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CRUNCH 1D
A COMPUTER PROGRAM FOR SEISMIC ANALYSIS OF THE HTGR CORE

by
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ABSTRACT

This document serves as a user's manual and theoretical manual for the CRUNCH1D computer program. CRUNCH1D is a numerical integration code designed to analyze the HTGR core for seismic excitation. The core is represented as a one-dimensional horizontal strip of blocks constrained within the PCRV. Each block of the CRUNCH model represents one or more columns of the actual core. One additional block is provided to model the core support floor. Seismic excitation is provided by defining the motion of the PCRV.

CRUNCH has two types of mathematical models for collisions; the standard spring-damper model, and an impulse-momentum model.

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1. INTRODUCTION

This document serves as a user's manual for the one-dimensional CRUNCH Version 5 program. The CRUNCH mathematical model has undergone considerable change since it was first programmed (Ref. 1). A history of this evolution can be found in Refs. 2-5.

CRUNCH was developed as an inexpensive tool to analyze the PCRV core for seismic excitation. The major cost savings were achieved by: (1) modeling the core as a horizontal row of blocks with each block having one degree-of-freedom, and (2) by using impulse-momentum theory to model collisions. A detailed description of the model is presented in the following sections. Input instructions, a description of the output and a sample problem are also presented.

2. MATHEMATICAL MODEL

CRUNCH models the core as a horizontal strip of blocks each with one horizontal degree-of-freedom. Each fuel or reflector column is represented as a single mass attached to the core support floor by a column spring. The entire system is contained by the PCRV. Blocks can collide directly with the PCRV or spring packs can be used. Collisions are modeled either by using an interblock spring and damper alone, or by using an interblock spring and damper in parallel with an impulse computation (Section 2.2). Seismic excitation is modeled by defining the PCRV acceleration. Figure 1 presents a typical CRUNCH model.

The motion of each block is determined by computing its acceleration (the sum of the forces acting on it divided by its mass), and then numerically integrating to determine velocities and displacements. When impulse-momentum is used, the velocities of the two colliding blocks are directly changed without numerical integration.

2.1 SIGN CONVENTION AND NUMBERING SYSTEM

Displacements, velocities, accelerations and column spring forces are positive to the right. All other spring forces are positive when in compression. Relative velocity is positive when the blocks are moving toward each other. Gaps are positive when there is space between the blocks.

Blocks and gaps are numbered from left to right. Gap I is the gap between blocks I and I-1. Gap 1 is the gap between block 1 and the left spring pack. Impulse forces, interblock forces, relative velocities and hits are numbered in the same manner as the gaps.

N is the total number of blocks not including the core support block. The number of the core support block is N+1. The number associated with the PCRV is N+2.

Fig. 1. Typical CRUNCH Model

2.2 COLLISION MODEL

The code provides two types of collision models: impulse-momentum and spring-damper. These models can be used separately or in parallel. Since the impulse-momentum model cannot transfer static forces, it should be used in parallel with a spring and damper.

2.2.1 Impulse-Momentum

Impulse-momentum theory models a collision of two blocks instantaneously, and has the advantage of being numerically stable for any time step. Integration step sizes are selected to achieve the desired accuracy and to satisfy the numerical stability considerations imposed by any springs and dampers which are used in the model.

The impulse-momentum model works as follows. When two blocks come into contact (i.e., the gap between them goes to zero), a collision is assumed to occur and the velocities of both blocks are adjusted using the following equations (Ref. 6):

$$v_1 = \frac{m_1 - e m_2}{m_1 + m_2} u_1 + (1 + e) \frac{m_2}{m_1 + m_2} u_2$$

$$v_2 = (1 + e) \frac{m_1}{m_1 + m_2} u_1 + \frac{m_2 - e m_1}{m_1 + m_2} u_2$$

where

- v = final velocity
- u = initial velocity
- m = mass
- e = coefficient-of-restitution.

In the case where m_1 is the PCRV, which has essentially an infinite mass, the above equations reduce to

$$v_1 = u_1$$

$$v_2 = (1 + e) u_1 - e u_2$$

where block 1 is the PCRV.

Although a force calculation is not necessary with the impulse-momentum technique, it is desirable to compute equivalent impulse forces for output data. These forces are based on the assumption that the impulse has a known contact time and a sine squared force distribution. The force printed by the code is the maximum force occurring during the impulse. The impulse force is only an output parameter and is not used in the equations of motion. The impulse force is computed using the following equation:

$$F = \frac{2 (u_1 - u_2) (e + 1)}{CT} \frac{m_1 m_2}{m_1 + m_2}$$

where

CT = contact time.

For collisions with the PCRV, the above equation reduces to

$$F = \frac{2(u_1 - u_2)(e+1)}{CT} m_2$$

The 2 is in the above equations because of the assumption that the impulse has a sine squared pulse shape. If a square pulse were assumed, the 2 would be replaced by a 1.

After two blocks have collided, the code will not do another impulse computation until CTM (an input value) seconds has past. This is done because in the code an impulse computation is assumed to occur instantly when actually a finite amount of time (represented by CTM) is required.

Block-on-block and block-on-PCRV coefficients-of-restitution data is input in tabular form, where coefficient-of-restitution is a function of impact velocity. The coefficient-of-restitution for the two mass spring pack is assumed to be a constant, while the coefficient-of-restitution for the rigid link is taken as zero.

The impulse-momentum theory as described above yields a unique solution for collisions between two blocks. The same theory, when applied to collisions involving three or more blocks, does not generally yield unique results. This is because the solution is dependent on the sequence in which the impulse-momentum theory is applied to the individual pairs of blocks. To ensure that CRUNCH yields a unique solution, the following sequencing procedure was incorporated into the code:

1. The code determines the number of consecutive pairs of blocks which are eligible for a collision. A block is eligible for a collision with an adjacent block if the two blocks are in contact, are moving towards each other and have not had an impulse computation for at least CTM (input) seconds.
2. The code determines which eligible pair has the maximum relative velocity.
3. Starting with the pair of blocks which has the maximum relative velocity, the sequence of blocks is divided into pairs. No block can belong to more than one pair. All blocks must be paired except for odd blocks at either end of the sequence.
4. Impulses are computed for each of these pairs.

The following is an example of how this procedure works. Assume the following pairs of blocks are eligible for collisions: 3-4, 4-5, 5-6, 6-7, 7-8, 8-9, and 10-11. Therefore, the sequence of eligible pairs of blocks is from block 3 through 9. Blocks 10 and 11 are not included in the sequence since the pair 9-10 is not eligible for a collision. Assuming that the maximum relative velocity occurs between blocks 7 and 8, then impulses will be computed between pairs 3-4, 5-6, and 7-8. Since block 9 is at the end of the sequence and there is no block to pair with it, it will not have an impulse computation at this time step. Since blocks 10 and 11 constitute an individual eligible pair, they will also have an impulse.

This procedure ensures that CRUNCH will yield a unique solution. There are other equally valid procedures which will produce different solutions. An exact multi-block impulse-momentum solution for this

problem has not been found. As the integration time step is decreased, the number of multi-block hits will be reduced and the solutions of the various procedures will tend to converge. However, unless all the multi-block hits are eliminated, the different procedures cannot be expected to produce the same solutions.

2.2.2 Spring-Damper

The second collision model consists of a linear spring and viscous damper in parallel. At the moment of impact, the interblock spring and damper engage producing an impulse force. When the blocks separate, the force becomes zero again. The following equations are used to compute the interblock spring and damping forces:

$$F_S = K X$$

$$F_D = C V$$

where

- K = interblock spring stiffness
- X = overlap of colliding blocks
- C = interblock damping coefficient
- V = relative velocity of colliding blocks.

Only the spring force is printed in the output. The damping force is included in the equations of motion but is not printed in the output for reasons discussed in Section 2.8.

2.3 SPRING PACK

CRUNCH has three different spring pack models; a massless spring pack (Fig. 2a), a single mass spring pack (Fig. 2b), and a two mass spring pack (Fig. 2c). In addition, a two-spring-single-mass model (Fig. 2d) can be created using some of the codes special features (Section 6.5). The core support floor spring pack has only one model available; a massless spring.

a. MASSLESS SPRING PACK

b. SINGLE MASS SPRING PACK

c. TWO MASS SPRING PACK

d. TWO-SPRING-SINGLE-MASS
SPRING PACK

Fig. 2. Spring packs

All of the spring packs have a viscous damper in parallel with each spring. An impulse model of a rigid stop is provided for collisions of blocks 1 and N with the PCRV (Section 6.2).

2.3.1 Massless Spring Pack

The mathematical model used to represent the massless spring pack is presented in Fig. 3. The spring pack consists of a piecewise linear spring CBS, a damper CBD, and a rigid stop located a distance GAP5 behind the undeflected position of the spring. The spring pack exerts no force until the interblock gap (Section 2.9.4) between the undeflected position of the spring and the first block is closed. When the interblock gap is less than or equal to zero, the spring pack engages producing a spring force (Section 2.3.4) and a damping force (Section 2.8). If the PCRV and first block move together the additional distance GAP5, the interblock spring and damper will engage the rigid stop and an impulse will be computed. If impulse-momentum is not used, the rigid stop is modeled by making CBS a bilinear spring.

2.3.2 Single Mass Spring Pack

The mathematical model used to represent the single mass spring pack is presented in Fig. 4. The model is identical to the massless spring pack except that the first mass is attached to the spring pack. Consequently, the spring pack can exert both tension and compression forces on the mass. Section 6.2 discusses the input required to model a single mass spring pack.

2.3.3 Two Mass Spring Pack

The mathematical model for the two mass spring pack is presented in Fig. 5. The model of the interaction of the first mass and the PCRV is identical to the single mass model. The second mass is attached to the first mass through the linear spring CSPS and the linear damper CSPD. Block 2 will impact block 1 if the two blocks move closer together than the initial gap GI(2). Section 6.4 presents an example of how to model a two mass spring pack.

2.3.4 Piecewise Linear Springs

The springs CSS (Fig. 1) of the core support floor spring packs and CBS (Figs. 1, 3-5) of the core spring packs are modeled as piecewise linear springs. Input for these springs is entered in the form of a force-deflection

* THE INTERBLOCK SPRING AND DAMPER IS SHOWN TWICE FOR SYMMETRY. THE VALUES ENTERED INTO THE CODE FOR CGS AND CGD ARE THE TOTAL STIFFNESS AND DAMPING ASSOCIATED WITH THE BLOCK.

Fig. 3. Massless spring pack

* THE INTERBLOCK SPRING AND DAMPER IS SHOWN TWICE FOR SYMMETRY. THE VALUES ENTERED INTO THE CODE FOR CGS AND CGD ARE THE TOTAL STIFFNESS AND DAMPING ASSOCIATED WITH THE BLOCK.

Fig. 4. Single mass spring pack

* THE INTERBLOCK SPRINGS AND DAMPERS ARE SHOWN TWICE FOR SYMMETRY. THE VALUES ENTERED INTO THE CODE FOR CGS AND CGD ARE THE TOTAL STIFFNESS AND DAMPING ASSOCIATED WITH EACH BLOCK.

Fig. 5. Two mass spring pack

table, where compressive forces and deflections are defined as positive. The code evaluates the deflection of the spring and then determines the corresponding force from the table. The code interpolates to find forces which correspond to deflections within the table and extrapolates for deflections outside the table.

The code provides a single linear viscous damper which acts throughout the entire stroke of the piecewise linear spring. If a damping ratio is input for the damper, a damping coefficient will be calculated using the slope of the first linear section of the force-deflection table.

Section 6.1 presents an example of a bilinear spring pack.

2.4 COLUMN STIFFNESS

Since each block represents an entire column attached to the core support floor, a model representing the column stiffness and damping is required. The model selected for CRUNCH is a linear limit load spring in parallel with a viscous damper. The limit load spring acts as a linear spring until the limit load is reached. Above that, the spring force remains constant. This model was selected since it very closely approximates the horizontal stiffness of a stacked column. For initial small horizontal deflections, the stack acts as a solid column. At the point when the column breaks, the force required to continue to deflect the column remains essentially constant. (Actually, it has a slightly negative slope, but for the small deflections which occur in the core, it can be approximated as a constant force.)

The viscous damping represents the energy loss which occurs due to column motion. The damping force is assumed to act throughout the entire range of deflection and has no limit load. Only the spring force is included in the output. The damping force is used as an energy dissipation model and is not considered a real force (Section 2.8).

2.5 CORE SUPPORT FLOOR

CRUNCH has an option to model the effect of the core support floor. When this option is invoked, the core support floor is represented as a single block free to translate between two piecewise linear spring packs.

The column springs connect the fuel and reflector blocks to the core support floor (Fig. 1). A viscous damper connecting the core support floor to ground* is used to model the energy loss due to friction and collisions between the blocks which make up the core support floor.

2.6 RIGID LINK

The rigid link option prevents any two blocks from moving closer together than a preassigned distance GAP4. When the two blocks move closer together than GAP4, the rigid link interblock spring SRL and damper DRL engage forcing them apart. In addition, if the impulse-momentum option has been selected, a zero coefficient-of-restitution impulse will occur which will stop all relative motion between them. Included with the rigid link option is a preload PLOAD which acts to push the two blocks together.

The purpose of the rigid link option is to model the solid ring (double arch) which is formed in the actual three-dimensional core, when the ring of reflector blocks move towards each other. The preload represents the pressure differential between the bypass area outside of the ring of reflector blocks and the core cavity. The core cavity pressure is always lower than the bypass flow. Figure 1 contains the rigid link model.

The impulse-momentum option requires that the two blocks, which are connected by the rigid link, have equal mass.

2.7 PCRV MOTION

Three different types of PCRV motion are available to the user. These are sinusoidal dwells, sinusoidal sweeps with constant acceleration amplitude and pointwise acceleration time history input. In all cases, the code computes the PCRV acceleration and then numerically integrates to determine PCRV velocities and displacements.

2.7.1 Sinusoidal Dwell

For sinusoidal dwells, the PCRV acceleration is computed using the following equation:

*Ground is defined as a point which has no motion.

$$\ddot{X} = \text{LSF} * \text{SIN} (\text{OMEG} * T + \text{PHI})$$

where

LSF = peak acceleration (in./sec²)

OMEG = frequency (rad/sec)

T = time (sec)

PHI = phase angle (rad)

The code also computes the initial PCRV displacement and velocity required for steady-state sinusoidal motion. These are:

$$\dot{X} = - \text{LSF} * \text{COS}(\text{OMEG} * T + \text{PHI}) / \text{OMEG}$$

$$X = - \text{LSF} * \text{SIN}(\text{OMEG} * T + \text{PHI}) / \text{OMEG}^2$$

If the user does not want these initial conditions, other values can be input by entering them as initial displacements and velocities for block N+2, which is the PCRV (Section 6.7).

