*CONTROL_FREQUENCY_RESPONSE_FUNCTION

Purpose: Set FRF (frequency response function) controls.

Card Format

Card 1	1	2	3	4	5	6	7	8
Variable	N1	N1TYP	DOF1	VAD1	VID	FNMAX		
Type	I	I	I	I	I	F		
Default	none	0	none	3	0	0.0		

Card 2	1	2	3	4	5	6	7	8
Variable	DAMPF	LCDAM	LCTYP	DMPMAS	DMPSTF			
Type	F	I	I	F	F			
Default	0.0	0	0	0.0	0.0			

Card 3	1	2	3	4	5	6	7	8
Variable	N2	N2TYP	DOF2	VAD2				
Type	I	I	I	I				
Default	none	0	none	2				

Card 4	1	2	3	4	5	6	7	8
Variable	FMIN	FMAX	NFREQ					
Type	F	F	I					
Default	none	none	2					

VARIABLE	DESCRIPTION
N1	Node / Node set/Segment set ID for excitation input.
N1TYP	Type of N1: EQ.0: node ID, EQ.1: node set ID, EQ.2: segment set ID.
DOF1	Applicable degrees-of-freedom for excitation input: EQ. ±1: x-translational degree-of-freedom (positive or negative), EQ. ±2: y-translational degree-of-freedom (positive or negative), EQ. ±3: z-translational degree-of-freedom (positive or negative), EQ. ±4: translational movement in direction given by vector VID (positive or negative).
VAD1	Excitation input type: EQ.0: velocity, EQ.1: acceleration,

EQ.2: displacement,
EQ.3: nodal force.
EQ.4: pressure.

VID	Vector ID for DOF1=4 for excitation input, see *DEFINE_VECTOR.
FNMAX	Maximum natural frequency employed in frequency response function computation.
DAMPF	Modal damping coefficient, ζ.
LCDAM	Load Curve ID defining frequency dependent modal damping coefficient, ζ.
LCTYP	Type of load curve defining modal damping coefficient EQ.0: Abscissa value defines frequency, EQ.1: Abscissa value defines mode number.
DMPMAS	Mass proportional damping constant α, in Rayleigh damping.
DMPSTF	Stiffness proportional damping constant β, in Rayleigh damping.
N2	Node / Node set/Segment set ID for response output.
N2TYP	Type of N2: EQ.0: node ID, EQ.1: node set ID, EQ.2: segment set ID.
DOF2	Applicable degrees-of-freedom for response output: EQ.1: x-translational degree-of-freedom, EQ.2: y-translational degree-of-freedom, EQ.3: z-translational degree-of-freedom.
VAD2	Response output type: EQ.0: velocity, EQ.1: acceleration, EQ.2: displacement, EQ.3: force.
FMIN	Minimum frequency for frequency response function output.
FMAX	Maximum frequency for frequency response function output.
NFREQ	Number of frequencies for frequency response function output.

Remarks:

1. This command computes the frequency response functions due to nodal excitations.
2. Natural frequencies and mode shapes are needed for computing the frequency response functions. Thus, keyword *CONTROL_IMPLICIT_EIGENVALUE has to be included in input.
3. The FRF (frequency response functions) can be given as Displacement / Force (called Admittance, Compliance, or Receptance), Velocity / Force (called Mobility),

Acceleration / Force (called Accelerance, Inertance), Force / Displacement (called Dynamic Stiffness), Force / Velocity (called Mechanical Impedance), Force / Acceleration (called Apparent Mass, Dynamic Mass).

4. FNMAX decides how many natural vibration modes are employed in the frequency response function computation. LS-DYNA uses only modes with lower or equal frequency than FNMAX in frequency response function computation. If FNMAX is not given, the number of modes in frequency response function computation is same as the number of modes, NEIG, from the *CONTROL_IMPLICIT_EIGENVALUE keyword card.

5. Damping can be prescribed in several ways:

   To use a constant modal damping coefficient ζ for all the modes, define DAMPF only. LCDMP, LCTYP, DMPMAS and DMPSTF are ignored.

   To use frequency dependent modal damping, define a load curve (*DEFINE_CURVE) and specify that if the abscissa value defines the frequency or mode number by LCTYP. DMPMAS and DMPSTF are ignored.

   To use Rayleigh damping, define DMPMAS (α) and DMPSTF (β) and keep DAMPF as 0.0, and keep LCDMP, LCTYP as 0. The damping matrix in Rayleigh damping is defined as $C = \alpha M + \beta K$, where, C, M and K are the damping, mass and stiffness matrices, respectively.

6. To remove rigid body modes in computing frequency response functions, set LFLAG=1 and set LFTEND as the tolerance for rigid body eigenvalues in *CONTROL_IMPLICIT_EIGENVALUE.