEG3
-rw-r--r--   1 bush bush 5124 Feb 18 09:04 1.SEG4

The command, "ASSEMBLE" (assemble) concatinates these four files.
```

bush-> assemble

```
Please enter case name: 1
How many segments in the model (excluding global data)? 3
 1.SEG1                              assembled into      1.ALL
 1.SEG2                              assembled into      1.ALL
 1.SEG3                              assembled into      1.ALL
 1.SEG4                              assembled into      1.ALL


  All segment files have been assembled. Now give the
  command  BIGBOSORALL.

-------- END OF "ASSEMBLE" -----------------------

There now exist in the working directory the following files:

-rw-r--r--   1 bush bush 13165 Feb 18 09:08 1.ALL
-rw-r--r--   1 bush bush  3548 Feb 18 08:25 1.SEG1
-rw-r--r--   1 bush bush  2293 Feb 18 08:37 1.SEG2
-rw-r--r--   1 bush bush  2215 Feb 18 08:43 1.SEG3
-rw-r--r--   1 bush bush  5124 Feb 18 09:04 1.SEG4

The file, 1.ALL, contains valid input data for BIGBOSOR4 (and BOSOR4).

------ 1.ALL file generated from the above run stream ------

ALUMINUM FRAME BUCKLING (INDIC=1)
        1        $ INDIC = analysis type indicator
```

```
         1          $ NPRT = output options (1=minimum, 2=medium, 3=maximum)
         0          $ ISTRES= output control (0=resultants, 1=sigma, 2=epsilon)
         3          $ NSEG  = number of shell segments (less than 295)
      H             $
      H             $ SEGMENT NUMBER     1   1   1   1   1   1   1   1
      H             $ NODAL POINT DISTRIBUTION FOLLOWS...
        11          $ NMESH = number of node points (5 = min.; 98 = max.)(  1)
         3          $ NTYPEH= control integer (1 or 3) for nodal point spacing
      H             $ REFERENCE SURFACE GEOMETRY FOLLOWS...
         1          $ NSHAPE= indicator (1,2 or 4) for geometry of meridian
  5.218000          $ R1     = radius at beginning of segment (see p. 66)
         0          $ Z1     = global axial coordinate at beginning of segment
  5.218000          $ R2     = radius at end of segment
 0.4530000          $ Z2     = global axial coordinate at end of segment
      H             $ IMPERFECTION SHAPE FOLLOWS...
         0          $ IMP   = indicator for imperfection (0=none, 1=some)
      H             $ REFERENCE SURFACE LOCATION RELATIVE TO WALL
         3          $ NTYPEZ= control (1 or 3) for reference surface location
         0          $ ZVAL  = distance from leftmost surf. to reference surf.
      N             $ Do you want to print out r(s), r'(s), etc. for this segment?
      H             $ DISCRETE RING INPUT FOLLOWS...
         0          $ NRINGS= number (max=20) of discrete rings in this segment
         0          $ K=elastic foundation modulus (e.g. lb/in**3)in this seg.
      H             $ LINE LOAD INPUT FOLLOWS...
         0          $ LINTYP= indicator (0, 1, 2 or 3) for type of line loads
      H             $ DISTRIBUTED LOAD INPUT FOLLOWS...
         1          $ IDISAB= indicator (0, 1, 2 or 3) for load set A and B
      H             $ SURFACE LOAD INPUT FOR LOAD SET "A" FOLLOWS
         1          $ NLTYPE=control (0,1,2,3) for type of surface loading
         2          $ NPSTAT= number of meridional callouts for surface loading
         0          $ NLOAD(1)=indicator for meridional traction (0=none, 1=some)
         0          $ NLOAD(2)=indicator for circumferential traction
         1          $ NLOAD(3)=indicator for normal pressure     (0=none, 1=some)
  1.000000          $ PN(i)  = normal pressure (p.74) at ith callout, PN(  1)
  1.000000          $ PN(i)  = normal pressure (p.74) at ith callout, PN(  2)
         2          $ NTYPE = control for meaning of loading callout (2=z, 3=r)
  0.000000          $ Z(I)  = axial coordinate of Ith loading callout, z(  1)
 0.4530000          $ Z(I)  = axial coordinate of Ith loading callout, z(  2)
      H             $ SHELL WALL CONSTRUCTION FOLLOWS...
         2          $ NWALL=index (1, 2, 4, 5, 6, 7, 8, 9, 10) for wall construction
0.1080000E+08 $ E     = Young's modulus for skin
0.3330000         $ U     = Poisson's ratio for skin
0.2500000E-03 $ SM =mass density of skin (e.g. alum.=.00025 lb-sec**2/in**4)
         0          $ ALPHA = coefficient of thermal expansion
         0          $ NRS  = control (0 or 1) for addition of smeared stiffeners
        -1          $ NSUR  = control for thickness input (0 or 1 or -1)
         3          $ NTYPET= index (1 or 3) for type of input for thickness
0.1820000         $ TVAL = thickness (constant in this segment)
      N             $ Do you want to print out ref. surf. location and thickness?
      N             $ Do you want to print out the C(i,j) at meridional stations?
      N             $ Do you want to print out distributed loads along meridian?
      H             $
      H             $ SEGMENT NUMBER     2   2   2   2   2   2   2   2
      H             $ NODAL POINT DISTRIBUTION FOLLOWS...
        10          $ NMESH = number of node points (5 = min.; 98 = max.)(  2)
         3          $ NTYPEH= control integer (1 or 3) for nodal point spacing
      H             $ REFERENCE SURFACE GEOMETRY FOLLOWS...
         1          $ NSHAPE= indicator (1,2 or 4) for geometry of meridian
```