2.7.2 Sinusoidal Sweep

A sinusoidal sweep is similar to a sinusoidal dwell except that the frequency is a logarithmic function of time. The frequency of the PCRV acceleration starts at the initial frequency SWBG and is swept upward at a sweep rate of SWR until the upper frequency SWDN is reached. At this time, the process is reversed and the frequency is brought back to SWBG. Throughout the entire sweep, the peak sinusoidal acceleration is maintained at a constant value LSF. The equation that describes motion of this type is

$$\ddot{X} = \text{LSF} * \text{SIN} \left(\int_0^T \text{OMEG} dt \right) \quad (2-1)$$

where

for $T \leq \text{TDWN}$

OMEG = frequency at time T

= $\text{SWBG} * 10^{\text{SWR} * T}$

TDWN = time at which OMEG = SWDN

= $\log (\text{SWDN} / \text{SWBG}) / \text{SWR}$

LSF = peak sinusoidal acceleration
 SWBG = sweep starting frequency
 SWDN = upper sweep frequency
 SWR = sweep rate

for $T > TDWN$

$$OMEG = SWBG * 10^{SWR * (2 * TDWN - T)}$$

Solving Eq. 2-1 yields the following expressions which are used to evaluate the PCRVR acceleration:

for $T \leq TDWN$

$$\ddot{X} = LSF * SIN \left\{ \frac{SWBG}{SWR * \ln 10} \left(10^{SWR * T} - 1 \right) \right\}$$

for $T > TDWN$

$$\ddot{X} = LSF * SIN \left\{ \frac{SWBG}{SWR * \ln 10} \left(2 * 10^{SWR * TDWN} - 1 - 10^{SWR * (2 * TDWN - T)} \right) \right\}$$

2.7.3 Time History

Time history motion is described by a table of accelerations equally spaced in time. Accelerations are determined for each time step by interpolating between the acceleration points in the table. Velocities and displacements are found by numerically integrating the accelerations.

2.8 DAMPING

Each spring used in CRUNCH has a viscous damper in parallel with it. The dampers act only when the springs are engaged. The purpose of the dampers is to provide a mechanism to model the energy losses due to friction and due to collisions of blocks not included in the one-dimensional CRUNCH model. The damping force is not included in the printed output since it is used as a mathematical technique for dissipating energy rather than an actual physical force.

Damping forces are computed using the following equation:

$$F_D = cv$$

where

c = damping coefficient

v = velocity .

The code has several options where the user can input damping ratios rather than damping coefficients. In these cases, the code uses the following equation to compute the damping coefficient:

$$c = 2\xi\sqrt{KM}$$

where

ξ = damping ratio

K = spring stiffness

M = mass.

For the core spring packs M is the mass of block 1. For column springs, M is the mass of the block associated with the column. For the second spring of a two mass spring pack, M is the mass of the second block. For the interblock springs, M is the equivalent mass of the two colliding blocks defined as follows:

$$M = \frac{M_1 \cdot M_2}{M_1 + M_2}$$

where

M_1 = mass of first block

M_2 = mass of second block.

For the core support floor spring pack, M is the mass of the core support floor.

2.9 GAPS

CRUNCH uses four types of gaps. Initial gaps, additional interblock impulse gaps and additional interblock spring gaps are input parameters. For most problems, additional interblock impulse and spring gaps are not used. The fourth gap is the interblock gap which is an output variable.

2.9.1 Initial Gap

The initial gaps GI are the distances between blocks when they are in their equilibrium position. An equilibrium position is a position where the column springs and spring packs are undeflected (interblock springs may be deflected). All motion of the blocks are measured from the equilibrium position. At time equal to zero, the blocks need not be in their equilibrium position since the code has the option to input initial displacements and velocities.

2.9.2 Additional Interblock Spring Gap

The additional interblock spring gap GSD is only used for runs which require special modeling. In general, the interblock springs and dampers engage when the blocks move toward each other a distance equal to the initial gap GI. If a positive value of GSD is input to the code, the springs will not engage until the blocks move toward each other a distance of GI plus GSD. This has the effect of displacing the interblock springs from the impulse calculation.

2.9.3 Additional Interblock Impulse Gap

The additional interblock impulse gap GID is used only for runs which require special modeling. If a positive value of GID is input to the code, impulses will not be computed until the two blocks move toward each other a distance of GI plus GID. This has the effect of displacing the impulse calculation from the interblock springs.

2.9.4 Interblock Gap

Interblock gaps G are the actual gaps between blocks. They are computed using the following equation:

$$G(I) = GI(I) + X(I) - X(I-1)$$

where

$G(I)$ = gap between blocks I and $I-1$

$GI(I)$ = initial gap between blocks I and $I-1$

$X(I)$ = displacement of block I .

The displacement of the PCRV is used to compute gaps between the PCRV and an adjacent block. Interblock gaps are positive if there is space between the blocks.

2.10 AUTOMATIC SELECTION OF INTERBLOCK SPRINGS

CRUNCH automatically selects the interblock spring stiffnesses such that the frequency associated with each mass is less than the input frequency CGF. Any of the automatically selected stiffnesses can be replaced by entering specific values of stiffness. The selection of interblock spring stiffnesses is a two step process. First, the stiffness is selected such that the frequency of a two block collision without column springs is equal to CGF (Fig. 6a). The equation for the natural frequency of two blocks colliding is

$$f = \frac{1}{2\pi} \sqrt{\frac{K}{M}}$$

where

M = effective mass

$$= \frac{M(I) * M(I-1)}{M(I) + M(I-1)}$$

$M(I)$ = mass of block I

a. TWO MASS MODEL

b. SINGLE MASS MODEL

Fig. 6. Models for automatic selection of interblock springs

$$\begin{aligned}
K &= \text{interblock stiffness between blocks I and I-1} \\
&= \text{CGS(I)} \\
f &= \text{CGF.}
\end{aligned}$$

Rearranging the terms yields the following equation which gives the first evaluation of interblock stiffness.

$$\text{CGS(I)} = (2\pi \text{CGF})^2 * M \quad (2-2)$$

The second step in the selection of interblock springs is to modify the stiffness (if required) so that the frequency associated with the single mass configuration shown in Fig. 6b is less than or equal to CGF. In Fig. 6b, block I is assumed to be locked between blocks I-1 and I+1. Both block I+1 and I-1 are assumed to be fixed and the base of column spring I is assumed to be fixed. The equation for the natural frequency of this system is

$$f = \frac{1}{2\pi} \sqrt{\frac{K}{M}}$$

where

$$\begin{aligned}
M &= M(I) = \text{mass of block I} \\
K &= \text{STIFF(I)} + \text{CGS(I)} + \text{CGS(I+1)} \\
\text{STIFF(I)} &= \text{stiffness of column I} \\
\text{CGS(I)} &= \text{interblock stiffness between blocks I and I-1} \\
f &= \text{CGF.}
\end{aligned}$$

Rearranging the terms yields an equation for the sum of interblock stiffnesses I and I+1.

$$\text{CGS(I)} + \text{CGS(I+1)} = (2\pi \text{CGF})^2 * M(I) - \text{STIFF(I)} \quad (2-3)$$

If the sum of the interblock spring stiffnesses computed using the two mass model (Eq. 2-2) is greater than those computed using the single mass model (Eq. 2-3), then the stiffnesses computed using the two mass model will be scaled to meet the criteria of the single mass model. If block I is associated with a spring pack, then the spring pack stiffness is included on the right side of Eq. 2-3.

This procedure is not exact and is provided as a user convenience for the selection of weak interblock springs to be used with the impulse-momentum option.

2.11 MINIMUM INTEGRATION TIME STEP

The code automatically computes some of the natural frequencies associated with the model and then checks to see if the integration time step ΔT is at least as small as $1/NCON$ times the period of the highest computed natural frequency. The code assumes that $NCON$ is equal to 20 unless a value of $NCON$ greater than 0 is input. The following single degree-of-freedom frequencies of the model are checked.

1. The frequencies associated with each piecewise linear section of the spring pack and mass 1.
2. The frequency associated with any two masses colliding (Fig. 6a).
3. The frequency of any mass locked between its two neighbors (Fig. 6b).

This procedure does not check all of the natural frequencies of the system nor does it check the stability requirements associated with the viscous dampers. Consequently, the user must ensure for himself the numerical stability and convergence of his particular analysis.

3. NUMERICAL INTEGRATION METHODS

Four integration methods are available in CRUNCH: Euler's method, central difference, second and fourth-order Runge-Kutta. The results of the study presented in Ref. 7 indicate that for CRUNCH the central difference method is the most economical.

3.1 EULER'S METHOD

The Euler's method which is used in CRUNCH has been modified for second-order equations. For first-order equations, Euler's method (Ref. 8, Eq. 6.28b) is written

$$x_{n+1} = x_n + h f(t_n, x_n) \quad (3-1)$$

where h = integration time step $(t_{n+1} - t_n)$

$$f(t, x) = \frac{dx}{dt} = \dot{x}.$$

The basic assumption of Euler's method is that $\dot{x}$ can be assumed constant over the time step h , and that it can be approximated by $f(t_n, x_n)$.

Euler's method can be used for the solution of second-order equations by reducing the second-order equation to two first-order equations:

$$\dot{x}_{n+1} = \dot{x}_n + h f(t_n, x_n, \dot{x}_n) \quad (3-2)$$

$$x_{n+1} = x_n + h \dot{x}_n \quad (3-3)$$

where

$$f(t, x, \dot{x}) = \frac{d^2x}{dt^2} = \ddot{x}.$$

The basic assumption in Eq. 3-2 is that $\ddot{x}$ remains constant over h and can be approximated by $f(t_n, x_n, \dot{x}_n)$. In Eq. 3-3, it has been assumed that $\dot{x}$ is constant over h and can be represented by $\dot{x}_n$. An assumption for Eq. 3-3 which is more compatible with Eq. 3-2, is to assume that $\dot{x}$ be approximated by the average value of $\dot{x}_n$ and $\dot{x}_{n+1}$, which yields the following:

$$x_{n+1} = x_n + \frac{h}{2} (\dot{x}_{n+1} + \dot{x}_n). \quad (3-4)$$

Substituting x_{n+1} from Eq. 3-2 into Eq. 3-4 yields

$$x_{n+1} = x_n + \frac{h}{2} (\dot{x}_n + h f(t_n, x_n, \dot{x}_n) + \dot{x}_n) \quad (3-5)$$

or

$$x_{n+1} = x_n + h \dot{x}_n + \frac{h^2}{2} f(t_n, x_n, \dot{x}_n). \quad (3-6)$$

Equations 3-2 and 3-6 are the equations used in the code. The function $f(t_n, x_n, \dot{x}_n)$ must be evaluated only once per integration time step.

3.2 CENTRAL DIFFERENCE

The central difference method was found in two different forms in the literature. The first (Ref. 9) was based on the following central difference formulas:

$$\ddot{x}_n = \frac{x_{n+1} - 2x_n + x_{n-1}}{h^2} \quad (3-7)$$

$$\dot{x}_n = \frac{x_{n+1} - x_{n-1}}{h} \quad (3-8)$$

The second (Refs. 10 and 11) was based on the central difference formulas expressed as:

$$\ddot{x}_n = \frac{\dot{x}_{n+1/2} - \dot{x}_{n-1/2}}{h} \quad (3-9)$$

$$\dot{x}_{n+1/2} = \frac{x_{n+1} - x_n}{h} \quad (3-10)$$

By simple substitution, it can be shown that $\ddot{x}_n$ in Eq. 3-7 is identical to that defined by Eqs. 3-9 and 3-10. The central difference method used in the computer analysis is based on Eqs. 3-9 and 3-10 rewritten as follows:

$$\dot{x}_{n+1/2} = \dot{x}_{n-1/2} + h \ddot{x}_n \quad (3-11)$$

$$x_{n+1} = x_n + h \dot{x}_{n+1/2} \quad (3-12)$$

Equations 3-11 and 3-12 can be shown to be equivalent to the Newmark- β formulas with $\beta = 0$.

A complication arises if $\ddot{x}_n$ is a function of velocity,

$$\ddot{x}_n = f(x_n, \dot{x}_n, t_n) \quad (3-13)$$

since $\dot{x}_n$ is not directly available from Eqs. 3-11 and 3-12. One solution is to evaluate $\dot{x}_n$ using the following backward difference formula:

$$\dot{x}_n = \frac{x_n - x_{n-1}}{h} \quad (3-14)$$

The value computed for $\dot{x}_n$ would be identical to the value previously computed for $\dot{x}_{n-1/2}$. Therefore, $\dot{x}_n$ need not be computed, and $\ddot{x}_n$ can be defined as follows:

$$\ddot{x}_n = f(x_n, \dot{x}_{n-1/2}, t_n) \quad (3-15)$$

The reason $\dot{x}_{n-1/2}$ is identical to $\dot{x}_n$ can be shown by subtracting one from the subscripts of the central difference Eqs. 3-12 and rewriting it in the following form:

$$\dot{x}_{n-1/2} = \frac{x_n - x_{n-1}}{h} \quad (3-16)$$

As can be seen, the right-hand sides of Eqs. 3-14 and 3-16 are identical. The above procedure is currently used in the computer analysis.

An alternate solution would be to use the following modifications of Eqs. 3-11 and 3-12 to evaluate $\dot{x}_n$.

$$\dot{x}_n = \dot{x}_{n-1} + h \ddot{x}_{n-1/2} \quad (3-17)$$

$$x_{n+1/2} = x_{n-1/2} + h \dot{x}_n \quad (3-18)$$

where

$$\ddot{x}_{n-1/2} = f(x_{n-1/2}, \dot{x}_{n-1/2}, t_{n-1/2}) \quad (3-19)$$

By using Eqs. 3-11, 3-12, 3-17 and 3-18, values of x and $\dot{x}$ will be computed at both half and full time steps. Thus, all of the information required to evaluate both $\ddot{x}_{n-1/2}$ and $\ddot{x}_n$ is available. The disadvantage of this method is that $\ddot{x}$ must be evaluated twice per integration step. The advantage is higher accuracy.

Stability of the central difference method for linear systems requires that

$$h < \frac{2}{w_{\max}}$$

where

$w_{\max}$ = the highest linear frequency of the system.

Reference 11 states "there is considerable empirical evidence that these stability limits are valid for nonlinear problems if the current highest frequency is used in the equation."

The method is not self-starting since one past value of $\dot{x}$ is required. The method can be started by using the following equation based on Euler's method:

$$\dot{x}_{n+1/2} = \dot{x}_n + \frac{h}{2} \ddot{x}_n$$

3.3 SECOND-ORDER RUNGE-KUTTA

The second-order Runge-Kutta method which is used was taken from Ref. 12, Eq. 3.12. The values selected for the constants are

$$\gamma_1 = \gamma_2 = 1/2$$

$$\alpha_1 = \alpha_2 = 2/3$$

$$\alpha_3 = 4/3$$

$$\sigma_1 = 1/2$$

$$\sigma_2 = 3/2$$

The selection of these constants causes the method to use the acceleration at $t = t_0$ and $t_0 + 2/3 h$ to evaluate the displacements and velocities at $t = t_0 + h$.

