Collaborative Solutions Inc

Harmonic Sweep

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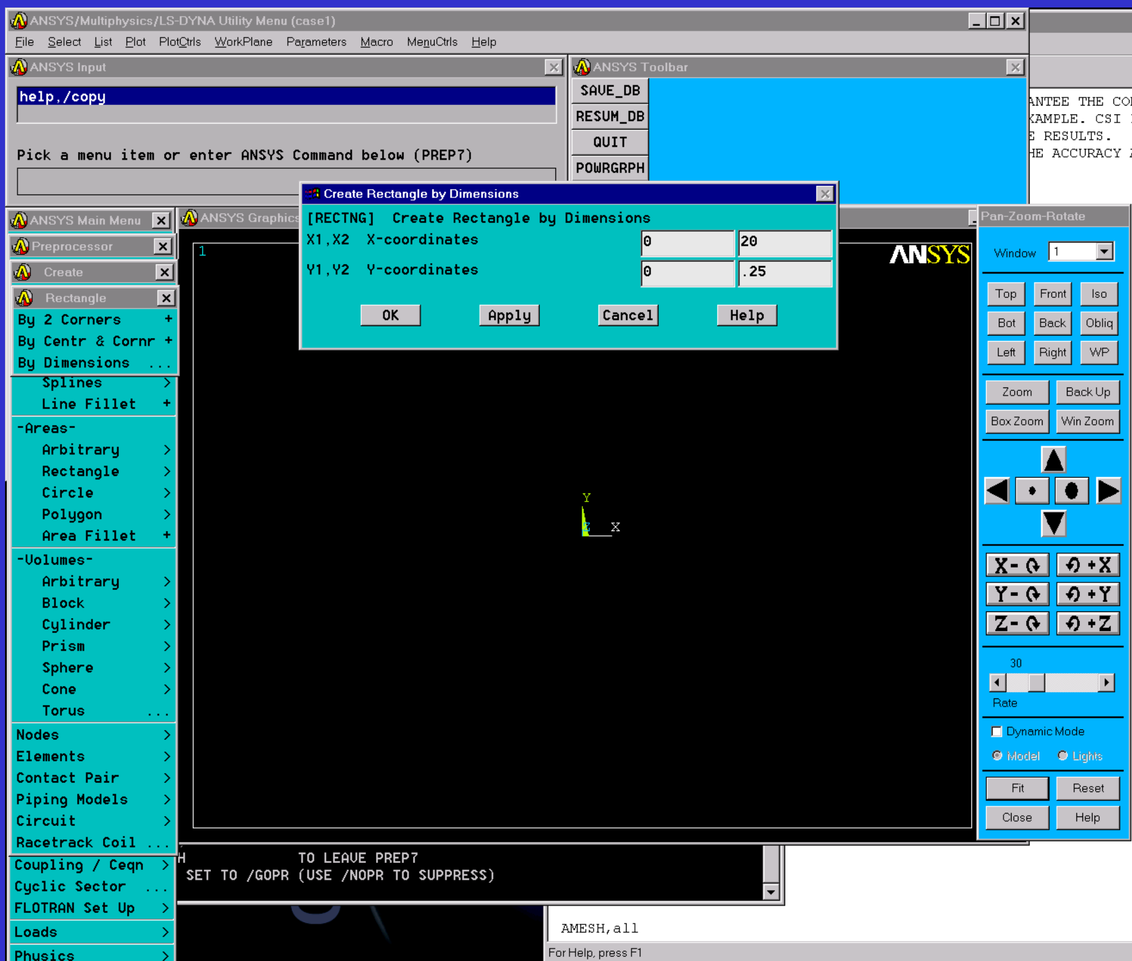
Example Objectives

- Build "base" Model
- Create Large Mass
- Connect Large Mass and "base" Model
- Run Free-Free Modal Analysis
- Run Harmonic Analysis
- Post-process Frequency Vs. Response (x-y plots)
- Copy Modal Results
- Expand Frequency Vs. Response Results into .rst file
- Post-process One Point in Time with a User Supplied Phase Angle

Building “base” Model



Menu Picks:

ANSYS Main Menu> Preprocessor> Create> Rectangle> By Dimensions …

What’s Happening:

Creating a 20x.25 rectangle (area).

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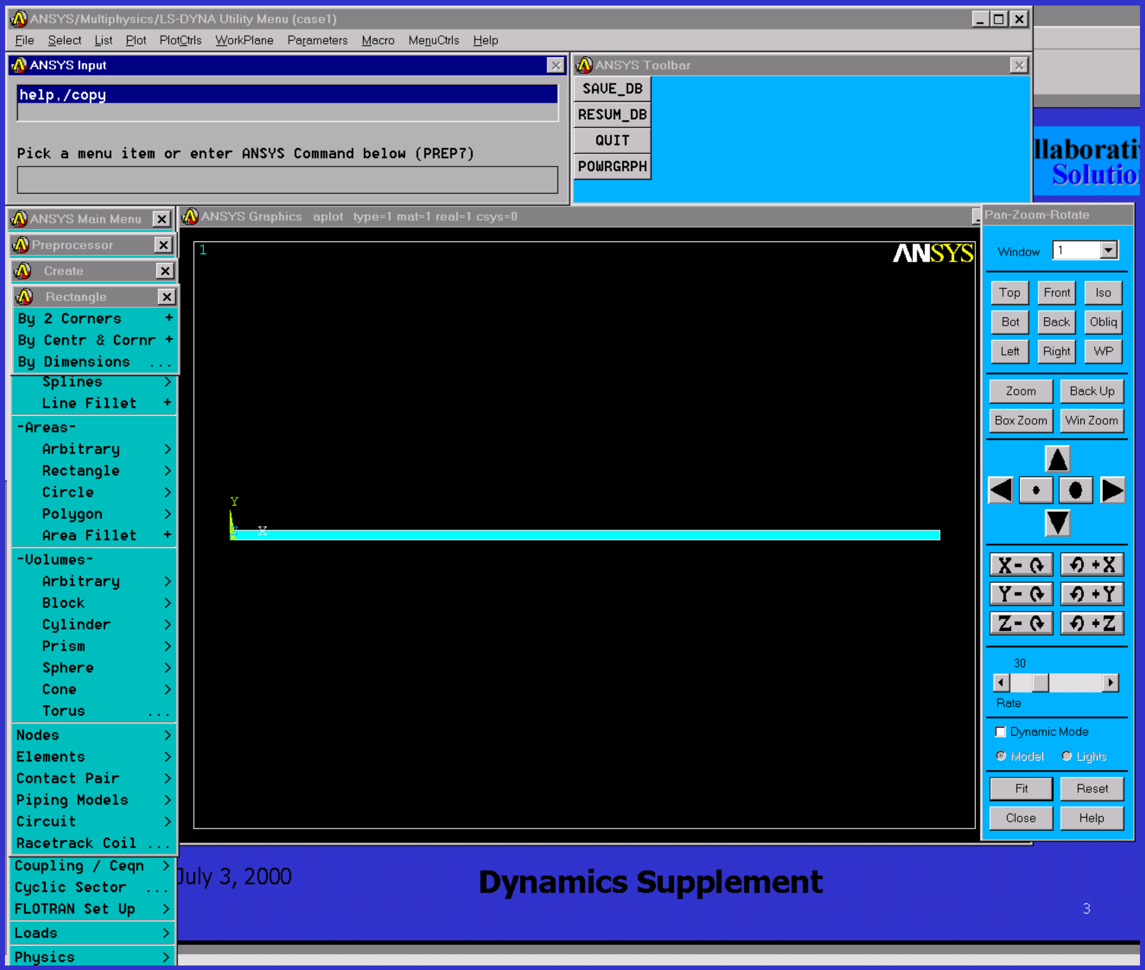
Build “base” Model



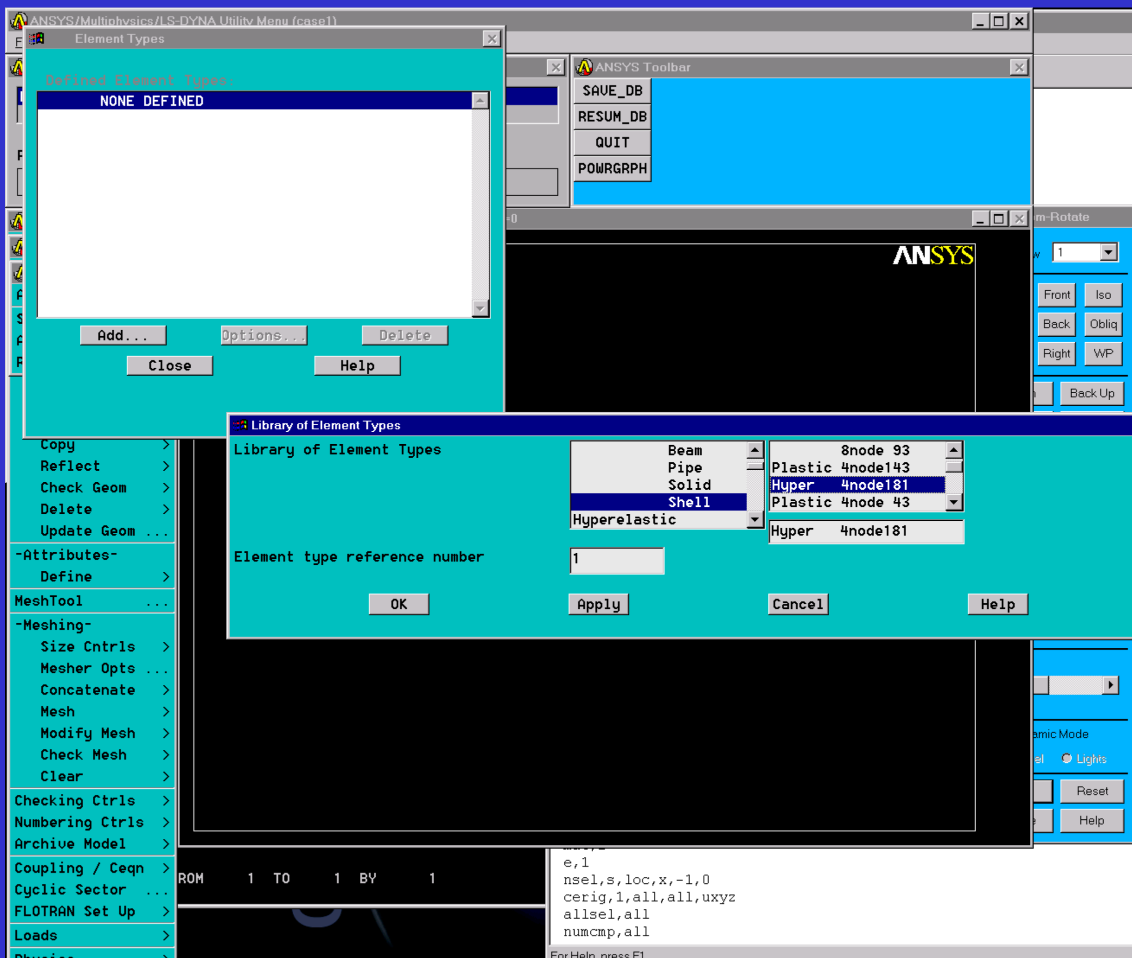
Menu Picks:

Utility Menu> Plot> Area

What’s Happening:

A plot of the rectangle (area) just created.

Build "base" Model



Menu Picks:

ANSYS Main Menu> Preprocessor> Element Type> Add/Edit/Delete … Add …

What's Happening:

Creating an element type 1 to be Shell181 (4 or 3 node shell element).

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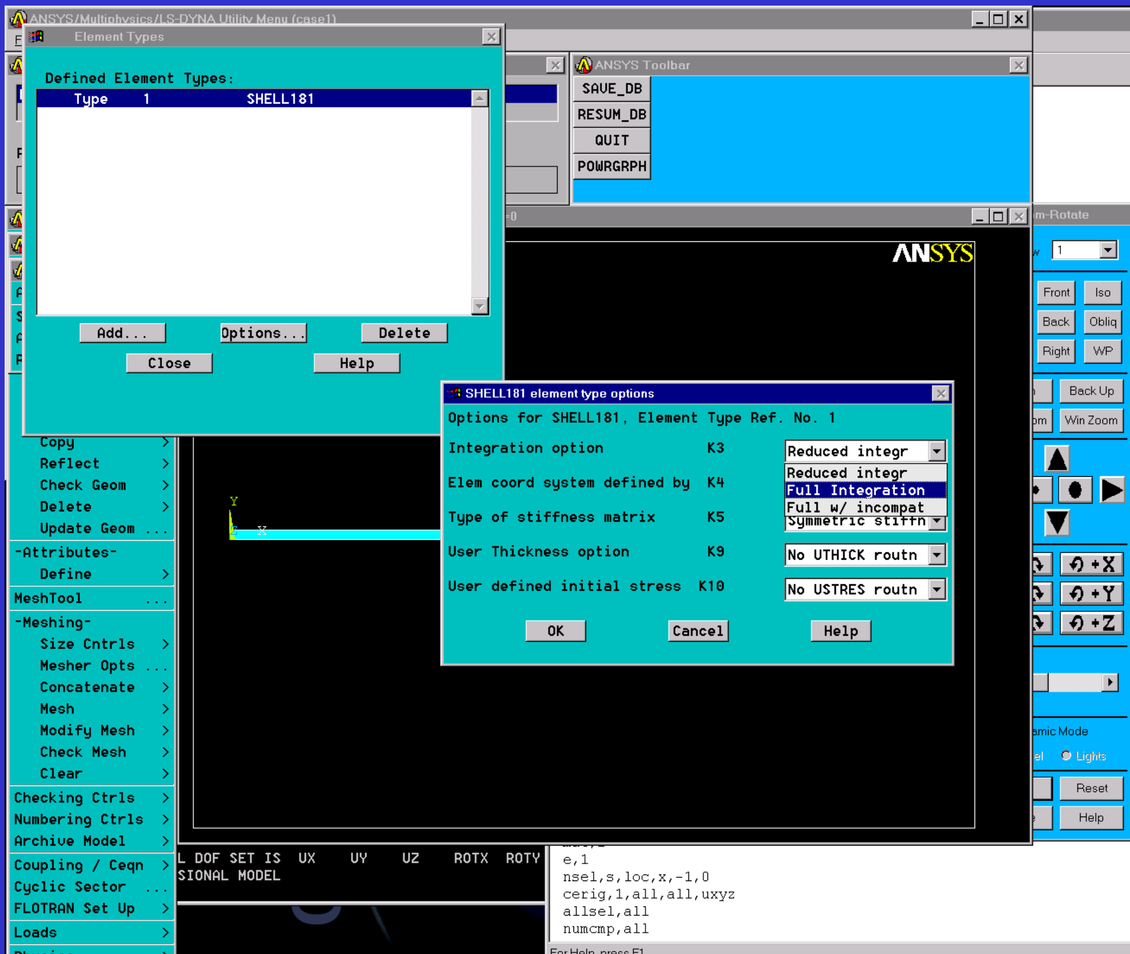
Build "base" Model



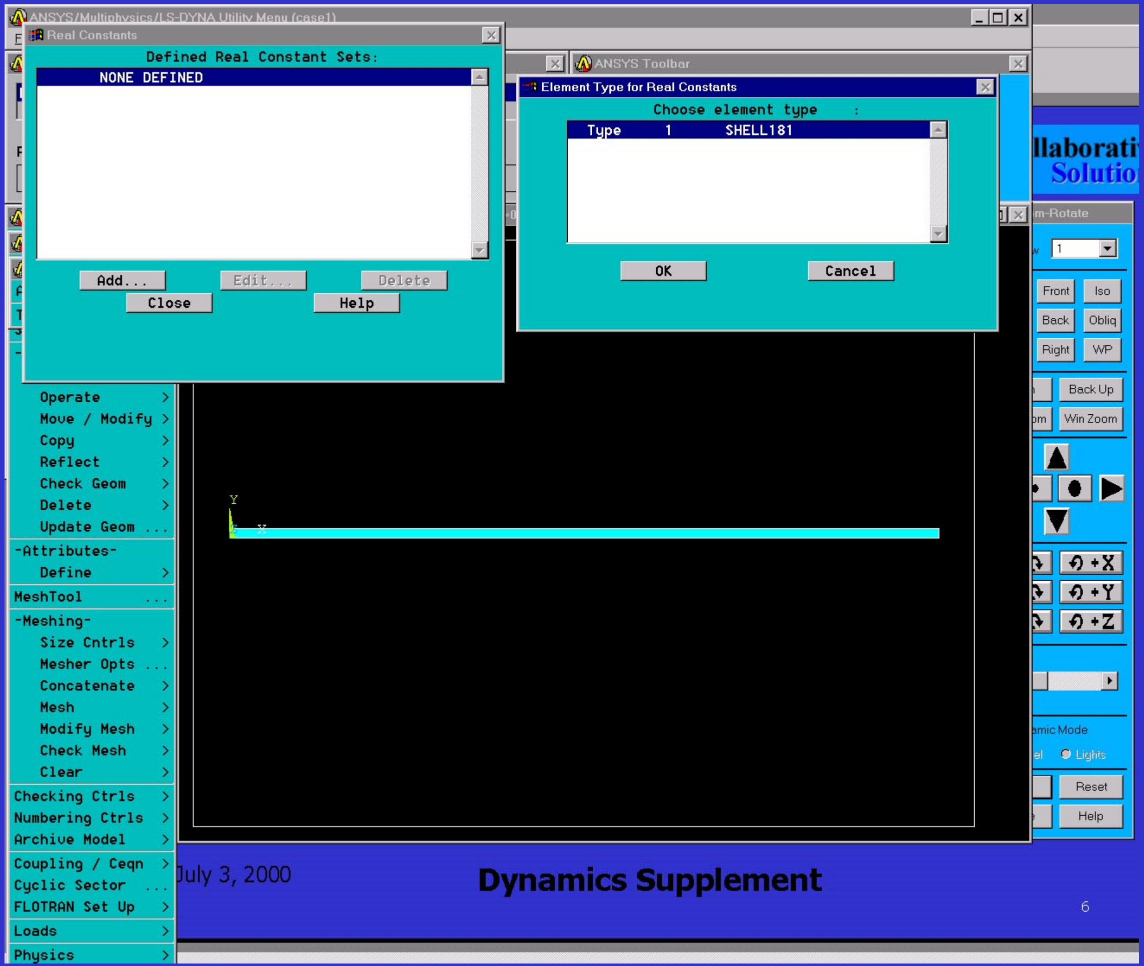
Menu Picks:

ANSYS Main Menu> Preprocessor> Element Type> Add/Edit/Delete … Options …

What's Happening:

The default for shell181 is reduced integration. We a switching to full integration.

Build “base” Model



Menu Picks:

ANSYS Main Menu> Preprocessor> Real Constant> Add/Edit/Delete …

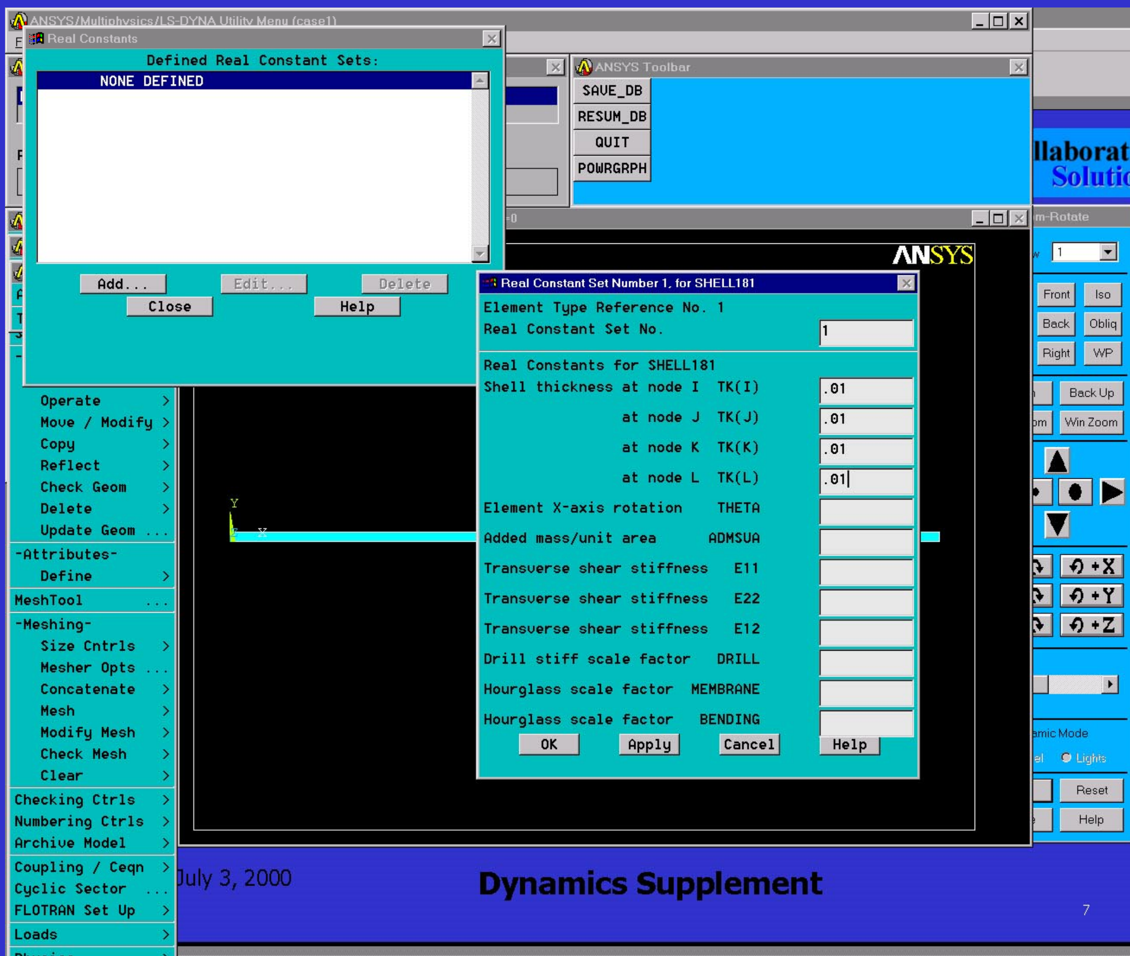
Add …

Highlight Shell181 and pick OK

What’s Happening:

We are going to define the shell thickness (real constant).

Build "base" Model



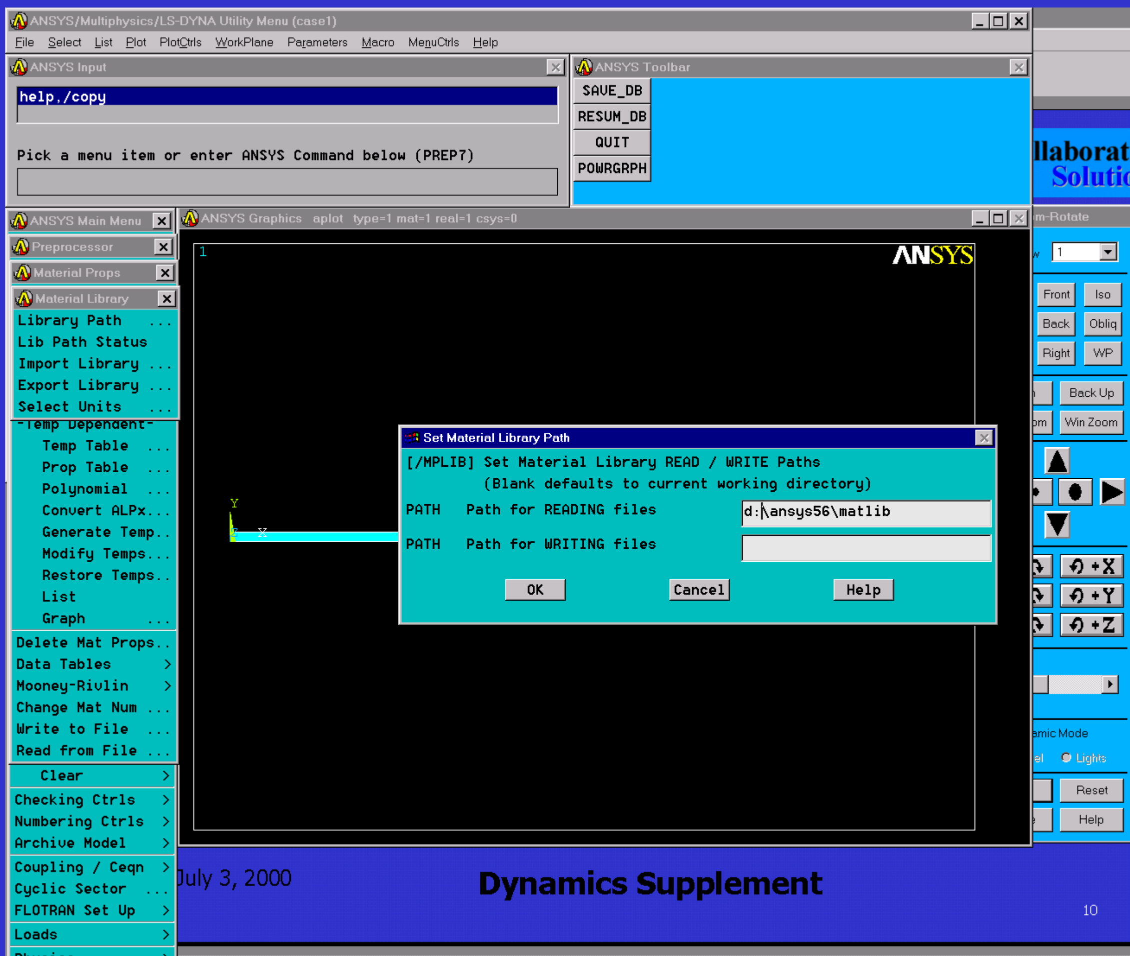
Menu Picks:

Continuation of the previous menu pick.

What's Happening:

Define the shell thickness to be .01 for all node that define the shell. This results in a shell having uniform thickness of .01.

Build “base” Model



Menu Picks:

ANSYS Main Menu> Preprocessor> Material Properties> Material Library> Library Path …

d:\ansys\matlib

What’s Happening:

We are telling ANSYS where the ANSYS material library is located.

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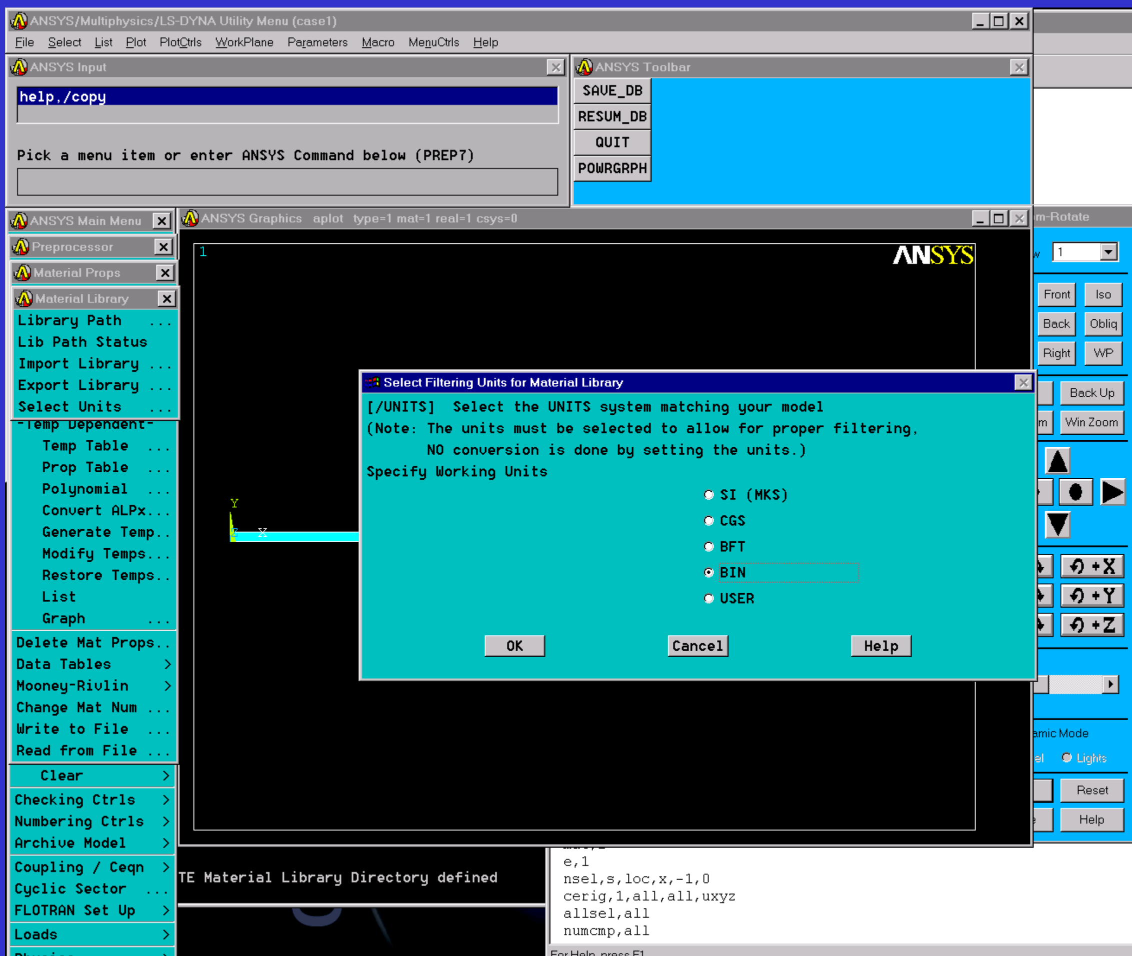
Build “base” Model



Menu Picks:

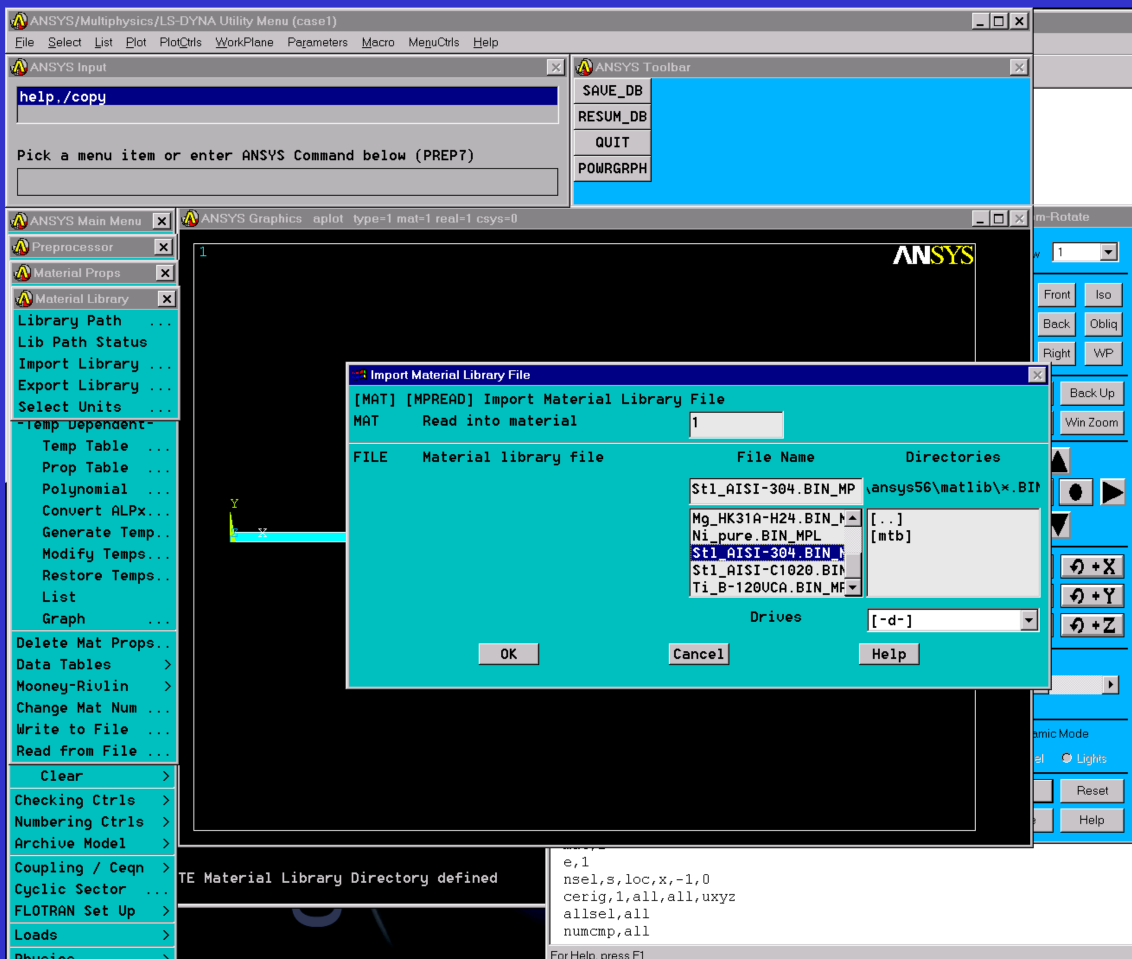
ANSYS Main Menu> Preprocessor> Material Properties> Material Library> Import Library …

Highlight BIN

What’s Happening:

First ANSYS will prompt you for the units of the material you are importing. Be sure to use consistent units. We are using BIN unit for this example.