```
  5.218000      $ R1     = radius at beginning of segment (see p. 66)
0.2265000       $ Z1     = global axial coordinate at beginning of segment
  4.882000      $ R2     = radius at end of segment
0.2265000       $ Z2     = global axial coordinate at end of segment
     H          $ IMPERFECTION SHAPE FOLLOWS...
        0       $ IMP    = indicator for imperfection (0=none, 1=some)
     H          $ REFERENCE SURFACE LOCATION RELATIVE TO WALL
        3       $ NTYPEZ= control (1 or 3) for reference surface location
0.7500000E-02   $ ZVAL   = distance from leftmost surf. to reference surf.
     N          $ Do you want to print out r(s), r'(s), etc. for this segment?
     H          $ DISCRETE RING INPUT FOLLOWS...
        0       $ NRINGS= number (max=20) of discrete rings in this segment
        0       $ K=elastic foundation modulus (e.g. lb/in**3)in this seg.
     H          $ LINE LOAD INPUT FOLLOWS...
        0       $ LINTYP= indicator (0, 1, 2 or 3) for type of line loads
     H          $ DISTRIBUTED LOAD INPUT FOLLOWS...
        0       $ IDISAB= indicator (0, 1, 2 or 3) for load set A and B
     H          $ SHELL WALL CONSTRUCTION FOLLOWS...
        2       $ NWALL=index (1, 2, 4, 5, 6, 7, 8, 9, 10) for wall construction
0.1080000E+08   $ E      = Young's modulus for skin
0.3330000       $ U      = Poisson's ratio for skin
0.2500000E-03   $ SM =mass density of skin (e.g. alum.=.00025 lb-sec**2/in**4)
        0       $ ALPHA = coefficient of thermal expansion
        0       $ NRS   = control (0 or 1) for addition of smeared stiffeners
        0       $ NSUR   = control for thickness input (0 or 1 or -1)
     N          $ Do you want to print out ref. surf. location and thickness?
     N          $ Do you want to print out the C(i,j) at meridional stations?
     N          $ Do you want to print out distributed loads along meridian?
     H          $
     H          $ SEGMENT NUMBER     3    3    3    3    3    3    3    3
     H          $ NODAL POINT DISTRIBUTION FOLLOWS...
        7       $ NMESH = number of node points (5 = min.; 98 = max.)(   3)
        3       $ NTYPEH= control integer (1 or 3) for nodal point spacing
     H          $ REFERENCE SURFACE GEOMETRY FOLLOWS...
        1       $ NSHAPE= indicator (1,2 or 4) for geometry of meridian
  4.882000      $ R1     = radius at beginning of segment (see p. 66)
0.1820000       $ Z1     = global axial coordinate at beginning of segment
  4.882000      $ R2     = radius at end of segment
0.2710000       $ Z2     = global axial coordinate at end of segment
     H          $ IMPERFECTION SHAPE FOLLOWS...
        0       $ IMP    = indicator for imperfection (0=none, 1=some)
     H          $ REFERENCE SURFACE LOCATION RELATIVE TO WALL
        3       $ NTYPEZ= control (1 or 3) for reference surface location
0.1500000E-01   $ ZVAL   = distance from leftmost surf. to reference surf.
     N          $ Do you want to print out r(s), r'(s), etc. for this segment?
     H          $ DISCRETE RING INPUT FOLLOWS...
        0       $ NRINGS= number (max=20) of discrete rings in this segment
        0       $ K=elastic foundation modulus (e.g. lb/in**3)in this seg.
     H          $ LINE LOAD INPUT FOLLOWS...
        0       $ LINTYP= indicator (0, 1, 2 or 3) for type of line loads
     H          $ DISTRIBUTED LOAD INPUT FOLLOWS...
        0       $ IDISAB= indicator (0, 1, 2 or 3) for load set A and B
     H          $ SHELL WALL CONSTRUCTION FOLLOWS...
        2       $ NWALL=index (1, 2, 4, 5, 6, 7, 8, 9, 10) for wall construction
0.1080000E+08   $ E      = Young's modulus for skin
0.3330000       $ U      = Poisson's ratio for skin
0.2500000E-03   $ SM =mass density of skin (e.g. alum.=.00025 lb-sec**2/in**4)
        0       $ ALPHA = coefficient of thermal expansion
```