The following equations are used in the code:

$$\ddot{x}_n = f(t_n, x_n, \dot{x}_n)$$

$$x_{n+2/3} = x_n + 2/3 h \dot{x}_n + 1/3 h^2 \ddot{x}_n$$

$$\dot{x}_{n+2/3} = \dot{x}_n + 2/3 h \ddot{x}_n$$

$$t_{n+2/3} = t_n + 2/3 h$$

$$\ddot{x}_{n+2/3} = f(t_{n+2/3}, x_{n+2/3}, \dot{x}_{n+2/3})$$

$$t_{n+1} = t_n + h$$

$$x_{n+1} = x_n + h \dot{x}_n + \frac{h^2}{4} (\ddot{x}_n + \ddot{x}_{n+2/3})$$

$$\dot{x}_{n+1} = \dot{x}_n + \frac{h}{4} (\ddot{x}_n + 3 \ddot{x}_{n+2/3})$$

This method is self-starting and requires two function evaluations per time step.

3.4 FOURTH-ORDER RUNGE-KUTTA

The fourth-order Runge-Kutta method (also referred to as a four step or four pass Runge-Kutta), which is used, is subroutine RKDE taken from the UNIVAC Math-Pack (Ref. 13). The method used in the RKDE subroutine is outlined by S. Gill in Ref. 14. The subroutine only integrates first-order equations, so the second-order dynamic equations were reduced to the following two sets of first order equations:

$$\dot{v} = \text{acceleration} = F(t, x, v)$$

$$\dot{x} = \text{velocity} = v$$

The numerical integration procedure is well defined in Refs. 13 and 14, and because of its length will not be presented here. In general, the procedure is very similar to that used for second-order Runge-Kutta, except that the solution is based on four function evaluations rather than two. The function is evaluated at $t = t_0$, twice at $t = t_0 + 1/2 h$ and once at $t = t_0 + h$.

4. DESCRIPTION OF INPUT

The philosophy which was used when coding CRUNCH was to make the code as general as possible and still not require the user to enter a lot of data which does not apply to his analysis. Consequently, only 5 of the 27 input cards used by CRUNCH are required. If an input variable does not apply to a particular analysis, but is read by a required card; it should be left blank.

The input data is oriented for eight-word data cards. Formats are either A, F or I (standard FORTRAN). Data read in A format can be any combination of alpha-numeric characters (e.g., ABC123\$*ETC). F format data is numeric and requires a decimal point. It can be located anywhere in the data field except when entered in exponential form (e.g., 7.15E-6). In this case, the number should be entered in the columns furthest to the right. I format data is numeric, cannot have a decimal, and must be entered in the columns furthest to the right. Input data forms are presented in Appendix A.

CARD 1

TITLE - Any 80 character title

CARD 2

N - Number of masses not including core support floor mass

IB - Type of spring pack
If = 0, no spring pack

This option is used to model tests which do not involve the PCRV (e.g., block-on-block coefficient-of-restitution tests) or when the PCRV stiffness and damping are modeled using a coefficient-of-restitution rather than springs and dampers.

If = 1, single mass spring pack

The spring pack attaches the PCRV to the mass nearest the PCRV.

If = 2, massless spring pack

The spring pack is attached to the PCRV but not to any mass. The spring pack exerts forces only when the nearest mass compresses it.

If = 3, two mass spring pack

The spring pack connects the PCRV to the first mass and a second spring attaches the first mass to the second mass.

NRL - Rigid link option
If = 0, no rigid link
If = 1, rigid link

IGM - Type of PCRV motion
If = 0, no PCRV motion
If = 1, time history (table of acceleration points)
If = 2, sinusoidal motion at constant frequency and amplitude
If = 3, sinusoidal sweep with the acceleration amplitude constant and the frequency varying with time

NPRT - Print interval
The code will print output every NPRT integration steps.

KP - Number of points in block-on-block coefficient-of-restitution table
If = 0, the code will not do any impulse computations.
This includes block-on-block, block-on-PCRV, and rigid link collisions.

- K5 - Number of points in spring pack force-deflection table
- NCSB - Number of points in core support floor spring pack force-deflection table
If = 0, no core support floor
- IMETH - Numerical integration method
The recommended method is central difference (IMETH = 4).
If = 1, Euler's method
If = 2, fourth-order Runge-Kutta
If = 3, second-order Runge-Kutta
If = 4, central difference
- NORGB - Number of points in block-on-PCRV coefficient-of-restitution table
If = 0, no block-on-PCRV impulses are computed.
- NOFIBR - NOFIBR + 1 = number of brackets for impulse force distribution
This option is available only if impulse forces are computed ($KP \geq 2$). The option causes the program output to include the distribution of impulse forces that fall in the brackets established by the forces indicated on Card 3. The first bracket is the number of impulse forces less than FB(1). The second is the number of impulse forces between FB(1) and FB(2). The last bracket is the number of impulse forces greater than FB(NOFIBR).
- IDAMP - Format of damping input
In most cases, this option allows the user to input damping in a format that is most convenient for him. However, there are some cases that require the damping be input in a specific format. These cases are indicated on the input instruction sheets.

If = 0, damping ratios (i.e., actual damping/critical damping)

If = 1, damping coefficients (lb-sec/in.)

- NCON - Minimum number of integration steps required per cycle of motion
- The code computes some of the natural frequencies associated with the model and checks to see if the integration time step is at least as small as $1/NCON$ times the period of the highest of the computed natural frequencies. If this condition is not met, the run is terminated. The default value for NCON is 20.

CARD 3

- FB(I) - Maximum impulse force included in bracket I of the impulse force distribution output (see card 2, NOFIBR)

CARD 4

- T - Starting time
- DT - Numerical integration time step
- TEND - End time
- The run is terminated when $T \geq TEND$.
- CT - Contact time for impulse calculations
- CT is used to compute the peak value of the impulse force. Changes of CT only affect the output value of the impulse force. All other output parameters will remain unchanged (Section 2.2.1).
- If $KP = 0$, CT is not used.
- CTM - Minimum time between impulse calculations
- In general, CTM is assumed to be equal to CT which is assumed to be equal to the interblock contact time measured

by test. The code requires that CTM seconds pass before a second impulse between two blocks can be computed. If $KP = 0$, CTM is not used.

CARD 5

- CGF - Frequency used for automatic selection of interblock springs
The code automatically selects the stiffness of the interblock springs such that the frequency associated with collisions between any two blocks is less than or equal to CGF. Card 27 can be used to replace any or all of these automatically selected stiffnesses.
- CGDR - Damping ratio associated with automatically selected interblock springs
The code automatically selects the damping coefficient of the interblock springs such that the damping ratio associated with the collision between any two blocks is equal to CGDR. Card 27 can be used to replace any of the automatically computed damping coefficients.
- CBD - Core spring pack damping
- GAP 5 - Initial gap for impulse calculation between first block and PCR
The code assumes that GAP5 applies to both the right and left sides of core (i.e., with respect to GAP5, the core is assumed symmetric). GAP5 should not be confused with GI(1) and GI(N) which are the distances from the nearest blocks to the spring packs (Section 2.9.1). GAP5 is not used if $NORGB = 0$.

CARD 6

- CSPS - Stiffness of spring connecting the first and second mass of the two mass spring pack (Section 2.3.3)
- CSPD - Damping associated with CSPS

- CRSP - Coefficient-of-restitution for hits between first and second mass of the two mass spring pack
GI(2) and GI(N-1) are the initial gaps between the first and second masses. When the first and second blocks move together GI(2), the interblock springs engage and an impulse is computed using a coefficient-of-restitution of CRSP.

CARD 7

- WFSB - Weight of core support floor
- GAP6 - Initial gap between the core support floor and core support floor spring pack
The initial gap is assumed symmetric.
- CSD - Core support floor spring pack damping
- CCSGD - Core support floor to ground damping coefficient
Ground is a point independent of the PCRV which has zero motion. Consequently, any motion of the core support floor produces a damping force. The purpose of this damper is to represent the energy loss due to friction and collisions between the core support blocks which make up the core support floor.

CARD 8 (See Section 2.6)

- K1 - Block number of first reflector block connected by rigid link
- K4 - Block number of last reflector block connected by rigid link
- GAP4 - Initial gap between reflector blocks before rigid link takes effect
- PLOAD - Force pushing reflector blocks toward each other
PLOAD represents the pressure drop from outside the reflector blocks to inside the core.

- SRL - Stiffness of rigid link interblock spring
When the two reflector blocks move a distance GAP4 towards each other, a zero coefficient-of-restitution impulse occurs and the rigid link interblock spring engages. This spring applies equal and opposite forces to the reflector blocks.
- DRL - Damping coefficient associated with the rigid link interblock spring

CARDS 9 & 10 (See Section 2.2.1)

- VP(I) - Velocity I of the block-on-block coefficient-of-restitution table
- EP(I) - Coefficient-of-restitution associated with VP(I)
Coefficient-of-restitution test data indicates that the block-on-block coefficient-of-restitution is a function of the relative velocities of the two blocks. Cards 9 and 10 allow this function to be represented as a table containing 24 piecewise linear segments.

CARDS 11 & 12 (See Section 2.2.1)

- VPB(I) - Velocity I of the block-on-PCR coefficient-of-restitution table
- EPB(I) - Coefficient-of-restitution associated with velocity I

CARDS 13 & 14 (See Section 2.3.4)

- CBS(1,I) - Deflection I of the spring pack force-deflection table
- CBS(2,I) - Force associated with deflection I
The force-deflection characteristics of the right and left spring packs are assumed to be symmetric. Compressive forces and deflections are positive. The code extrapolates for deflections outside the range of the table. A linear spring pack with stiffness K can be input as:

CBS(1,1) = CBS(2,1) = 0

CBS(1,2) = 1.0

CBS(2,2) = K

CARDS 15 & 16 (See Section 2.3.4)

CSS(1,I) - Deflection I of the core support floor spring pack force-deflection table

CSS(2,I) - Force associated with deflection I

CARDS 17 & 18

GMDT - Time step between PCRIV acceleration points

LSF - Scale factor for PCRIV accelerations
PCRIV accelerations are multiplied by LSF.

NGMPTS - Number of points in acceleration table

NFORMT - Format for reading LAT(I)

If = 0, 8F9.0

If = 1, 8F10.0

LAT(I) - PCRIV acceleration point I for time-acceleration table
The code forms a time-acceleration table with NGMPTS points equally spaced GMDT seconds apart. The first point LAT(1) occurs at T = 0.

CARD 19 (See Section 2.7.1)

OMEG - PCRIV sinusoidal dwell frequency

PHI - Phase angle

By setting PHI = 90, the sinusoidal motion is modeled as a cosine function rather than a sine function.

LSF - Peak sinusoidal acceleration

CARD 20 (See Section 2.7.2)

SWBG - Starting frequency for PCRIV sinusoidal sweep

SWDN - Upper frequency for sinusoidal sweep

SWR - Logarithmic sweep rate

CARD 20 (continued)

- SPF - Print interval (Hz)
For sinusoidal sweeps, output is printed at even increments of frequency rather than even increments of time.
- LSF - Peak sinusoidal acceleration (at all frequencies)
The PCRV sinusoidal sweep starts at a frequency of SWBG. The frequency is then swept upward at a rate of SWR until the frequency SWDN is reached. At this point, the process is reversed and the frequency is swept back to SWBG. At all times, the peak PCRV acceleration is maintained at LSF in./sec². Output is printed each time the frequency is incremented by SPF.

CARDS 21-27 (General Data)

- I - Card type
This variable identifies the type of data that is being input.
- IF - The first block or gap of a series that has the properties which are on the card
- IL - The last block or gap of a series that has the properties which are on the card
- I1, I2, ... I10 - Additional blocks or gaps that have the properties which are on the card

The code reads the properties on the card and assigns them to blocks (or gaps) IF through IL and to blocks I1, I2, ... I10. If IF = 0, no data is assigned to IF through IL. IL must be equal to or greater than IF. Data is assigned to I1 through I10 in order until a zero (or blank) is encountered. Some cards do not read the entire series I1 through I10 (e.g., Card 21 reads I1 through I4). Enter as many of card types 21 through 27 as required. Block N + 1 is the core support floor. Block N + 2 is the PCRV.

CARD 21 (See Section 2.4)

- W - Block weight

- STIFF - Column stiffness
The horizontal stiffness of the spring connecting the block to the core support floor (or PCRV if the model has no core support floor).
- BF - Column breaking force
This is the maximum force the column spring can exert. The column acts as a linear spring for forces of BF or less. For increased deflections, the force remains constant at BF. If $BF = 0$, the column spring is linear for all deflections.
- DAMP - The damping associated with the column spring

CARD 22 (See Section 2.9.1)

- GI - Initial gap
Initial gaps are the distances between blocks when all the column springs and spring packs are undeflected. Interblock springs can be compressed. Initial gaps can be negative if required.

CARDS 23 and 24 (See Sections 9.2.2 and 9.2.3)

- GSD - Additional gap added to GI before interblock springs engage
- GID - Additional gap added to GI before interblock impulse occurs
- These two variables are used only to do special modeling. In general, the interblock springs and impulses take effect simultaneously when two blocks move together a distance GI. By varying GSD or GID, the user can cause either the impulse or the spring to engage first.

CARD 25

- X - Initial block displacements
By entering initial values of X, runs may be started at positions other than determined by GI.

CARD 26

XD - Initial block velocities

CARD 27

CGS - Interblock spring stiffness

CGD - Damping associated with interblock springs

5. DESCRIPTION OF OUTPUT

Printed output consists of input data, time history results and an output summary. These are discussed in the following sections.

5.1 INPUT DATA

Input data is printed in two formats. The first is printed by the input repeat subroutine. This subroutine reads the data and then prints it in exactly the same format as it was read. If the input repeat does not list the complete input deck, then most likely the input deck has a control card error.

Immediately following the input repeat, the program lists the data as interpreted by the code. This data should be checked carefully, since errors in input format (e.g., data entered in the wrong columns or missing decimal points) will be obvious.

In addition to input data, this section also prints some data which was automatically computed by the code.

5.2 TIME HISTORY OUTPUT

The main section of the output data is the time history output. This data is printed every NPRT (print interval) integration steps and describes the motion as a function of time. The first line of the time history output is the title. The following is a description of the remaining data:

TIME - Current value of time (sec)

ENERGY - System energy at current time (lb-in.)