Build “base” Model



Menu Picks:

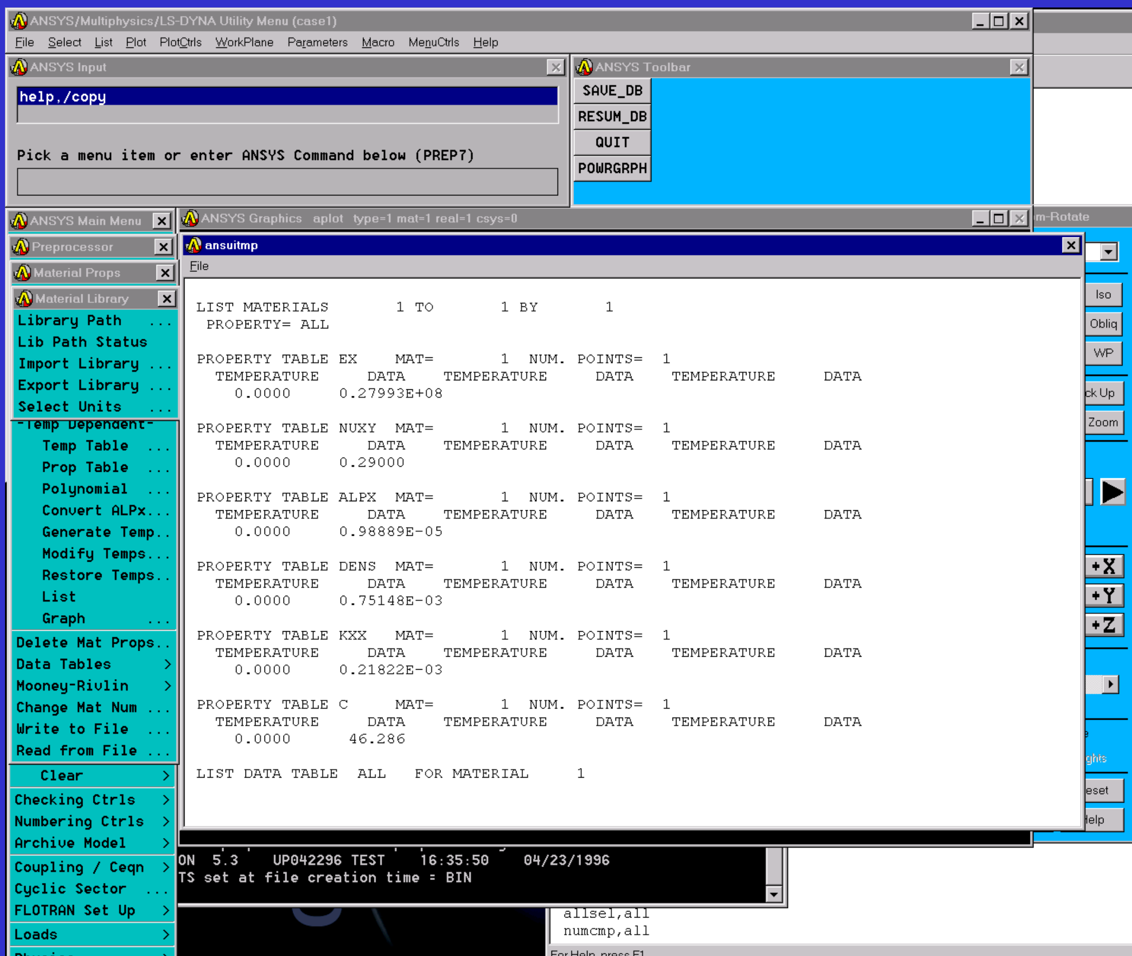
Continuation from the menu pick.

Highlight Stl+AISI-304.BIN_MP

What’s Happening:

We are telling ANSYS which material to use. In this case we are using a steel AISI 304.

Build "base" Model



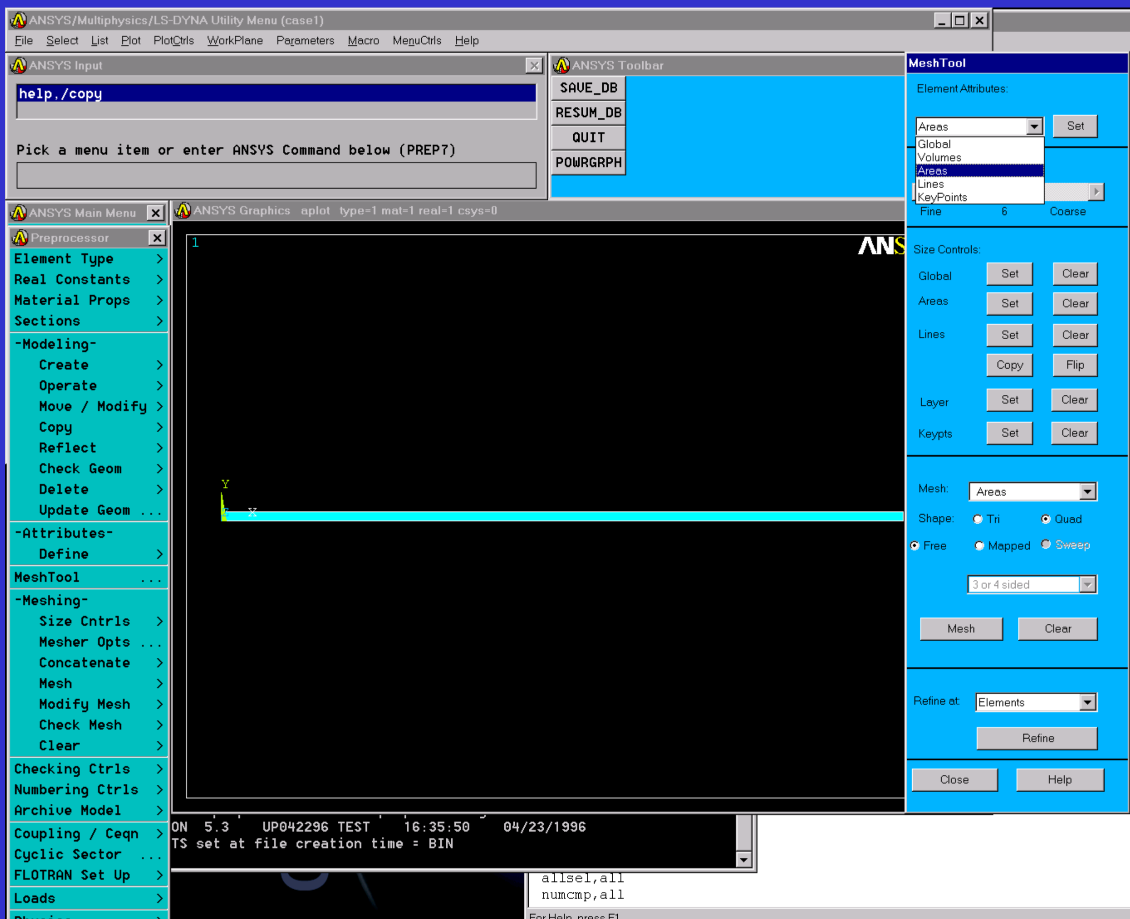
Menu Picks:

Feed Back from the last menu pick.

What's Happening:

ANSYS is tell us the material properties it will be using for material type 1.

Build “base” Model



Menu Picks:

ANSYS Main Menu> Preprocessor> MeshTool …

Element Attributed

What’s Happening:

We are telling ANSYS which material to use. In this case we are using a steel AISI 304.

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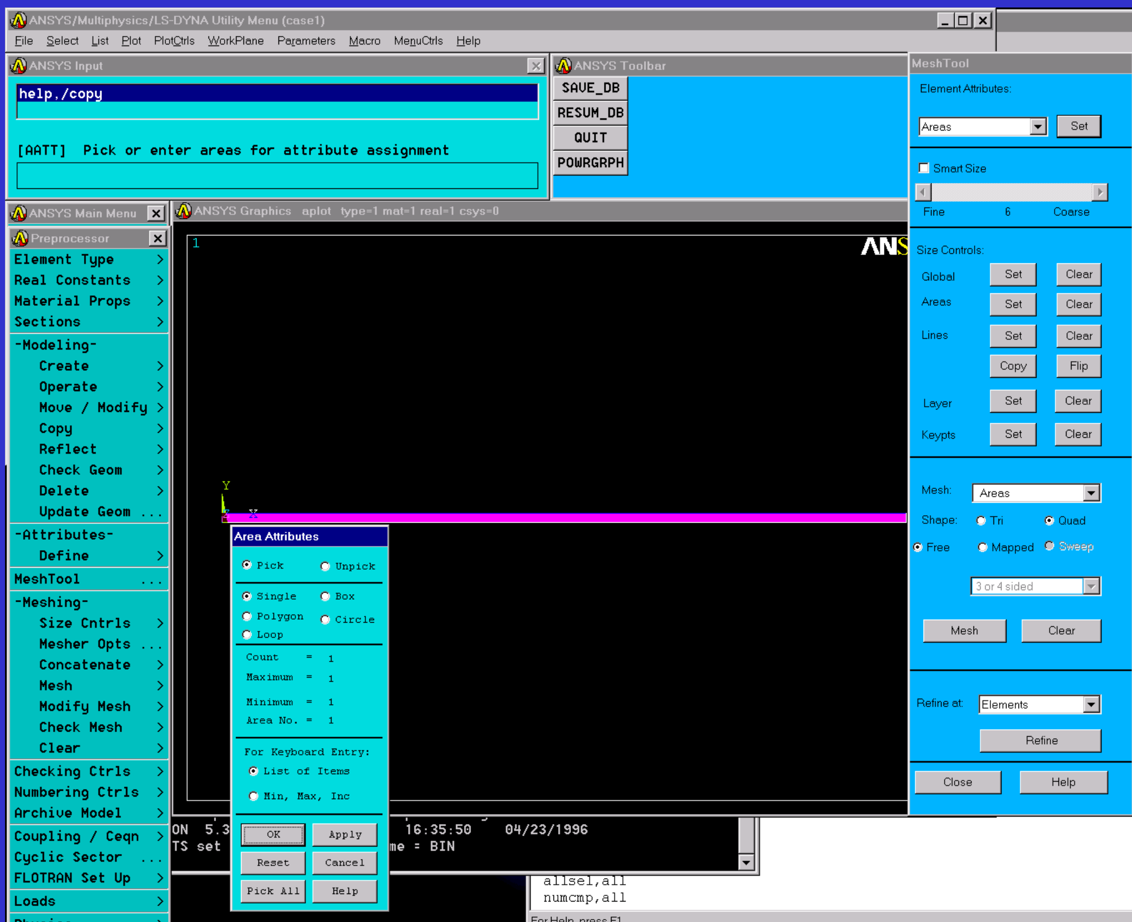
Build “base” Model



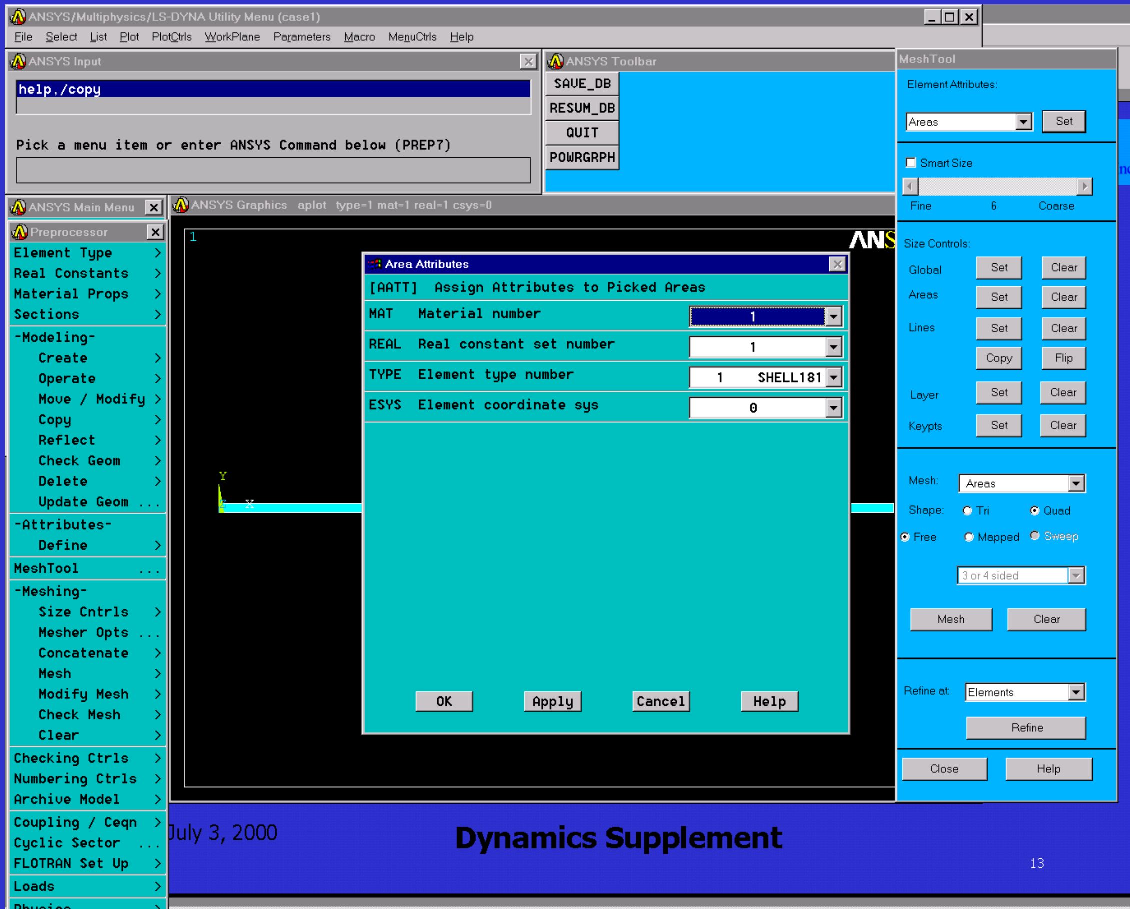
Menu Picks:

Continuation of last slide

What’s Happening:

You are going to pick the area you would like to assign attributes (element type, material properties, and real constants).

Build “base” Model



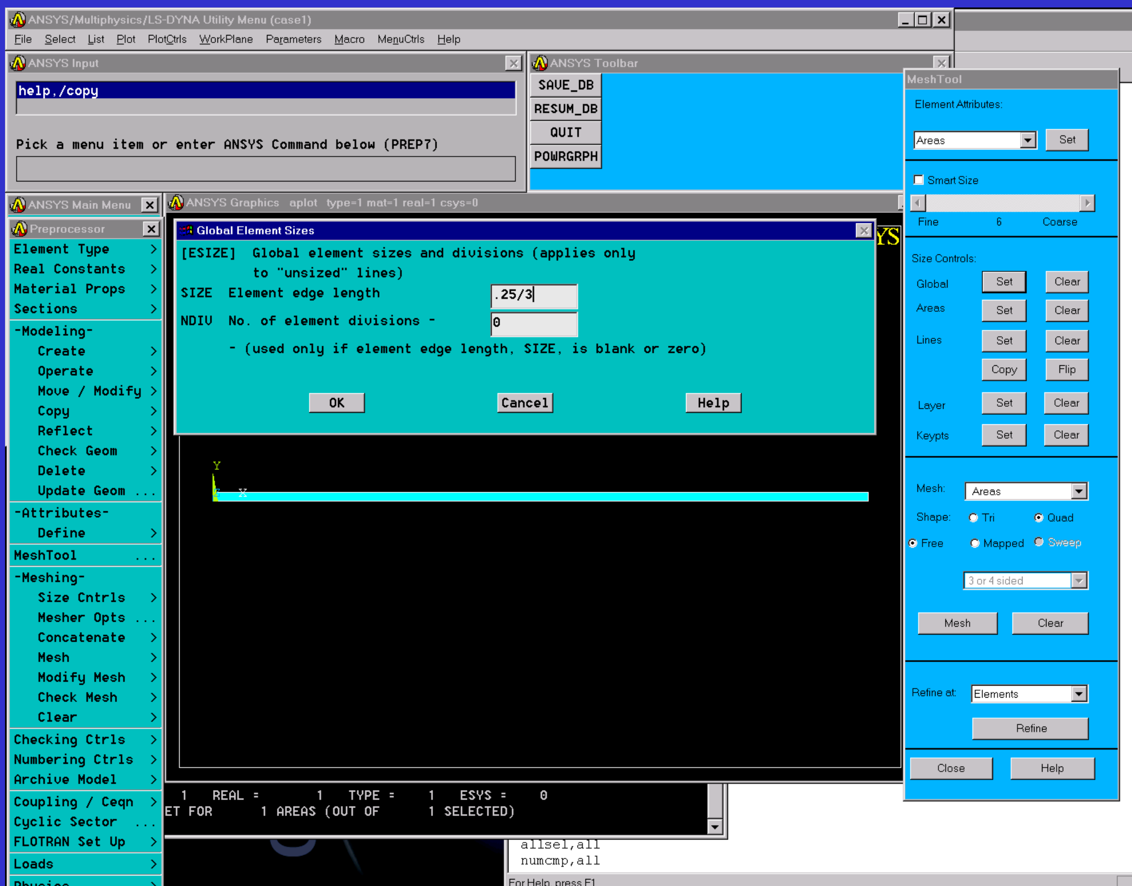
Menu Picks:

Continuation of last slide

What’s Happening:

You will toggle the attributes you would like to assign to the previously picked areas.

Build "base" Model



Menu Picks:

Main Menu> Preprocessor>

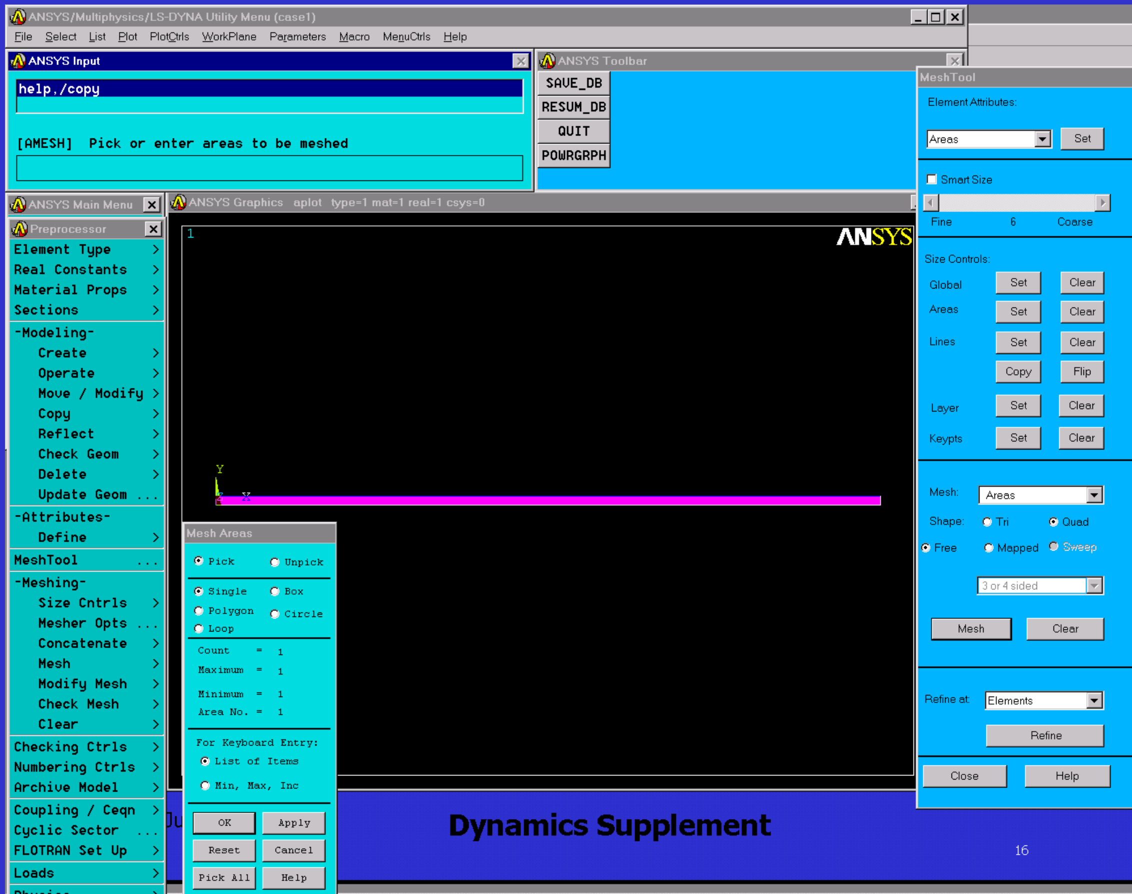
MeshTool …

Size Control> Global> Set

What's Happening:

You are specifying mesh controls for the entire model.

Build "base" Model



Menu Picks:

Main Menu> Preprocessor>

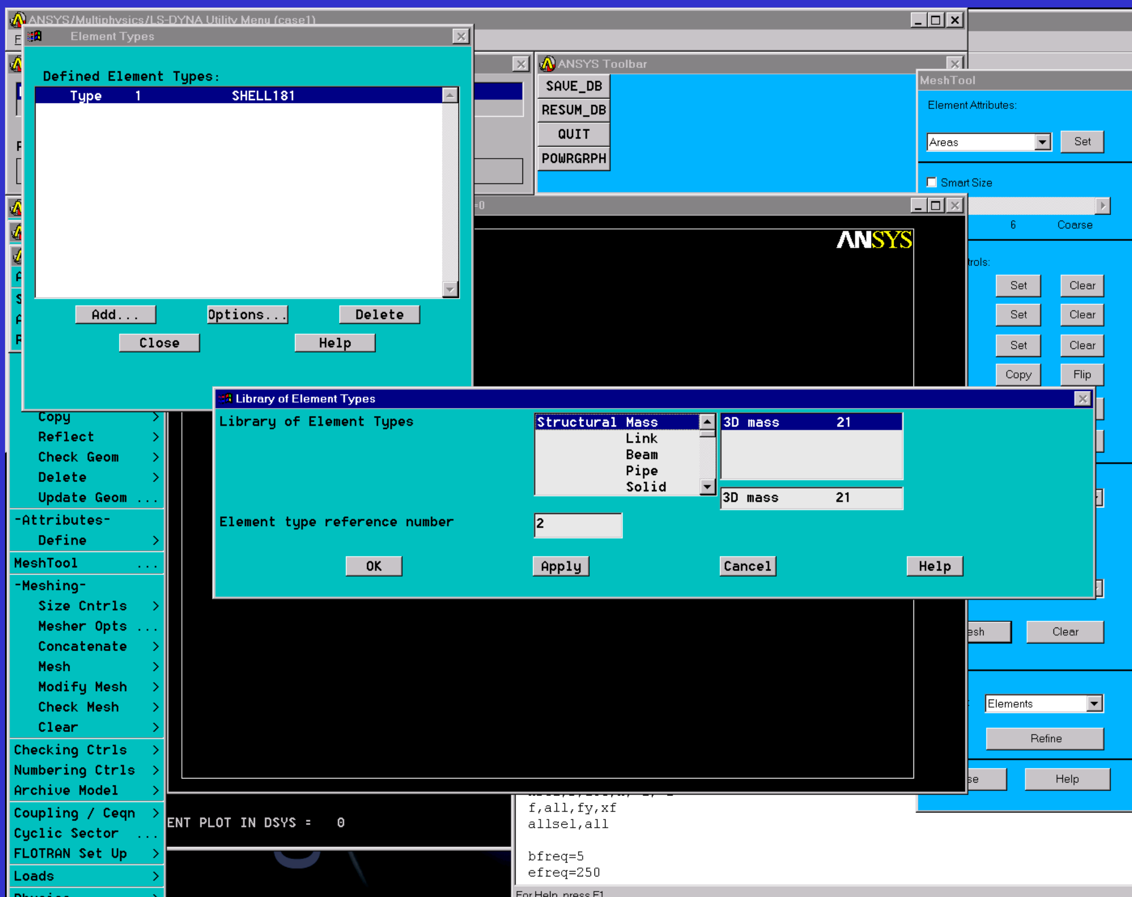
MeshTool …

Mesh

What's Happening:

You are going to mesh a user picked area.

Create Large Mass



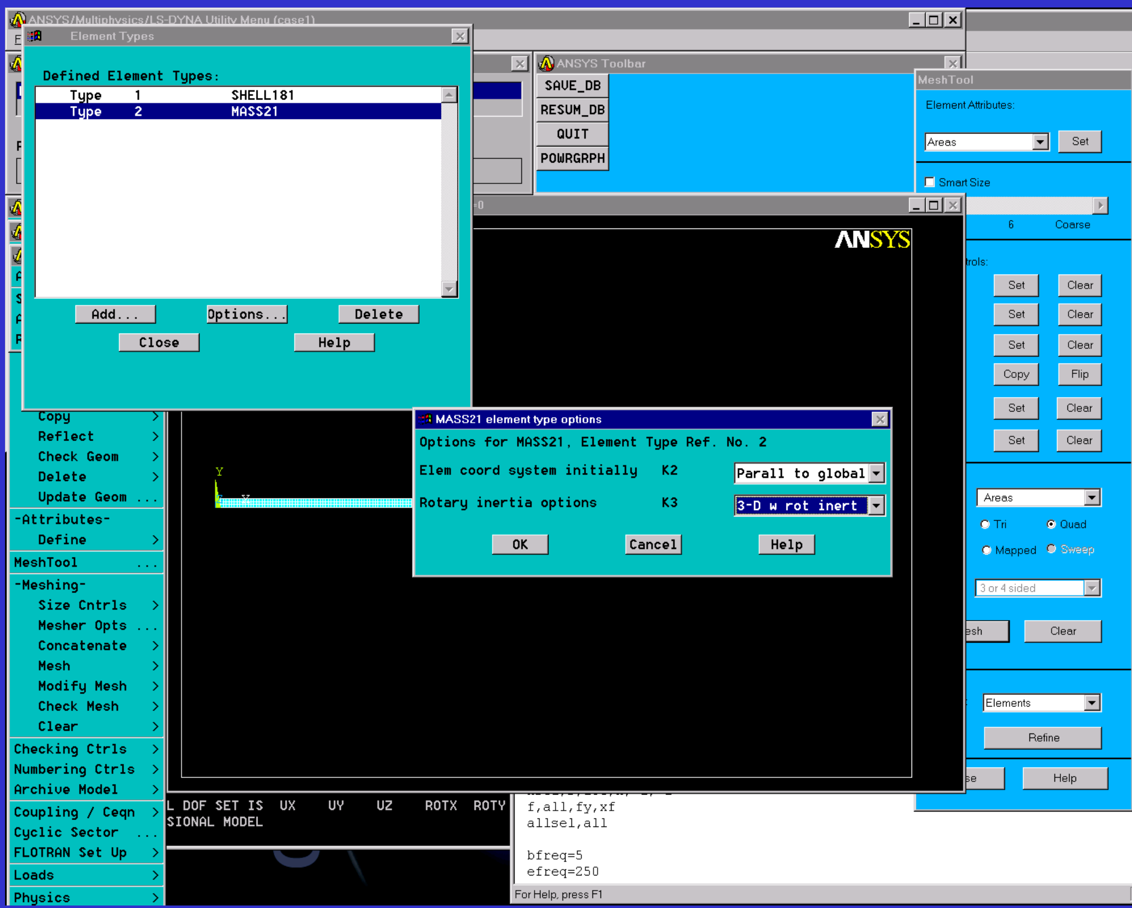
Menu Picks:

ANSYS Main Menu> Preprocessor> Element Type> Add/Edit/Delete … Add …

What's Happening:

Creating an element type 2 to be Structural Mass 21 (a 3-D mass).

Create Large Mass



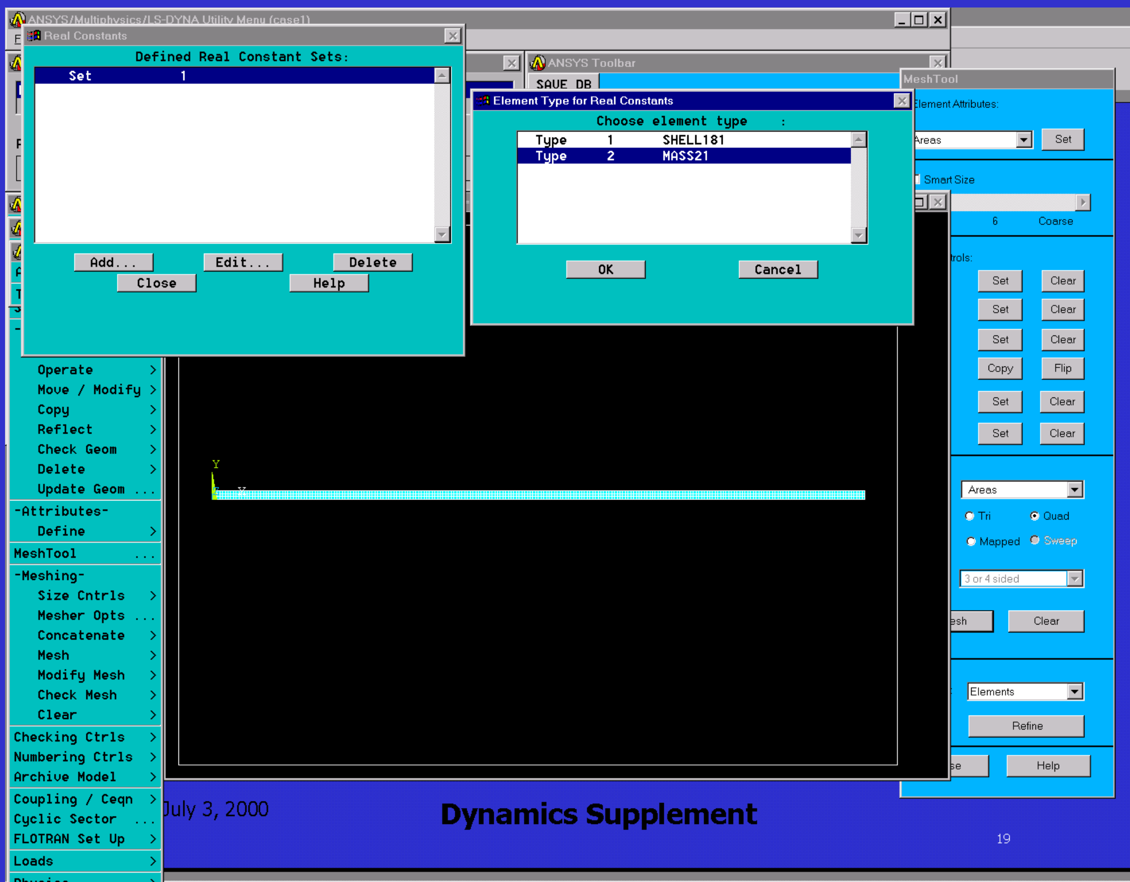
Menu Picks:

ANSYS Main Menu> Preprocessor> Element Type> Add/Edit/Delete … Options…

What's Happening:

Setting the keyoption 3 to be: 3-D with rotational inertia.

Create Large Mass



Menu Picks:

ANSYS Main Menu> Preprocessor> Real Constant> Add/Edit/Delete …

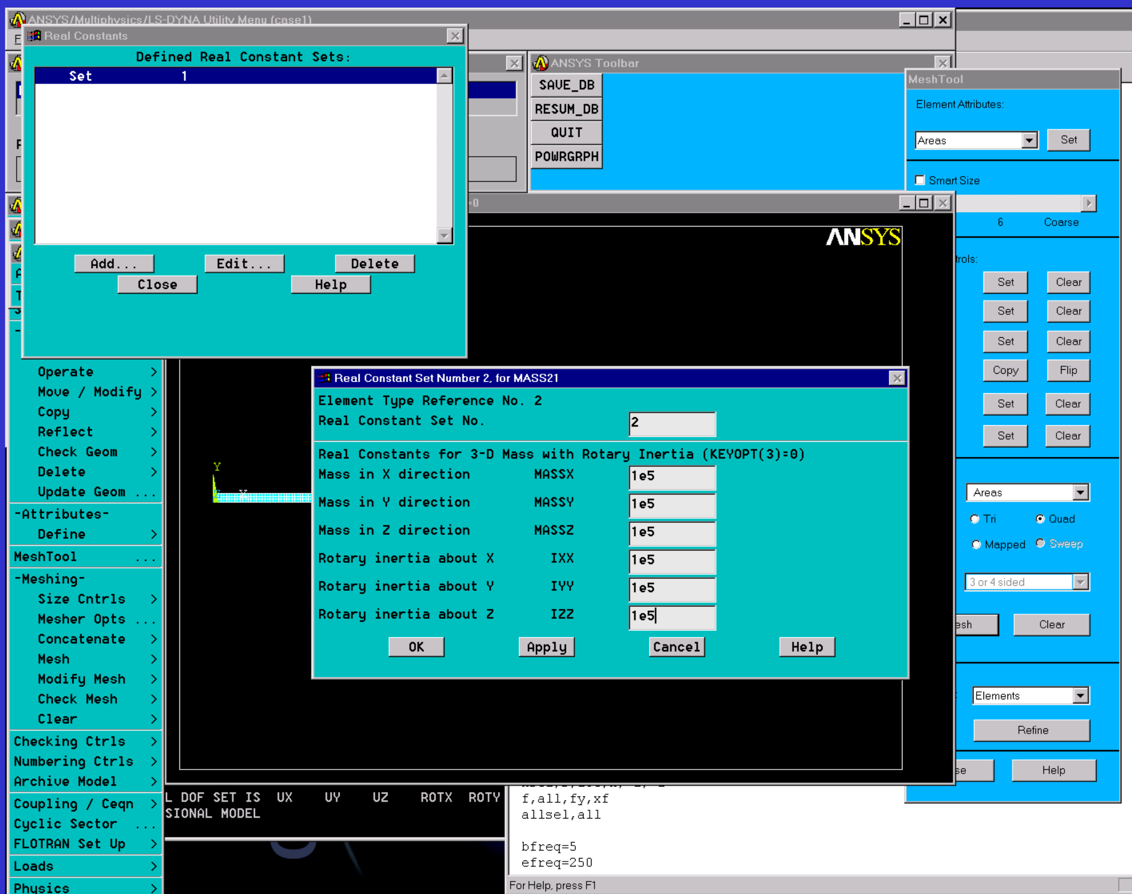
Add …

Highlight Mass21 and pick OK

What's Happening:

We are going to define the mass for the mass elements.

Create Large Mass



Menu Picks:

Continuation of the previous menu pick.

What’s Happening:

Define the mass of the mass elements to be 1e5 (3-4 orders of magnitude larger then the structures mass, large mass).

