Shock Response Spectrum in Autodesk Nastran In-CAD

In order to do SRS inside Autodesk Nastran In-CAD a modal analysis needs to be created and the bulk data file modified with the SRS setup.

Model Setup within Autodesk Nastran In-CAD

First (like all dynamic analyses) run a normal modes analysis with a fixed base to ensure at least 80% (or whatever your required %age is) mass participation in all six directions.

Add an RBE2 to a center point. Only check the DOF that corresponds to the direction of the shock load that will be applied. For example, if the acceleration shock is going to be in the X direction, only check that direction.

Constrain the dependent nodes of the RBE2 in all DOFs *except* for the direction of the shock load. Also, constrain the independent node of the RBE2 in the same degrees of freedom.

Write-out the Bulk Data file

Ensure that the Analysis type is set to Normal Modes and Generate the Nastran file.

Locate the independent node of the RBE2. This number can be anything, and it's important so take note of it.

In the Case Control section add the following items:

DLOAD = Unique ID
SDAMPING = Unique ID

In the Bulk Data section add the following items:

PARAM, SCRSPEC, 0	This parameter "turns on" SRS in a modal solution.
PARAM, OPTION, SRSS	This is the mode summation procedure to be used. More information about the options allowed can be found in the Autodesk Nastran Reference Manual.
TABDMP1, ID, Type	This is a table, and defines the damping of interest for the model. The ID of this table must be the same as that used on the SDAMPING Case Control command. More information about the usage and formatting

	of this entry can be found in the Autodesk Nastran Reference Manual.
SUPORT, GID, DOF	This is the direction of the loading to be applied, and at what grid point. Notice that there is only one P! (it is not SUPPORT with 2 p's)
CMASS2, EID, mass value, Grid ID, DOF	The mass value must be "large" (ie 1e6 x the model mass). This one is easiest for the situation at hand. More information can be found in the Autodesk Nastran Reference Manual.
PARAM, LFREQ, value	Use this param to clip the rigid body mode. One rigid body mode will exist because we have not SPC'd the independent node in 1 DOF.
DLOAD, ID, global scale, local scale, SPECSEL ID	This is the dynamic load bulk data card. The ID of this entry must be the same as the ID of the Case control command.
TABLED1 entries	The TABLED1 entries are the tables that contain the shock response curves and each table corresponds to a particular damping value. These tables must be Acceleration, Velocity, or Displacement versus Frequency. The format of the TABLED1 entries (like all Nastran bulk data entries) is very critical. Please use the Autodesk Nastran Reference Manual to define these.
DTI, SPECSEL, 0	This is a required bulk data entry
DTI, SPECSEL, SPECSEL ID from DLOAD, [Blank], A (or V or D), TID1, Damp. Value, TID2, Damp. Value, etc.	This bulk data entry specifies the DLOAD bulk data entry to be used, as well as calls upon the different TABLED1 entries to be used and their associated damping values. An A, V, or D define the spectrum type for the tables referenced.

Figure 1 shows an example bulk data file with the correct wiring.

```
$
$ NORMAL MODES SOLUTION
$
SOL SEMODES
$
$
DLOAD = 100
SDAMPING = 900
$
DISPLACEMENT(PLOT) = ALL
STRESS(PLOT) = ALL
   METHOD = 1
   SPC = 1
BEGIN BULK
$
$ RBE INDEPENDENT GRID ID = 16744
$
PARAM, SCRSPEC, 0
PARAM, OPTION, SRSS
$
TABDMP1, 900, CRIT,
, 0.0, 0.03, 80., 0.03, ENDT
PARAM, LFREQ, 0.1
SUPORT, 16744, 1
CMASS2, 5555555, 1.E6, 16744, 1
DLOAD, 100, 1.0, 386.0, 50
$
DTI,SPECSEL,0
DTI,SPECSEL,50,  , A, 2, 0.0, 3, 0.02, 4, 0.04, ENDREC
$
$ RESPONSE SPECTRUM TABLES.
$
$ TABLE 2 - DAMPING = 0.0%
$
TABLED1, 2,
, 20., .038684 40., .15254, 60.,  .33511, 80., .576057, ENDT
$
$ TABLE 3 - DAMPING = 2.0%
$
TABLED1, 3,
, 20., .037712 40., .143379 60., .314988, 80., .541456, ENDT
$
$ TABLE 4 - DAMPING = 4.0%
$
TABLED1, 4,
, 20., .039345 40., .137732 60., .297482 80., .511465, ENDT

. . . .

ENDDATA
```

Figure 1