System energy is the sum of the kinetic energy of all the blocks including the core support block plus the potential energy in all of the springs. Potential energy is

computed assuming that all springs are linear. Consequently, the energy computed for the spring packs will be incorrect if they are loaded past the first linear section of their force-deflection curve.

LUMPING - A measure of the tendency of the fuel blocks to move together as a single mass
If = 0, fuel blocks are spread throughout the entire core
If = 100, fuel blocks are grouped in a solid lump
Mathematically lumping is equal to

$$100 \left(1 - \frac{\text{sum of the gaps between fuel elements}}{\text{total gap between spring packs}} \right)$$

LUMPING can be greater than 100 if the interblock springs are compressed.

LUMPING is computed at the current time.

I - Block or gap number
X - Block displacement at the printed time (in.)
XD - Block velocity at the printed time (in./sec)
XDD - Block acceleration at the printed time (in./sec²)
GAP - Distance between blocks I and I-1 at the printed time (in.)
Negative gaps indicate that the blocks are in contact.

IMPULSE FORCE - Peak value of the impulse force plus the interblock spring force occurring at the printed time (lb). The peak value is computed assuming that the duration of the impulse is CT and that it has a sine squared distribution. Impulse forces are computed only when the impulse-momentum option is selected (KP ≥ 2).

MAX REL VEL - Maximum relative velocity between colliding blocks occurring during the print interval (in./sec)

MAX IMPULSE - Maximum impulse force occurring during the print interval (lb.)

MAX SPRING - Maximum column spring force occurring during the print interval (lb)
For blocks 1 and N, this is the sum of the column force and the spring pack force.

MAX INTERBLK - Maximum interblock spring force occurring between blocks I and I-1 during the print interval (lb)

HITS - Number of collisions between blocks I and I-1
Hits are counted only when the impulse-momentum option is selected ($KP \geq 2$).

NO. OF RIGID LINK HITS - Number of rigid link collisions
Hits are counted only when the impulse-momentum option is selected ($KP \geq 2$).

TIME RIGID LINK IN CONTACT - The time the rigid link was engaged during the print interval (sec)

MAX RIGID LINK FORCE - Maximum rigid link force computed during print interval (lb)

5.3 OUTPUT SUMMARY

The final four pages of the CRUNCH output contain a summary of the maximum and minimum values of the time history output plus the times that these values occurred. All of the output included in the summary is described in Section 5.2. The values printed for system energy and lumping are the maximums which occurred at the print intervals. These parameters are computed only when output is being printed. Consequently, intermediate maximums are not available.

6. MODELING TECHNIQUES

This section presents examples of how to model some of the configurations which may require analysis. In general, information which is common to several of the examples is only discussed in the first section to which it applies.

6.1 BILINEAR SPRING PACK

Figure 7 shows a typical massless bilinear spring pack. When block 1 moves to the left a distance D_2 it encounters the first spring K_1 and a distance D_1 later, it encounters the second spring K_2 . (In the figure, K_2 is shown as two springs for symmetry.) The force-deflection curve associated with the bilinear spring pack is shown in Fig. 8 and the corresponding force-deflection table in Table 1. The first point is the point of contact which has zero force and deflection. During the portion of the curve from 0 to D_1 , only the first spring is deflecting. Consequently, the slope of this section of the curve is K_1 and the force at D_1 is $D_1 K_1$. For the next section of the curve, both springs are being compressed so the slope is $K_1 + K_2$. For simplicity, the third deflection point for the table is selected to be at $1.0 + D_1$. The force associated with this deflection is the force at point 2 plus one times the slope ($K_1 + K_2$) or $D_1 K_1 + K_1 + K_2$. The code will extrapolate to determine forces for deflections greater than $1.0 + D_1$.

The input for this spring pack is as follows:

IB = 2	(massless spring pack)
K5 = 3	(No. of points in spring pack force deflection table)
CBD = C_1	(spring pack damping)

* K_2 IS THE COMBINED
STIFFNESS OF THE TWO
SPRINGS.

Fig. 7: Bilinear spring pack

TABLE 1
BILINEAR FORCE-DEFLECTION TABLE

POINT	DEFLECTION	FORCE
1	0	0
2	D_1	$K_1 D_1$
3	$D_1 + 1$	$K_1 D_1 + K_1 + K_2$

Fig. 8. Bilinear force-deflection curve

```

CBS(1,1)  = 0.0  (force-deflection table)
CBS(1,2)  = D1
CBS(1,3)  = D1 + 1
CBS(2,1)  = 0.
CBS(2,2)  = D1K1
CBS(2,3)  = D1K1 + K1 + K2
GI(1)     = D2  (initial gap)
GI(N+1)   = D2
W(1)      = W1
W(N)      = W1 .

```

6.2 SINGLE MASS SPRING PACK WITH RIGID STOP

A single mass spring pack with a rigid stop is shown in Fig. 2b. Block 1 is attached to the spring pack which can exert both tensile and compressive forces. If the block moves to the left more than D_1 , a rigid stop is encountered which causes an impulse to be applied to block 1. Figure 9 presents a typical coefficient-of-restitution curve for a rigid stop. Table 2 shows a coefficient-of-restitution table which represents that curve.

The input required for this configuration is as follows:

```

IB = 1      (single mass spring pack)
KP ≥ 2      (If KP=0, the code will not compute the rigid stop impulse.)
K5 = 2      (number of points in spring pack force-deflection table)
NORGB = 2   (number of points in rigid stop coefficient-of-restitution
              table)
CBD = C1    (spring pack damping)
GAP5 = D1   (distance to rigid stop)
VP(I)       (A block-on-block coefficient-of-restitution table must be
              input.)
VPB(1) = V1 (rigid stop coefficient-of-restitution table)
VPB(2) = V2

```

TABLE 2
COEFFICIENT-OF-RESTITUTION TABLE

POINT	RELATIVE VELOCITY	COEFFICIENT-OF-RESTITUTION
1	V_1	C_1
2	V_2	C_2

Fig. 9. Typical coefficient-of-restitution curve

EPB(1) = e_1
 EPB(2) = e_2
 CBS(1,1) = 0 (spring pack force-deflection table --
 CBS(1,2) = 1 see Section 6.1)
 CBS(2,1) = 0
 CBS(2,2) = K_1
 W(1) = W_1 (weight of block 1)
 W(N) = W_1
 GI(1) = 0 (initial gap between spring pack and block 1)
 GI(N+1) = 0

To eliminate the rigid stop, the following data should be changed:

NORGB = 0
 GAP5 = 0.

The cards for VPB and EPB should be removed from the input deck. The restrictions on KP no longer apply (i.e., KP can be zero).

6.3 MASSLESS SPRING PACK WITH RIGID STOP

Figure 2a presents a massless spring pack with a rigid stop. The input is identical to that presented in Section 6.2 except for the following:

IB = 2
 GI(1) = D2
 GI(N+1) = D2.

6.4 TWO MASS SPRING PACK

The two mass spring pack (Fig. 2c) was added to CRUNCH to model the spring pack that is used in the current full scale core design. This design consists of a light face plate W_2 attached by a spring K_2 to the heavier side shield W_1 . The side shield is in turn attached by a spring K_1 to the PCRV. If the face plate moves closer than D_2 to the side shield, it will impact with the side shield. Similarly, if the side shield moves closer than D_1 to the PCRV, it will impact with the PCRV.

The following describes the input required to model this configuration. The input for the properties of W_1 , K_1 , C_1 and the PCRV are identical to the single mass spring pack presented in Section 6.2 with the exception that

$$IB = 3.$$

In addition, the following data is required to describe K_2 , C_2 , D_2 , W_2 and the coefficient-of-restitution e_3 for an impulse between W_1 and W_2 :

$$\begin{aligned} \text{CSPS} &= K_2 \\ \text{CSPD} &= C_2 \\ \text{CRSP} &= e_3 \\ W(2) &= W_2 \\ W(N-1) &= W_2 \\ \text{GI}(2) &= D_2 \\ \text{GI}(N) &= D_2. \end{aligned}$$

6.5 TWO-SPRING-SINGLE-MASS SPRING PACK

Numerical difficulties can occur if W_2 of the two mass spring pack (Fig. 6c) is small compared to W_1 or W_3 . If this is the case, it may be desirable to eliminate W_2 from the model (W_3 of the two mass model would then become W_2) to form a two-spring-single-mass spring pack (Fig. 6d).

The input for W_1 , K_1 , C_1 and the impulse with the PCRV will be identical to the single mass spring pack data (Section 6.2). The coefficient-of-restitution for impacts between W_1 and W_2 must be the same as the coefficient-of-restitution for all other block-on-block impulses (input data VP and EP). The new required data are

$$\begin{aligned} W(2) &= W_2 \\ W(N-1) &= W_2 \\ \text{GI}(2) &= D_3 \\ \text{GI}(N) &= D_3 \\ \left. \begin{aligned} \text{GID}(2) &= D_2 \\ \text{GID}(N) &= D_2 \end{aligned} \right\} && \text{These displace the impulse computation} \\ && \text{from the gap spring.} \\ \left. \begin{aligned} \text{CGS}(2) &= K_2 \\ \text{CGS}(N) &= K_2 \end{aligned} \right\} && \text{The gap spring is used to model the} \\ && \text{second spring of the spring pack.} \\ \text{CGD}(2) &= C_2 \\ \text{CGD}(N) &= C_2. \end{aligned}$$

6.6 PRELOADED SPRING PACK

During the life of the core, a condition can occur where the reflector blocks expand forming a rigid ring (see Section 2.6) which can produce a preload in the spring packs. The two-spring-single-mass spring pack (Fig. 2d) will be used to show how this condition is modeled. Except for GI(2), all of the data which was input for the unloaded spring pack is identical for the preloaded model. GI(2) is the gap between W_2 and the beginning of the undeflected spring pack. Since W_2 is preloading the spring pack, GI(2) will be the negative value of the initial preload deflection of the spring pack (D_4). Therefore,

$$\begin{aligned} \text{GI}(2) &= -D_4 \\ \text{GI}(N) &= -D_4. \end{aligned}$$

Next, the initial deflected position X_D of block 1 must be computed. X_D is the distance that W_1 moves to the left from its undeflected position due to the preload.

$$\begin{aligned} X(1) &= -X_D \\ X(2) &= 0 \\ X(N-1) &= 0 \\ X(N) &= X_D. \end{aligned}$$

The remaining input describes the rigid link.

$$\begin{aligned} \text{NRL} &= 1 \\ \text{K1} &= 2 \\ \text{K4} &= N - 1 \\ \text{GAP4} &= 0 \quad (\text{The rigid link is in contact when the reflector blocks are in their undeflected position.}) \\ \text{SRL} &= \quad (\text{A value for SRL must be input.}) \end{aligned}$$

SRL should be significantly stiffer than K_1 and K_2 . If not, the initial deflection of SRL must be computed and GAP4 should be set equal to the negative value of this deflection.

6.7 PCRIV INITIAL CONDITIONS

Initial displacements and velocities for the PCRIV can be input by entering initial conditions for block N+2. One case where this might be desirable is for PCRIV sinusoidal dwell excitation (Section 2.7.1). The code automatically sets up steady state sinusoidal conditions. For example, if the initial phase angle PHI is input as zero, the code will automatically compute the initial velocity required for steady state motion. To run the transient solution (initial velocity of zero), the following addition to the steady state data is required:

$$XD(N+2) = 0.$$

Initial conditions for the core support floor can be input by entering initial conditions for block N+1.

7. SAMPLE PROBLEM

The sample problem is the model used in Ref. 15 to correlate with the 1/5 scale full array tests. The differences between the results presented here and those of Ref. 15 are due to improvements added to CRUNCH Version 4 when CRUNCH Version 5 was created (Ref. 5).

Figure 1 presents the CRUNCH model which was used to idealize the core. Table 3 summarizes the input parameters which are used. Appendix B presents the computer output of the sample problem. Included in the output is a listing of all input cards. Since there is no exact solution to this problem, the results can only be compared to test data. Figure 10 compares the results of this analysis to test. To complete the comparison, the sample problem would have to be run at several other g levels.

The following control cards are required to run CRUNCH Version 5:

▽ASG,A	CRUNCH*VER5
▽XQT	CRUNCH*VER5.ABS

The sample problem is stored on catalog file and can be added to the run stream with the following card:

▽ADD	CRUNCH*VER5.SAMPLE
------	--------------------

The symbol ▽ represents a 7-8 punch in column 1.

Fig. 10. CRUNCH correlation with 1/5 scale full array test.

Table 3

SAMPLE PROBLEM INPUT

Number of masses = 29
 Integration time step = .0001 sec
 Contact time = .0004 sec
 Minimum time between impulse computations = .0004 sec
 Frequency for automatic interblock spring selection = 250 Hz
 Interblock damping = 0
 Core support floor to ground damping = 11.8 lb-sec/in.
 Core and core support floor spring pack
 stiffness = 800 lb/in.
 damping = 1.13 lb-sec/in.
 Rigid link stiffness = 50,000 lb/in.
 Rigid link damping = 0
 Rigid link preload = 0
 Quarter g time history with .00447 seconds between time points.

Mass Properties

Mass Type	Block No.	Weight (lb)
Core Barrel Plate	1, 29	12.738
Reflector Block	2, 28	27.02
Fuel Block	3, 27	13.124
Core Support Floor	--	200.3

Table 3 (continued)

Column Properties

Column Type	Stiffness (lb/in.)	Damping (lb-sec/in.)	Breaking Force (lb)
Fuel	400	.136	2.25
Reflector	7000	.797	22.1

Coefficient-of-Restitution

Point	Relative Velocity (in./sec)	Coefficient-of- Restitution
1	0	.319
2	40	.395

Gaps

Gaps Between:	Gap (in.)
Core Barrel Plate and Reflector Block	.0
Reflector Block and Fuel Block	.040
Fuel Blocks	.048
Rigid Link	.870
Core Support Floor and Spring Pack	.125

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APPENDIX A
INPUT DATA FORMS

Word	1	
Column	1-80	
Format	A	
Card 1	Title	
Symbol	TITLE

Word	1	2	3
Column	1-5	6-10	11-15
Format	I	I	I
Card 2	No. of masses (do not include core support floor) $1 < N \leq 37$	0 - No spring pack 1 - Single mass spring pack 2 - Massless spring pack 3 - Two mass spring pack	0 - No rigid link 1 - Reflector blocks connected with rigid link :
Symbol	II	IB	NRI

Word	N	5	66
Column	16-20	21-25	26-30
Format	I	I	I
Card 2 (continued)	0 - No PCRV motion 1 - Time history 2 - Sinusoidal dwell 3 - Sinusoidal sweep	Print interval NPRT ≥ 1	No. of points in block-on-block coefficient-of-restitution table $2 \leq KP \leq 25$ If KP = 0, no impulses will be computed
Symbol	IGM	NPRT	KP.