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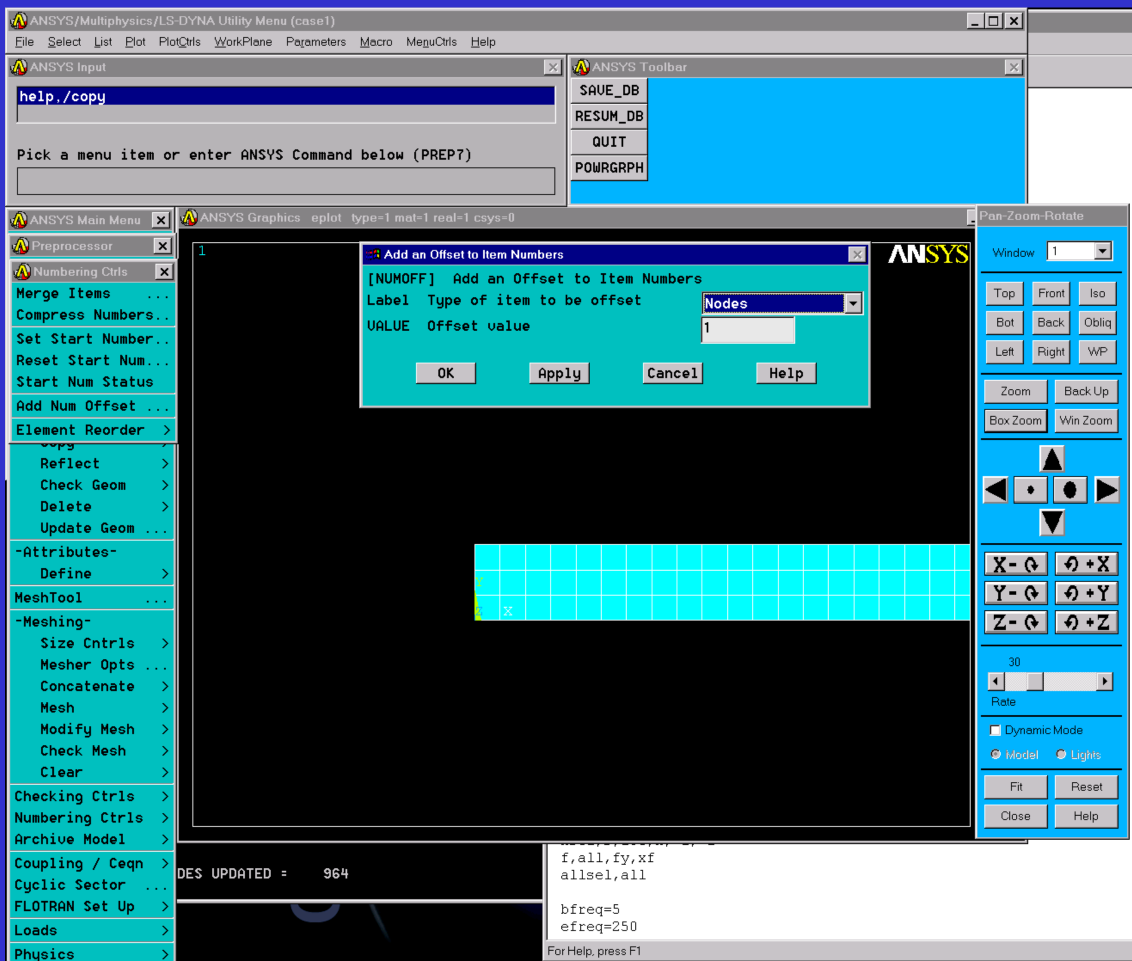
Create Large Mass



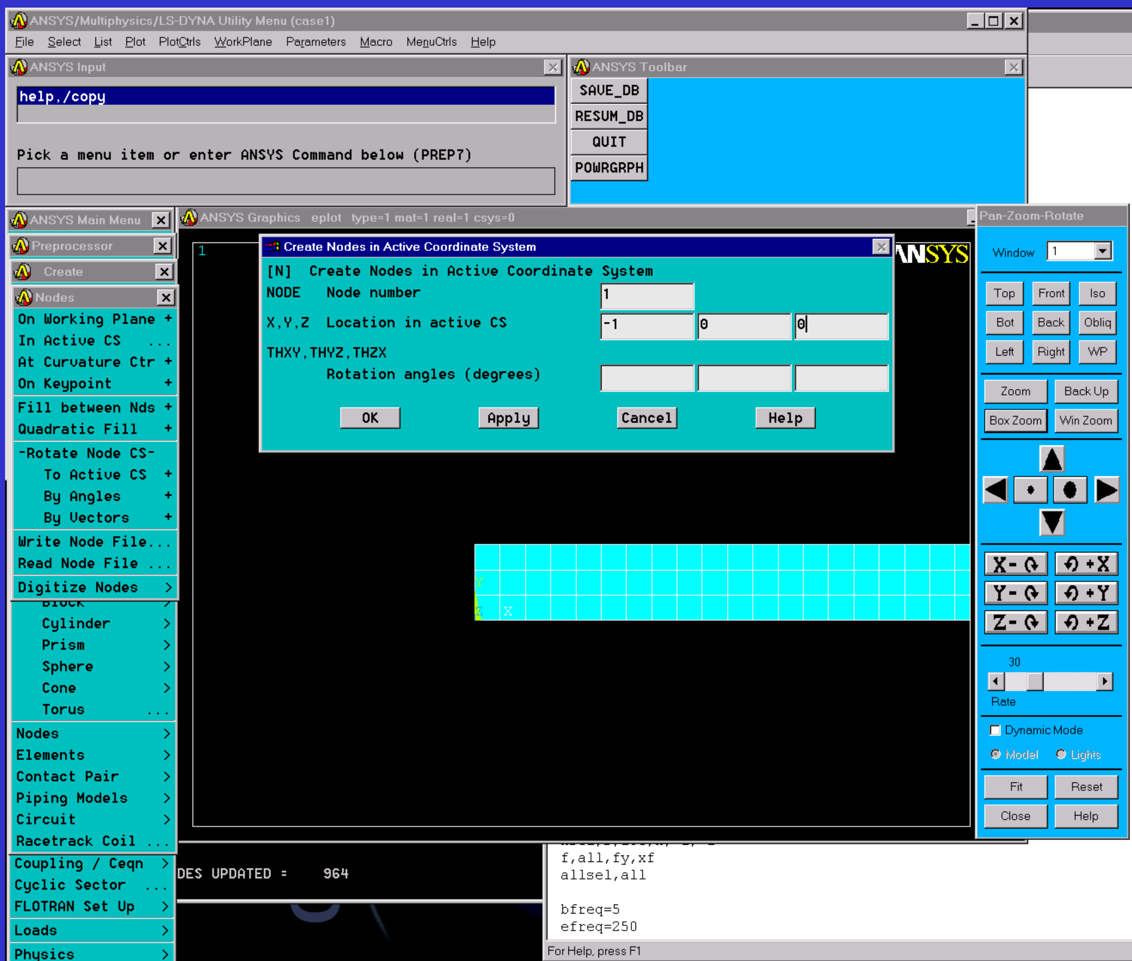
Menu Picks:

Main Menu> Preprocessor> Numbering Cntrls> Add Num Offset …

What's Happening:

Offsetting all the nodes numbers in the base model by 1. This is done so the large mass, which will be defined next will have the lowest node number. This makes it easier to define the rigid link between the large mass and the structure.

Create Large Mass



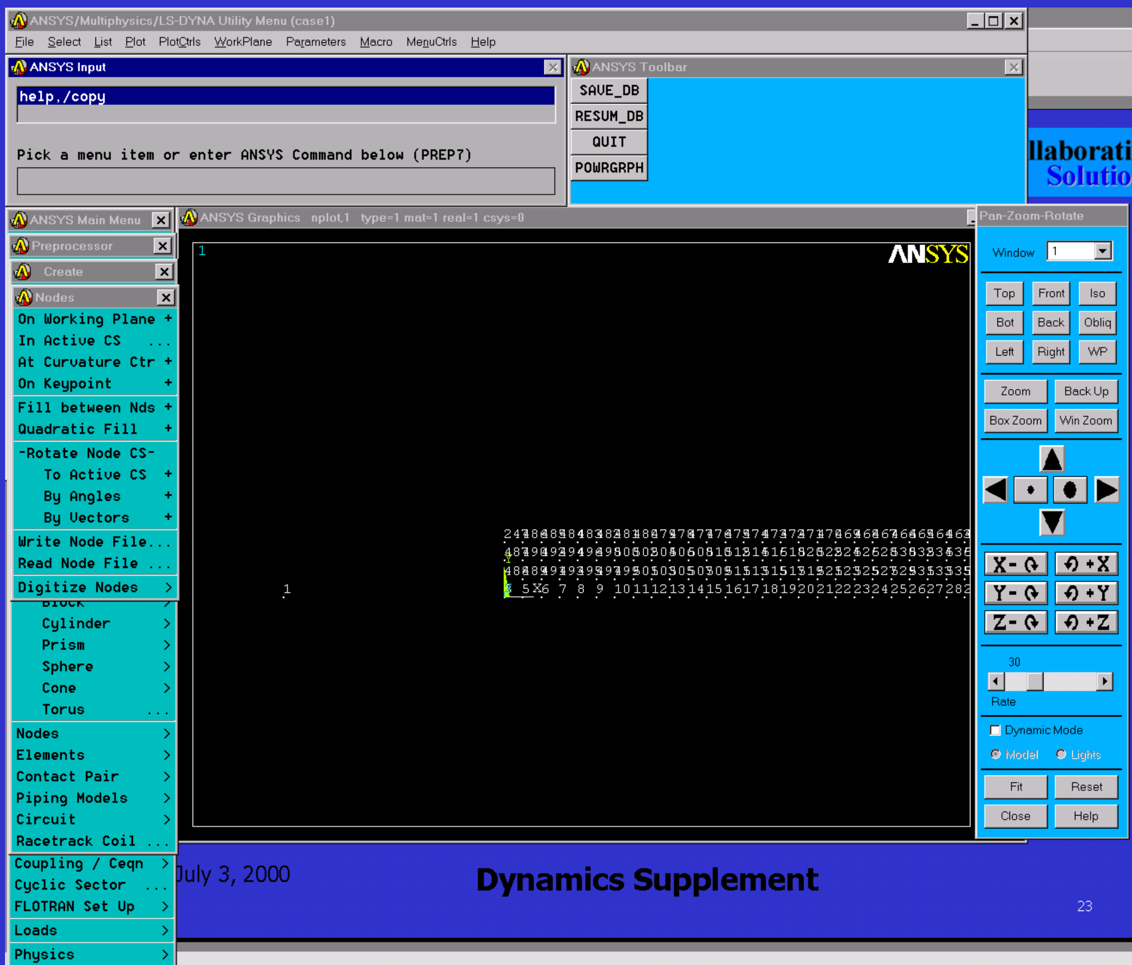
Menu Picks:

Main Menu> Preprocessor> Create> Nodes> In Active CS …

What’s Happening:

Defining nodes number 1 to be located at position x=-1, y=0, and z=0. This will become our large mass.

Create Large Mass



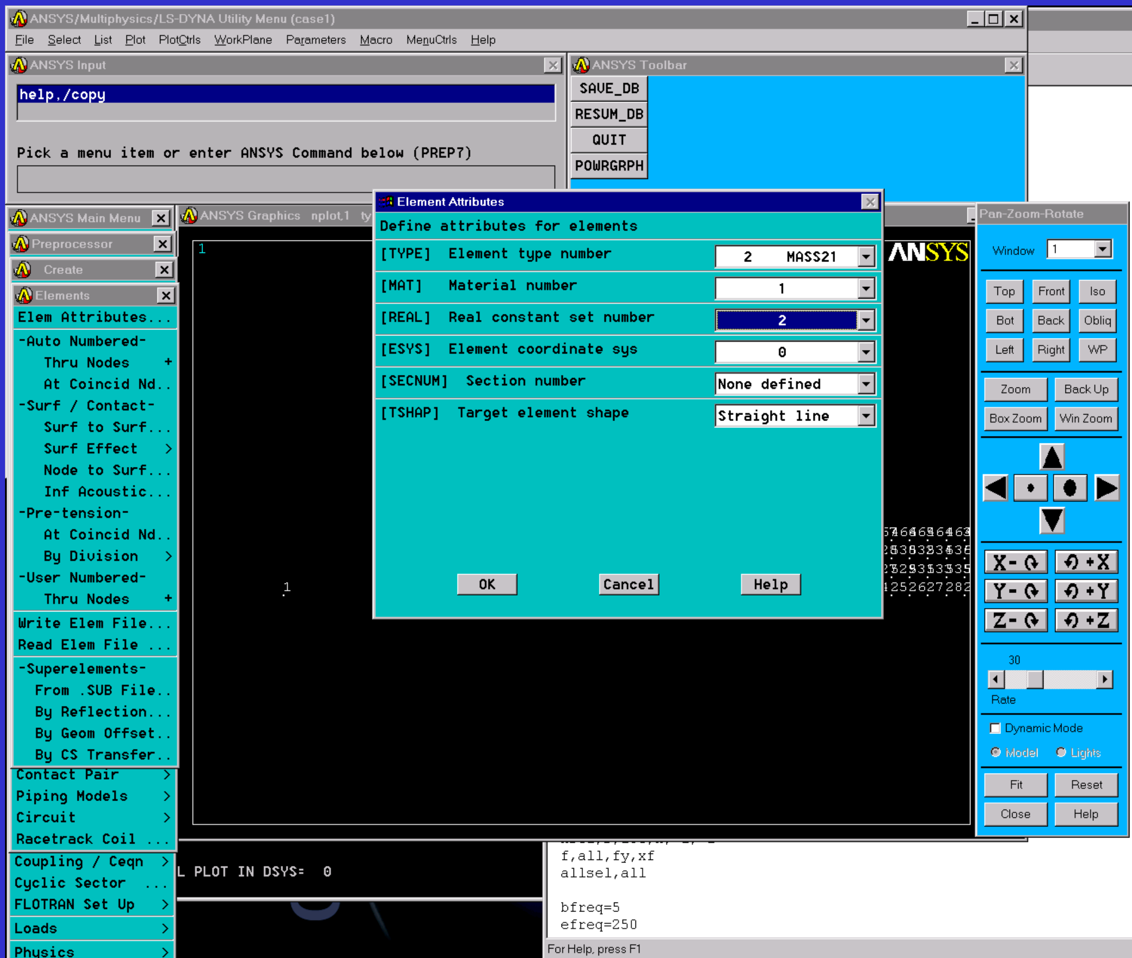
Menu Picks:

Continuation of last slide.

What's Happening:

This is a node plot, showing the structure and the node we just defined. The node we just defined will soon become our large mass.

Create Large Mass



Menu Picks:

Main Menu> Pre-processor> Create> Elements> Elem Attributes …

What's Happening:

Setting the default element attributes to be consistent with the large mass (type=2, real=2, mat=(it does not matter, mass elements do not you a material type)).

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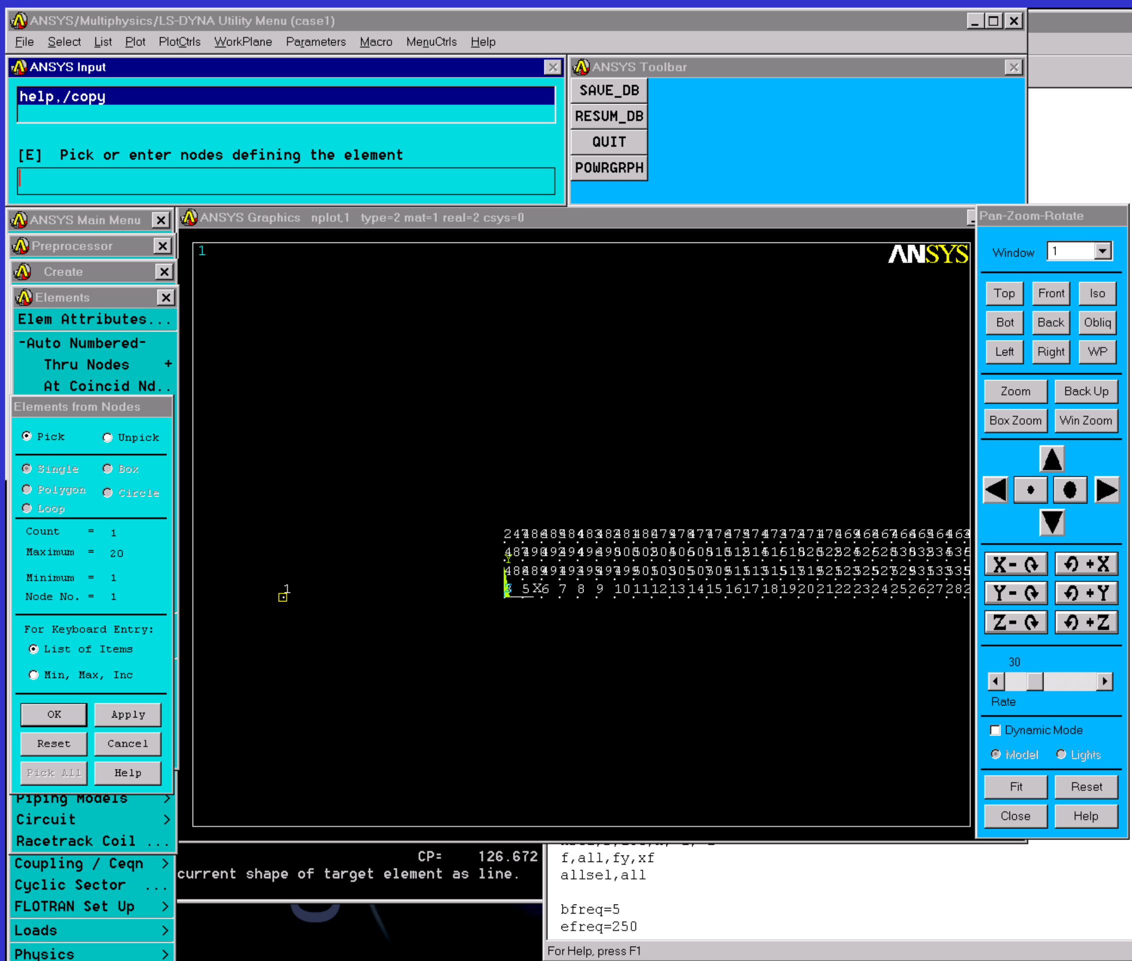
Create Large Mass



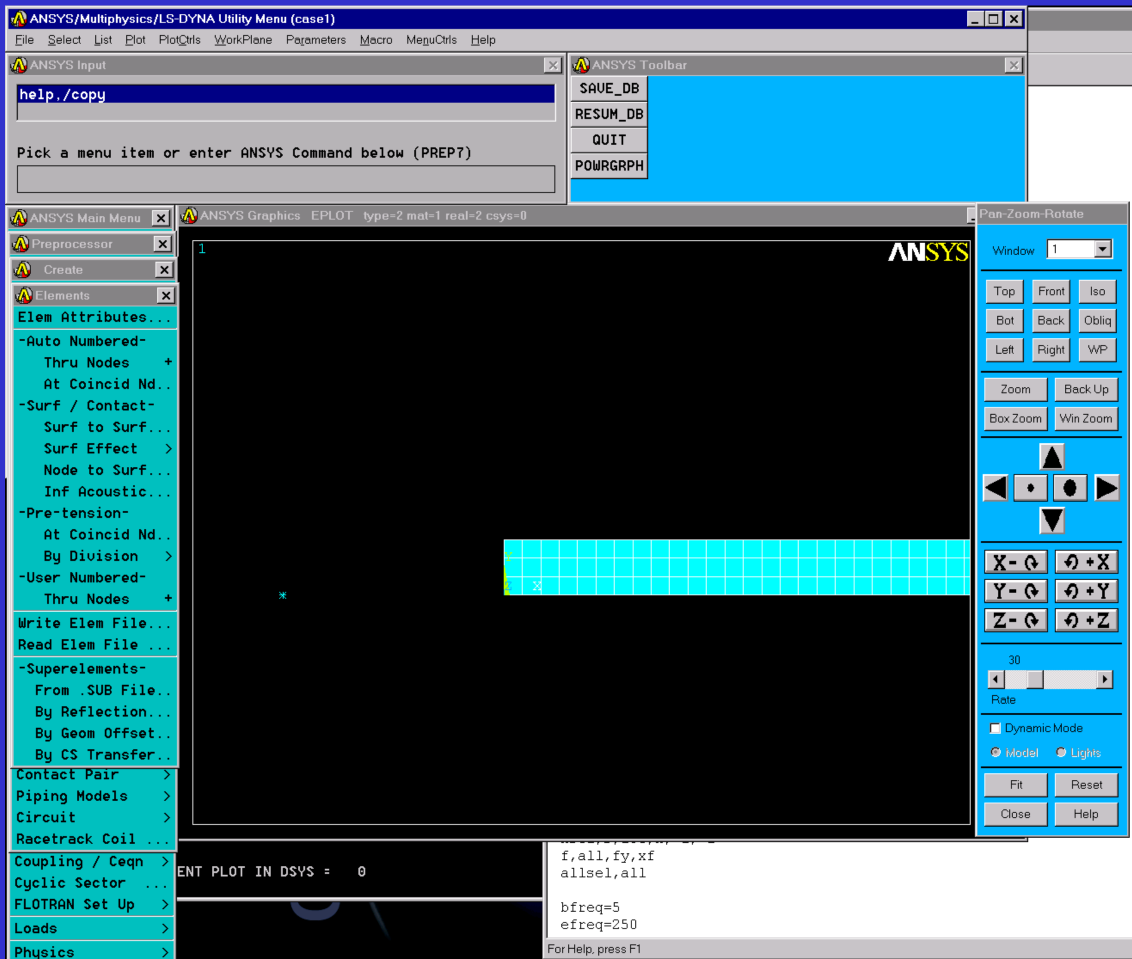
Menu Picks:

Main Menu> Pre-processor> Create> Elements> Thru Nodes +

What's Happening:

We will pick node 1, such that node 1 will now be associated with a mass element (element type 2) with real constant set 2. This is now our large mass.

Create Large Mass



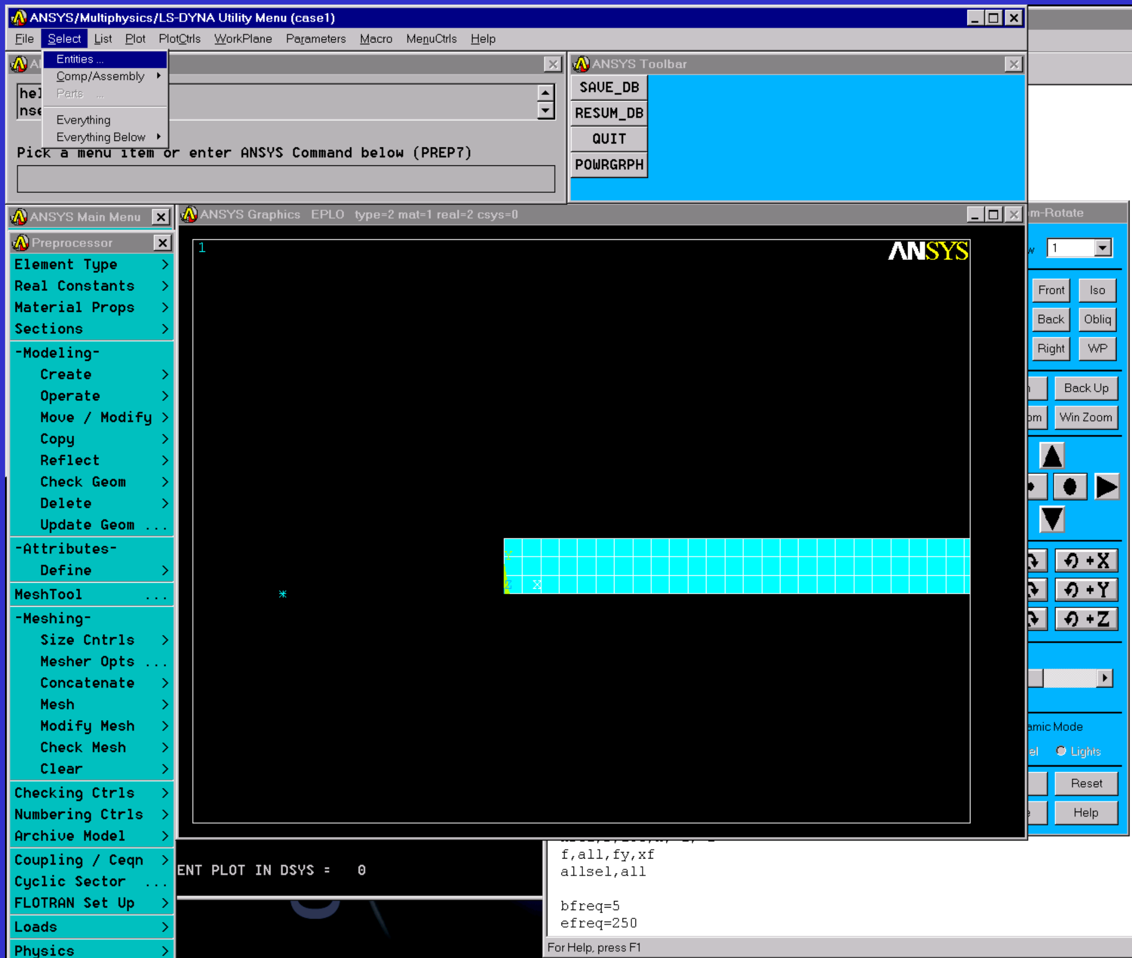
Menu Picks:

Continuation of the last slide

What's Happening:

Element plot. Zoomed in on the large mass.

Connect Large Mass and “base” Model



Menu Picks:

Utility Menu> Select> Entities …

What’s Happening:

We are going to select the nodes associated with the large mass and the node where the large mass would connect to.

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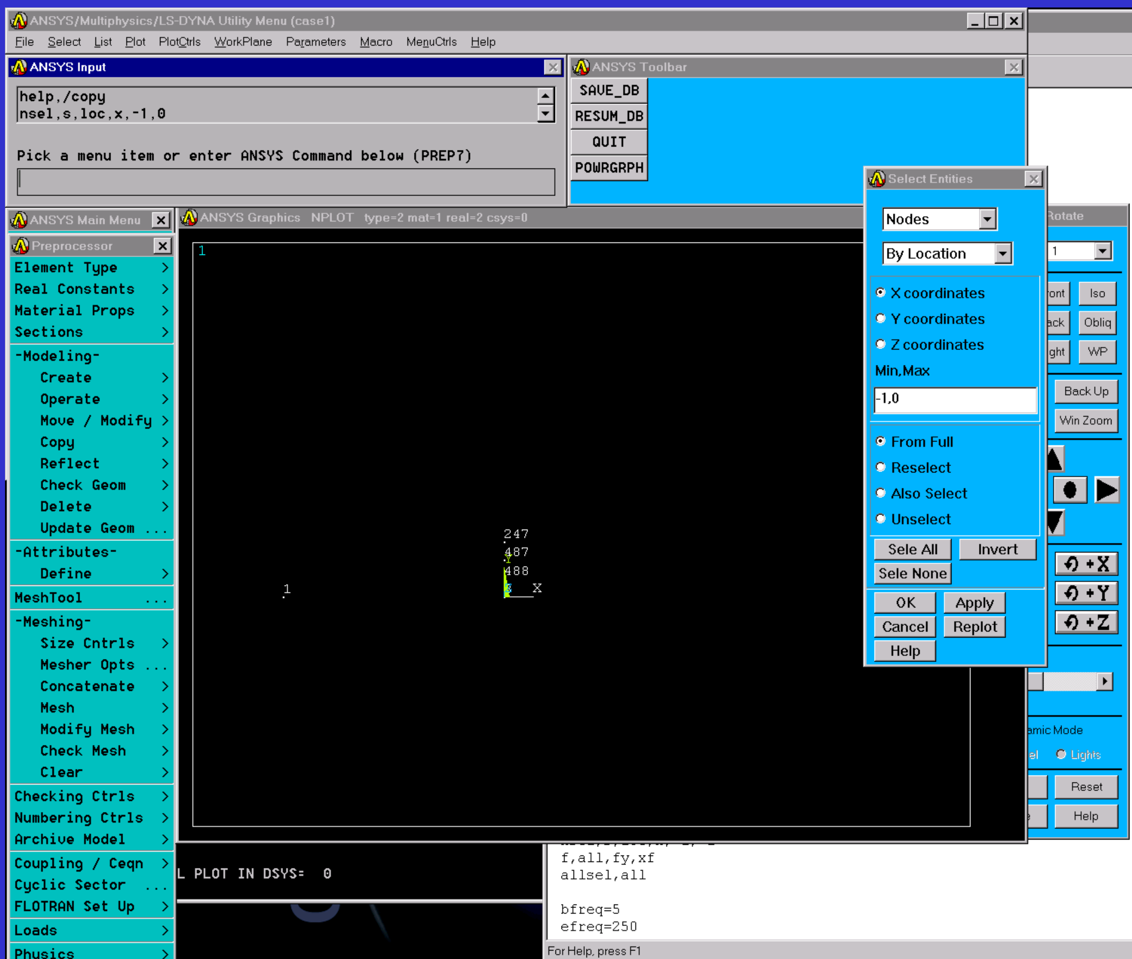
Connect Large Mass and “base” Model



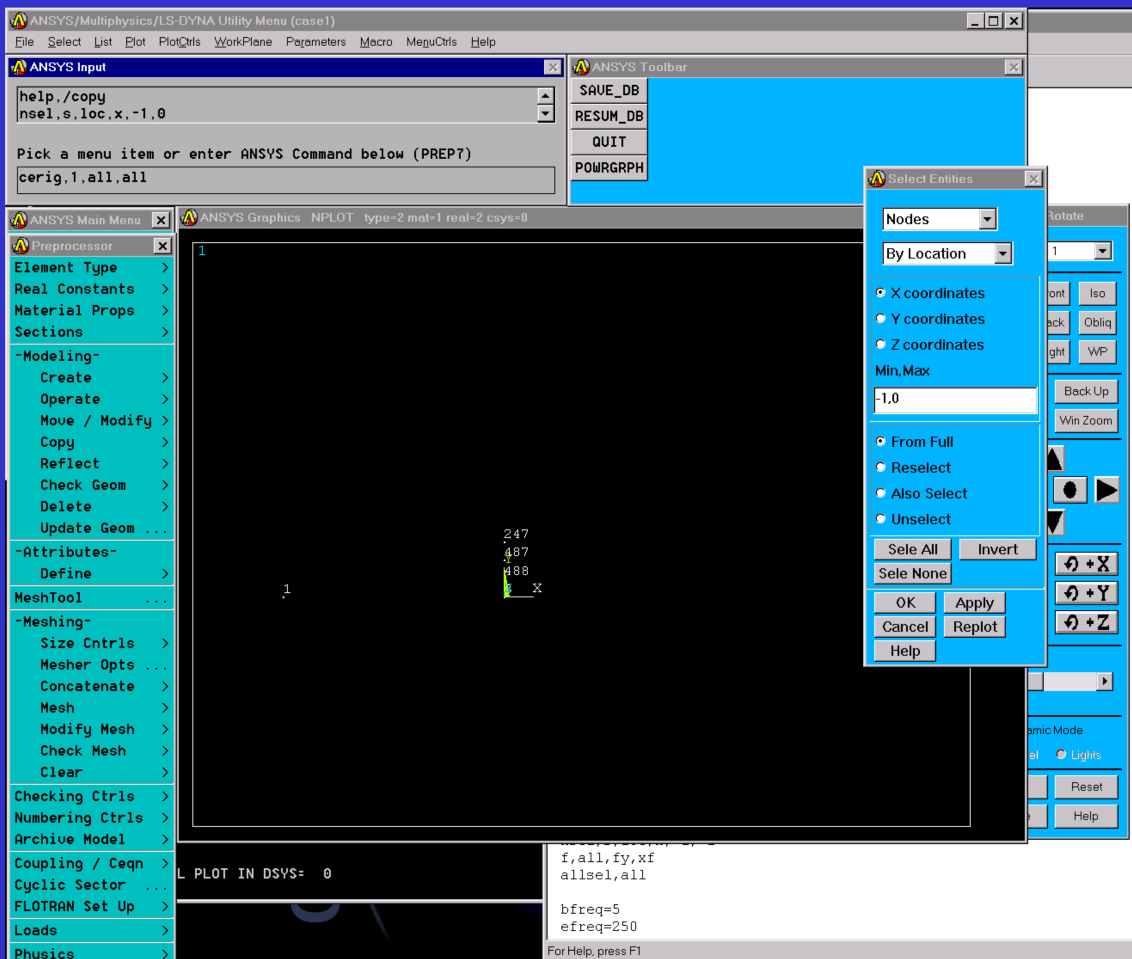
Menu Picks:

Continuation of the last slide

What’s Happening:

We are going to select all the nodes from x=-1 to x=0. These represent the nodes making up the large mass and the base structure where the large mass attaches to.

Connect Large Mass and “base” Model



Menu Picks:

ANSYS Input (type the following command into the input window)

cerig,1,all,all

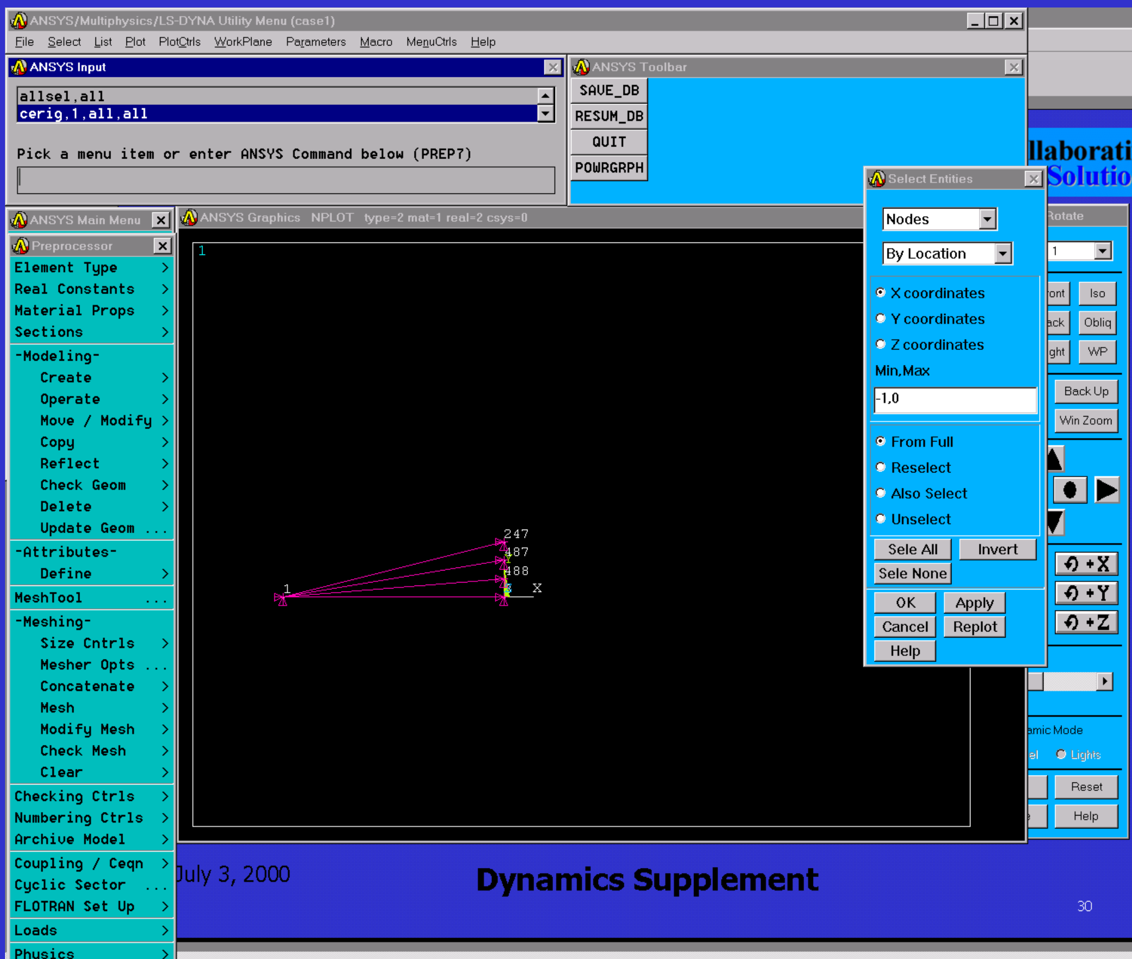
What’s Happening:

We are creating a rigid constraint between the large mass and the base structure.