```
        0          $ NRS  = control (0 or 1) for addition of smeared stiffeners
        1          $ NSUR   = control for thickness input (0 or 1 or -1)
     N             $ Do you want to print out the C(i,j) at meridional stations?
     N             $ Do you want to print out distributed loads along meridian?
     H             $
     H             $ GLOBAL DATA BEGINS...
        1          $ NLAST = plot options  (-1=none, 0=geometry, 1=u,v,w)
     N             $ Are there any regions for which you want expanded plots?
        2          $ N0B  = starting number of circ. waves (buckling analysis)
        2          $ NMINB = minimum number of circ. waves  (buckling analysis)
       20          $ NMAXB = maximum number of circ. waves  (buckling analysis)
        2          $ INCRB = increment in number of circ. waves (buckling)
        1          $ NVEC  = number of eigenvalues for each wave number
        0          $ P      = pressure or surface traction multiplier
 -1.000000         $ DP     = pressure or surface traction multiplier increment
        0          $ TEMP  = temperature rise multiplier
        0          $ DTEMP  = temperature rise multiplier increment
        0          $ OMEGA  = angular vel. about axis of revolution (rad/sec)
        0          $ DOMEGA = angular velocity increment (rad/sec)
     H             $ CONSTRAINT CONDITIONS FOLLOW....
        3          $ How many segments in the structure?
     H             $
     H             $ CONSTRAINT CONDITIONS FOR SEGMENT NO.   1    1    1    1
     H             $ POLES INPUT FOLLOWS...
        0          $ Number of poles (places where r=0) in SEGMENT
     H             $ INPUT FOR CONSTRAINTS TO GROUND FOLLOWS...
        1          $ At how many stations is this segment constrained to ground?
        1          $ INODE = nodal point number of constraint to ground, INODE(  1)
        1          $ IUSTAR=axial displacement constraint (0 or 1 or 2)
        0          $ IVSTAR=circumferential displacement(0=free,1=0,2=imposed)
        0          $ IWSTAR=radial displacement(0=free,1=constrained,2=imposed)
        0          $ ICHI=meridional rotation (0=free,1=constrained,2=imposed)
        0          $ D1    = radial component of offset of ground support
        0          $ D2    = axial component of offset of ground support
     Y             $ Is this constraint the same for both prebuckling and buckling?
     H             $ JUNCTION CONDITION INPUT FOLLOWS...
     N             $ Is this segment joined to any lower-numbered segments?
     H             $
     H             $ CONSTRAINT CONDITIONS FOR SEGMENT NO.   2    2    2    2
     H             $ POLES INPUT FOLLOWS...
        0          $ Number of poles (places where r=0) in SEGMENT
     H             $ INPUT FOR CONSTRAINTS TO GROUND FOLLOWS...
        0          $ At how many stations is this segment constrained to ground?
     H             $ JUNCTION CONDITION INPUT FOLLOWS...
     Y             $ Is this segment joined to any lower-numbered segments?
        1          $ At how may stations is this segment joined to previous segs.?
        1          $ INODE = node in current segment (ISEG) of junction, INODE(  1)
        1          $ JSEG  = segment no. of lowest segment involved in junction
        6          $ JNODE = node in lowest segmnt (JSEG) of junction
        1          $ IUSTAR= axial displacement (0=not slaved, 1=slaved)
        1          $ IVSTAR= circumferential displacement (0=not slaved, 1=slaved)
        1          $ IWSTAR= radial displacement (0=not slaved, 1=slaved)
        1          $ ICHI  = meridional rotation (0=not slaved, 1=slaved)
        0          $ D1    = radial component of juncture gap
        0          $ D2    = axial component of juncture gap
     Y             $ Is this constraint the same for both prebuckling and buckling?
     H             $
     H             $ CONSTRAINT CONDITIONS FOR SEGMENT NO.   3    3    3    3
```