Word	7	8	9
Column	31-35	36-40	41-45
Format	I	I	I
Card 2 (continued)	No. of points in spring pack force-deflection table. $2 \leq K5 \leq 10$ If IB = 0, K5 is not used.	No. of points in core support floor spring pack force-deflection table. $2 \leq NCSB \leq 10$ If NCSB = 0, there is no core support floor.	Integration Method 1 - Euler's 2 - Fourth-order Runge-Kutta 3 - Second-order Runge-Kutta 4 - Central difference
Symbol	K5	NCSB	IMETH

Word	10	11	12	13
Column	46-50	51-55	56-60	61-65
Format	I	I	I	I
Card 2 (continued)	No. of points in block-on-PCRVR coefficient-of-restitution table $2 \leq NORGB \leq 10$ If NORGB = 0, no block-on-PCRVR impulses are computed	NOFIBR + 1 = No. of brackets for impulse distribution. $0 \leq NOFIBR \leq 9$	0 - Input damping ratios 1 - Input damping coefficients	Minimum no. of integration time steps allowed per cycle of motion. Default: NCON = 20
Symbol	NORGB	NOFIBR	IDAMP	NCON

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 3 Use only if NOFIBR > 0	Max. impulse force included in bracket 1. (1b)	Bracket 2 (1b)	Bracket 3	Bracket 4	Bracket 5	Bracket 6	Bracket 7
Symbol	FB(1)	FB(2)	FB(3)	FB(4)	FB(5)	FB(6)	FB(7)

Enter NOFIBR values. Use two cards if required.

Word	1	2	3	4	5
Column	1-10	11-20	21-30	31-40	41-50
Format	F	F	F	F	F
Card 4	Starting time (sec)	Integration time step (sec)	End time (sec)	Contact time used for impulse force calculation (sec)	Minimum time between impulse calculations (sec)
Symbol	T	DT	TEND	CT	CTM

Word	1	2	3	4
Column	1-10	11-20	21-30	31-40
Format	F	F	F	F
Card 5	Frequency used for automatic selection of interblock springs (Hz) optional	Damping ratio associated with automatically selected springs optional	* Spring pack damping	Initial gap for impulse calculations between first block and PCRV (in.) Required only if NORGB > 0
Symbol	CGF	CGDR	CBD	GAP5

* If IDAMP = 0,
damping ratios are
input (i.e., actual
damping divided by
critical damping).
If IDAMP = 1,
damping coefficient
is input.
(lb-sec/in.)

Word	1	3
Column	1-10	21-30
Format	F	F
Card 6 Use only if IB = 3.	Stiffness of spring connecting the first and second mass of two mass spring pack. (lb/in.)	* Damping associated with CSPA
Symbol	CSPS	CSPD

Coefficient-of-restitution
for hits between first and
second mass of the two mass
spring pack.

* See note on
Card 5

Word	1	2	3	4
Column	1-10	11-20	21-30	31-40
Format	F	F	F	F
Card 7 Use only if NCSB > 0	Weight of core support floor. (lb)	Initial gap between the core support floor and core support floor spring pack (in.)	*Core Support floor spring pack damping	Core support floor to ground damping coefficient. (lb-sec/in.)
Symbol	WFSB	GAP6	CSD	CCSGD

*See note on
Card 5

Word	1	2	3	4
Column	1-5	6-10	11-20	21-30
Format	I	I	F	F
Card 8 Use only if NRL = 1	Block no. of first reflector block.	Block no. of last reflector block.	Initial gap between reflector blocks before rigid link takes effect. (in.)	Force pushing reflector blocks toward each other. (lb)
Symbol	K1	K4	GAP4	LOAD

Word	5	6	
Column	31-40	41-50	
Format	F	F	
Card 8 (continued)	Stiffness of rigid link interblock spring (lb/in.)	Damping Coefficient of rigid link inter- block spring (lb-sec/in.)	
Symbol	SRL	DRL	

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 9 Use only if KP > 0	Block-on-block coefficient-of- restitution table. Velocity 1 (in./sec)	Velocity 2	Velocity 3	Velocity 4	Velocity 5	Velocity 6	Velocity 7
Symbol	VP(1)	VP(2)	VP(3)	VP(4)	VP(5)	VP(6)	VP(7)

Use additional
cards if neces-
sary. Total of
KP values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 10 Use only if KP > 0	Block-on-block coefficient- of-restitution table. Coefficient 1	Coefficient 2	Coefficient 3	Coefficient 4	Coefficient 5	Coefficient 6	Coefficient 7
Symbol	EP(1)	EP(2)	EP(3)	EP(4)	EP(5)	EP(6)	EP(7)

Use additional
cards if neces-
sary. Total of
KP values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 11 Use only if NORGB > 0	Block-on-PCR coefficient-of- restitution table. Velocity 1 (in./sec)	Velocity 2	Velocity 3	Velocity 4	Velocity 5	Velocity 6	Velocity 7
Symbol	VPB(1)	VPB(2)	VPB(3)	VPB(4)	VPB(5)	VPB(6)	VPB(7)

Use additional
cards if neces-
sary. Total of
NORGB values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 12 Use only if NORGB > 0	Block-on-PCRV coefficient-of- restitution table. Coefficient 1	Coefficient 2	Coefficient 3	Coefficient 4	Coefficient 5	Coefficient 6	Coefficient 7
Symbol	EPB(1)	EPB(2)	EPB(3)	EPB(4)	EPB(5)	EPB(6)	EPB(7)

Use additional
cards if neces-
sary. Total of
NORGB values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 13 Use only if IB > 0	Spring pack force-deflec- tion table. Deflection 1 (in.)	Deflection 2	Deflection 3	Deflection 4	Deflection 5	Deflection 6	Deflection 7
Symbol	CBS(1,1)	CBS(1,2)	CBS(1,3)	CBS(1,4)	CBS(1,5)	CBS(1,6)	CBS(1,7)

Use additional
cards if neces-
sary. Total of
K5 values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 14 Use only if IB > 0	Spring pack force deflection table. Force 1 (lbs)	Force 2	Force 3	Force 4	Force 5	Force 6	Force 7
Symbol	CBS(2,1)	CBS(2,2)	CBS(2,3)	CBS(2,4)	CBS(2,5)	CBS(2,6)	CBS(2,7)

Use an additional
card if necessary.
Total of K5
values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 15 Use only if NCSB > 0	Core support floor spring pack force- deflection table. Deflection 1 (in.)	Deflection 2	Deflection 3	Deflection 4	Deflection 5	Deflection 6	Deflection 7
Symbol	CSS(1,1)	CSS(1,2)	CSS(1,3)	CSS(1,4)	CSS(1,5)	CSS(1,6)	CSS(1,7)

Use additional
cards if neces-
sary. Total of
NCSB values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 16 Use only if NCSB > 0	Core support floor spring pack force- deflection table. Force 1 (lbs)	Force 2	Force 3	Force 4	Force 5	Force 6	Force 7
Symbol	CSS(2,1)	CSS(2,2)	CSS(2,3)	CSS(2,4)	CSS(2,5)	CSS(2,6)	CSS(2,7)

Use an additional
card if necessary.
Total of NCSB
values.

Word	1	2	3	4
Column	1-10	11-20	21-25	26-30
Format	F	F	I	I
Card 17 Use only if IGM = 1	Time step between PCRv acceleration points (sec)	Scale factor for PCRv accelerations	No. of points in acceleration table	Format for reading LAT(I) 0 - (8F9.0) 1 - (8F10.0)
Symbol	GMDT	LSF	NGMPTS	NEFORMT

Word	1	2	3	4	5	6	7
Column	1-9	10-18	19-27	28-36	37-45	46-54	55-63
Format	F	F	F	F	F	F	F
Card 18A Use only if IGM = 1 and NFORMT = 0	PCRV accel- eration table. Acceleration 1. (in./sec ²)	Acceleration 2	Acceleration 3	Acceleration 4	Acceleration 5	Acceleration 6	Acceleration 7
Symbol	LAT(1)	LAT(2)	LAT(3)	LAT(4)	LAT(5)	LAT(6)	LAT(7)

Word	8	
Column	64-72	
Format	F	
Card 18A (continued)	Acceleration 8	
Symbol	LAT(8)	

Use additional
cards if necessary.
Total of NGMPTS
values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 18B Use only if IGM = 1 and NFORMT = 1	PCRV accel- eration table. Acceleration 1. (in./sec ²)	Acceleration 2	Acceleration 3	Acceleration 4	Acceleration 5	Acceleration 6	Acceleration 7
Symbol	LAT(1)	LAT(2)	LAT(3)	LAT(4)	LAT(5)	LAT(6)	LAT(7)

Word	8	
Column	71-80	
Format	F	
Card 188 (continued)	Acceleration 8	
Symbol	LAT(8)	

Use additional
cards if necessary
Total of NGMPTS
values

Word	1	2	3	
Column	1-10	11-20	21-30	
Format	F	F	F	
Card 19 Use only if IGM = 2	Frequency of PCRV acceleration (Hz)	Phase Angle (degrees)	Peak sinusoidal acceleration (in./sec ²)	i.e., : $\ddot{x} = \text{LSF} * \text{SIN} (\text{OMEG} * T + \text{PHI})$ where T = time
Symbol	OMEG	PHI	LSF	

Word	1	2	3	4	5
Column	1-10	11-20	21-30	31-40	41-50
Format	F	F	F	F	F
Card 20 Use only if IGM = 3	Lower frequency (Hz)	Upper frequency (Hz)	Sweep rate (decades per minute)	Print interval (Hz)	Peak sinusoidal acceleration for all frequencies (in./sec ²)
Symbol	SWBG	SWDN	SWR	SPF	LSF

Word	1	2	3	4	5	6	7
Column	1	2-10	11-20	21-30	31-40	41-45	46-50
Format	I	F	F	F	F	I	I
Card 21	Enter a "1"	Weight (lb)	Column stiffness (lb/in.)	Column breaking force. (lb) If BF = 0, the column is treated as a linear spring.	If IDAMP = 0, input column damping ratio. If IDAMP = 1, input column damping coefficient. (lb-sec/in.)	First block of a series that has these properties.	Last block of the series that has these properties.
Symbol	I	W(J)	STIF(J)	BF(J)	DAMP(J)	IF	IL

Word	8	9	10	11	
Column	51-55	56-60	61-65	66-70	
Format	I	I	I	I	
Card 21 (continued)	Additional blocks with these properties. Start with I1 and continue to I4. Leave unused words blank.				These properties will be assigned to blocks J = IF to IL and to blocks J = I1, I2, I3, I4.
Symbol	I1	I2	I3	I4	

Use as many cards as required to define the mass and stiffness of all the blocks

Word	1	2	3	4	5, 6, 7, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 31-35, 66-70
Format	I	F	I	I	I
Card 22 (optional)	Enter a "2"	Initial gap between block J and J-1 (in.)	First gap in a series	Last gap in the series.	Additional gaps with this initial condition.
Symbol	I	GI(J)	IF	IL	I1, I2, I3, I10

See notes on Card 21. Only nonzero gaps need to be entered.

Word	1	2	3	4	5, 6, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 66-70
Format	1	F	I	I	I
Card 23 This card is used only for special modeling	Enter a "3"	Additional gap added to GI(J) before inter- block springs engage. (in.)	First gap in a series.	Last gap in the series.	Additional gaps with this gap spring offset.
Symbol	I	GSD(J)	IF	IL	I1, I2, I10

See notes on
Card 21.

Word	1	2	3	4	5, 6, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 66-70
Format	1	F	I	I	I
Card 24 This card is used only for special model- ing	Enter a "4"	Additional gap added to GI(J) before inter- block impulse acts. (in.)	First gap in a series.	Last gap in the series.	Additional gaps with this impulse offset.
Symbol	I	GID(J)	IF	IL	I1, I2, I10

See notes on
Card 21

Word	1	2	3	4	5, 6, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 66-70
Format	I	F	I	I	I
Card 25 (optional)	Enter a "5"	Block initial displacement. (in.)	First block in a series.	Last block in a series.	Additional blocks with this initial displacement.
Symbol	I	X(J)	IF	IL	I1, I2, I10

See notes on
Card 21.

Word	1	2	3	4	5, 6, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 66-70
Format	I		I	I	
Card 26 (optional)	Enter a "6"	Block initial velocity. (in./sec)	First block in a series.	Last block in the series.	Additional blocks with this initial velocity.
Symbol	I	XD(J)	IF	II	I1, I2, I10

See notes on
Card 21

Word	1	2	3	4	5	6, 7, 14
Column	1	2-10	11-20	21-25	26-30	31-35, 36-40, 66-70
Format	I	F	F	I	I	I
Card 27 (optional)	Enter a "7"	Interblock spring stiffness. (lb/in.)	Interblock spring damp- ing coeffic- ient (lb-sec/in.)	First spring in a series	Last spring in the : series	Additional springs with these properties
Symbol	I	CGS(J)	CGD(J)	IF	II	I1, I2, I9

See notes on
Card 21

Word	
Column	
Format	
Card	
Symbol	

APPENDIX B
SAMPLE PROBLEM OUTPUT

INPUT REPEAT

CARD
NO.

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 8 .25 G

29 1 1 1 2000 2 2 2 4 0 0 1 0

0. .0001 7.15 .0004 .0004

250. 0. 1.13

200.3 .125 1.13 11.6

2 28 .87 .0 50000.

0. 40.

.319 .395

0. 1.

0. 800.

0. 1.

0. 800.