Note node 1 is the master node, and has to be because will will be applying our load to it later I the forced vibration section of this exercise.

Note we typed in the command because if the GUI were used it requires the user to pick every node of the rigid region. For this model it would be trivial, but for a more realistic model it could mean quite a bit of picking.

Connect Large Mass and “base” Model



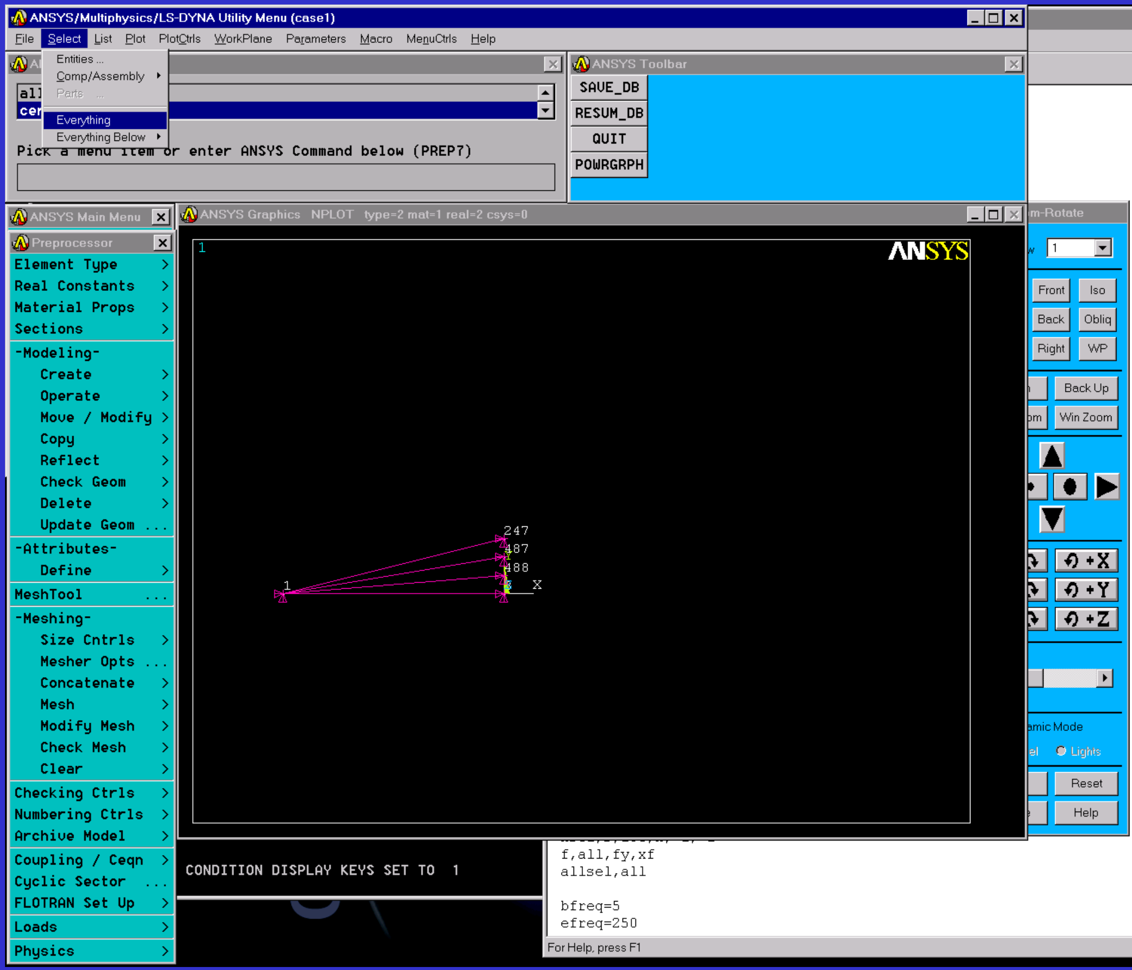
Menu Picks:

Continuation of previous slide

What’s Happening:

Node plot, showing the constraint equations symbols.

Connect Large Mass and “base” Model



Menu Picks:

Utility Menu> Select> Everything

What’s Happening:

Selecting/Activating the entire model

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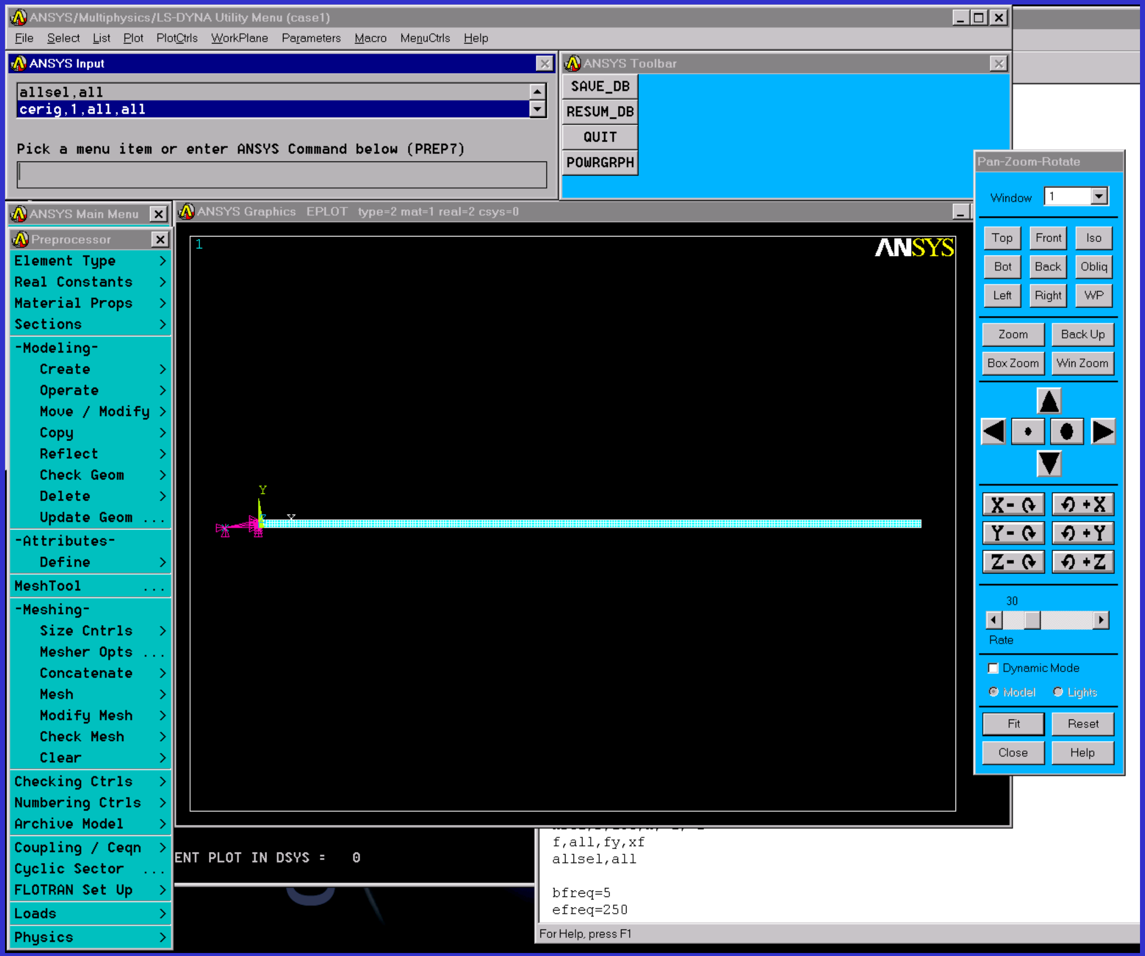
Connect Large Mass and “base” Model



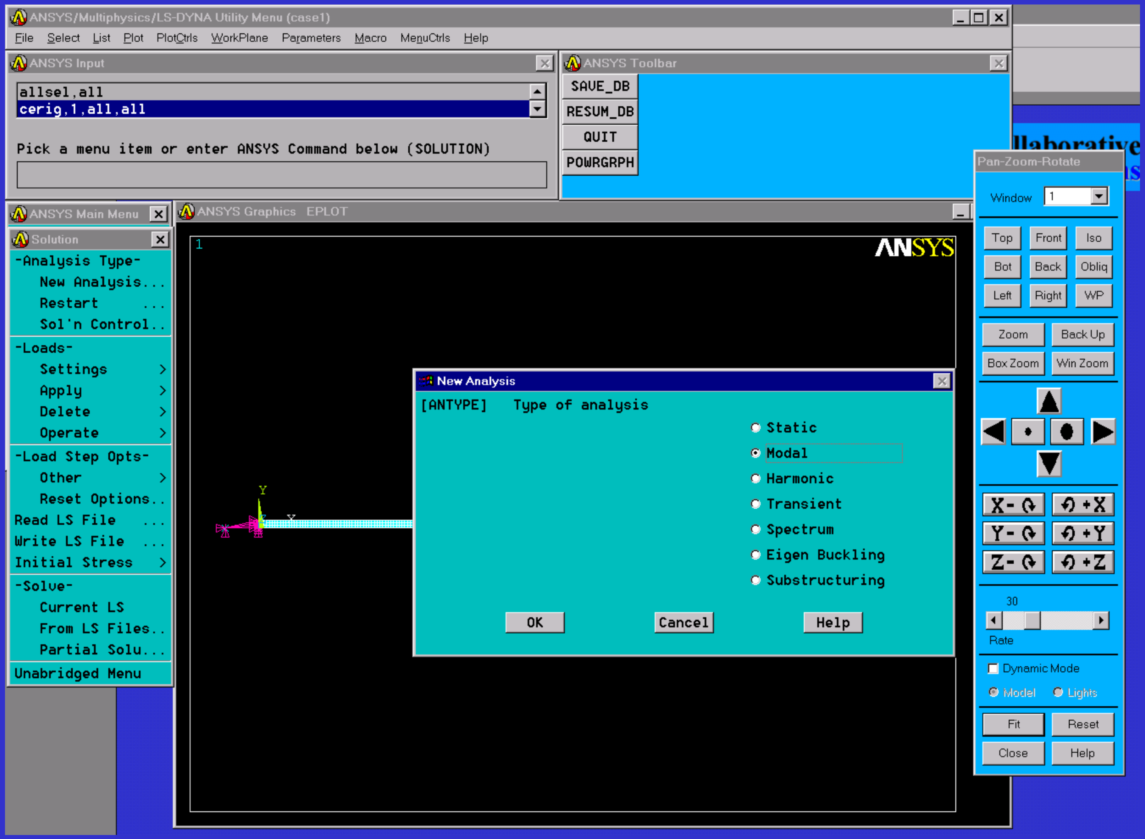
Menu Picks:

Continuation of previous slide

What’s Happening:

Element plot of whole model, with the constraint equations symbols turned on.

Run Free-Free Modal Analysis



Menu Picks:

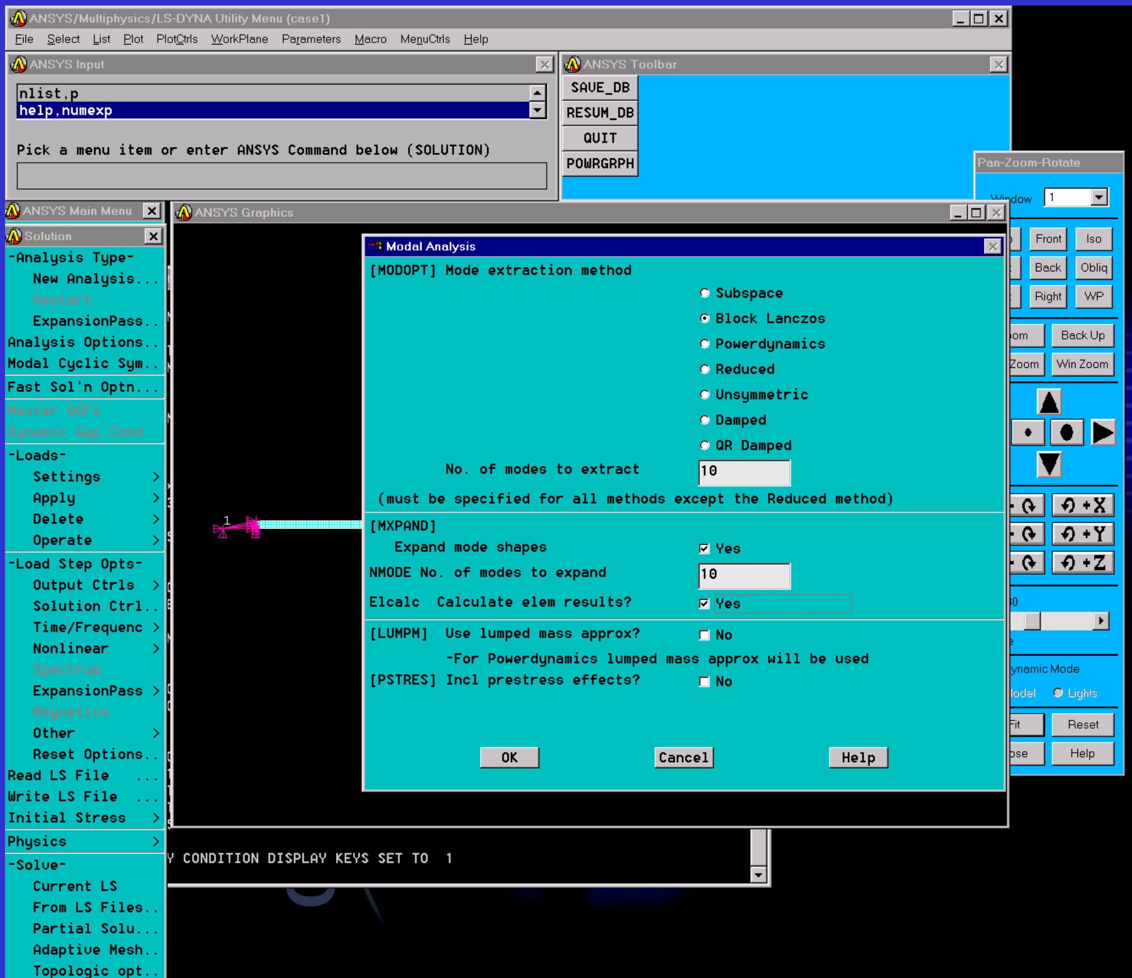
Main Menu> Solution>

New Analysis …

What's Happening:

Define the analysis type to be Modal.

Run Free-Free Modal Analysis



Menu Picks:

Main Menu> Solution> Analysis Options …

What's Happening:

Set the solver to use for modal extraction (block lanczos), set the number of modes to calculate (10), set the number of modes to expand (10), and set ANSYS to calculate element results.

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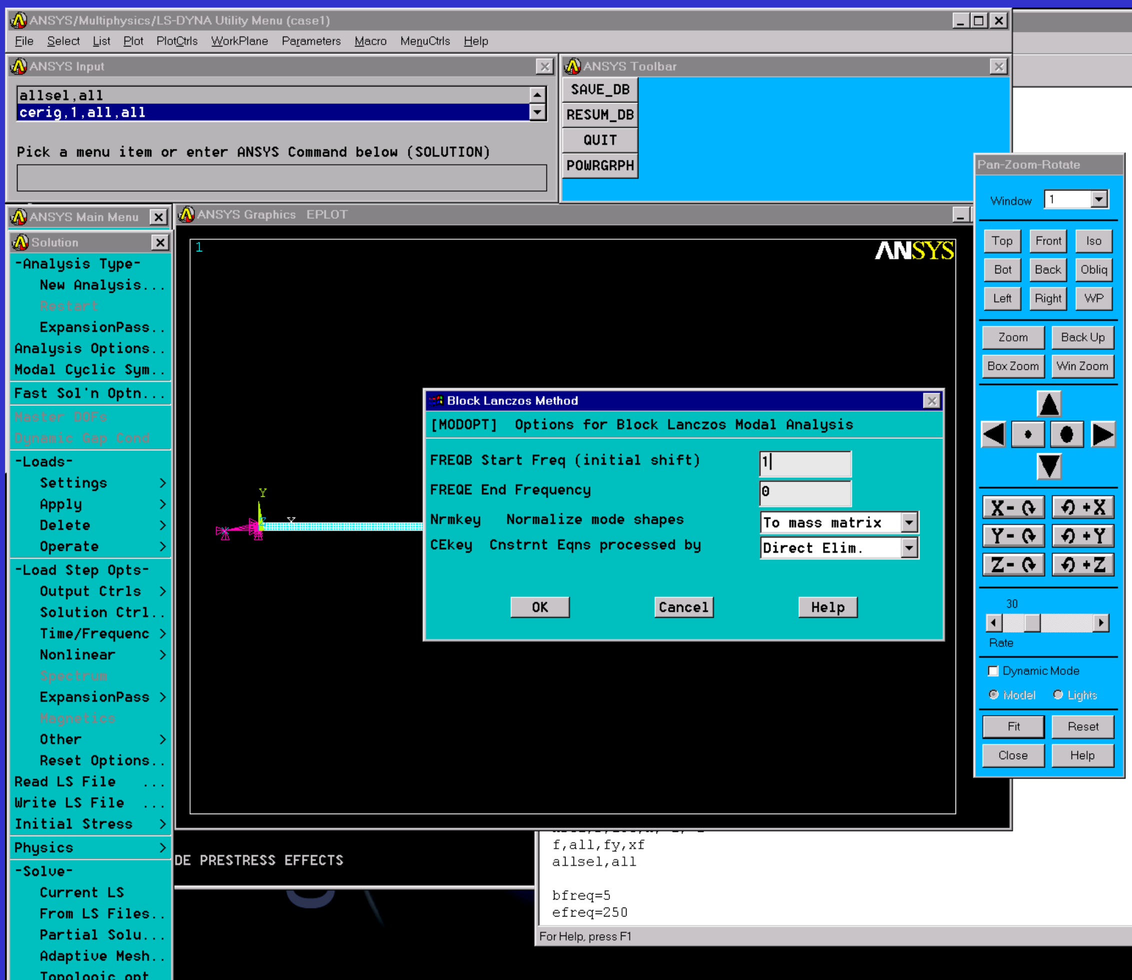
Run Free-Free Modal Analysis



Menu Picks:

Continuation of pervious slide

What’s Happening:

Set the beginning frequency to be 1HZ. This is necessary because there are no constraints on the model, otherwise there would be 6 rigid body modes.

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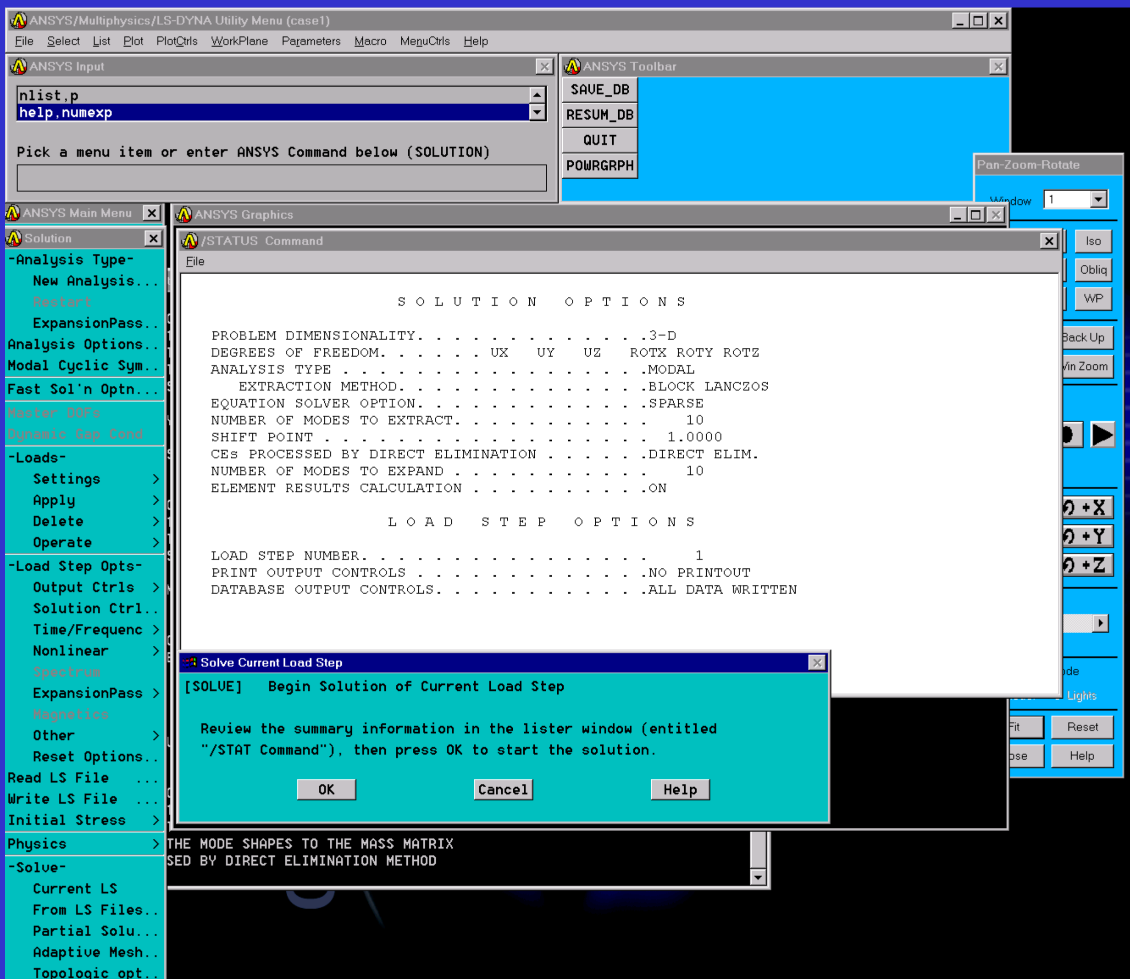
Run Free-Free Modal Analysis



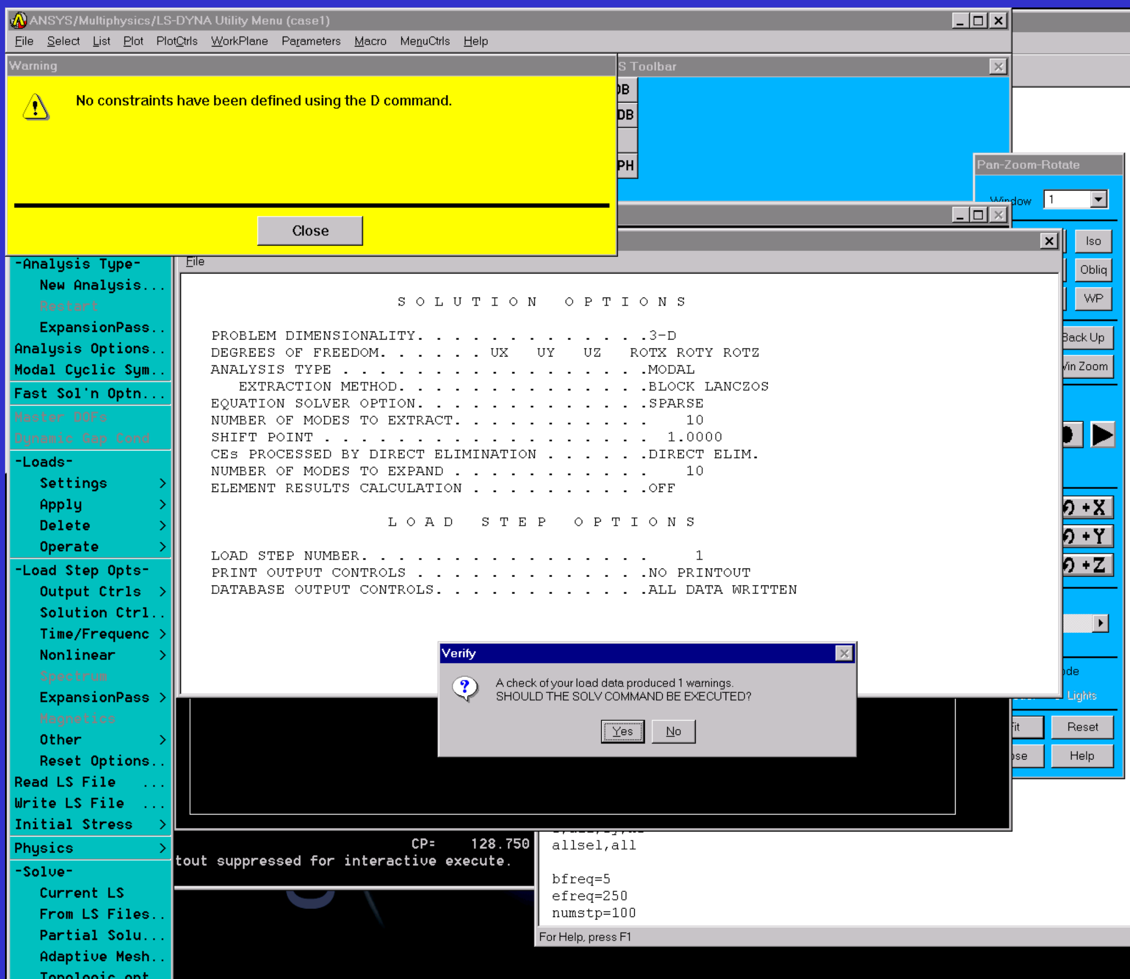
Menu Picks:

Main Menu> Solution> Current LS

What's Happening:

Solving the model using the previously define settings.

Run Free-Free Modal Analysis



Menu Picks:

Continuation of the previously slide

What's Happening:

There are no constraints define and ANSYS will warning you of this fact, but for this model we do not want any constraints (free-free modal analysis).

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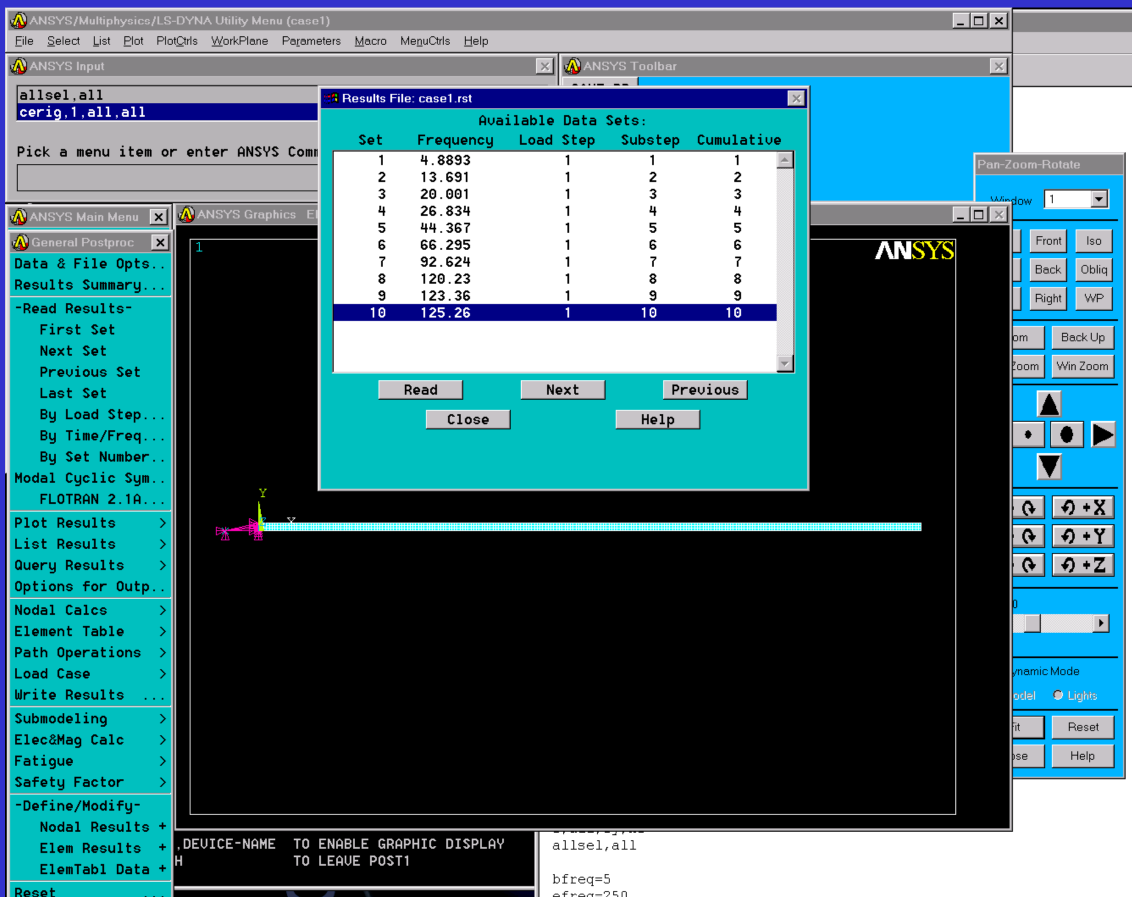
Run Free-Free Modal Analysis



Menu Picks:

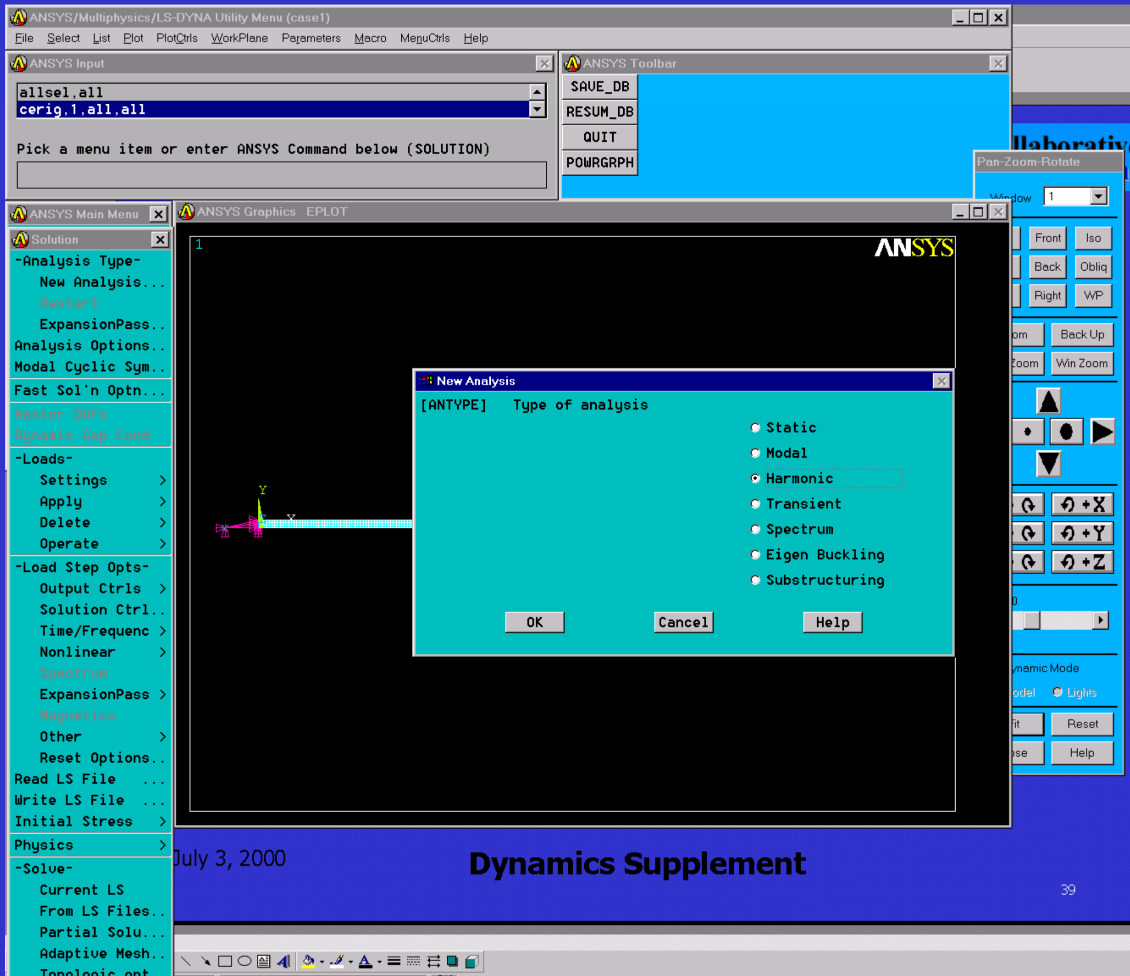
Main Menu> General Postprocessor> Results Summary …

What's Happening:

Listing the modes from the previous modal analysis.

Note this is a free-free modal analysis, but because our base structure is connected to such a massive structure it is as if the base structure is "fixed" where it connects to the large mass.

Run Harmonic Analysis



Menu Picks:

Main Menu> Solution>

New Analysis …

Harmonic

What's Happening:

Setting the analysis type to be harmonic (forced vibrations).