```
     H              $ POLES INPUT FOLLOWS...
         0          $ Number of poles (places where r=0) in SEGMENT
     H              $ INPUT FOR CONSTRAINTS TO GROUND FOLLOWS...
         0          $ At how many stations is this segment constrained to ground?
     H              $ JUNCTION CONDITION INPUT FOLLOWS...
     Y              $ Is this segment joined to any lower-numbered segments?
         1          $ At how may stations is this segment joined to previous segs.?
         4          $ INODE = node in current segment (ISEG) of junction, INODE(  1)
         2          $ JSEG  = segment no. of lowest segment involved in junction
        10          $ JNODE = node in lowest segmnt (JSEG) of junction
         1          $ IUSTAR= axial displacement (0=not slaved, 1=slaved)
         1          $ IVSTAR= circumferential displacement (0=not slaved, 1=slaved)
         1          $ IWSTAR= radial displacement (0=not slaved, 1=slaved)
         1          $ ICHI  = meridional rotation (0=not slaved, 1=slaved)
         0          $ D1    = radial component of juncture gap
         0          $ D2    = axial component of juncture gap
     Y              $ Is this constraint the same for both prebuckling and buckling?
     H              $ RIGID BODY CONSTRAINT INPUT FOLLOWS...
     N              $ Given existing constraints, are rigid body modes possible?
     H              $ "GLOBAL3" QUESTIONS (AT END OF CASE)...
     Y              $ Do you want to list output for segment(  1)
     Y              $ Do you want to list output for segment(  2)
     Y              $ Do you want to list output for segment(  3)
     Y              $ Do you want to list forces in the discrete rings, if any?

-------------------- end of 1.ALL file ------------------------
```

Next, execute BIGBOSOR4

bush–> bigbosorall

```
Enter case name: 1
B (background), F (foreground), or Q (NQS – network queue system): f

Running BIGBOSOR4: bigbosorall, case: 1

Executing bigbosorall
Normal termination: bigbosorall
Job finished.
Inspect the output file 1.OUT

Menu: bosorplot, resetup, cleanup, getsegs, modify, input, help4

0.595u 0.222s 0:01.24 65.3%      0+0k 0+0io 0pf+0w
bush–> vi 1.OUT
```

(search for the string, "EIGENVALUE(", including the trailing
parenthesis. You will find the following output:)