.00447 +1.0 1600

-4.463+01 4.707+01 1.721+00 3.621+00 5.567+00 6.532+00 6.592+00 5.721+00

4.233+00 9.537+01-3.439+00-9.100+00-1.427+01-1.942+01-2.451+01-2.739+01

-2.899+01-2.659+01-2.623+01-2.246+01-1.657+01-1.043+01-2.191+00 5.365+00

1.174+01 1.719+01 2.039+01 2.095+01 1.834+01 1.335+01 5.477+00-2.978+00

-1.292+01-2.099+01-2.747+01-3.213+01-3.352+01-3.179+01-2.692+01-1.994+01

-1.138+01-5.553+01 9.100+00 1.508+01 2.251+01 2.643+01 2.770+01 2.676+01

2.390+01 2.101+01 1.792+01 1.522+01 1.317+01 1.171+01 1.084+01 1.039+01

9.922+00 9.448+00 8.841+00 7.817+00 5.613+00 2.953+00-1.274+00-4.791+00

-8.401+00-1.124+01-1.202+01-1.042+01-6.253+00 9.739+01 2.990+00 1.971+01

2.806+01 3.743+01 4.321+01 4.693+01 4.657+01 4.225+01 3.338+01 1.857+01

4.659+00-1.296+01-3.115+01-4.362+01-5.533+01-6.217+01-6.495+01-6.284+01

-5.500+01-4.507+01-3.266+01-1.754+01-5.222+00 5.671+00 1.534+01 2.085+01

2.351+01 2.352+01 2.055+01 1.554+01 9.844+00 2.058+00-5.572+00-1.266+01

-1.806+01-2.333+01-2.814+01-3.205+01-3.593+01-3.957+01-4.294+01-4.536+01

-4.690+01-4.625+01-4.306+01-3.667+01-2.647+01-1.424+01-7.157+02 1.762+01

3.351+01 4.992+01 6.421+01 7.579+01 9.318+01 8.477+01 8.074+01 7.029+01

5.441+01 3.682+01 1.533+01-5.861+00-2.612+01-4.282+01-5.476+01-6.225+01

-6.253+01-5.686+01-4.556+01-3.082+01-1.105+01 5.626+00 2.567+01 4.169+01

5.337+01 6.154+01 6.556+01 6.526+01 6.131+01 5.398+01 4.392+01 3.147+01

1.717+01 2.555+00-1.210+01-2.633+01-3.259+01-5.216+01-6.222+01-6.976+01

-7.482+01-7.617+01-7.445+01-6.904+01-5.220+01-4.751+01-3.313+01-1.703+01

-8.974+01 1.370+01 2.700+01 3.644+01 4.227+01 4.351+01 4.082+01 3.350+01

2.397+01 1.189+01-1.366+00-1.423+01-2.645+01-3.458+01-4.050+01-4.188+01

-3.915+01-3.264+01-2.221+01-1.200+01 4.094+01 1.171+01 2.363+01 3.215+01

4.009+01 4.716+01 5.236+01 5.645+01 5.972+01 6.221+01 6.406+01 6.475+01

6.374+01 6.081+01 5.534+01 4.734+01 3.727+01 2.440+01 1.006+01-5.351+00

-1.840+01-3.069+01-3.911+01-4.435+01-4.504+01-4.137+01-3.202+01-1.948+01

-3.960+00 1.184+01 2.721+01 3.928+01 4.673+01 4.970+01 4.599+01 3.562+01

2.225+01 3.786+00-1.626+01-3.046+01-5.442+01-6.874+01-7.686+01-7.866+01

-7.378+01-6.314+01-4.856+01-3.091+01-1.136+01 7.446+00 2.338+01 2.335+01

4.025+01 4.127+01 3.846+01 3.119+01 2.352+01 1.327+01 4.314+00-3.335+00

-8.336+00-1.008+01-8.842+00-4.708+00 2.151+00 9.692+00 1.593+01 2.243+01

2.745+01 2.997+01 2.999+01 2.792+01 3.402+01 1.876+01 1.352+01 9.430+00

5.995+00 4.699+00 6.274+00 9.923+00 1.631+01 2.449+01 3.337+01 4.220+01

5.140+01 5.690+01 5.972+01 5.865+01 5.346+01 4.517+01 3.355+01 1.660+01

6.264+01-1.786+01-3.485+01-5.016+01-6.456+01-7.514+01-8.292+01-8.715+01

-8.680+01-8.235+01-7.265+01-6.047+01-4.482+01-2.748+01-7.045+00 1.133+01

INPUT REPEAT

CARD
NO.

3.028+01 4.475+01 5.712+01 6.718+01 7.212+01 7.244+01 6.680+01 5.765+01
 4.054+01 2.279+01 1.646+00 2.166+01 4.571+01 6.372+01 7.924+01 6.901+01
 -9.082+01 -6.559+01 -7.263+01 -5.112+01 -2.907+01 -6.960+02 2.984+01 6.045+01
 8.792+01 1.100+02 1.223+02 1.290+02 1.265+02 1.150+02 9.471+01 6.854+01
 3.921+01 4.119+00 -3.154+01 -6.179+01 -8.971+01 -1.113+02 -1.279+02 -1.364+02
 -1.379+02 -1.333+02 -1.208+02 -1.048+02 -8.461+01 -6.310+01 -3.880+01 -1.577+01
 6.569+00 2.928+01 4.947+01 6.429+01 7.768+01 3.598+01 2.000+01 8.875+01
 8.124+01 6.910+01 5.156+01 2.225+01 1.450+00 2.620+01 5.003+01 7.662+01
 -2.839+01 -1.143+02 -1.241+02 -1.261+02 -1.195+02 -1.043+02 -8.147+01 -4.889+01
 -1.766+01 1.366+01 4.608+01 7.283+01 9.438+01 1.126+02 1.105+02 1.190+02
 1.122+02 1.003+02 8.157+01 6.326+01 3.206+01 1.719+01 3.515+00 2.350+01
 -4.108+01 -5.399+01 -6.416+01 -7.015+01 -7.226+01 -7.049+01 -6.630+01 -5.751+01
 -4.720+01 -3.303+01 -1.860+01 -1.213+01 1.868+01 3.891+01 5.656+01 7.422+01
 8.711+01 9.580+01 9.730+01 9.141+01 7.820+01 5.915+01 3.363+01 2.016+00
 -2.796+01 -6.060+01 -8.715+01 -1.100+02 -1.208+02 -1.252+02 -1.200+02 -1.057+02
 -8.411+01 -5.511+01 -2.545+01 9.363+00 4.157+01 6.665+01 8.684+01 1.025+02
 1.085+02 1.061+02 9.784+01 8.255+01 6.308+01 4.202+01 2.391+01 2.936+00
 -1.447+01 -2.935+01 -4.035+01 -4.780+01 -5.124+01 -5.079+01 -4.641+01 -3.969+01
 -3.104+01 -2.151+01 -1.161+01 -1.806+00 1.146+01 2.282+01 3.435+01 4.428+01
 5.383+01 6.061+01 6.425+01 6.356+01 5.804+01 4.721+01 3.340+01 1.677+01
 -3.286+00 -2.270+01 -4.006+01 -5.752+01 -7.014+01 -7.852+01 -8.099+01 -7.655+01
 -6.686+01 -5.354+01 -3.457+01 -1.494+01 8.383+00 2.554+01 4.361+01 5.471+01
 6.069+01 6.233+01 5.883+01 4.950+01 3.282+01 2.450+01 9.673+00 7.086+00
 -1.952+01 -3.034+01 -3.235+01 -4.545+01 -4.736+01 -4.645+01 -4.242+01 -3.420+01
 -2.580+01 -1.542+01 -2.773+00 8.779+00 1.997+01 3.204+01 4.313+01 5.212+01
 6.009+01 6.406+01 6.654+01 6.445+01 5.806+01 4.760+01 3.280+01 1.513+01
 -6.779+00 -2.391+01 -4.289+01 -5.973+01 -7.311+01 -8.257+01 -8.663+01 -8.392+01
 -7.572+01 -6.000+01 -4.382+01 -2.000+01 -1.614+01 2.004+01 3.774+01 5.100+01
 6.021+01 6.385+01 6.148+01 5.239+01 4.121+01 2.416+01 4.895+00 -1.240+01
 -3.304+01 -4.784+01 -6.140+01 -7.262+01 -7.938+01 -8.152+01 -7.994+01 -7.453+01
 -6.614+01 -5.303+01 -3.905+01 -2.023+01 -4.608+00 1.390+01 3.174+01 4.757+01
 5.873+01 6.771+01 7.224+01 7.112+01 6.470+01 5.365+01 3.812+01 1.983+01
 -9.674+01 -1.685+01 -3.322+01 -4.443+01 -4.894+01 -4.682+01 -3.573+01 -1.826+01
 1.453+00 2.774+01 5.726+01 8.356+01 1.080+02 1.266+02 1.394+02 1.417+02
 1.364+02 1.216+02 9.806+01 7.038+01 3.575+01 3.508+00 2.727+01 5.140+01
 -7.287+01 -8.715+01 -9.378+01 -9.334+01 -9.731+01 -7.533+01 -6.060+01 -4.239+01
 -2.253+01 -3.174+00 1.643+01 3.451+01 4.902+01 5.964+01 6.629+01 6.961+01
 6.903+01 6.483+01 5.700+01 4.547+01 2.999+01 9.593+00 -1.267+01 -3.592+01
 -5.762+01 -8.020+01 -9.927+01 -1.167+02 -1.301+02 -1.370+02 -1.370+02 -1.306+02
 -1.170+02 -9.673+01 -7.405+01 -4.705+01 -1.944+01 7.265+00 3.139+01 5.061+01
 6.301+01 6.991+01 7.054+01 6.550+01 5.390+01 4.051+01 2.317+01 7.066+00
 -1.032+01 -2.754+01 -4.140+01 -5.062+01 -5.726+01 -5.963+01 -5.856+01 -5.505+01
 -4.901+01 -4.184+01 -3.384+01 -2.449+01 -1.588+01 -7.514+00 7.146+01 7.420+00
 1.296+01 1.732+01 2.067+01 2.243+01 2.286+01 2.121+01 1.760+01 1.197+01
 4.963+00 -3.626+00 -1.316+01 -2.511+01 -3.511+01 -4.439+01 -5.230+01 -5.962+01
 -6.338+01 -6.506+01 -6.354+01 -5.887+01 -5.145+01 -4.320+01 -3.148+01 -2.139+01
 -1.136+01 -2.133+00 4.087+00 8.946+00 1.088+01 1.041+01 7.574+00 3.034+00
 -3.040+00 -9.871+00 -1.709+01 -2.602+01 -2.188+01 -3.561+01 -3.710+01 -3.576+01
 -3.235+01 -2.623+01 -1.763+01 -8.316+00 2.629+00 1.450+01 2.906+01 4.226+01
 5.661+01 7.081+01 8.523+01 9.747+01 1.082+02 1.164+02 1.216+02 1.233+02

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INPUT REPEAT

CARD
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1.216+02	1.163+02	1.084+02	9.593+01	8.167+01	6.617+01	4.986+01	3.482+01	88
2.833+01	9.390+00	2.573+00	1.225+02	4.867+00	1.337+01	2.527+01	4.019+01	89
5.720+01	7.615+01	9.256+01	1.072+02	1.194+02	1.263+02	1.284+02	1.254+02	90
1.172+02	1.071+02	8.305+01	6.172+01	3.577+01	1.173+01	1.662+01	3.904+01	91
-6.301+01	-6.109+01	-9.264+01	-1.012+02	-1.041+02	-1.022+02	-9.563+01	-8.484+01	92
-7.110+01	-5.499+01	-3.841+01	-2.209+01	-6.891+00	5.020+00	1.472+01	1.925+01	93
1.899+01	1.329+01	2.744+00	-1.101+01	-2.986+01	-5.082+01	-7.453+01	-9.807+01	94
-1.199+02	-1.366+02	-1.512+02	-1.599+02	-1.637+02	-1.615+02	-1.542+02	-1.414+02	95
-1.235+02	-1.014+02	-7.545+01	-4.976+01	-2.369+01	6.392+01	2.264+01	4.089+01	96
5.245+01	5.816+01	5.755+01	5.012+01	3.753+01	2.020+01	-6.879+01	-2.304+01	97
-4.623+01	-6.482+01	-7.772+01	-8.849+01	-9.255+01	-9.044+01	-8.157+01	-6.585+01	98
-4.480+01	-1.709+01	1.157+01	4.179+01	7.144+01	1.001+02	1.191+02	1.350+02	99
1.441+02	1.456+02	1.399+02	1.291+02	1.079+02	8.979+01	6.460+01	4.115+01	100
1.804+01	-2.600+00	-2.026+01	-3.082+01	-3.656+01	-3.694+01	-3.181+01	-2.096+01	101
-7.708+00	1.137+01	2.898+01	5.022+01	7.003+01	8.898+01	1.031+02	1.159+02	102
1.231+02	1.270+02	1.264+02	1.212+02	1.108+02	9.618+01	7.585+01	5.361+01	103
2.660+01	1.968+00	-2.572+01	-5.376+01	-8.024+01	-1.074+02	-1.235+02	-1.383+02	104
-1.470+02	-1.489+02	-1.445+02	-1.378+02	-1.167+02	-9.279+01	-6.969+01	-4.071+01	105
-1.358+01	1.102+01	3.090+01	4.549+01	5.316+01	5.269+01	4.385+01	2.668+01	106
6.362+01	-2.734+01	-5.947+01	-9.246+01	-1.234+02	-1.501+02	-1.688+02	-1.786+02	107
-1.785+02	-1.693+02	-1.481+02	-1.172+02	-8.226+01	-4.435+01	-6.781+00	3.211+01	108
6.622+01	8.902+01	1.085+02	1.198+02	1.229+02	1.184+02	1.062+02	9.191+01	109
7.355+01	5.527+01	3.390+01	2.683+01	1.802+01	1.568+01	1.737+01	2.411+01	110
3.326+01	4.626+01	6.129+01	7.806+01	9.172+01	1.057+02	1.182+02	1.295+02	111
1.395+02	1.476+02	1.550+02	1.509+02	1.604+02	1.591+02	1.544+02	1.471+02	112
1.357+02	1.229+02	1.079+02	8.862+01	7.030+01	4.704+01	7.781+01	1.166+01	113
-4.404+00	-1.555+01	-2.331+01	-2.653+01	-2.661+01	-2.418+01	-1.971+01	-1.551+01	114
-1.352+01	-1.363+01	-1.677+01	-2.320+01	-3.287+01	-4.515+01	-6.053+01	-7.515+01	115
-8.855+01	-1.003+02	-1.069+02	-1.100+02	-1.085+02	-1.026+02	-9.611+01	-8.678+01	116
-7.836+01	-7.247+01	-6.942+01	-7.053+01	-7.601+01	-8.407+01	-9.506+01	-1.075+02	117
-1.102+02	-1.285+02	-1.337+02	-1.379+02	-1.289+02	-1.166+02	-9.776+01	-7.721+01	118
-5.323+01	-2.513+01	-2.480+00	1.578+01	7.242+01	4.366+01	5.089+01	5.321+01	119
5.276+01	5.863+01	4.801+01	4.656+01	4.683+01	4.996+01	5.667+01	6.607+01	120
7.955+01	9.113+01	1.043+02	1.155+02	1.222+02	1.261+02	1.257+02	1.207+02	121
1.135+02	1.022+02	8.996+01	7.280+01	6.944+01	6.160+01	5.641+01	5.324+01	122
5.164+01	5.076+01	4.807+01	4.402+01	3.562+01	2.468+01	1.189+01	6.328+00	123
-2.710+01	-4.937+01	-7.090+01	-9.161+01	-1.109+02	-1.254+02	-1.359+02	-1.416+02	124
-1.439+02	-1.422+02	-1.385+02	-1.372+02	-1.269+02	-1.217+02	-1.177+02	-1.154+02	125
-1.150+02	-1.165+02	-1.194+02	-1.232+02	-1.271+02	-1.310+02	-1.347+02	-1.371+02	126
-1.394+02	-1.407+02	-1.411+02	-1.402+02	-1.379+02	-1.341+02	-1.288+02	-1.199+02	127
-1.001+02	-9.305+01	-7.436+01	-4.998+01	-7.144+01	1.171+01	4.209+01	7.438+01	128
1.051+02	1.336+02	1.580+02	1.769+02	1.391+02	1.943+02	1.923+02	1.053+02	129
1.735+02	1.597+02	1.446+02	1.328+02	1.237+02	1.186+02	1.181+02	1.224+02	130
1.310+02	1.423+02	1.566+02	1.702+02	1.827+02	1.900+02	1.944+02	1.936+02	131
1.882+02	1.765+02	1.626+02	1.457+02	1.267+02	1.029+02	8.186+01	6.066+01	132
3.960+01	1.540+01	-5.007+00	-2.514+01	-4.498+01	-6.764+01	-8.639+01	-1.041+02	133
-1.203+02	-1.366+02	-1.477+02	-1.556+02	-1.601+02	-1.610+02	-1.584+02	-1.532+02	134
-1.463+02	-1.372+02	-1.299+02	-1.240+02	-1.203+02	-1.126+02	-1.223+02	-1.279+02	135
-1.358+02	-1.466+02	-1.561+02	-1.644+02	-1.704+02	-1.729+02	-1.704+02	-1.631+02	136
-1.510+02	-1.311+02	-1.100+02	-8.613+01	-6.056+01	-3.010+01	-4.663+00	1.920+01	137

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INPUT REPEAT

CARD
NO.