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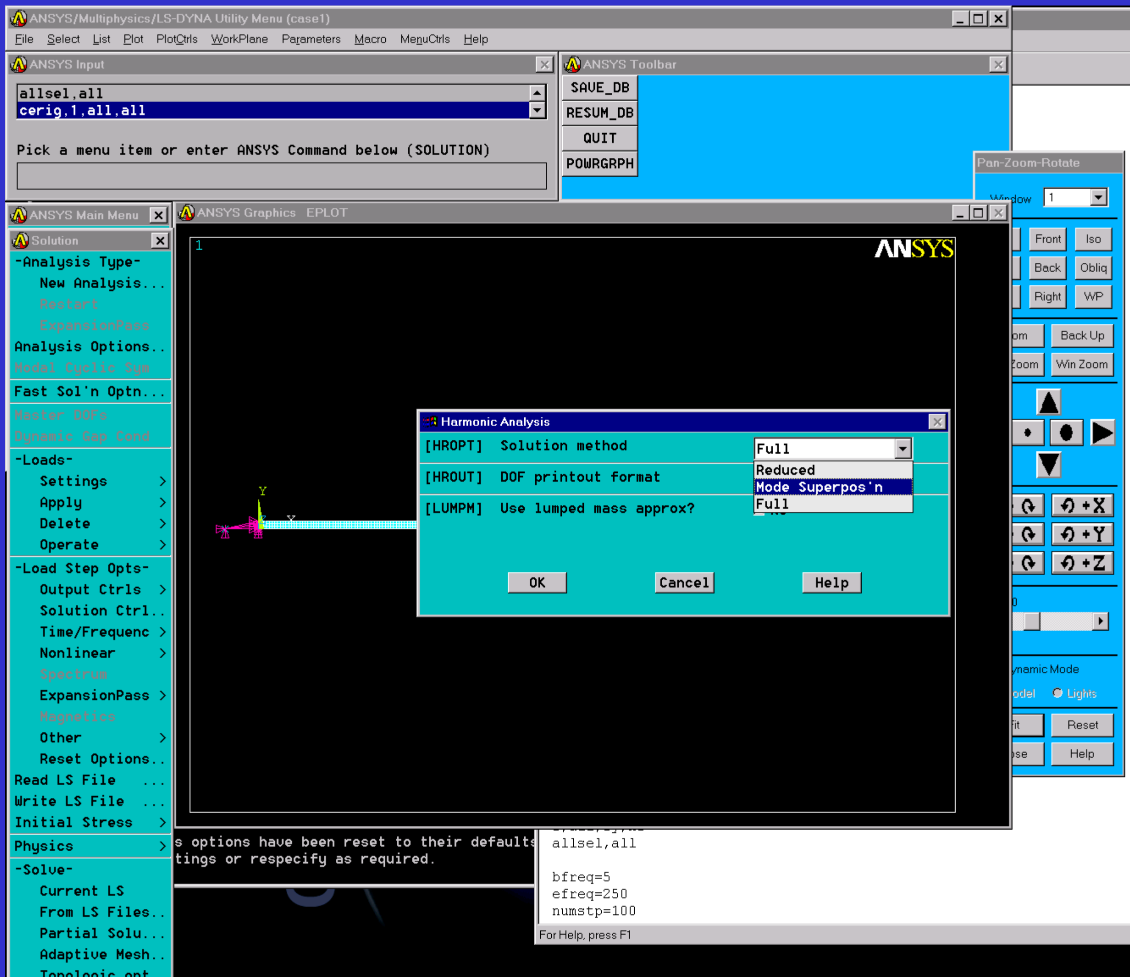
Run Harmonic Analysis



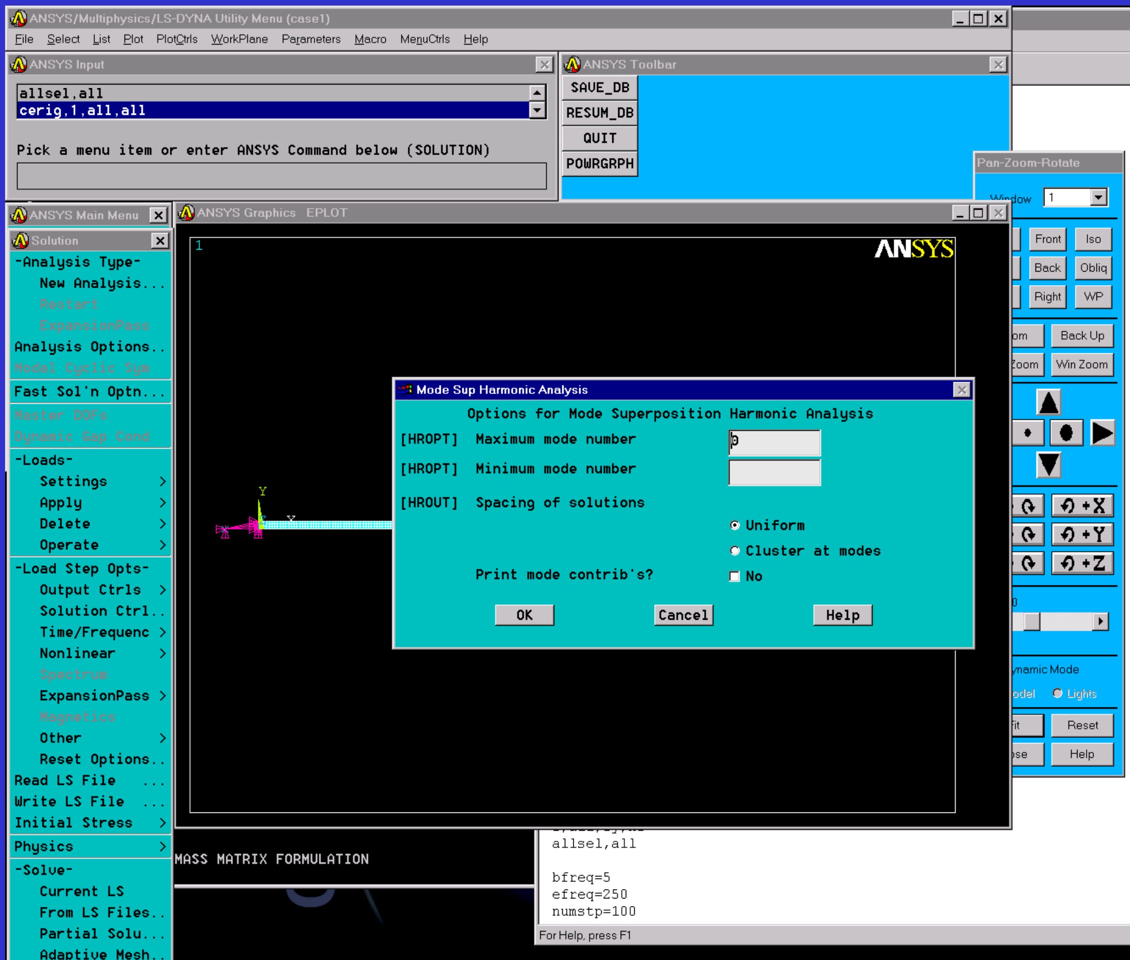
Menu Picks:

Main Menu> Solution> Analysis Options …

What's Happening:

Setting modal super position to be the numerical technique of calculating the harmonic response.

Run Harmonic Analysis



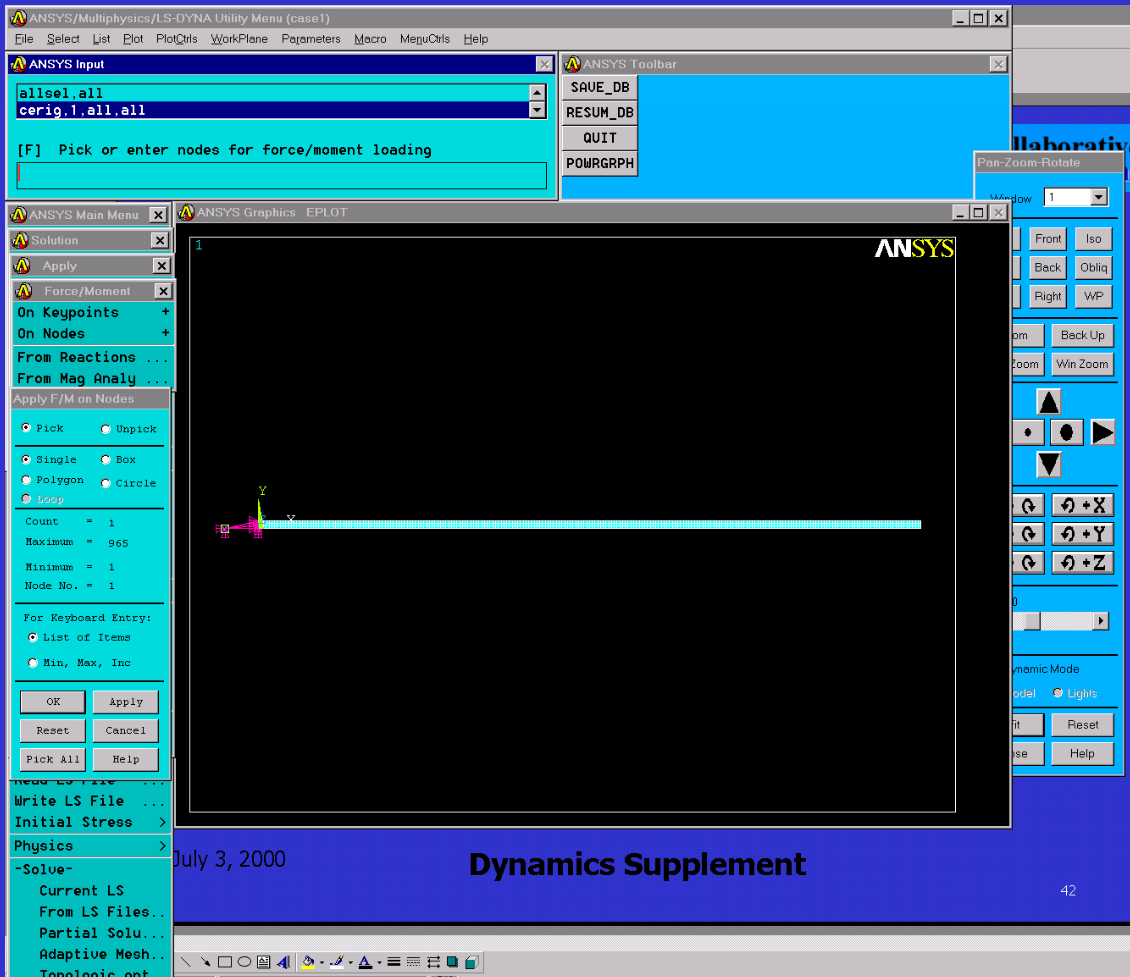
Menu Picks:

Continuation of the previous slide.

What's Happening:

Setting the modes to use for modal super position. By using the default ANSYS will use all the modes.

Run Harmonic Analysis



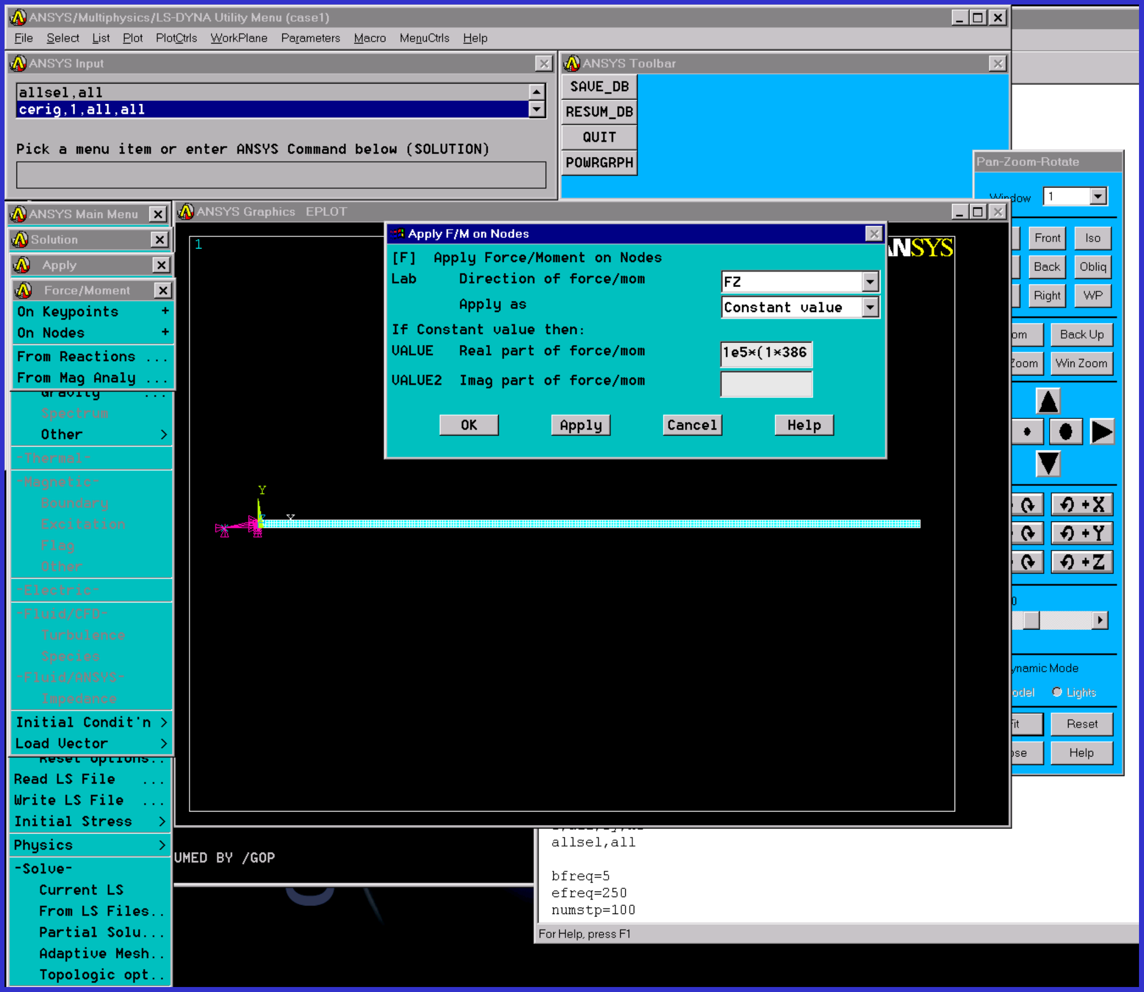
Menu Picks:

Main Menu> Solution>Apply> Force/Moment> On Node …

What's Happening:

Pick the node associated with the large mass.

Run Harmonic Analysis



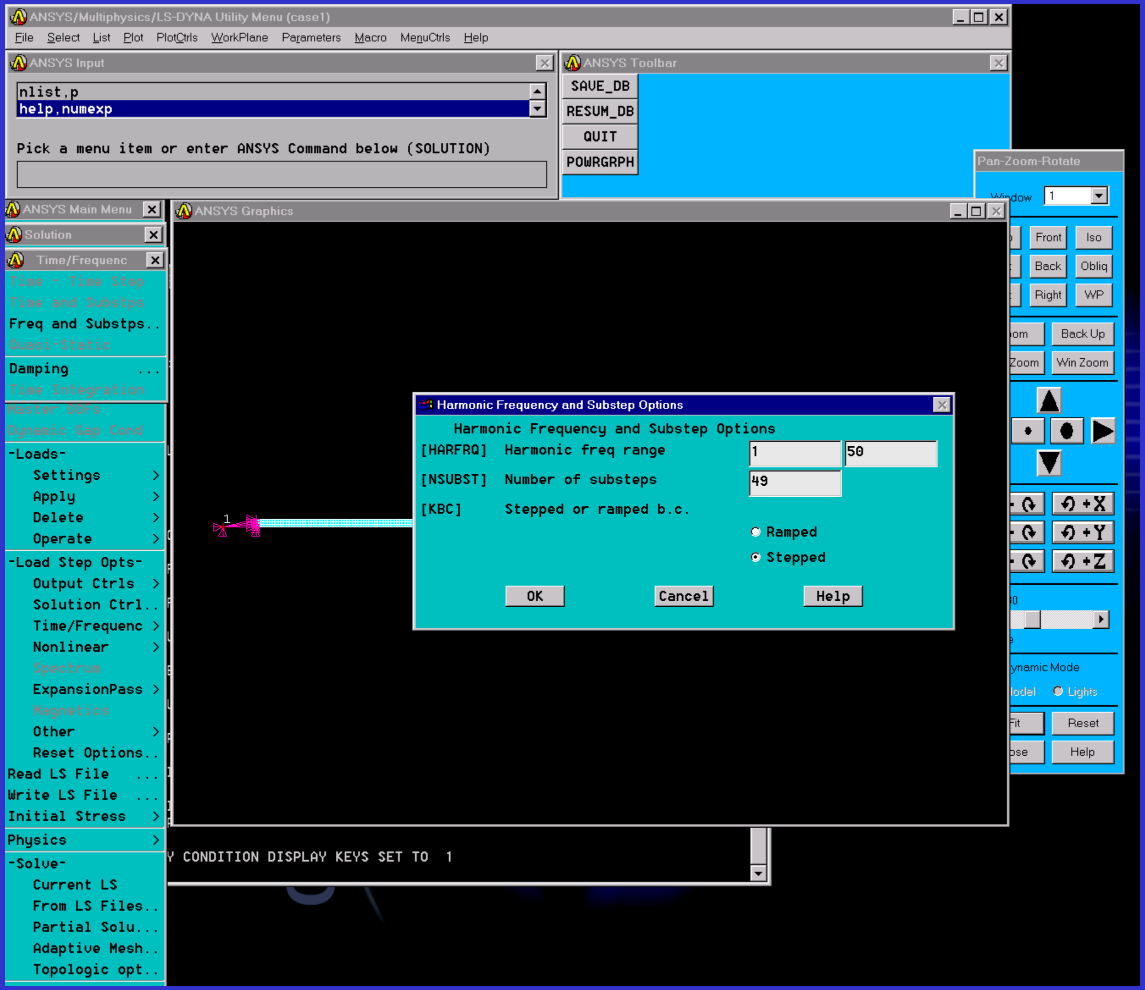
Menu Picks:

Continuation of the previous slide

What's Happening:

Applying a force in the z-direction. The force is the amplitude of the harmonic load. The value of force will be related to the desired acceleration (f=ma). In this example we are applying 1 g of acceleration.

Run Harmonic Analysis



Menu Picks:

Main Menu> Solution> Time Frequency> Freq and Substeps …

What's Happening:

Setting the frequency sweep range and step size.

Note the beginning frequency will be as follows:

sfreq=bfreq+(efreq-bfreq)/nsub

where,

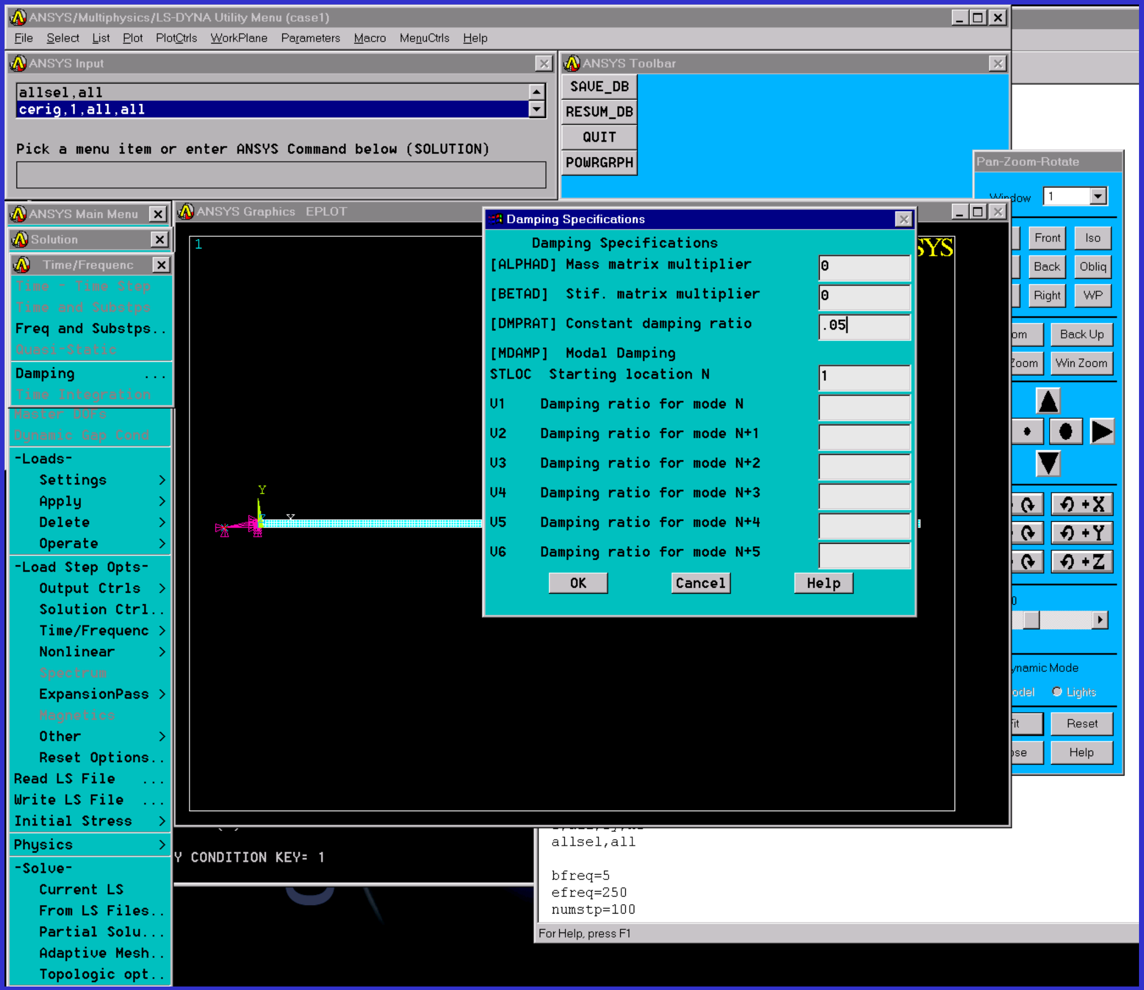
sfreq=1st freq solved for

bfreq=1st freq in the range command

efreq=last freq solved for and the 2nd freq in the range command

nsub= the number of total freq to solve for.

Run Harmonic Analysis



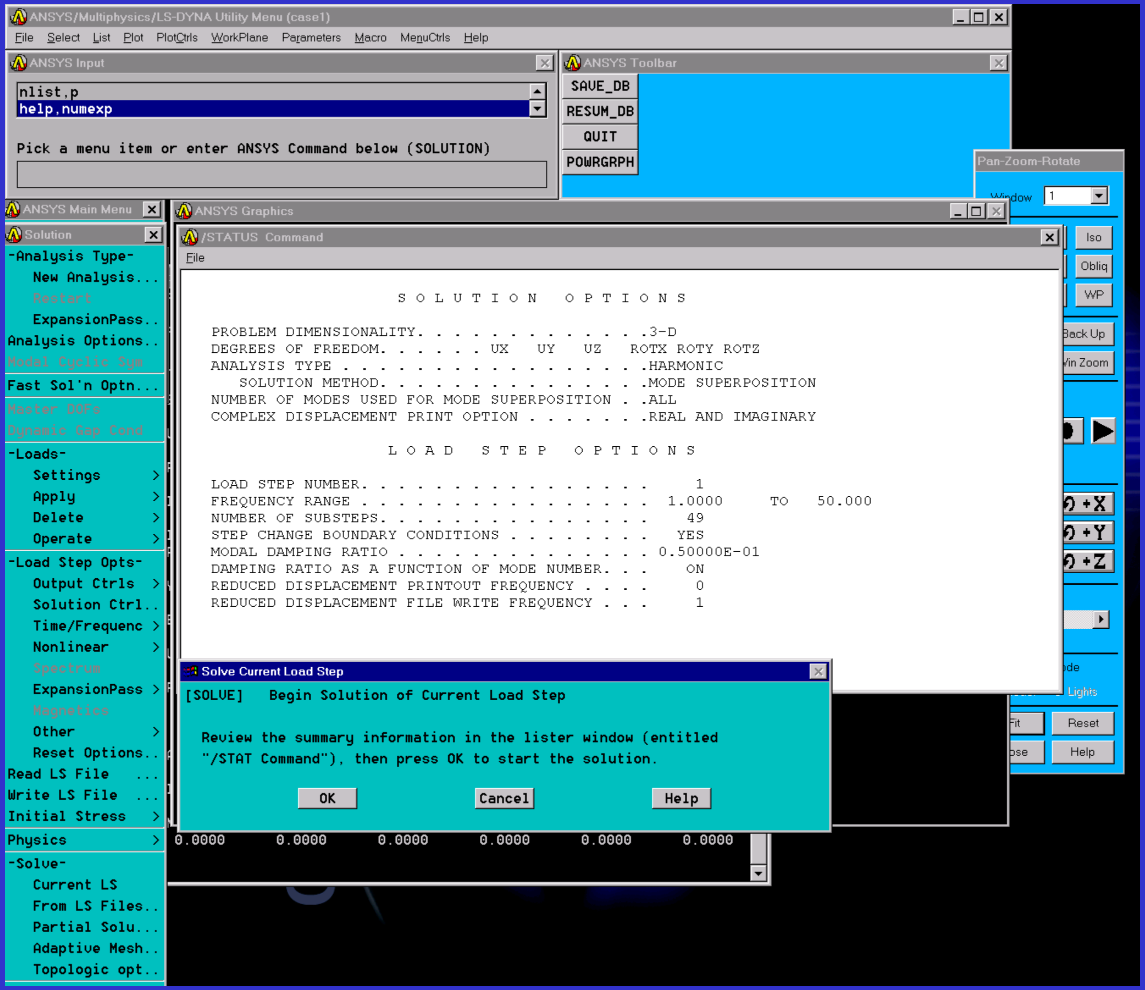
Menu Picks:

Main Menu> Solution>Time Frequency> Damping …

What's Happening:

Setting the constant damping ratio. For our example we are setting this to be .05 of 5%.

Run Harmonic Analysis



Menu Picks:

Main Menu> Solution>Current LS

What's Happening:

Solving the harmonic analysis.

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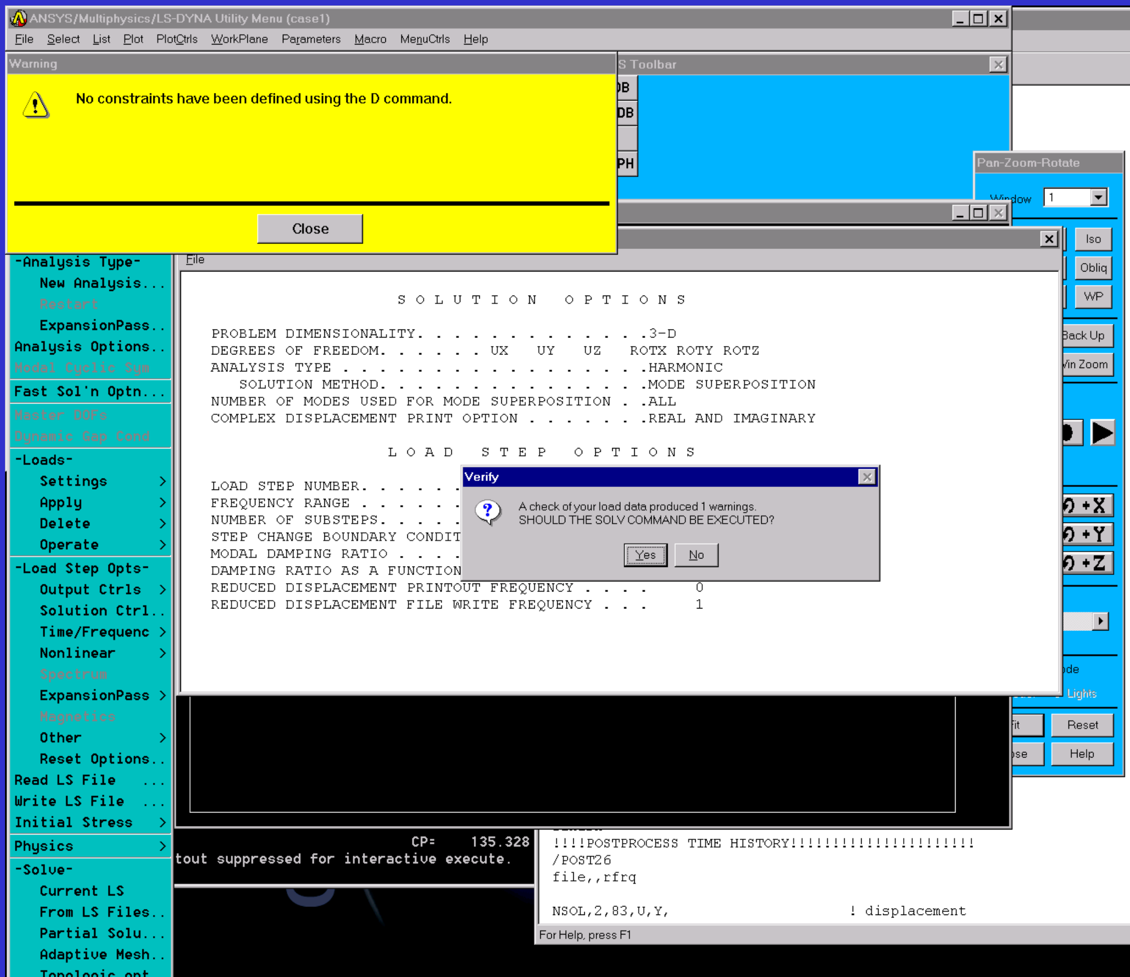
Run Harmonic Analysis



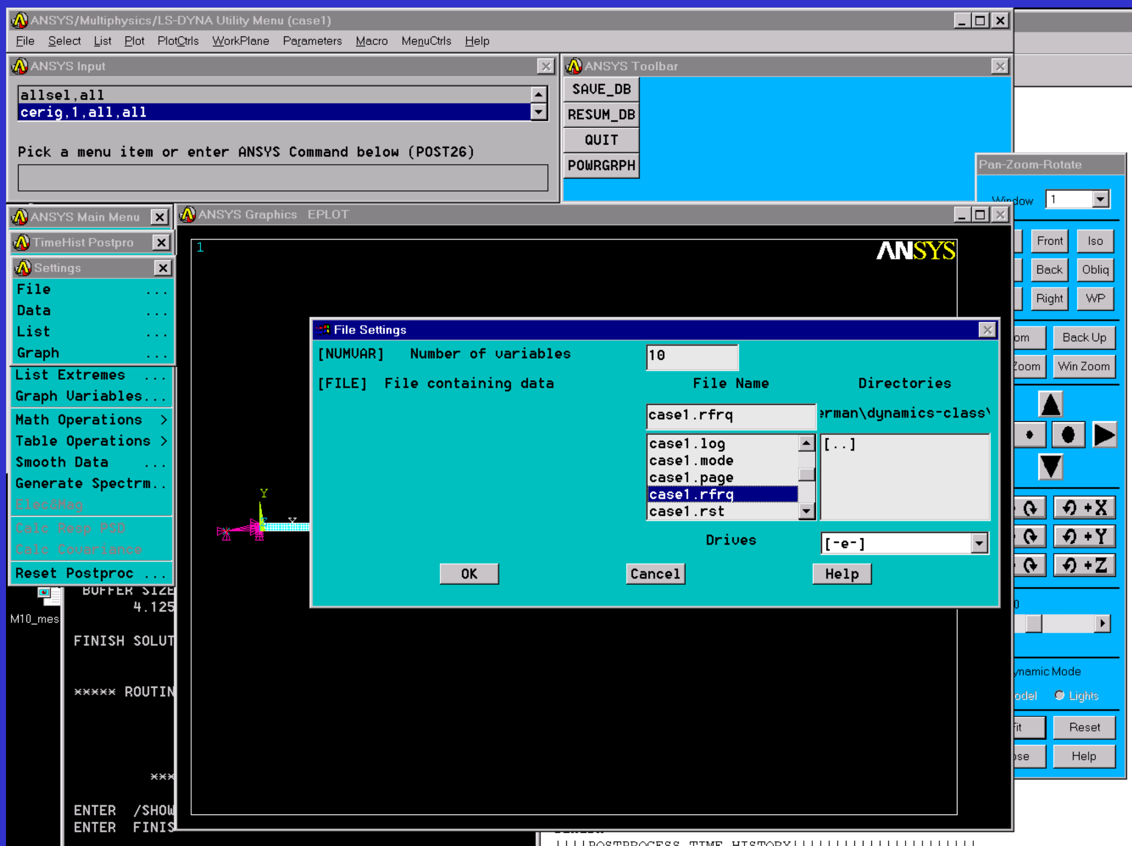
Menu Picks:

Continuation of previous slide

What's Happening:

ANSYS is warning the user that there are no displacement constraints set. We know this, and it is OK for this model.

Post-process Frequency Vs. Response (x-y plots)



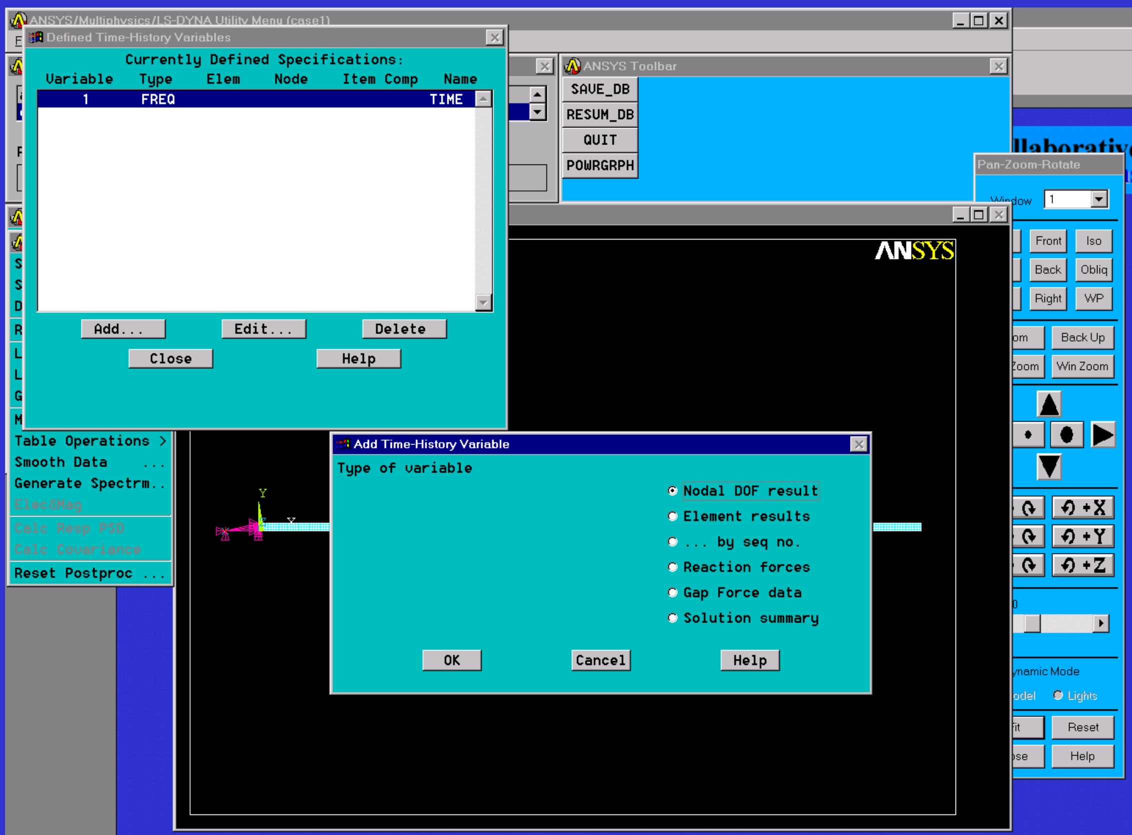
Menu Picks:

Main Menu> TimeHistory Postprocessor> Settings> File…

What's Happening:

Setting the .rfrq file as the file the post processor uses. This is necessary because the default file is the .rst file and because we use modal super position and have not expanded the result all we have is a .rfrq file.