```
----------- begin the abridged 1.OUT file -------------

 **** CRITICAL EIGENVALUE AND WAVENUMBER ****
 EIGCRT=  4.1833E+02; NO. OF CIRC. WAVES, NWVCRT=     2
```

```
    ***********************************************

    ***** EIGENVALUES AND MODE SHAPES *****
     EIGENVALUE(CIRC. WAVES)
    ======================================
        4.1833E+02(     2)
        1.9615E+03(     4)
        2.1497E+03(     6)
        1.7981E+03(     8)
        1.6828E+03(    10)
        1.7129E+03(    12)
        1.8346E+03(    14)
        2.0142E+03(    16)
        2.2280E+03(    18)
        2.4563E+03(    20)
    ======================================
```

--- end of the abridged 1.OUT file ---------------

There are two minima in the "curve", EIGENVALUE versus N, in
which N is the number of circumferential waves in the buckling
mode: the first minimum corresponds to N = 2 circ. waves;
the second minimum corresponds to N = 10 circ. waves. Let us
next obtain plots of these two bifurcation buckling modes.

bush-> bosorplot
Please enter the BIGBOSOR4 case name: 1

Do you want to use Xgraph or create a PostScript file? (Choose X or P) p

One, maybe Two moments please...

Text file(s) have been created containing plot data. The names of the
files explain to a greater or lesser extent what the data represent.
Some plot files contain data for more than one plot.
```
1)      1..EIGENMODE_1--N_10
2)      1..EIGENMODE_1--N_12
3)      1..EIGENMODE_1--N_14
4)      1..EIGENMODE_1--N_16
5)      1..EIGENMODE_1--N_18
6)      1..EIGENMODE_1--N_2
7)      1..EIGENMODE_1--N_20
8)      1..EIGENMODE_1--N_4
9)      1..EIGENMODE_1--N_6
10)     1..EIGENMODE_1--N_8
11)     1..R,Z_EIGENMODE_1--N_10
12)     1..R,Z_EIGENMODE_1--N_12
13)     1..R,Z_EIGENMODE_1--N_14
14)     1..R,Z_EIGENMODE_1--N_16
15)     1..R,Z_EIGENMODE_1--N_18
16)     1..R,Z_EIGENMODE_1--N_2
17)     1..R,Z_EIGENMODE_1--N_20
18)     1..R,Z_EIGENMODE_1--N_4
```

```
19)     1..R,Z_EIGENMODE_1--N_6
20)     1..R,Z_EIGENMODE_1--N_8
21)     1..R,Z_RingLocation
CR)     to QUIT
Please choose the number of the file you wish to plot: 16
Plotting: Undeformed & Deformed Axial Station as a function of Radius

The PostScript file, metafile.ps, has been created.
Please choose one of the three options below:

    1) Rename the PostScript file.  This is useful if
       you don't have access to a PostScript printer on your
       machine, but you wish to save to a file so you can later
       transfer it to a different machine for printing.

          Example:  mv metafile.ps plot1.ps

    2) Enter an "lpr" command.  This is useful if your default
       printer is not PostScript, but there is a PostScript
       printer available on your system.

          Example:  lpr -PApplelaser metafile.ps

    3) Press the return key.  This executes the command:

                    lpr metafile.ps

       This assumes that your default printer is a PostScript
       printer.

Enter your command> <enter>
Printing PostScript plot on the default printer...

Text file(s) have been created containing plot data.  The names of the
files explain to a greater or lesser extent what the data represent.
Some plot files contain data for more than one plot.
1)      1..EIGENMODE_1--N_10
2)      1..EIGENMODE_1--N_12
3)      1..EIGENMODE_1--N_14
4)      1..EIGENMODE_1--N_16
5)      1..EIGENMODE_1--N_18
6)      1..EIGENMODE_1--N_2
7)      1..EIGENMODE_1--N_20
8)      1..EIGENMODE_1--N_4
9)      1..EIGENMODE_1--N_6
10)     1..EIGENMODE_1--N_8
11)     1..R,Z_EIGENMODE_1--N_10
12)     1..R,Z_EIGENMODE_1--N_12
13)     1..R,Z_EIGENMODE_1--N_14
14)     1..R,Z_EIGENMODE_1--N_16
15)     1..R,Z_EIGENMODE_1--N_18
16)     1..R,Z_EIGENMODE_1--N_2
17)     1..R,Z_EIGENMODE_1--N_20
18)     1..R,Z_EIGENMODE_1--N_4
```