4.097+01	6.276+01	7.847+01	9.146+01	1.020+02	1.116+02	1.161+02	1.234+02	138	151
1.276+02	1.316+02	1.743+02	1.364+02	1.378+02	1.385+02	1.364+02	1.377+02	139	152
1.364+02	1.348+02	1.334+02	1.325+02	1.321+02	1.327+02	1.740+02	1.360+02	140	153
1.361+02	1.402+02	1.409+02	1.399+02	1.366+02	1.328+02	1.167+02	1.056+02	141	154
8.794+01	6.438+01	4.179+01	1.789+01	6.357+00	3.377+01	5.547+01	7.471+01	142	155
-9.094+01	-1.057+02	-1.149+02	-1.208+02	-1.241+02	-1.255+02	-1.251+02	-1.242+02	143	156
-1.230+02	-1.222+02	-1.221+02	-1.237+02	-1.240+02	-1.262+02	-1.284+02	-1.305+02	144	157
-1.324+02	-1.339+02	-1.344+02	-1.342+02	-1.330+02	-1.306+02	-1.276+02	-1.237+02	145	158
-1.189+02	-1.118+02	-1.044+02	-9.559+01	-8.515+01	-7.074+01	-5.844+01	-4.041+01	146	159
-2.283+01	-8.622+01	1.868+01	3.824+01	5.717+01	7.756+01	9.295+01	1.058+02	147	160
1.159+02	1.240+02	1.278+02	1.292+02	1.284+02	1.257+02	1.225+02	1.192+02	148	161
1.163+02	1.140+02	1.133+02	1.139+02	1.155+02	1.184+02	1.213+02	1.241+02	149	162
1.263+02	1.276+02	1.271+02	1.249+02	1.207+02	1.135+02	1.053+02	9.546+01	150	163
8.420+01	6.960+01	5.613+01	4.202+01	2.740+01	1.024+01	-4.621+00	-1.939+01	151	164
-3.391+01	-5.030+01	-6.366+01	-7.615+01	-8.754+01	-9.913+01	-1.074+02	-1.135+02	152	165
-1.107+02	-1.220+02	-1.231+02	-1.226+02	-1.214+02	-1.189+02	-1.163+02	-1.135+02	153	166
-1.119+02	-1.103+02	-1.097+02	-1.098+02	-1.104+02	-1.114+02	-1.125+02	-1.121+02	154	167
-1.112+02	-1.064+02	-1.042+02	-9.803+01	-8.994+01	-7.814+01	-6.621+01	-5.294+01	155	168
-3.867+01	-2.131+01	-6.272+00	3.523+00	2.276+01	3.833+01	5.059+01	6.174+01	156	169
7.174+01	8.196+01	8.951+01	9.600+01	1.015+02	1.066+02	1.100+02	1.125+02	157	170
1.141+02	1.150+02	1.150+02	1.143+02	1.132+02	1.114+02	1.096+02	1.078+02	158	171
1.061+02	1.041+02	1.026+02	1.011+02	9.939+01	9.702+01	9.434+01	9.077+01	159	172
8.608+01	7.891+01	7.115+01	6.184+01	5.104+01	3.676+01	2.339+01	9.320+00	160	173
-5.059+00	-2.168+01	-3.534+01	-4.809+01	-5.964+01	-7.134+01	-7.973+01	-8.661+01	161	174
-9.205+01	-9.677+01	-9.965+01	-1.017+02	-1.030+02	-1.040+02	-1.045+02	-1.049+02	162	175
-1.050+02	-1.050+02	-1.048+02	-1.044+02	-1.037+02	-1.025+02	-1.008+02	-9.897+01	163	176
-9.649+01	-9.292+01	-8.924+01	-8.495+01	-8.001+01	-7.335+01	-6.683+01	-5.950+01	164	177
-5.135+01	-4.077+01	-3.082+01	-2.013+01	-0.824+00	4.929+00	1.695+01	2.898+01	165	178
4.056+01	5.342+01	6.350+01	7.249+01	8.024+01	8.760+01	9.244+01	9.599+01	166	179
9.837+01	9.989+01	1.003+02	1.002+02	9.277+01	9.897+01	9.821+01	9.746+01	167	180
9.660+01	9.582+01	9.492+01	9.378+01	9.198+01	8.988+01	8.715+01	8.368+01	168	181
7.863+01	7.341+01	6.736+01	6.053+01	5.165+01	4.333+01	3.297+01	2.354+01	169	182
1.380+01	4.068+00	-6.047+00	-1.616+01	-2.780+01	-3.764+01	-4.701+01	-5.728+01	170	183
-6.535+01	-7.261+01	-7.896+01	-8.431+01	-9.985+01	-9.279+01	-9.475+01	-9.582+01	171	184
-9.611+01	-9.579+01	-9.489+01	-9.370+01	-9.232+01	-9.084+01	-8.906+01	-8.751+01	172	185
-8.589+01	-8.414+01	-8.139+01	-7.836+01	-7.576+01	-7.199+01	-6.743+01	-6.204+01	173	186
-5.578+01	-4.868+01	-3.948+01	-3.084+01	-2.169+01	-8.995+00	6.558+01	1.031+01	174	187
1.974+01	2.882+01	3.745+01	4.553+01	5.300+01	6.194+01	6.686+01	7.300+01	175	188
7.749+01	8.128+01	8.438+01	8.679+01	8.854+01	8.990+01	9.025+01	9.006+01	176	189
8.939+01	8.831+01	8.686+01	8.513+01	8.312+01	8.047+01	7.751+01	7.471+01	177	190
7.162+01	6.819+01	6.435+01	6.003+01	5.517+01	4.773+01	4.141+01	3.446+01	178	191
2.690+01	1.882+01	1.033+01	1.750+00	1.017+01	-1.905+01	-2.769+01	-3.595+01	179	192
-4.369+01	-5.081+01	-5.723+01	-6.291+01	-6.930+01	-7.322+01	-7.643+01	-7.861+01	180	193
-8.095+01	-8.235+01	-8.326+01	-8.373+01	-8.371+01	-8.326+01	-8.245+01	-8.128+01	181	194
-7.978+01	-7.793+01	-7.573+01	-7.319+01	-7.005+01	-6.676+01	-6.179+01	-5.762+01	182	195
-5.305+01	-4.806+01	-4.265+01	-3.692+01	-3.055+01	-2.389+01	-1.441+01	-6.943+00	183	196
7.627+01	8.610+00	1.565+01	2.603+01	3.356+01	4.072+01	4.741+01	5.353+01	184	197
5.900+01	6.376+01	6.779+01	7.204+01	7.442+01	7.615+01	7.732+01	7.798+01	185	198
7.820+01	7.799+01	7.745+01	7.663+01	7.554+01	7.418+01	7.254+01	6.986+01	186	199
6.745+01	6.466+01	6.146+01	5.783+01	5.376+01	4.924+01	4.429+01	3.864+01	187	200

INPUT REPEAT

CAPD
NO.

3.239+01	2.628+01	1.989+01	1.104+01	4.219+00	-2.692+00	-9.601+00	-1.647+01	128
-2.322+01	-2.978+01	-3.609+01	-4.397+01	-4.940+01	-5.436+01	-5.879+01	-6.256+01	129
-6.586+01	-6.855+01	-7.122+01	-7.254+01	-7.332+01	-7.360+01	-7.344+01	-7.287+01	190
-7.195+01	-7.072+01	-6.863+01	-6.676+01	-6.463+01	-6.222+01	-5.973+01	-5.674+01	191
-5.281+01	-4.905+01	-4.489+01	-4.034+01	-3.366+01	-2.822+01	-2.245+01	-1.641+01	192
-1.015+01	-3.744+00	2.733+00	9.202+00	1.768+01	2.385+01	2.976+01	3.526+01	193
4.016+01	4.546+01	4.991+01	5.390+01	5.848+01	6.134+01	6.371+01	6.559+01	194
6.698+01	6.790+01	6.836+01	6.839+01	6.780+01	6.691+01	6.565+01	6.412+01	195
6.226+01	6.019+01	5.755+01	5.484+01	5.132+01	4.799+01	4.437+01	4.043+01	196
3.619+01	3.004+01	2.507+01	1.982+01	1.431+01	8.603+00	2.740+00	-3.209+00	197
-9.174+00	-1.702+01	-2.274+01	-2.709+01	-3.278+01	-3.845+01	-4.290+01	-4.692+01	198
-5.050+01	-5.363+01	-5.710+01	-5.918+01	-6.083+01	-6.206+01	-6.288+01	-6.332+01	199
-6.339+01	-6.309+01	-6.215+01	-6.105+01	-5.993+01	-5.792+01	-5.584+01	-5.347+01	200
1 12.738					1 20			213
1 27.02	7000.	22.1	.797		2 20			214
1 13.124	400.	2.25	.136	3 27				215
2 .048	4	27						216
2 .040		3	20					217
								218

*****PROBLEM INPUT PARAMETERS*****

TITLE... SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK B .25 G

NUMBER OF ELEMENTS = 29
 INTEGRATION STEP = .000100 SECONDS
 CONTACT TIME FOR FORCE = .000400 SECONDS
 CONTACT TIME FOR IMPULSE DURATION = .000400 SECONDS
 INTERBLOCK SPRING FREQUENCY = 250.000 HZ
 INTERBLOCK SPRING DAMPING = .000 OF CRITICAL
 SPRING PACK DAMPING = 1.130 LB-SEC/IN
 CSF SPRING PACK DAMPING = 1.130 LB-SEC/IN
 CSF TO GROUND DAMPING = 11.800 LB-SEC/IN
 GAP BETWEEN CSF AND SPRING PACK = .125 IN
 RIGID LINK GAP = .870 IN
 RIGID LINK PRELOAD = .000 LB
 RIGID LINK STIFFNESS = 50000.000 LB/IN
 RIGID LINK DAMPING = .000 LB-SEC/IN
 NO. OF INTEG. STEPS REQUIRED PER CYCLE = 20

BLOCKS 2 AND 28 ARE CONNECTED BY A RIGID LINK

*****OPTIONS REQUESTED*****

SINGLE MASS SPRING PACK (IS=1)

REFLECTOR BLOCKS CONNECTED WITH RIGID LINK (RRL=1)

PCRV MOTION IS ACCELERATION TIME HISTORY INPUT DECK * SCALE FACTOR = 1.00 (IGH=1)

THIS MODEL HAS A CORE SUPPORT FLOOR (NCSB = 1)

IMPULSE FORCES ARE COMPUTED (KP = 2)

CENTRAL DIFFERENCE INTEGRATION IS USED. (IMETH=4)

MODEL HAS NO IMPULSE BOUNDARIES. (NOPBR=0)

TITLE... SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 8 .25 G

RELATIVE VELOCITY VS. COEFFICIENT OF RESTITUTION TABLES

BLOCK ON BLOCK

I	VFI	F
1	.000	.319
2	40.000	.395

DESCRIPTION OF SPRING PACKS

DISPLACEMENT	SPRING FORCE
.0000	.0000
.1000+01	.8000+03

DESCRIPTION OF CORE SUPPORT FLOOR SPRING

DISPLACEMENT	SPRING FORCE
.0000	.0000
.1000+01	.8000+03

TITLE... SAMPLE PROBLEM 1/3 SCALE FULL ARRAY TEST SHOCK 8 .25 G

INITIAL CONDITIONS

I	W	STIF	BF	DAMP	X	XD
1	12.738	.000	.000	.000	.000	.000
2	27.020	7000.000	22.100	.797	.000	.000
3	13.124	400.000	2.250	.136	.000	.000
4	13.124	400.000	2.250	.136	.000	.000
5	13.124	400.000	2.250	.136	.000	.000
6	13.124	400.000	2.250	.136	.000	.000
7	13.124	400.000	2.250	.136	.000	.000
8	13.124	400.000	2.250	.136	.000	.000
9	13.124	400.000	2.250	.136	.000	.000
10	13.124	400.000	2.250	.136	.000	.000
11	13.124	400.000	2.250	.136	.000	.000
12	13.124	400.000	2.250	.136	.000	.000
13	13.124	400.000	2.250	.136	.000	.000
14	13.124	400.000	2.250	.136	.000	.000
15	13.124	400.000	2.250	.136	.000	.000
16	13.124	400.000	2.250	.136	.000	.000
17	13.124	400.000	2.250	.136	.000	.000
18	13.124	400.000	2.250	.136	.000	.000
19	13.124	400.000	2.250	.136	.000	.000
20	13.124	400.000	2.250	.136	.000	.000
21	13.124	400.000	2.250	.136	.000	.000
22	13.124	400.000	2.250	.136	.000	.000
23	13.124	400.000	2.250	.136	.000	.000
24	13.124	400.000	2.250	.136	.000	.000
25	13.124	400.000	2.250	.136	.000	.000
26	13.124	400.000	2.250	.136	.000	.000
27	13.124	400.000	2.250	.136	.000	.000
28	27.020	7000.000	22.100	.797	.000	.000
29	12.738	.000	.000	.000	.000	.000
CSF	200.300				.000	.000
PCRV					.000	.000

TITLE... SAMPLE PROBLEM 1/5 SCALE FULL AREA TEST SHOCK B .25 G

INITIAL CONDITIONS (CONT.)