Post-process Frequency Vs. Response (x-y plots)



Menu Picks:

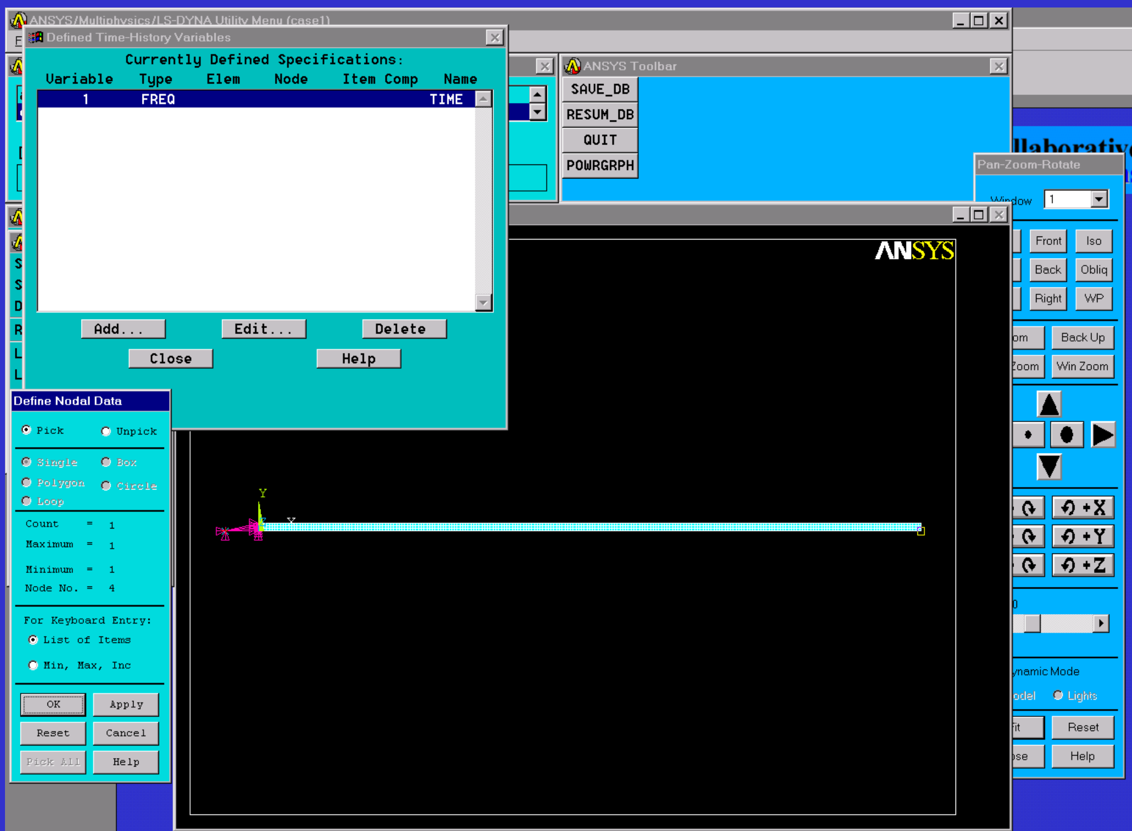
Main Menu> TimeHistory Postprocessor> Define Variables …

Nodal DOF results

What’s Happening:

We are defining results at a node for later post processing. This will allow us to plot x-y plot of results vs.. frequency.

Post-process Frequency Vs. Response (x-y plots)



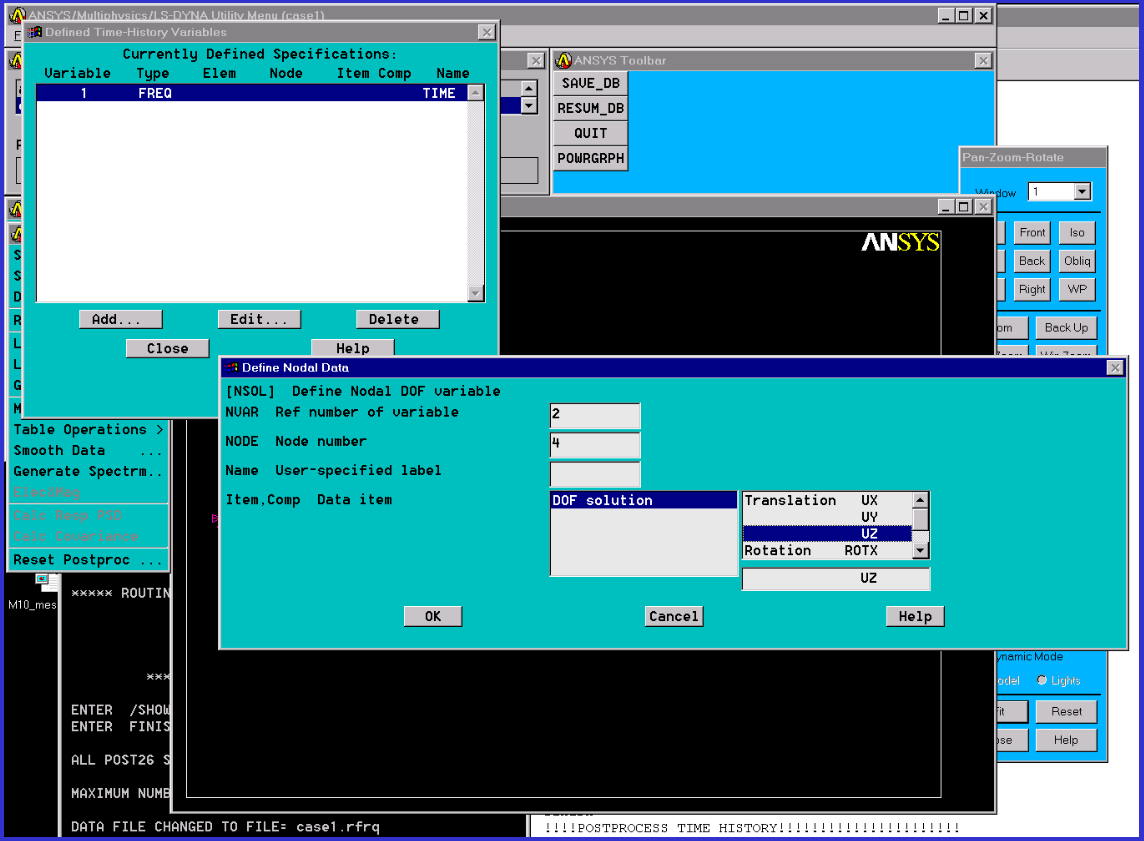
Menu Picks:

Continuation of previous slide

What's Happening:

Picking the node we would like to define the results of.

Post-process Frequency Vs. Response (x-y plots)



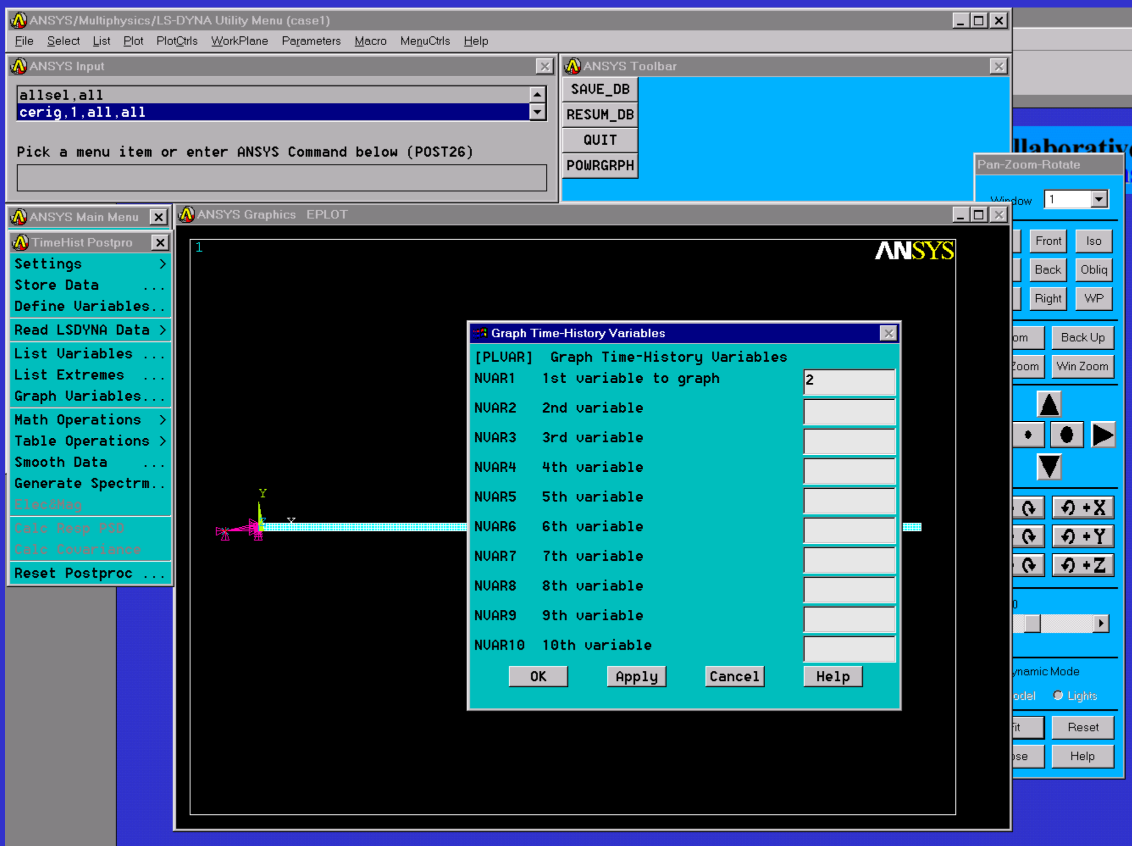
Menu Picks:

Continuation of previous slide.

What's Happening:

Defining the specific result we would like to define. In this example we are defining displacement in the z direction.

Post-process Frequency Vs. Response (x-y plots)



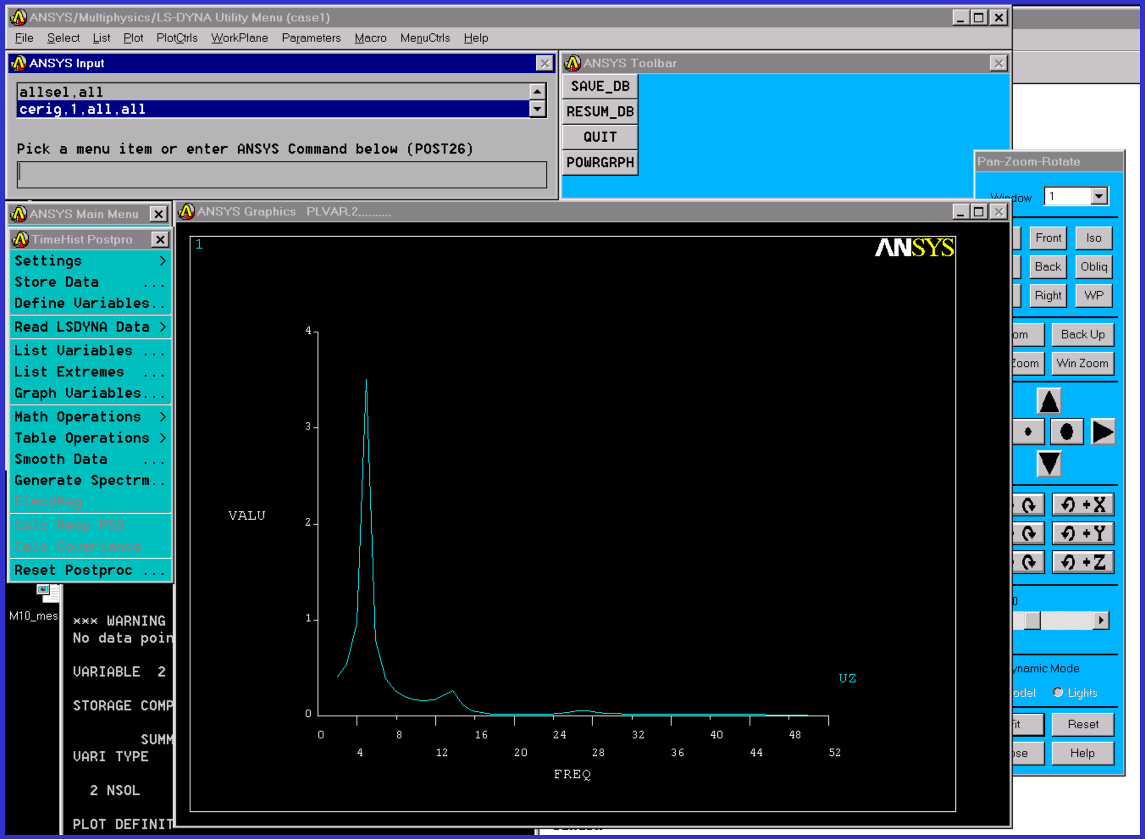
Menu Picks:

Main Menu> TimeHistory Postprocessor> Graph Variables ...

What's Happening:

Graphing the results of the variable we had just defined.

Post-process Frequency Vs. Response (x-y plots)



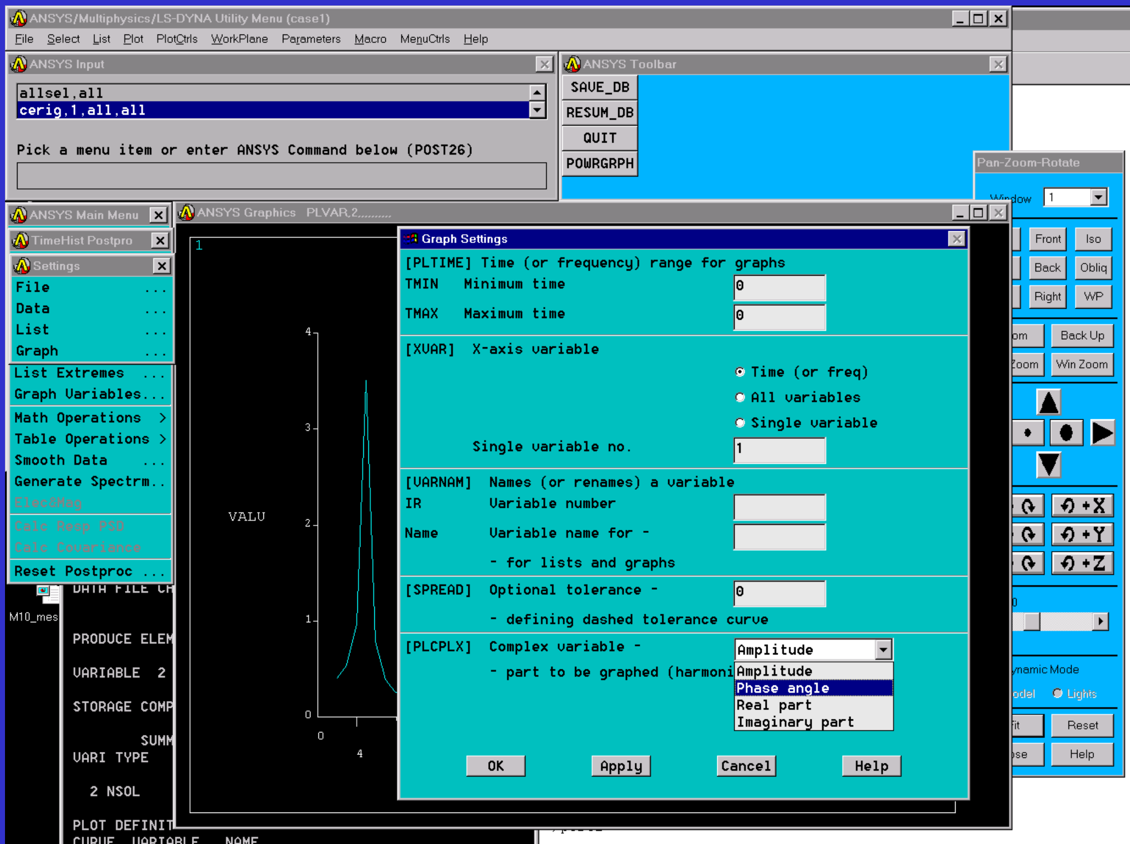
Menu Picks:

Continuation of the previous slide

What's Happening:

x-y plot of response (amplitude) vs. frequency. For this example this is UZ Vs. Frequency.

Post-process Frequency Vs. Response (x-y plots)



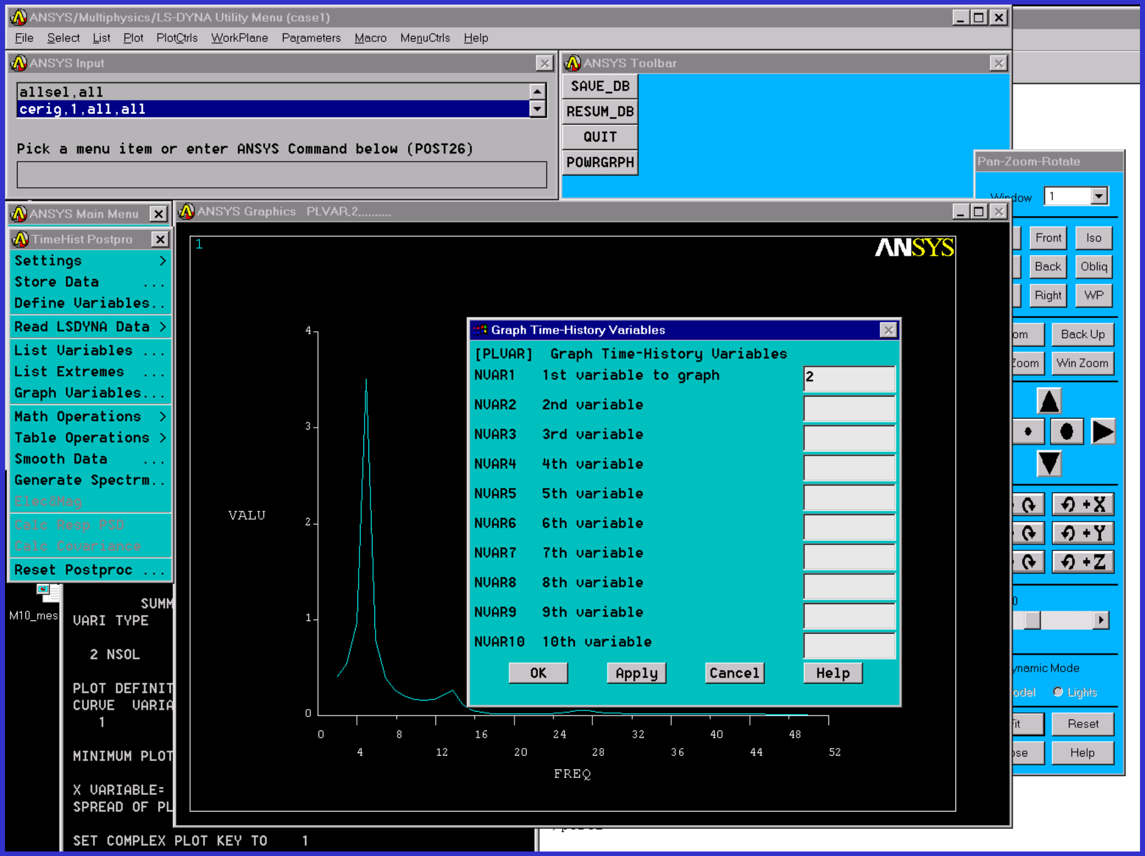
Menu Picks:

Main Menu> TimeHistory Postprocessor> Settings> Graph …

What’s Happening:

The previous plot was amplitude (the default) of the UZ vs. frequency. By changing from amplitude to phase angle you can plot phase angle of UZ vs. frequency.

Post-process Frequency Vs. Response (x-y plots)



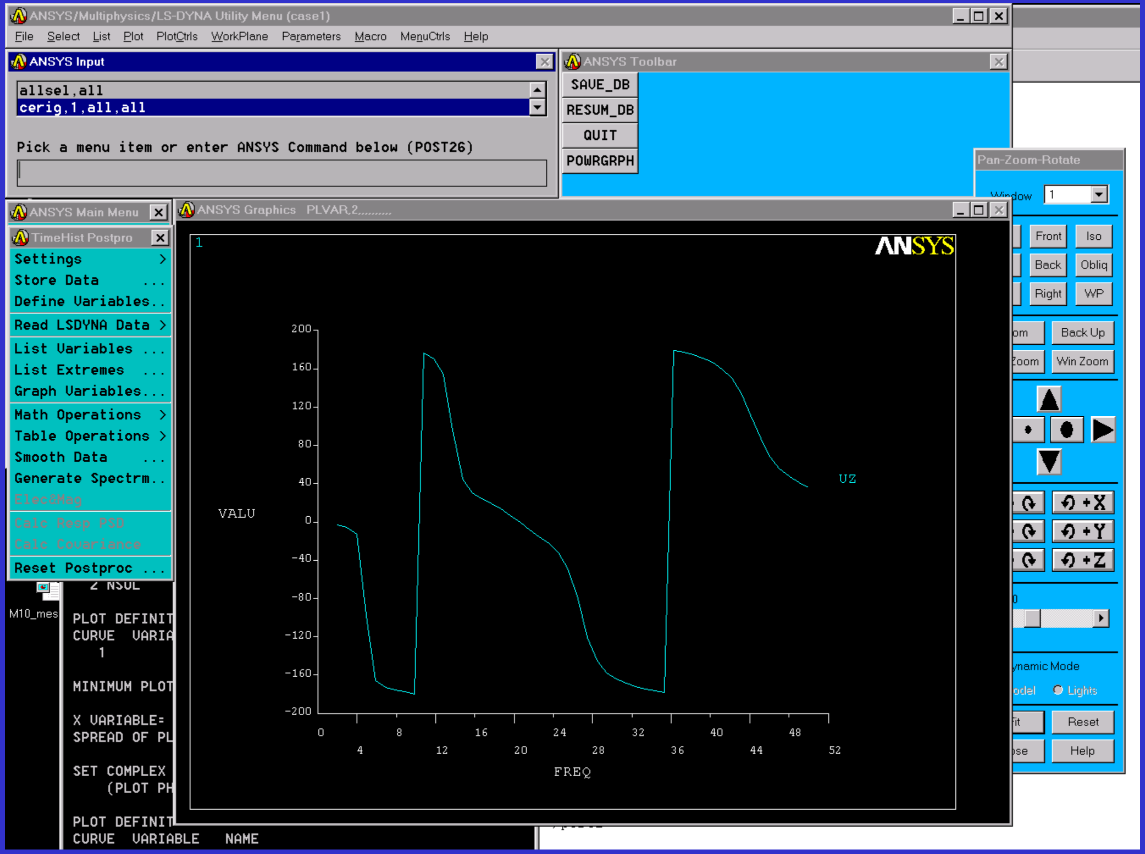
Menu Picks:

Main Menu> TimeHistory Postprocessor> Graph Variables ...

What's Happening:

Graphing the results of the variable we had just defined.

Post-process Frequency Vs. Response (x-y plots)



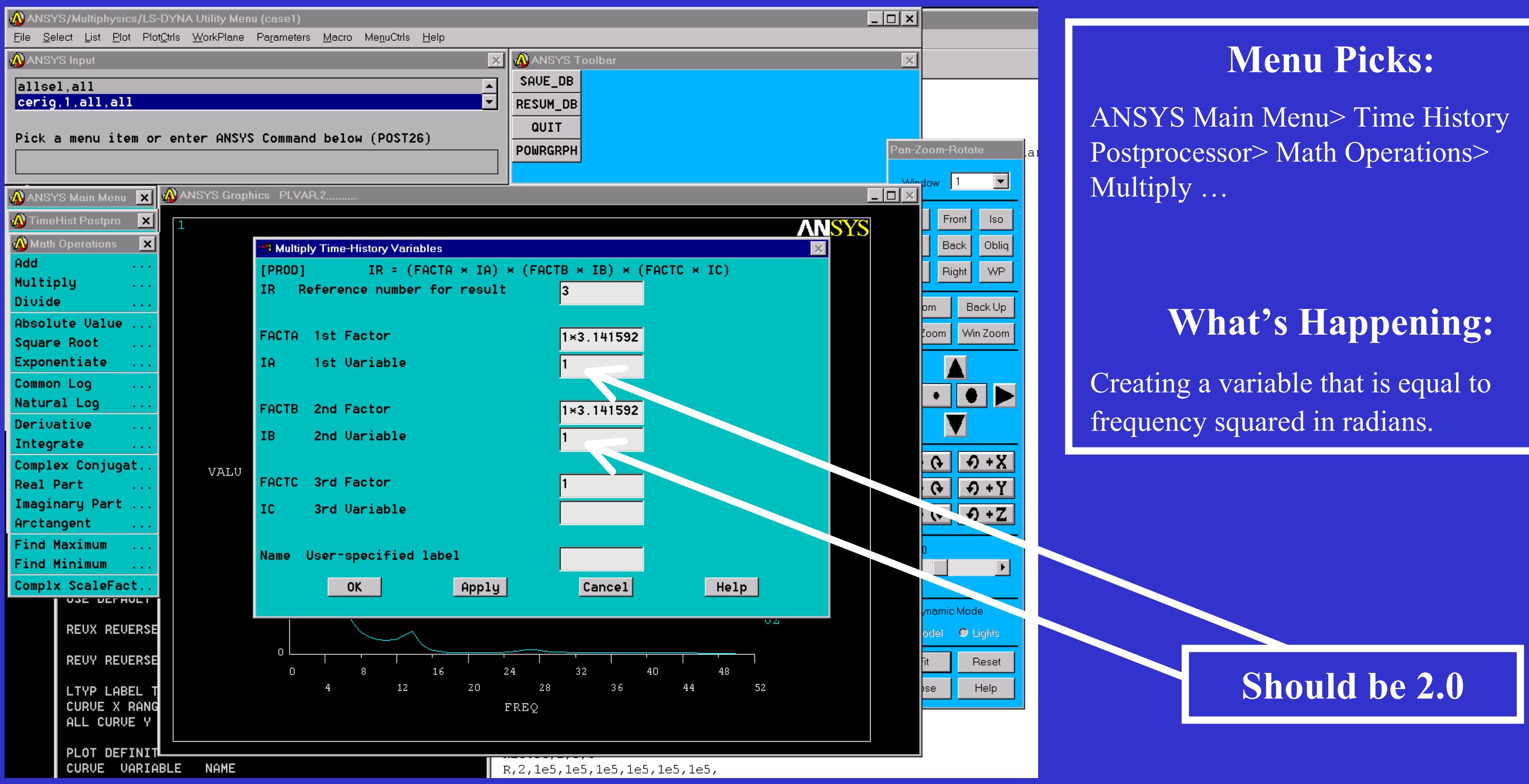
Menu Picks:

Continuation of the previous slide

What's Happening:

x-y plot of response (phase angle) vs. frequency. For this example this is UZ Vs. Frequency.

Post-process Frequency Vs. Response (x-y plots)



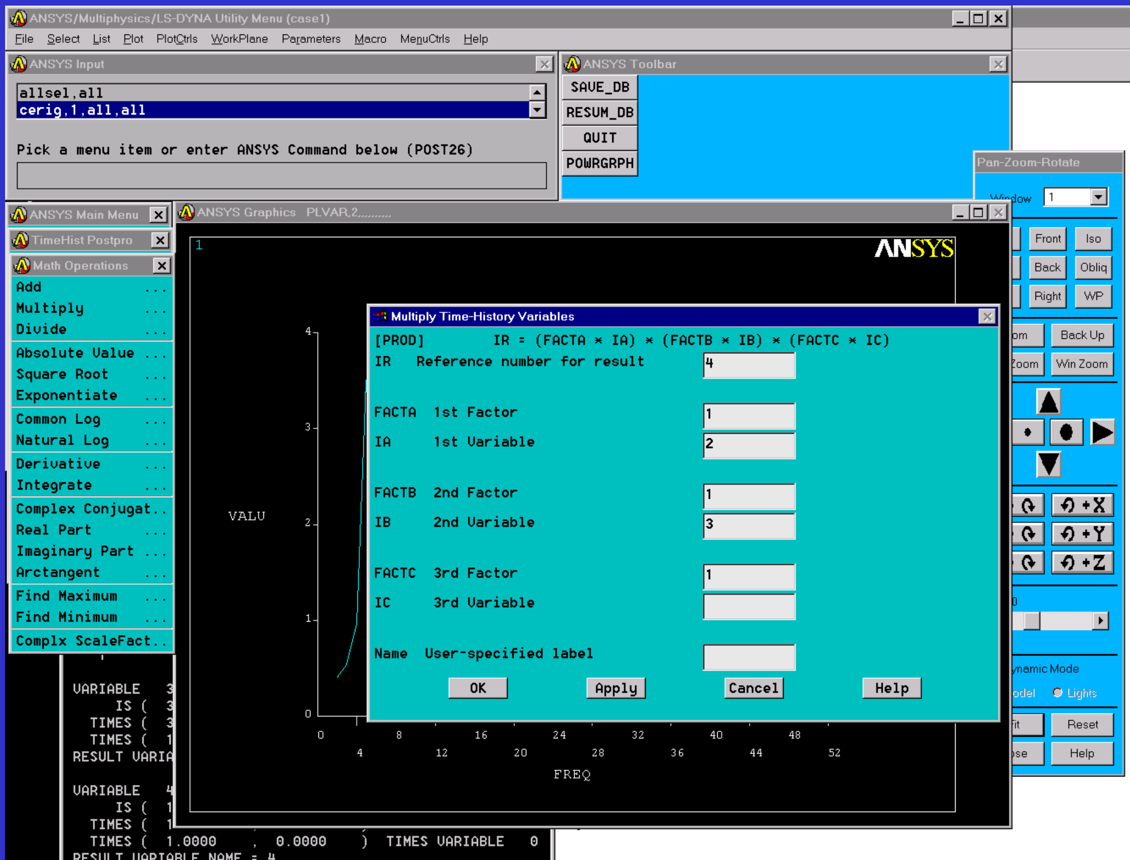
Menu Picks:

ANSYS Main Menu> Time History Postprocessor> Math Operations> Multiply …

What's Happening:

Creating a variable that is equal to frequency squared in radians.

Post-process Frequency Vs. Response (x-y plots)



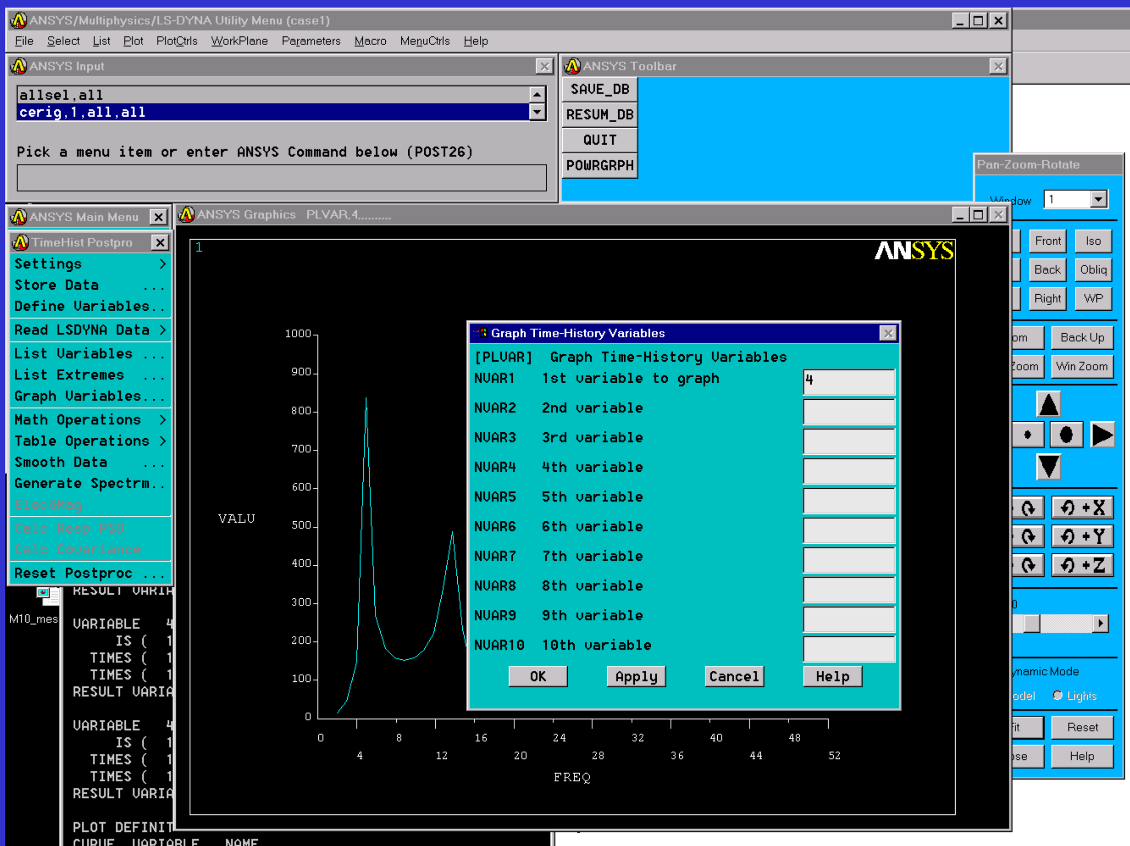
Menu Picks:

ANSYS Main Menu> Time History Postprocessor> Math Operations> Multiply …

What’s Happening:

Creating a variable that is equal to UZ (variable 2) times frequency squared. This will be acceleration.