```
19)       1..R,Z_EIGENMODE_1--N_6
20)       1..R,Z_EIGENMODE_1--N_8
21)       1..R,Z_RingLocation
CR)       to QUIT
Please choose the number of the file you wish to plot: <enter>
```

bush-> cp metafile.ps plot1.ps
bush-> gv plot1.ps


```
The file, plot1.ps, contains the eigenvector corresponding to
N = 2 circumferential waves. In this particular case the
entire cross section does not deform. Instead the entire
3-segment shell structure behaves like a ring and ovalizes.
```


bush-> bosorplot
```
Please enter the BIGBOSOR4 case name: 1

Do you want to use Xgraph or create a PostScript file? (Choose X or P) p

One, maybe Two moments please...

Text file(s) have been created containing plot data.  The names of the
files explain to a greater or lesser extent what the data represent.
Some plot files contain data for more than one plot.
1)        1..EIGENMODE_1--N_10
2)        1..EIGENMODE_1--N_12
3)        1..EIGENMODE_1--N_14
4)        1..EIGENMODE_1--N_16
5)        1..EIGENMODE_1--N_18
6)        1..EIGENMODE_1--N_2
7)        1..EIGENMODE_1--N_20
8)        1..EIGENMODE_1--N_4
9)        1..EIGENMODE_1--N_6
10)       1..EIGENMODE_1--N_8
11)       1..R,Z_EIGENMODE_1--N_10
12)       1..R,Z_EIGENMODE_1--N_12
13)       1..R,Z_EIGENMODE_1--N_14
14)       1..R,Z_EIGENMODE_1--N_16
15)       1..R,Z_EIGENMODE_1--N_18
16)       1..R,Z_EIGENMODE_1--N_2
17)       1..R,Z_EIGENMODE_1--N_20
18)       1..R,Z_EIGENMODE_1--N_4
19)       1..R,Z_EIGENMODE_1--N_6
20)       1..R,Z_EIGENMODE_1--N_8
21)       1..R,Z_RingLocation
CR)       to QUIT