Post-process Frequency Vs. Response (x-y plots)



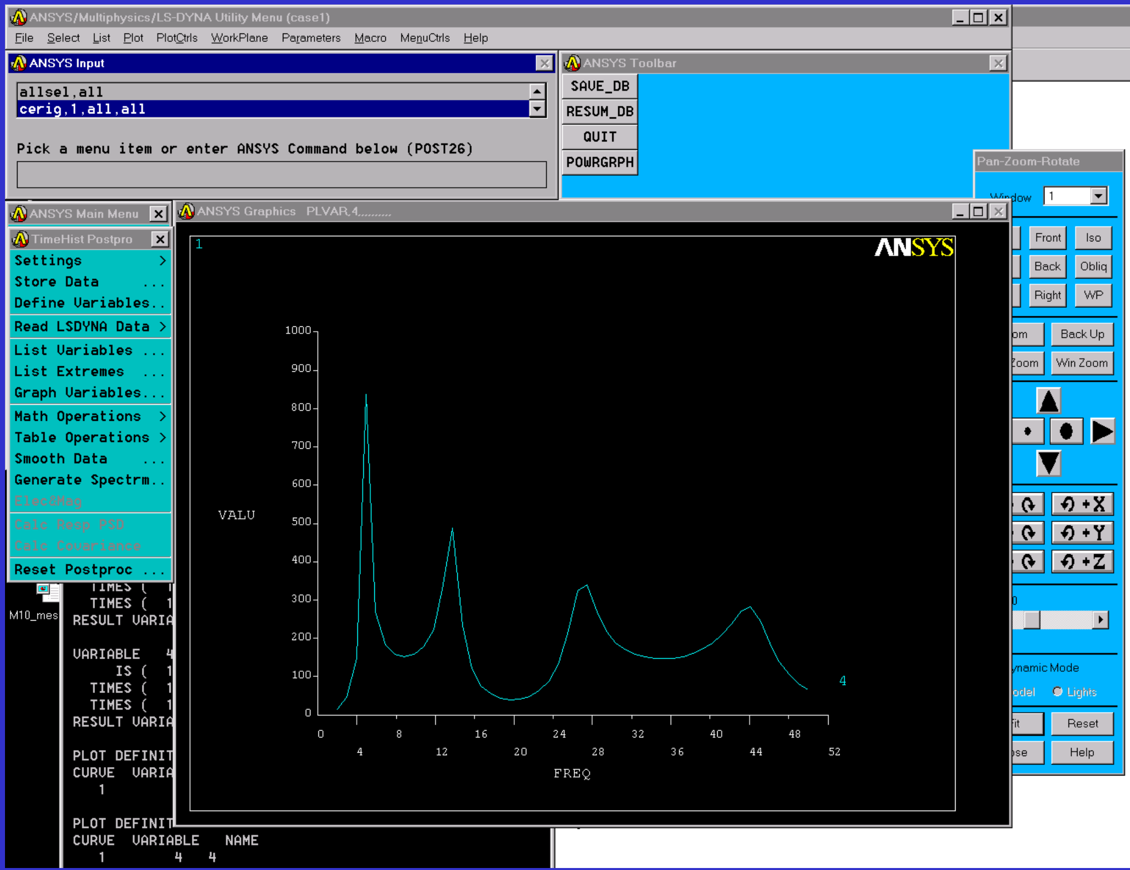
Menu Picks:

ANSYS Main Menu> Time History Postprocessor> Graph Variables …

What's Happening:

Plotting variable 4 (this was previously created). This will result in a plot of acceleration vs. frequency.

Post-process Frequency Vs. Response (x-y plots)



Menu Picks:

Continuation of the previous slide

What's Happening:

x-y plot of response (amplitude) vs. frequency. For this example this is acceleration Vs. Frequency.

Note: The step of setting the graph back to amplitude was not shown. If you did not do this please set the graphs back to amplitude.

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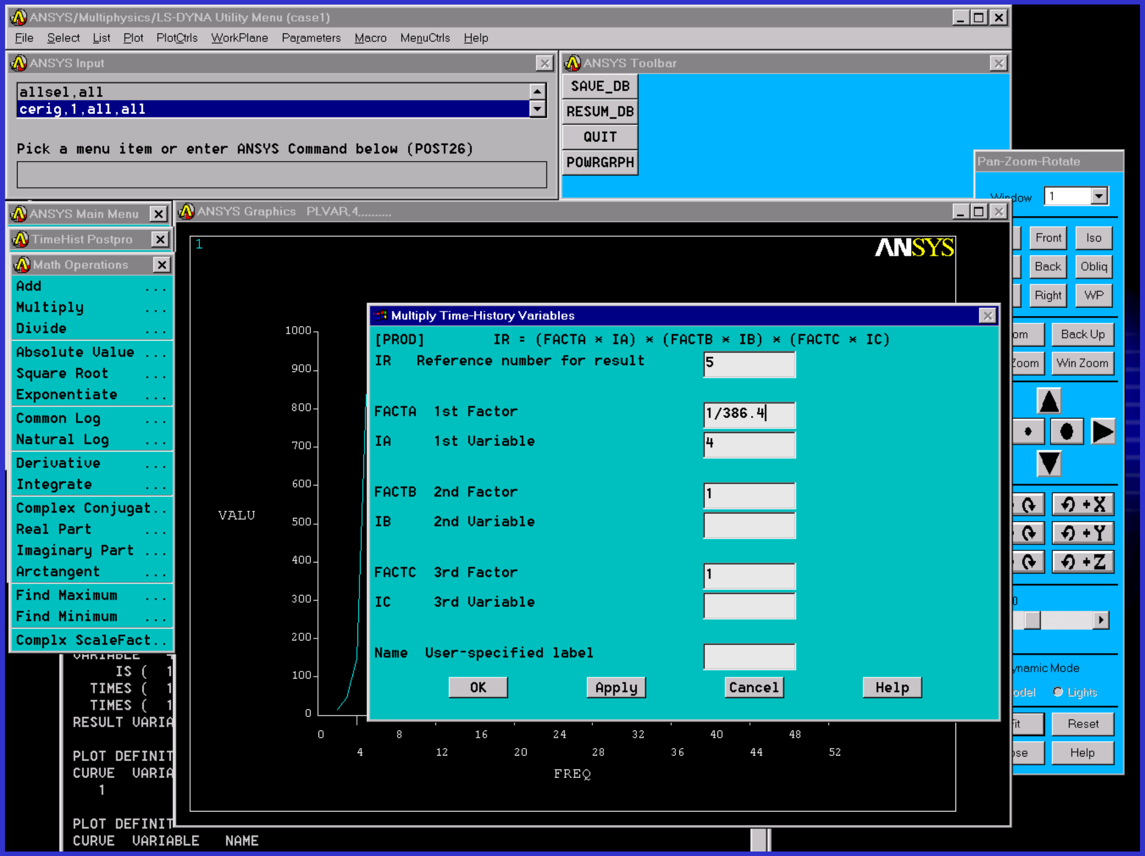
Post-process Frequency Vs. Response (x-y plots)



Menu Picks:

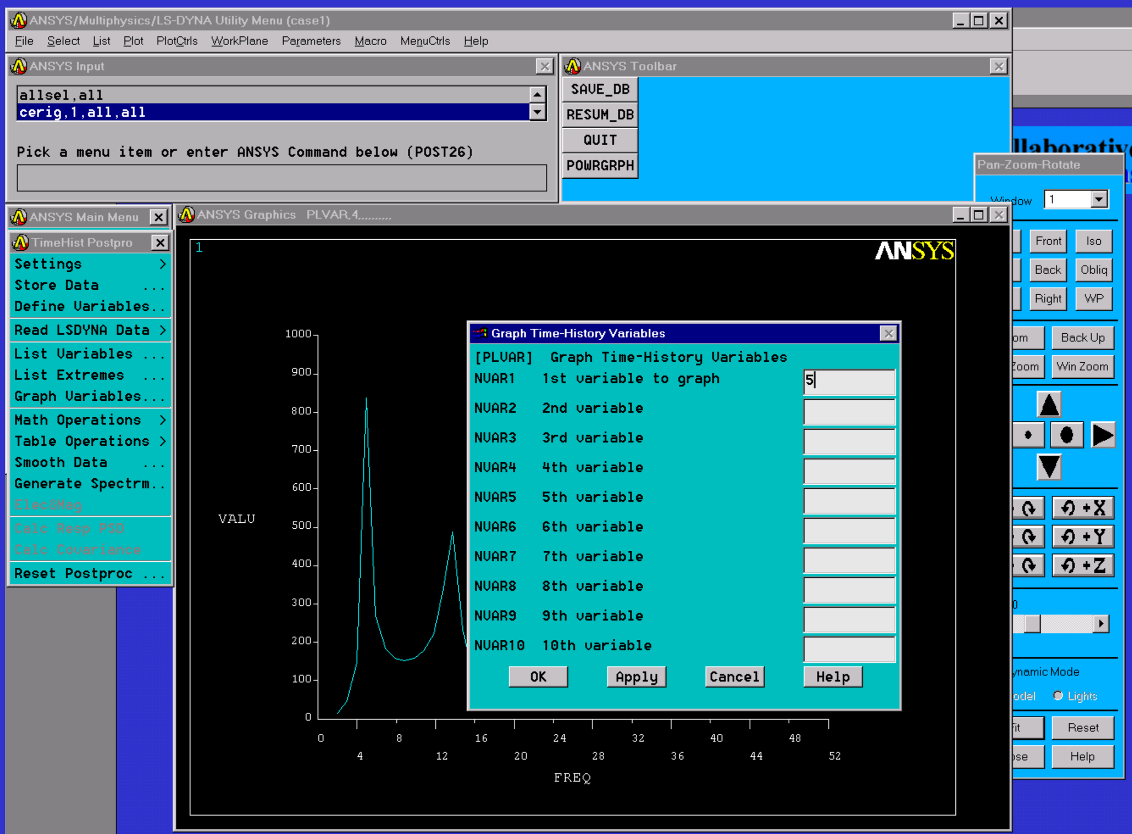
ANSYS Main Menu> Time History Postprocessor> Math Operations> Multiply …

What's Happening:

Creating a variable that is equal to UZ (variable 2) times frequency squared times 1/gravity. This will be g's.

Note depending on the system of unit being used the user may have to use different values of gravity.

Post-process Frequency Vs. Response (x-y plots)



Menu Picks:

ANSYS Main Menu> Time History Postprocessor> Graph Variables …

What’s Happening:

Plotting variable 5 (this was previously created). This will result in a plot of g’s vs. frequency.

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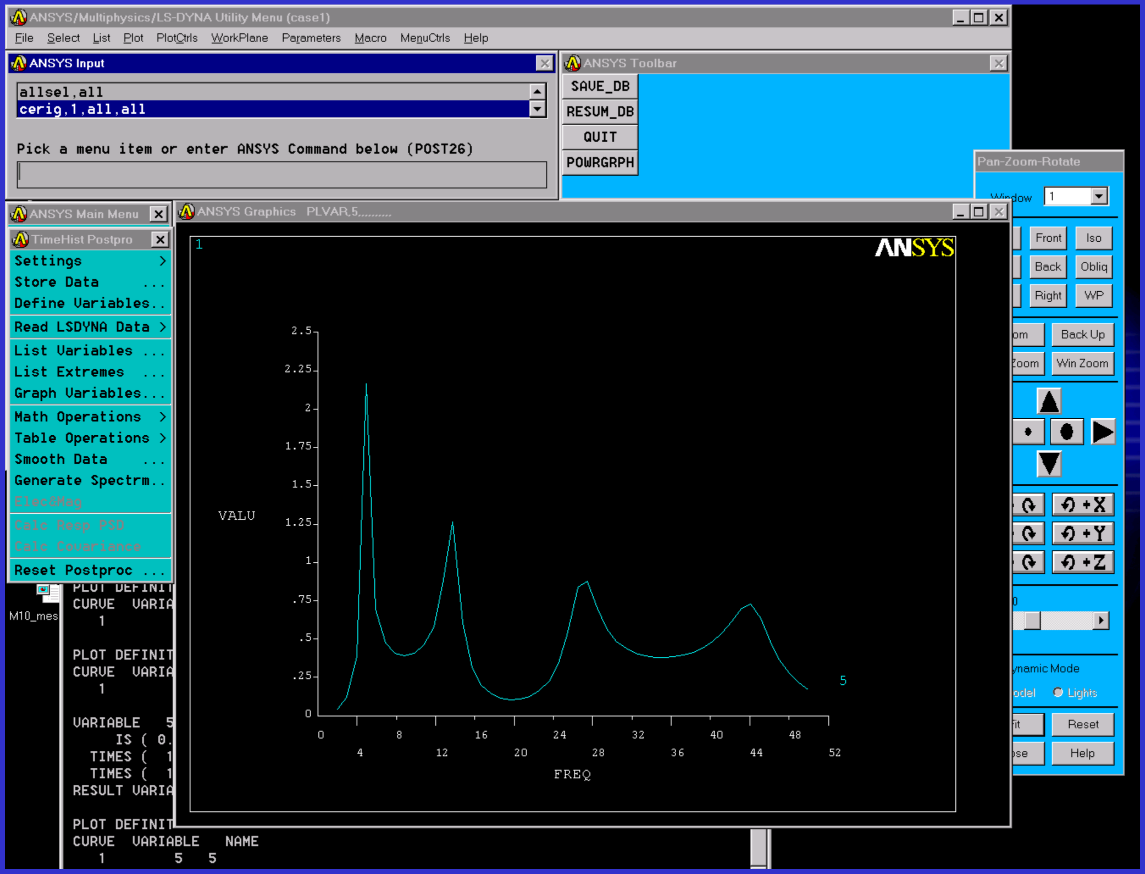
Post-process Frequency Vs. Response (x-y plots)



Menu Picks:

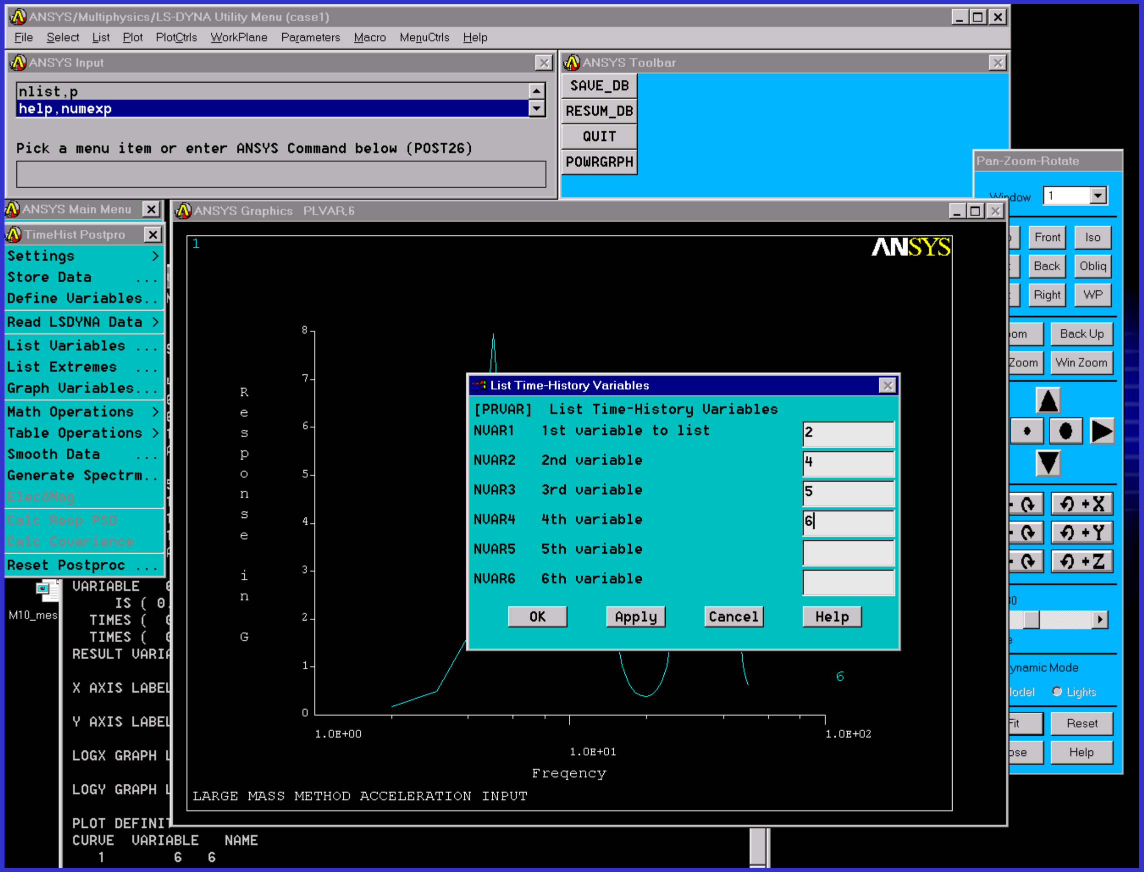
Continuation of the previous slide

What's Happening:

x-y plot of response (amplitude) vs. frequency. For this example this is g's Vs. Frequency.

Note: The step of setting the graph back to amplitude was not shown. If you did not do this please set the graphs back to amplitude.

Post-process Frequency Vs. Response (x-y plots)



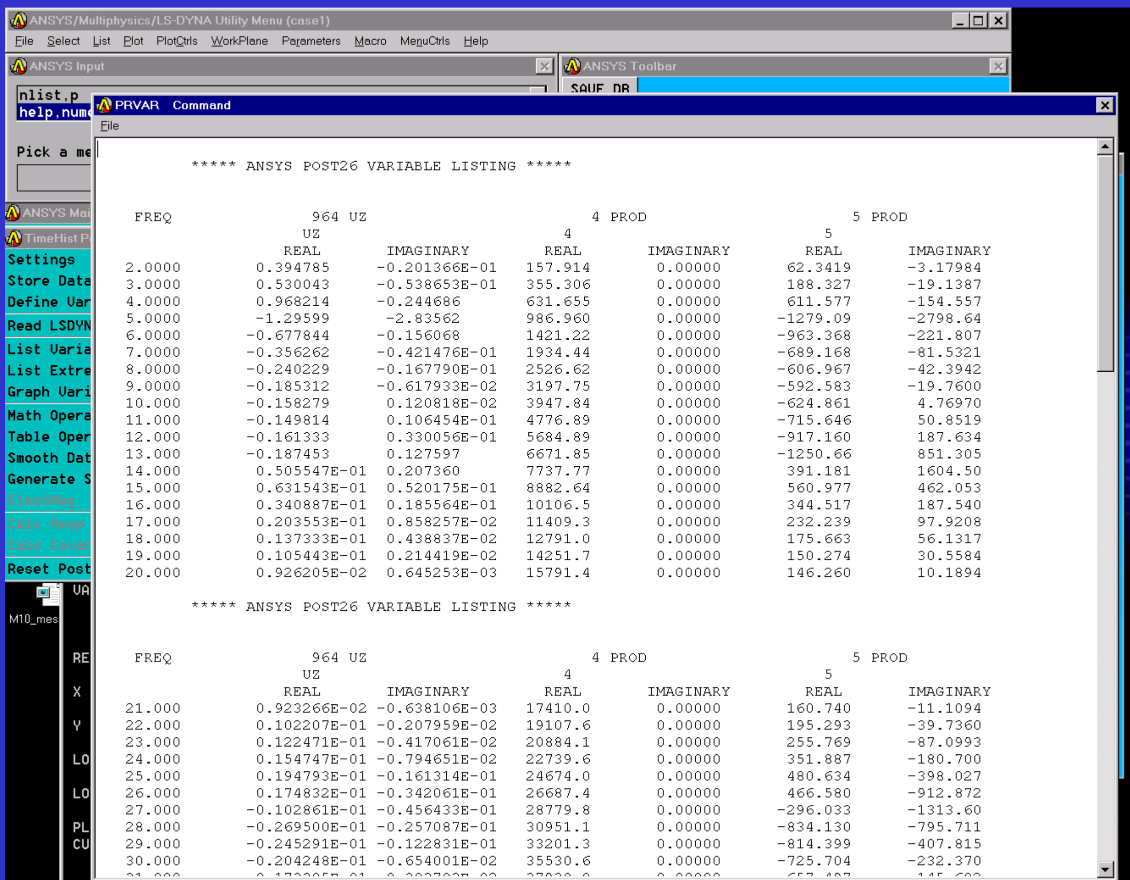
Menu Picks:

ANSYS Main Menu> Time History Postprocessor> List Variables …

What's Happening:

Creating a list of all the variables create thus far in this example.

Post-process Frequency Vs. Response (x-y plots)



FREQ	964 UZ UZ REAL	IMAGINARY	4 PROD 4 REAL	IMAGINARY	5 PROD 5 REAL	IMAGINARY
2.0000	0.394785	-0.201366E-01	157.914	0.00000	62.3419	-3.17984
3.0000	0.530043	-0.538653E-01	355.306	0.00000	188.327	-19.1387
4.0000	0.968214	-0.244686	631.655	0.00000	611.577	-154.557
5.0000	-1.29599	-2.83562	986.960	0.00000	-1279.09	-2798.64
6.0000	-0.677844	-0.156068	1421.22	0.00000	-963.368	-221.807
7.0000	-0.356262	-0.421476E-01	1934.44	0.00000	-689.168	-81.5321
8.0000	-0.240229	-0.167790E-01	2526.62	0.00000	-606.967	-42.3942
9.0000	-0.185312	-0.617933E-02	3197.75	0.00000	-592.583	-19.7600
10.000	-0.158279	0.120818E-02	3947.84	0.00000	-624.861	4.76970
11.000	-0.149814	0.106454E-01	4776.89	0.00000	-715.646	50.8519
12.000	-0.161333	0.330056E-01	5684.89	0.00000	-917.160	187.634
13.000	-0.187453	0.127597	6671.85	0.00000	-1250.66	851.305
14.000	0.505547E-01	0.207360	7737.77	0.00000	391.181	1604.50
15.000	0.631543E-01	0.520175E-01	8882.64	0.00000	560.977	462.053
16.000	0.340887E-01	0.185564E-01	10106.5	0.00000	344.517	187.540
17.000	0.203553E-01	0.858257E-02	11409.3	0.00000	232.239	97.9208
18.000	0.137333E-01	0.438837E-02	12791.0	0.00000	175.663	56.1317
19.000	0.105443E-01	0.214419E-02	14251.7	0.00000	150.274	30.5584
20.000	0.926205E-02	0.645253E-03	15791.4	0.00000	146.260	10.1894

***** ANSYS POST26 VARIABLE LISTING *****

FREQ	964 UZ UZ REAL	IMAGINARY	4 PROD 4 REAL	IMAGINARY	5 PROD 5 REAL	IMAGINARY
21.000	0.923266E-02	-0.638106E-03	17410.0	0.00000	160.740	-11.1094
22.000	0.102207E-01	-0.207959E-02	19107.6	0.00000	195.293	-39.7360
23.000	0.122471E-01	-0.417061E-02	20884.1	0.00000	255.769	-87.0993
24.000	0.154747E-01	-0.794651E-02	22739.6	0.00000	351.887	-180.700
25.000	0.194793E-01	-0.161314E-01	24674.0	0.00000	480.634	-398.027
26.000	0.174832E-01	-0.342061E-01	26687.4	0.00000	466.580	-912.872
27.000	-0.102861E-01	-0.456433E-01	28779.8	0.00000	-296.033	-1313.60
28.000	-0.269500E-01	-0.257087E-01	30951.1	0.00000	-834.130	-795.711
29.000	-0.245291E-01	-0.122831E-01	33201.3	0.00000	-814.399	-407.815
30.000	-0.204248E-01	-0.654001E-02	35530.6	0.00000	-725.704	-232.370

Menu Picks:

Continuation of the previous slide

What's Happening:

List of all the variables created thus far.

Note the list is real and imaginary.

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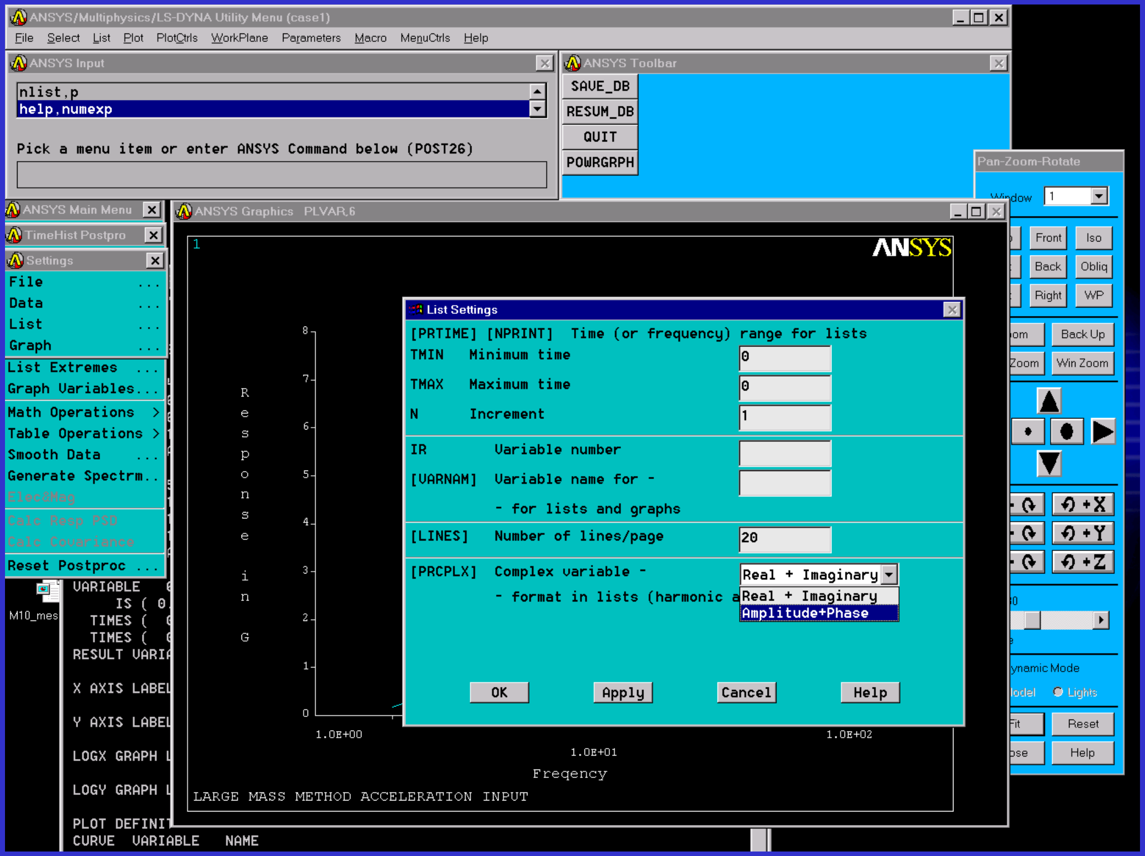
Post-process Frequency Vs. Response (x-y plots)



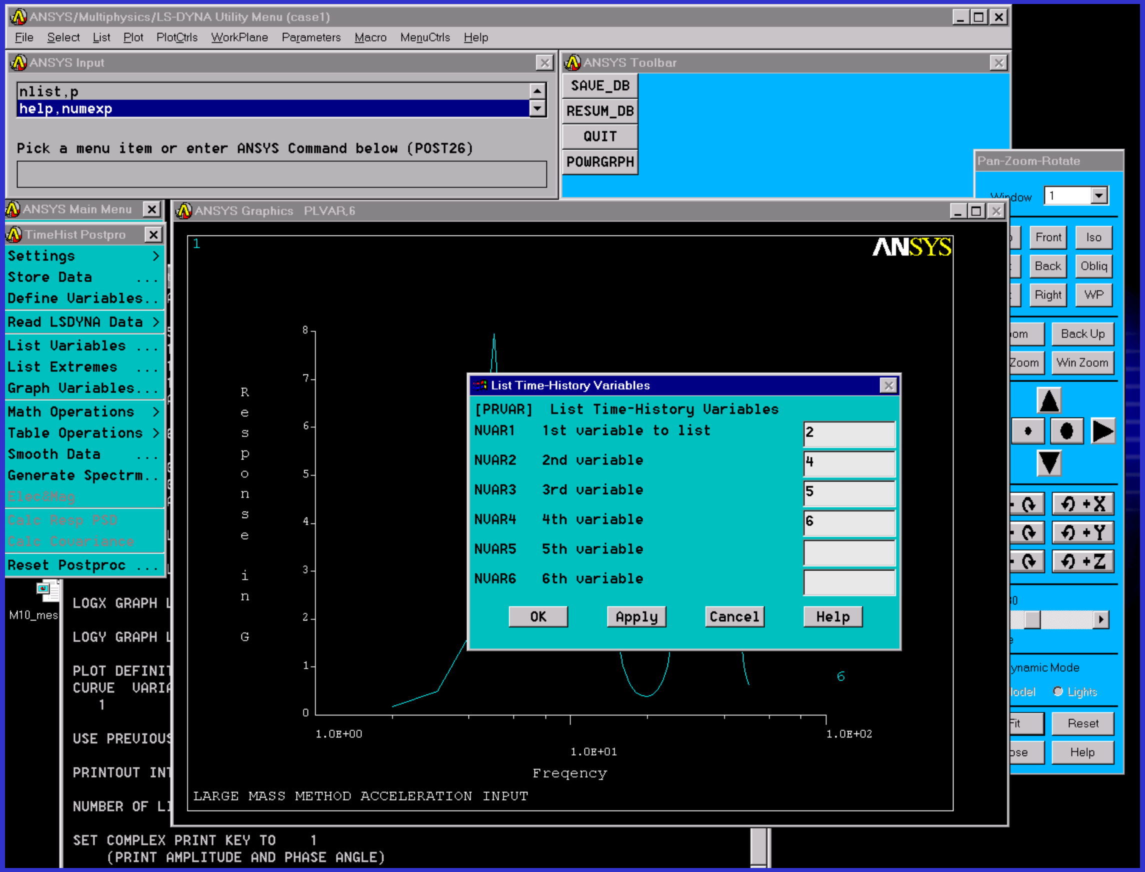
Menu Picks:

Main Menu> TimeHistory Postprocessor> Settings> List …

What's Happening:

The previous list was real and imaginary. We are setting subsequent list to be amplitude and phase.

Post-process Frequency Vs. Response (x-y plots)



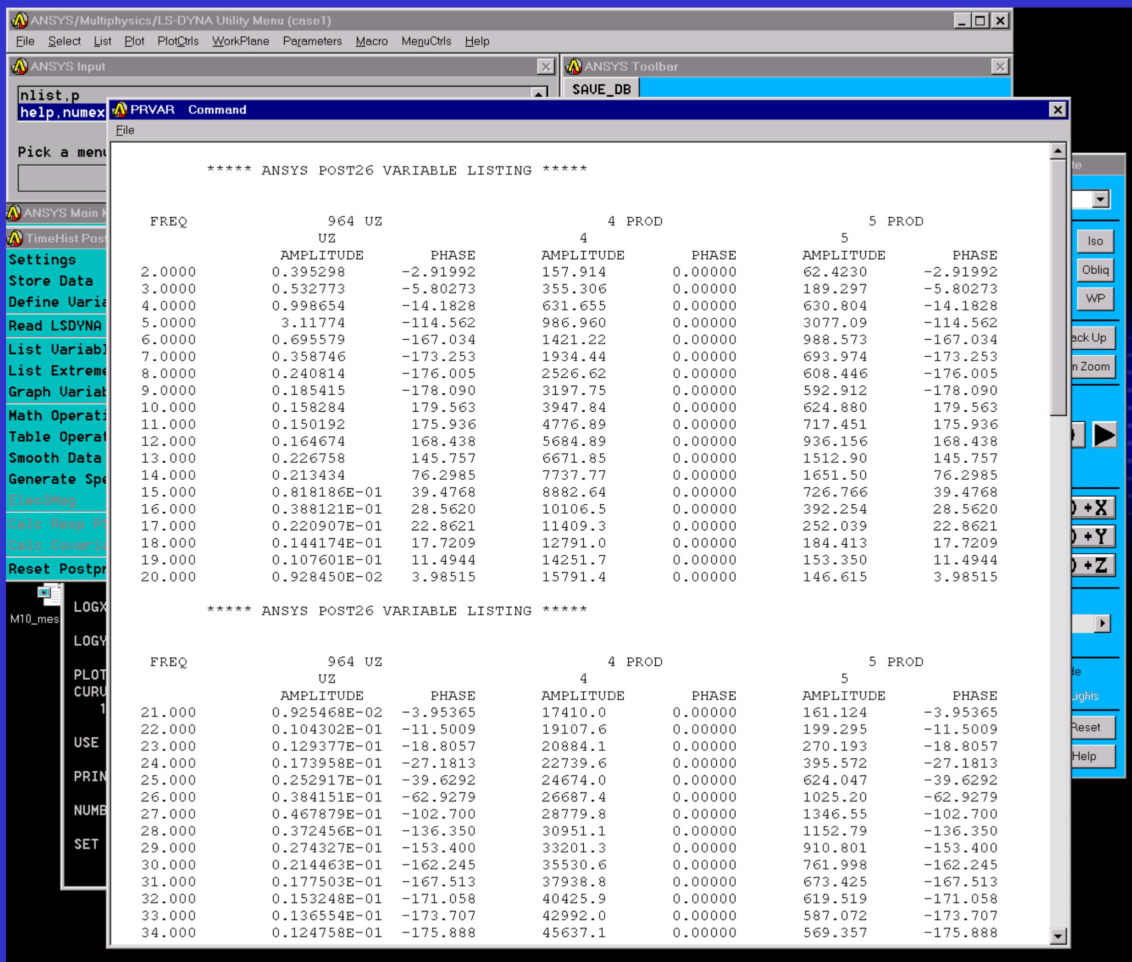
Menu Picks:

ANSYS Main Menu> Time History Postprocessor> List Variables …

What's Happening:

Creating a list of all the variables create thus far in this example.