Please choose the number of the file you wish to plot: 11
Plotting: Undeformed & Deformed Axial Station as a function of Radius
etc., etc. (as above)
```
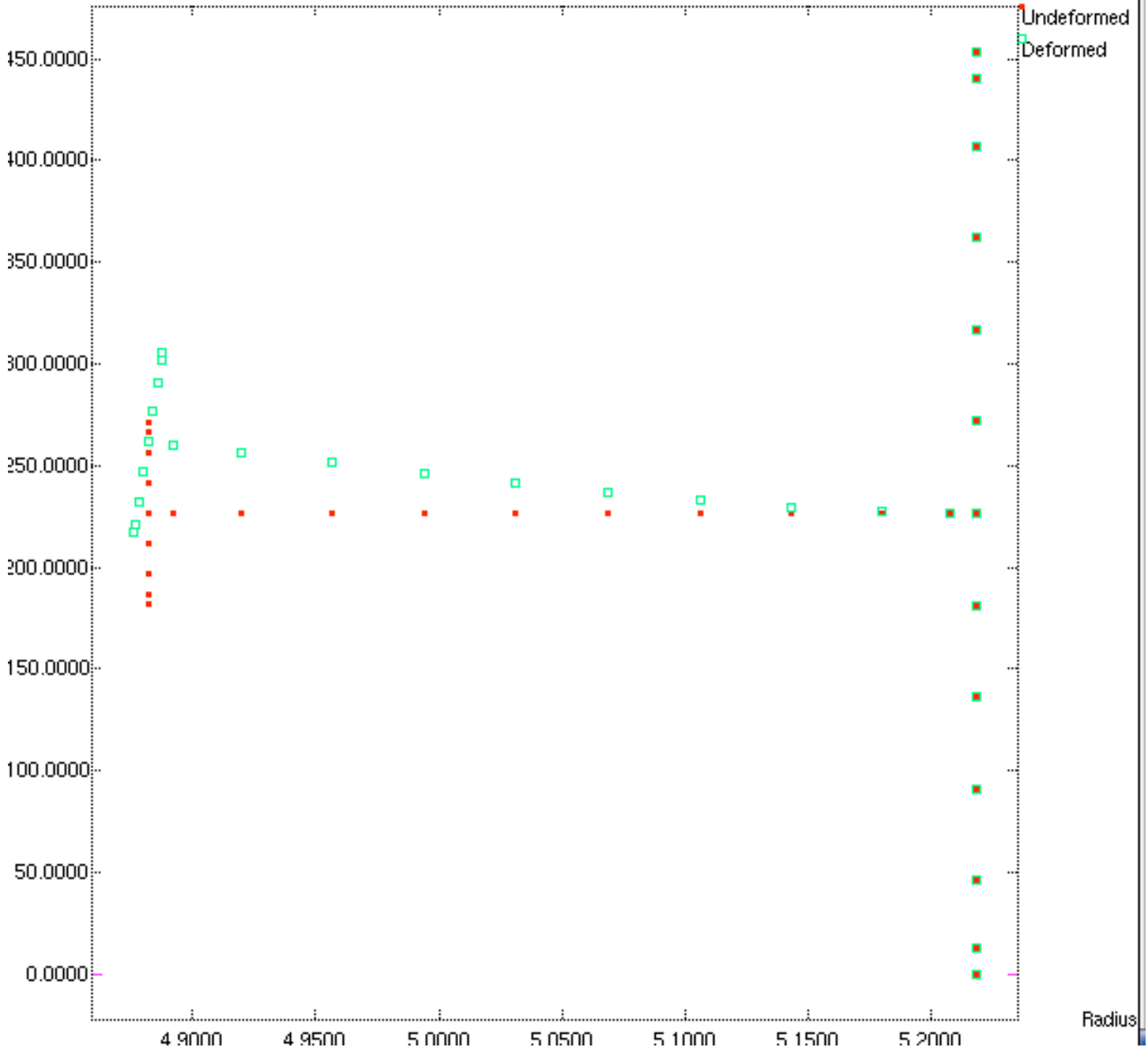
```
bush-> cp metafile.ps plot2.ps
bush-> gv plot2.ps
```

The file, plot2.ps, contains the eigenvector corresponding to
N = 10 circumferential waves. In this particular case the
cross section does deform: the web (Segment 2) and the inner
flange (Segment 3) sidesway in a mode with 10 circumferential
waves. This plot of the buckling mode for N = 10 is shown on the
next page.

plot2.ps = 1.buckle.n10.png This is the bifurcation buckling eigenvector
(mode shape) from BIGBBOSOR4 corresponding to N = 10 circumferential waves.
The eigenvalue (buckling load factor) is listed above as 1.6828E+03(
10).

bush-> cleanup

This procedure clears out old files and replaces
the 'NAME'.ALL file with the most recent 'NAME'.DOC
file.

WARNING: DO NOT USE THIS PROCEDURE UNLESS YOU ARE
          SURE THAT YOU HAVE A COMPLETE, GOOD
          'NAME'.DOC FILE.

Enter case name: 1

You now have the following files with the name
1.* :
-rw-r--r-- 1 bush bush 13219 Feb 18 09:58 1.ALL
-rw-r--r-- 1 bush bush 13219 Feb 18 09:10 1.DOC
-rw-r--r-- 1 bush bush   0 Feb 18 09:10 1.RES
-rw-r--r-- 1 bush bush 3548 Feb 18 08:25 1.SEG1
-rw-r--r-- 1 bush bush 2293 Feb 18 08:37 1.SEG2
-rw-r--r-- 1 bush bush 2215 Feb 18 08:43 1.SEG3
-rw-r--r-- 1 bush bush 5124 Feb 18 09:04 1.SEG4
If you want to get 1.SEG files, please type

        getsegs

---------------- end of run stream ---------------------