Post-process Frequency Vs. Response (x-y plots)



***** ANSYS POST26 VARIABLE LISTING *****

FREQ	964 UZ UZ AMPLITUDE	PHASE	4 PROD 4 AMPLITUDE	PHASE	5 PROD 5 AMPLITUDE	PHASE
2.0000	0.395298	-2.91992	157.914	0.00000	62.4230	-2.91992
3.0000	0.532773	-5.80273	355.306	0.00000	189.297	-5.80273
4.0000	0.998654	-14.1828	631.655	0.00000	630.804	-14.1828
5.0000	3.11774	-114.562	986.960	0.00000	3077.09	-114.562
6.0000	0.695579	-167.034	1421.22	0.00000	988.573	-167.034
7.0000	0.358746	-173.253	1934.44	0.00000	693.974	-173.253
8.0000	0.240814	-176.005	2526.62	0.00000	608.446	-176.005
9.0000	0.185415	-178.090	3197.75	0.00000	592.912	-178.090
10.000	0.158284	179.563	3947.84	0.00000	624.880	179.563
11.000	0.150192	175.936	4776.89	0.00000	717.451	175.936
12.000	0.164674	168.438	5684.89	0.00000	936.156	168.438
13.000	0.226758	145.757	6671.85	0.00000	1512.90	145.757
14.000	0.213434	76.2985	7737.77	0.00000	1651.50	76.2985
15.000	0.818186E-01	39.4768	8882.64	0.00000	726.766	39.4768
16.000	0.388121E-01	28.5620	10106.5	0.00000	392.254	28.5620
17.000	0.220907E-01	22.8621	11409.3	0.00000	252.039	22.8621
18.000	0.144174E-01	17.7209	12791.0	0.00000	184.413	17.7209
19.000	0.107601E-01	11.4944	14251.7	0.00000	153.350	11.4944
20.000	0.928450E-02	3.98515	15791.4	0.00000	146.615	3.98515

***** ANSYS POST26 VARIABLE LISTING *****

FREQ	964 UZ UZ AMPLITUDE	PHASE	4 PROD 4 AMPLITUDE	PHASE	5 PROD 5 AMPLITUDE	PHASE
21.000	0.925468E-02	-3.95365	17410.0	0.00000	161.124	-3.95365
22.000	0.104302E-01	-11.5009	19107.6	0.00000	199.295	-11.5009
23.000	0.129377E-01	-18.8057	20884.1	0.00000	270.193	-18.8057
24.000	0.173958E-01	-27.1813	22739.6	0.00000	395.572	-27.1813
25.000	0.252917E-01	-39.6292	24674.0	0.00000	624.047	-39.6292
26.000	0.384151E-01	-62.9279	26687.4	0.00000	1025.20	-62.9279
27.000	0.467879E-01	-102.700	28779.8	0.00000	1346.55	-102.700
28.000	0.372456E-01	-136.350	30951.1	0.00000	1152.79	-136.350
29.000	0.274327E-01	-153.400	33201.3	0.00000	910.801	-153.400
30.000	0.214463E-01	-162.245	35530.6	0.00000	761.998	-162.245
31.000	0.177503E-01	-167.513	37938.8	0.00000	673.425	-167.513
32.000	0.153248E-01	-171.058	40425.9	0.00000	619.519	-171.058
33.000	0.136554E-01	-173.707	42992.0	0.00000	587.072	-173.707
34.000	0.124758E-01	-175.888	45637.1	0.00000	569.357	-175.888

Menu Picks:

Continuation of the previous slide

What's Happening:

List of all the variables created thus far.

Note the list is amplitude and phase.

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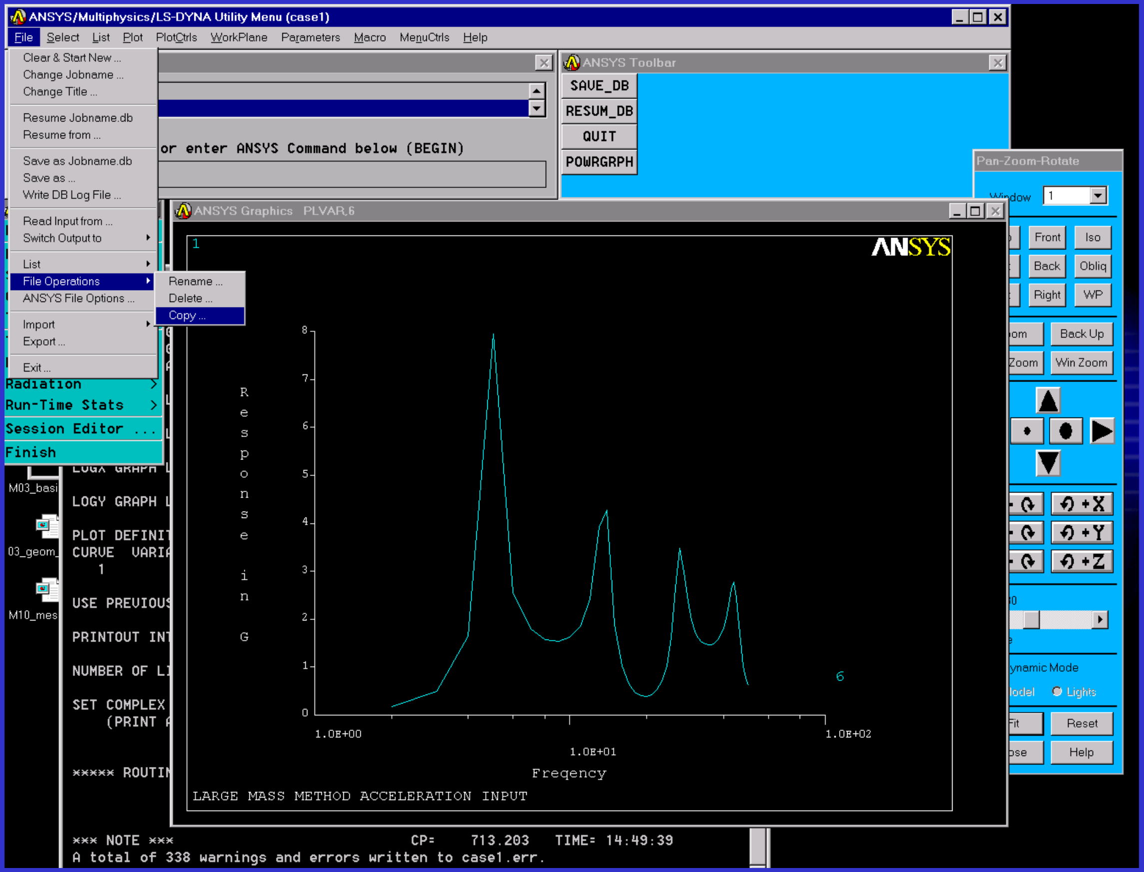
Copy Modal Results



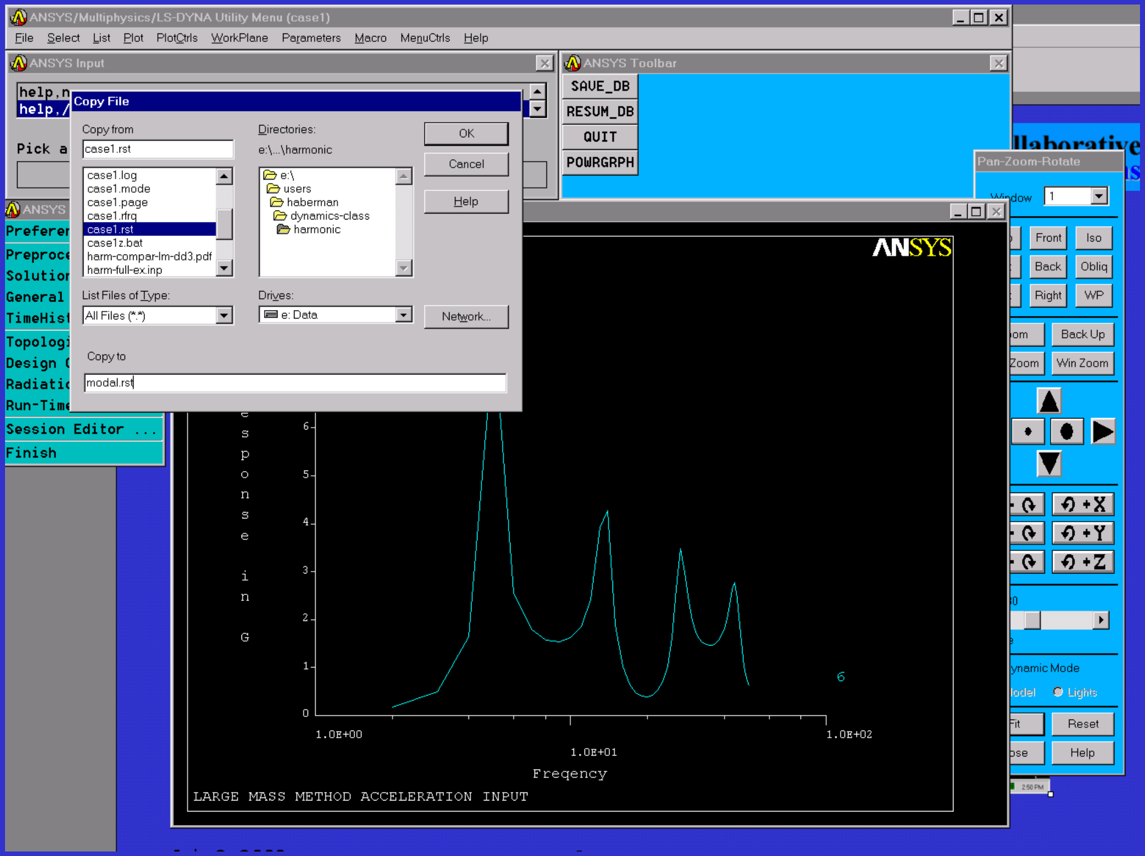
Menu Picks:

Utility Menu> File Operations> Copy …

What's Happening:

We are going to copy the .rst file to a different name. This is so the modal results are not overwritten when we expand the harmonic results.

Copy Modal Results



Menu Picks:

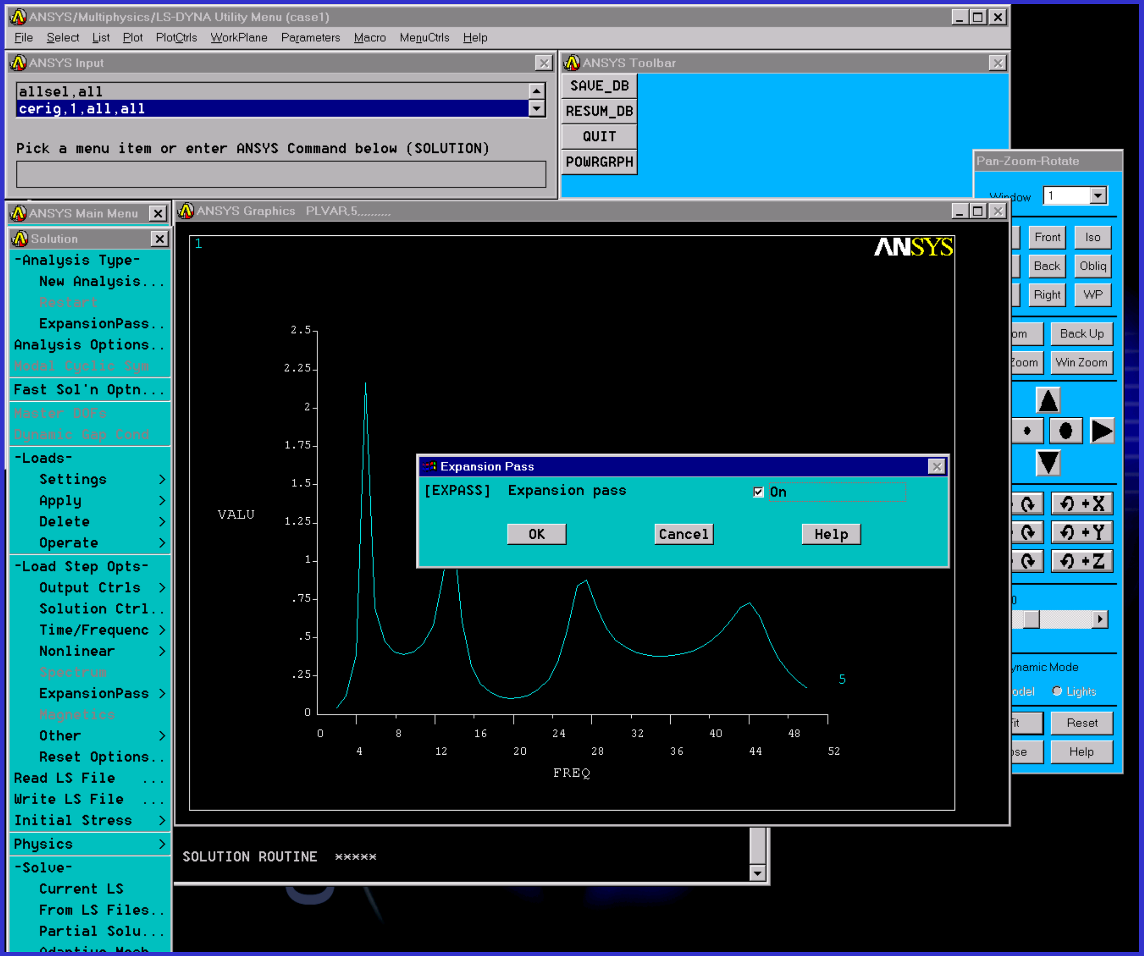
Continuation of the previous slide.

What's Happening:

Writing the modal .rst file to a file called modal.rst.

Note for your own models the file you copy the modal results to is arbitrary.

Expand Frequency Vs. Response Results in .rst file



Menu Picks:

Main Menu> Solution>

ExpansionPass …

What's Happening:

Turning on the expansion pass, so we can expand the harmonic analysis.

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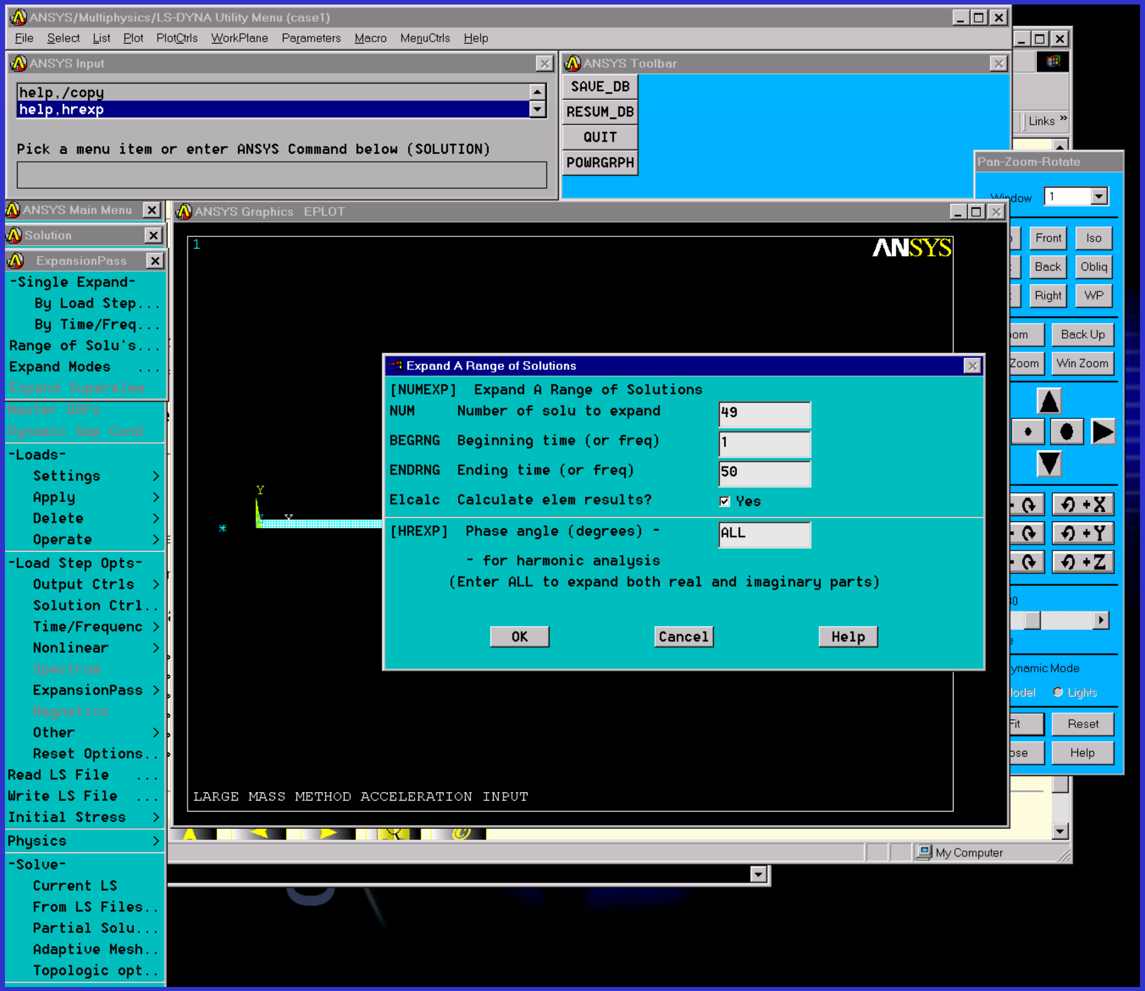
Expand Frequency Vs. Response Results in .rst file



Menu Picks:

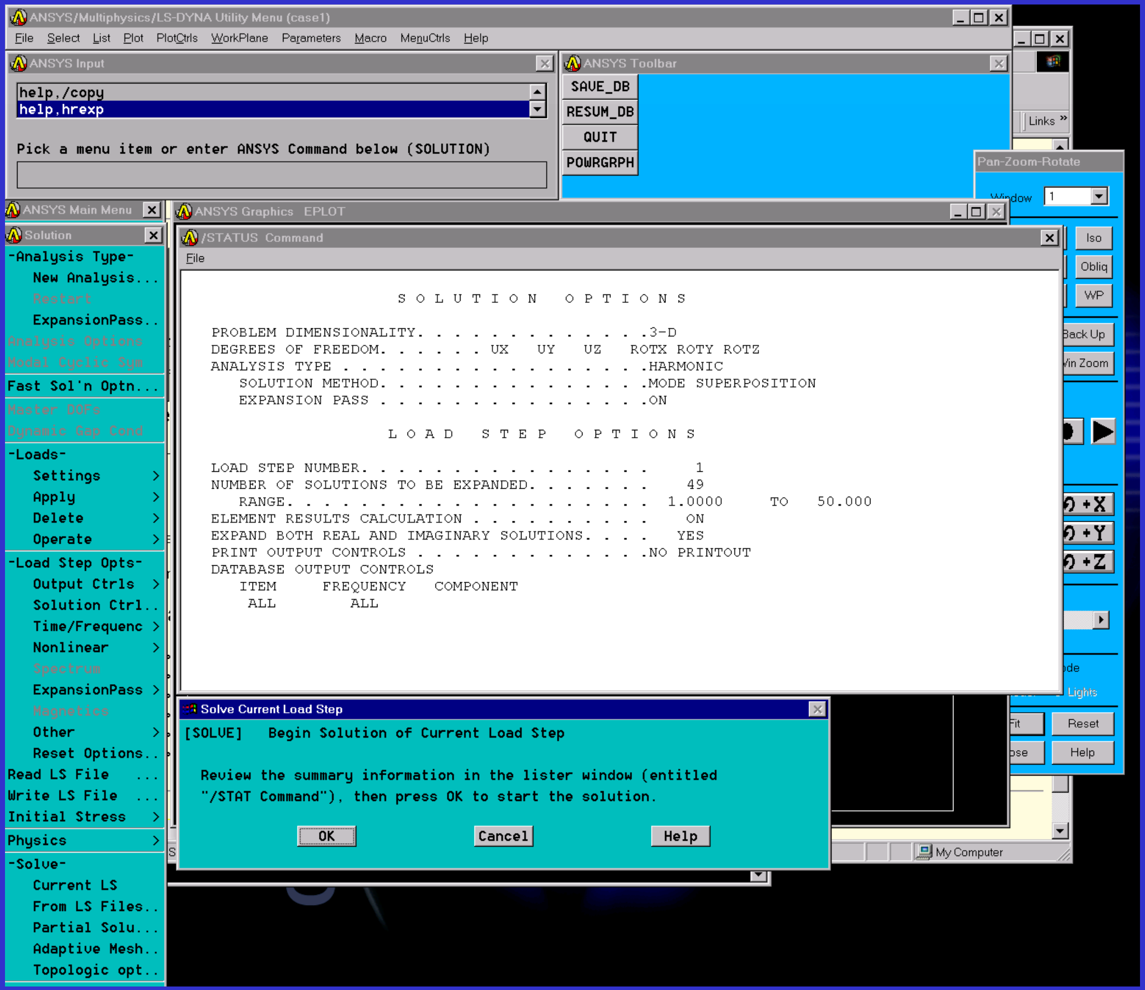
Main Menu> Solution>

ExpansionPass> Range of Solu's …

What's Happening:

Setting a range of solutions to expand.

Expand Frequency Vs. Response Results in .rst file



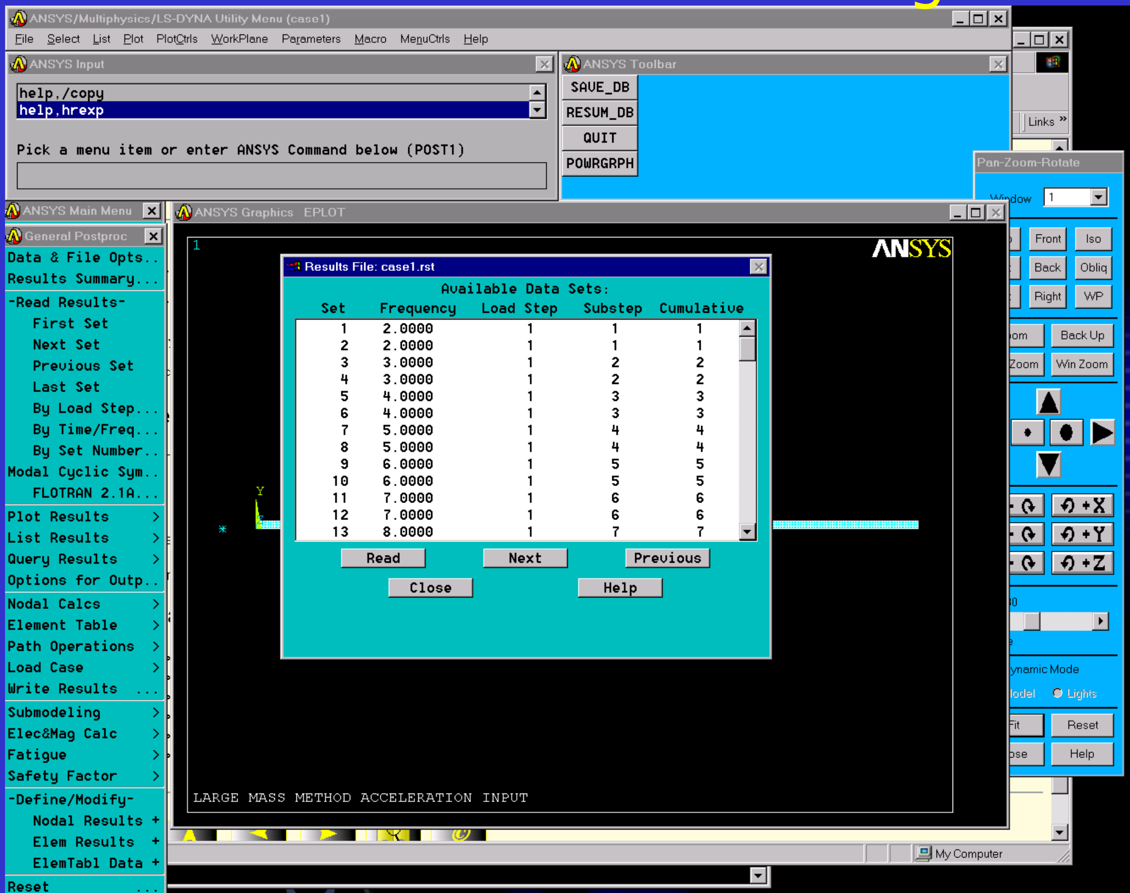
Menu Picks:

Main Menu> Solution> Current LS …

What's Happening:

Expanding the results from the previous harmonic analysis.

Post-process One Point in Time with a User Supplied Phase Angle



Menu Picks:

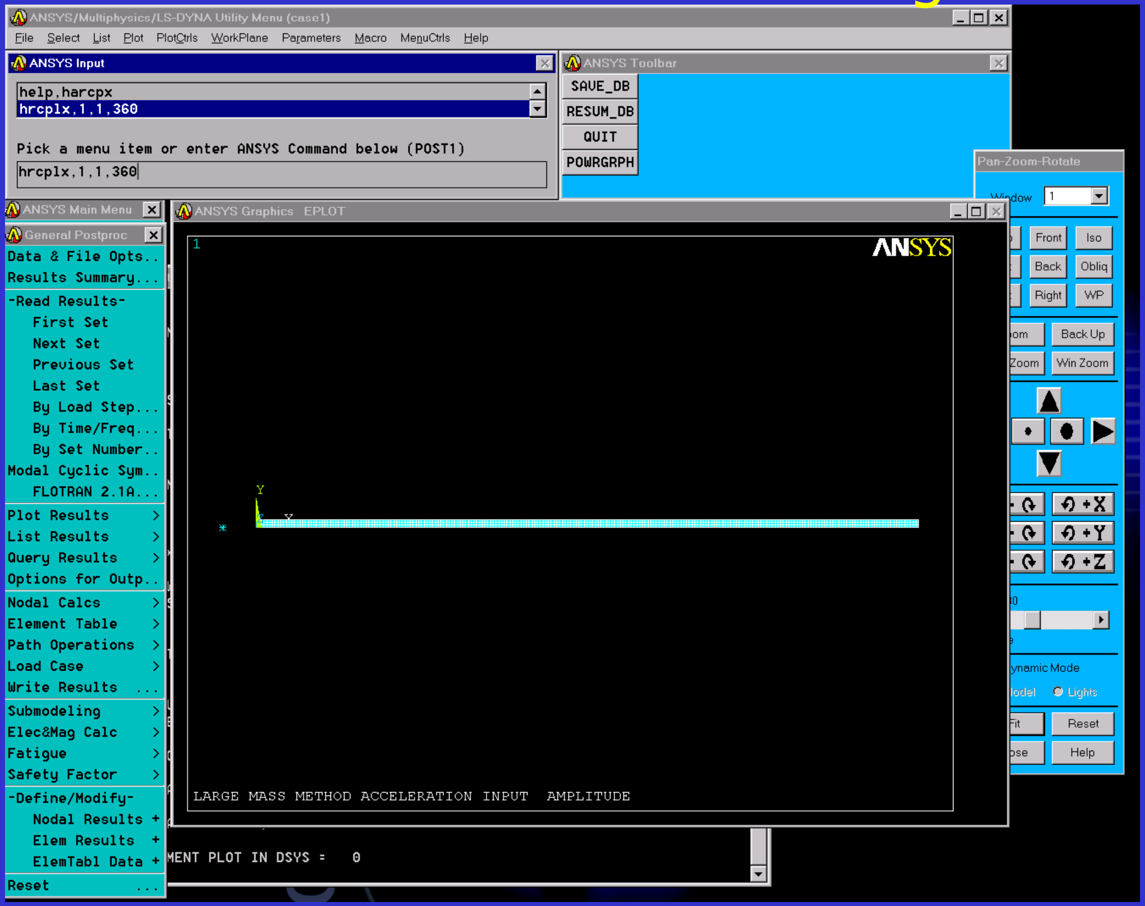
ANSYS Main Menu>General Post Processor> Results Summary …

What's Happening:

Expanded results from the harmonic analysis.

Note we have both real and imaginary results.

Post-process One Point in Time with a User Supplied Phase Angle



Menu Picks:

ANSYS Input

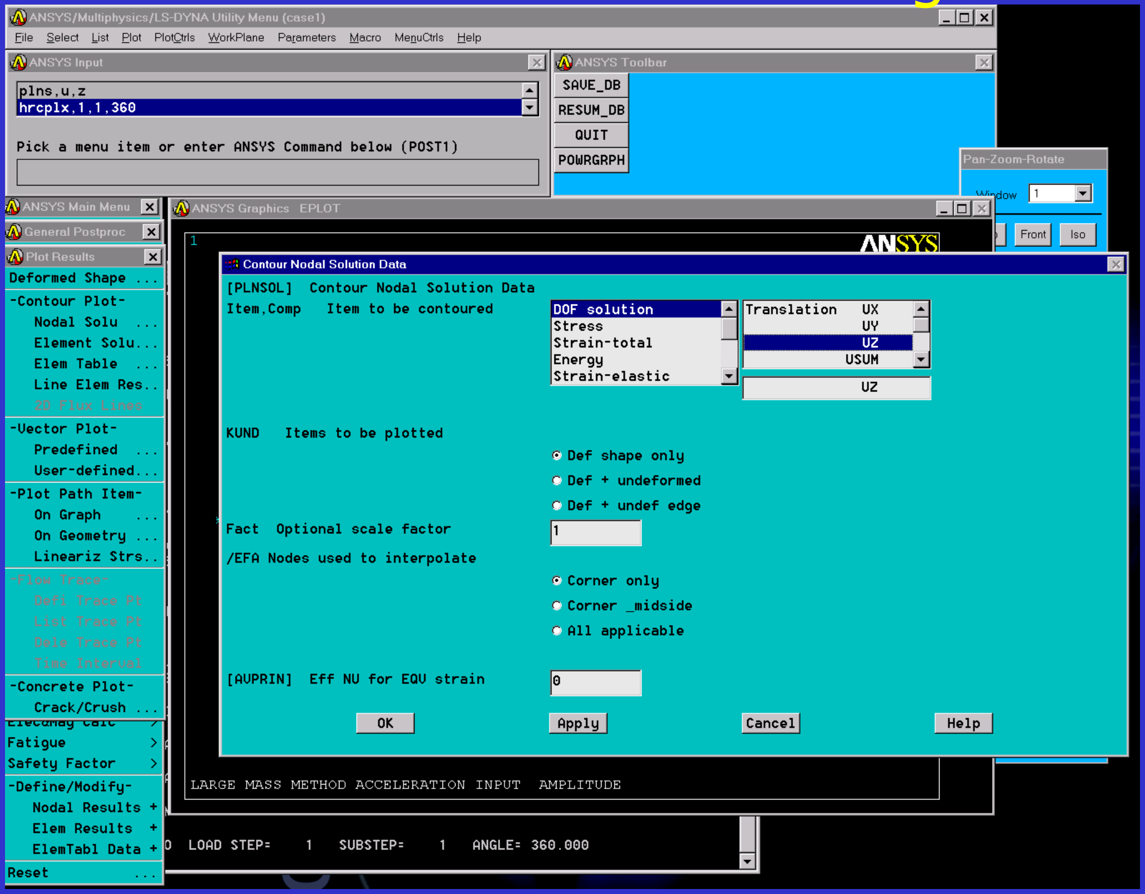
hrcplx,1,1,360

What's Happening:

Combining the real and imaginary SRSS.

Note it may not be appropriate to combine the real and imaginary as SRSS. For those case it is required to get the phase angle are the node of interest and combine the real and imaginary with the appropriate phase angle.

Post-process One Point in Time with a User Supplied Phase Angle



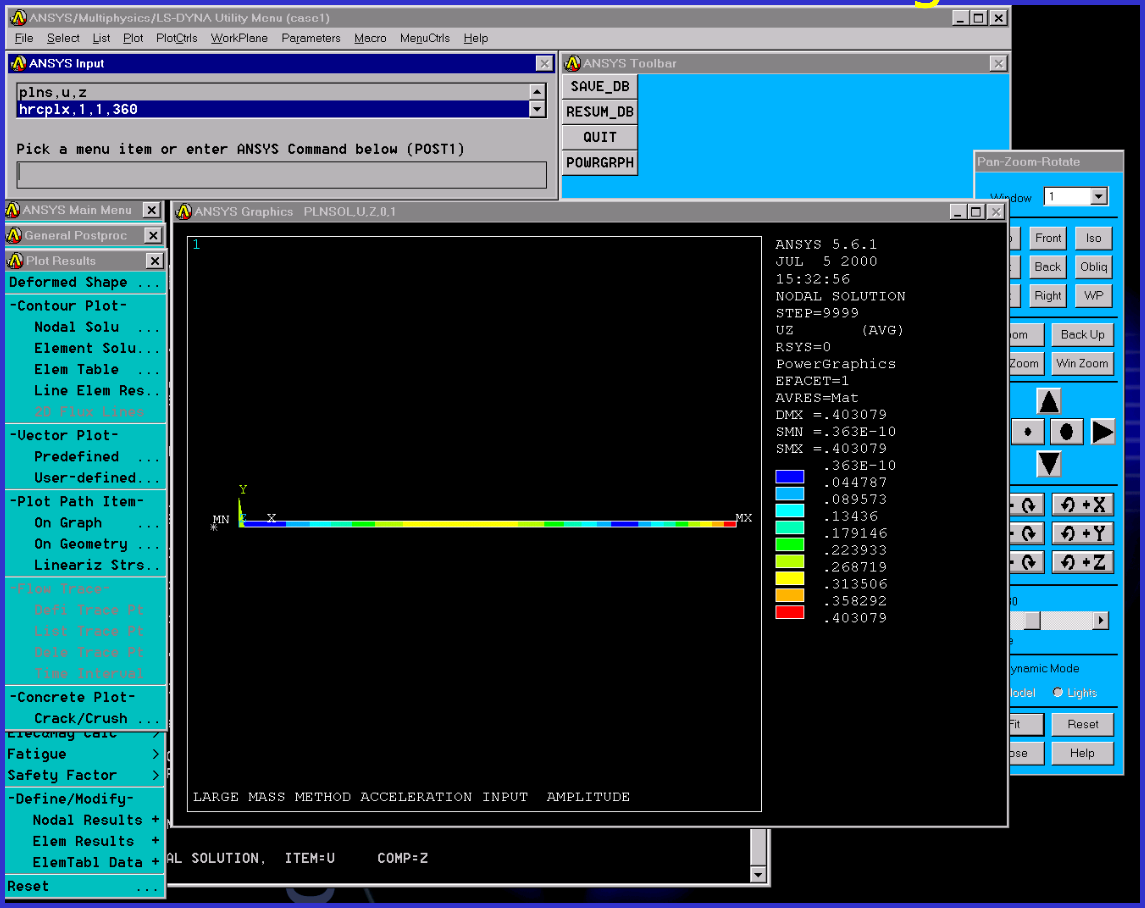
Menu Picks:

ANSYS Main Menu>General Post Processor> Plot Results> Nodal Solu …

What’s Happening:

Plot the SRSS results.

Post-process One Point in Time with a User Supplied Phase Angle



Menu Picks:

Continuation of previous slide

What's Happening:

Plot of SRSS UZ displacement.