I	COS	CGD	GI	GID	GSD
1	.000	.000	.00000	.00000	.00000
2	55336.859	.000	.00000	.00000	.00000
3	47905.037	.000	.04000	.00000	.00000
4	35586.598	.000	.04800	.00000	.00000
5	41745.817	.000	.04800	.00000	.00000
6	41745.817	.000	.04800	.00000	.00000
7	41745.817	.000	.04800	.00000	.00000
8	41745.817	.000	.04800	.00000	.00000
9	41745.817	.000	.04800	.00000	.00000
10	41745.817	.000	.04800	.00000	.00000
11	41745.817	.000	.04800	.00000	.00000
12	41745.817	.000	.04800	.00000	.00000
13	41745.817	.000	.04800	.00000	.00000
14	41745.817	.000	.04800	.00000	.00000
15	41745.817	.000	.04800	.00000	.00000
16	41745.817	.000	.04800	.00000	.00000
17	41745.817	.000	.04800	.00000	.00000
18	41745.817	.000	.04800	.00000	.00000
19	41745.817	.000	.04800	.00000	.00000
20	41745.817	.000	.04800	.00000	.00000
21	41745.817	.000	.04800	.00000	.00000
22	41745.817	.000	.04800	.00000	.00000
23	41745.817	.000	.04800	.00000	.00000
24	41745.817	.000	.04800	.00000	.00000
25	41745.817	.000	.04800	.00000	.00000
26	41745.817	.000	.04800	.00000	.00000
27	35586.598	.000	.04800	.00000	.00000
28	47905.037	.000	.04000	.00000	.00000
29	55336.859	.000	.00000	.00000	.00000
30	.000	.000	.00000	.00000	.00000

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK R .25 G

TIME = .00000 SEC. ENERGY = .00 LB-IN. LUMPING = 6.49 PERCENT

	I	X	XD	XDD	GAP	IMPULSF FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRPLK	HITS
	1	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	2	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	3	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	4	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	5	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	6	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	7	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	8	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	9	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	10	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	11	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	12	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	13	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
83	14	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	15	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	16	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	17	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	18	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	19	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	20	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	21	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	22	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	23	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	24	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	25	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	26	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	27	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	28	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	29	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
	30	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	0
JP FLOOR		.00000	.00000	.00000					.00000		
PCR V		.00000	.00000	-.44630							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROFILE 1/5 SCALE FULL ARRAY TEST SHOCK P .25 G

TIME = .20000 SEC.

ENERGY = 2.17 LB-IN.

LUMPING = 0.70 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX ELL VEL	MAX IMPULSE	MAX SPRING	MAX INTRPLK	HITS
1	-.10396	-1.13092	29.31191	-.06121	.00000	.00000	.00000	2.71649	.00000	0
2	-.05761	-1.04722	-23.77121	.04635	.00000	.00356	2.87407	-2.81792	2.71530	2
3	-.05728	-1.03674	-6.69424	.04033	.00000	.00000	.00000	-.48663	.00000	0
4	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
5	-.05728	-1.03674	-6.69424	.04600	.00000	.00000	.00000	-.48663	.00000	0
6	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
7	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
8	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
9	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
10	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
11	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
12	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
13	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
14	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
15	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
16	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
17	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
18	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
19	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
20	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
21	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
22	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
23	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
24	-.05728	-1.03674	-6.69424	.04000	.00000	.00000	.00000	-.48663	.00000	0
25	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
26	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
27	-.05728	-1.03674	-6.69424	.04800	.00000	.00000	.00000	-.48663	.00000	0
28	-.07392	-1.71533	4.19168	.02346	.00000	.00000	.00000	22.10000	.00000	0
29	-.07423	-1.70875	5.30937	-.00040	.00000	.54565	83.59648	-26.62948	25.23457	4
30				-.02852	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.05785	-1.04239	-5.74666					.00000		
PCR V	-.10275	-1.13333	25.42150							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALL FULL ARRAY TEST SHOCK R .25 G

TIME = .40000 SEC.

ENERGY = 4.52 LB-IN.

LUMPING = 0.22 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRPLK	HITS
1	-.11540	-.81006	-113.60758	-.01089	.00000	.00000	.00000	31.34962	.00000	0
2	-.11563	-.81012	-117.82225	-.00023	.00000	1.52154	233.31466	-22.10000	28.50987	5
3	-.14071	-.39402	-64.42048	.01492	.00000	1.21475	187.65308	-2.25000	3.99786	1
4	-.15037	.78776	13.02752	.03834	.00000	.00000	.00000	.99671	.00000	0
5	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
6	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
7	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
8	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
9	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
10	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
11	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
12	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
13	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
14	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
15	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
16	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
17	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
18	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
19	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
20	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
21	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
22	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
23	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
24	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
25	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
26	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
27	-.15037	.78776	13.02752	.04800	.00000	.00000	.00000	.99671	.00000	0
28	-.14934	.58524	9.00386	.04103	.00000	.00000	.00000	22.10000	.00000	0
29	-.10280	-.90067	-35.65375	.04654	.00000	.03671	20.29186	-22.76877	22.30581	4
30				-.00171	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.14927	.81552	4.07240					.00000		
PCRV	-.10451	-.73039	-39.04544							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 8 .25 G

TIME = .60000 SEC. ENERGY = 12.67 LB-IN. LUMPING = 17.49 PERCENT

I	X	XD	XDU	GAP	IMPULSF FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	-.30556	-.01494	-22.56395	.00365	.00000	.00000	.00000	16.75826	.00000	0
2	-.22583	-1.47573	82.39837	.07973	.00000	.15125	23.07437	22.10000	15.95744	6
3	-.22328	-2.24656	-17.92971	.04255	.00000	.00000	.00000	2.25000	.00000	1
4	-.22494	-1.66357	-.73708	.04634	.00000	.00000	.00000	-1.46709	.00000	0
5	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
6	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
7	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
8	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
9	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
10	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
11	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
12	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
13	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
14	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
15	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
16	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
17	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
18	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
19	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
20	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
21	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
22	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
23	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
24	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
25	-.22494	-1.66357	-.73708	.04600	.00000	.00000	.00000	-1.46709	.00000	0
26	-.23723	.36928	57.66526	.03571	.00000	.00000	.00000	2.25000	.00000	0
27	-.26488	.37694	57.63459	.00035	.00000	2.36969	267.70773	2.25000	5.43605	3
28	-.27668	1.62780	-43.96375	.04820	.00000	1.60985	248.64151	22.10000	11.29448	3
29	-.27709	1.60487	-157.14500	-.00041	.00000	1.21401	186.16578	-33.86526	33.82998	7
30				-.03213	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.22497	-1.75853	-13.83144					.00000		
PCRV	-.30922	-.13157	-56.46912							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALL FULL ARRAY TEST SHOCK R .25 G

TIME = .80000 SEC. ENERGY = 1.40 LB-IN. LUMPING = 2.31 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VCL	MAX IMPULSE	MAX SPRING	MAX INTROK	HITS
1	-.46957	-.68673	166.61947	-.00738	.00000	.00000	.00000	33.96046	.00000	0
2	-.42160	.77023	-62.96798	.04797	.00000	2.46686	379.20587	22.10000	30.33375	10
3	-.41717	.68645	-63.87161	.04443	.00000	2.38315	371.06218	2.25000	10.15260	2
4	-.42048	-.20584	-21.43395	.04470	.00000	.00000	.00000	2.24502	.00000	0
5	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
6	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
7	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
8	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
9	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
10	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
11	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
12	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
13	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
14	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
15	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
16	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
17	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
18	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
19	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
20	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
21	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
22	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
23	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
24	-.42048	-.20584	-21.43395	.04800	.00000	.00000	.00000	2.24502	.00000	0
25	-.42240	.11303	-.01121	.04607	.00000	.00000	.00000	2.25000	.00000	0
26	-.37833	-.58415	-67.78608	.09208	.00000	.53042	61.06975	2.25000	1.55640	1
27	-.41620	-1.15604	-65.50051	.01013	.00000	.00000	.00000	2.25000	.00000	3
28	-.42979	-.49671	-31.58186	.02641	.00000	3.87127	588.61068	22.10000	1.08415	4
29	-.43073	-.49672	-68.84374	-.00043	.00000	2.85140	427.84333	-40.60361	38.47403	10
30				-.03196	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.42203	-.98705	31.51486					.00000		
PCRV	-.46219	-1.04708	-14.43839							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 2 .25 G

TIME = 1.00000 SEC.

ENERGY = 9.66 LB-IN.

LUMPING = 12.54 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	-.53932	.57718	114.15432	-.02291	.00000	.00000	.00000	32.90466	.00000	0
2	-.53970	.56398	-20.26574	-.00039	.00000	2.84996	427.50982	22.10000	29.36012	13
3	-.57927	.48115	-67.65560	.00043	.00000	1.44979	222.54745	2.25000	3.28260	3
4	-.59062	.13431	8.90845	.03665	.00000	.00000	.00000	1.95547	.00000	0
5	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
6	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
7	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
8	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
9	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
10	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
11	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
12	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
13	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
14	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
15	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
16	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
17	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
18	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
19	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
20	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
21	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
22	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
23	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
24	-.59062	.13431	8.90845	.04800	.00000	.00000	.00000	1.95547	.00000	0
25	-.58881	-.02292	-11.76072	.04961	.00000	.00000	.00000	-2.01390	.00000	0
26	-.60235	.44129	54.85678	.03446	.00000	.00000	.00000	2.25000	.00000	1
27	-.62562	1.41197	60.97407	.02473	.00000	3.01452	346.34074	2.25000	8.90025	5
28	-.59299	.20007	312.08134	.07263	.00000	2.77020	424.32236	22.10000	11.40146	8
29	-.50708	2.16118	-84.11761	.08591	.00000	1.19969	210.16669	-29.91005	32.41706	11
30				-.00233	.00000	.00000	.00000		.00000	0
SUP FLOOP	-.58986	.11137	-16.64613					.00000		
PCRV	-.50941	1.35354	26.13580							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK P .25 G

TIME = 1.20000 SEC.

ENERGY = .30 LB-IN.

LUMPING = 6.63 PERCENT

I	X	XD	XDU	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	-.47158	.24246	159.07255	-.00097	.00000	.00000	.00000	32.20938	.00000	0
2	-.47165	.27551	-185.11589	-.00007	19.59366	1.17006	179.34218	22.10000	30.31251	17
3	-.49375	-.62501	68.26042	.01790	.00000	1.63533	250.49992	2.25000	4.13278	6
4	-.47310	.37589	-11.96696	.06865	.00000	.00000	.00000	-1.92019	.00000	0
5	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
6	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
7	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
8	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
9	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
10	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
11	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
12	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
13	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
14	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
15	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
16	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
17	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
18	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
19	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
20	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
21	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
22	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
23	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
24	-.47310	.37589	-11.96696	.04800	.00000	.00000	.00000	-1.92019	.00000	0
25	-.47405	.44211	4.80458	.04655	.00000	.00000	.00000	-1.95564	.00000	0
26	-.47515	-.78504	16.80202	.04740	.00000	.00000	.00000	2.25000	.00000	1
27	-.48996	.20950	65.62238	.03319	.00000	.00000	.00000	2.25000	.00000	5
28	-.47403	.00867	2.15410	.05593	.00000	.00000	.00000	22.10000	.00000	8
29	-.46567	1.18454	28.01099	.00036	.00000	.44040	67.80581	-15.22008	14.67552	15
30				.00406	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.47401	.07098	36.57632					.00000		
PCRV	-.46161	1.17275	20.04315							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK B .25 G

TIME = 1.40000 SEC. ENERGY = 10.77 LB-IN. LUMPING = 0.72 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRLK	HITS
1	-.15343	.87284	-169.89735	-.00452	.00000	.00000	.00000	32.06441	.00000	0
2	-.15358	.97609	-183.56707	-.00015	.00000	1.71748	293.68394	-22.10000	46.87530	17
3	-.18583	2.00242	-66.99102	.00775	.00000	7.91544	610.75507	2.25000	34.64233	13
4	-.20674	4.31823	56.22670	.02709	.00000	3.29640	378.45843	2.25000	7.12752	6
5	-.19065	1.04829	-63.04650	.06400	.00000	1.81763	209.96371	2.25000	6.47986	1
6	-.20057	1.93237	-2.95836	.03808	.00000	.00000	.00000	1.07906	.00000	0
7	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
8	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
9	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
10	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
11	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
12	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
13	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
14	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
15	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
16	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
17	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
18	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
19	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
20	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
21	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
22	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
23	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
24	-.20057	1.93237	-2.95836	.04800	.00000	.00000	.00000	1.07906	.00000	0
25	-.19952	1.92101	-15.25111	.04905	.00000	.00000	.00000	1.29379	.00000	0
26	-.19721	1.76780	-39.84912	.05032	.00000	.00000	.00000	2.25000	.00000	1
27	-.20524	2.90155	48.06724	.03997	.00000	.00000	.00000	2.25000	.00000	5
28	-.20086	1.85525	6.70120	.04438	.00000	.00000	.00000	5.72756	.00000	8
29	-.14463	.09105	-99.35326	.05623	.00000	.00000	.00000	-3.56653	.00000	15
30				-.00422	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.20079	1.93079	7.54953					.00000		
PCRV	-.14085	.17951	-83.00964							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK P .25 G

TIME = 1.60000 SEC. ENERGY = 1.92 LB-IN. LUMPING = 8.91 PERCENT

	I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
	1	-.01294	1.86139	-128.85928	.00437	.00000	.00000	.00000	28.82107	.00000	0
	2	.01120	.36988	-320.31953	.02414	.00000	2.83267	423.62780	22.10000	32.27146	20
	3	.03081	.11092	-66.75495	.05961	.00000	2.91018	445.85325	2.25000	4.79569	14
	4	.03372	-1.34396	-60.93901	.05091	.00000	.00000	.00000	2.25000	.00000	6
	5	.02577	-1.33654	-60.96870	.04005	.00000	1.62237	184.08131	2.25000	1.76405	2
	6	.01675	.18013	-67.03537	.03899	.00000	.00000	.00000	2.25000	.00000	0
	7	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	8	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	9	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	10	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	11	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	12	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	13	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
91	14	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	15	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	16	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	17	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	18	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	19	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	20	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	21	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	22	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	23	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	24	.01675	.18013	-67.03537	.04800	.00000	.00000	.00000	2.25000	.00000	0
	25	.01704	.16963	-66.99417	.04829	.00000	.00000	.00000	2.25000	.00000	0
	26	.01954	-.04017	-66.15418	.05050	.00000	.00000	.00000	2.25000	.00000	1
	27	.00579	-.69228	14.11855	.03425	.00000	.00000	.00000	2.25000	.00000	5
	28	-.00753	1.86524	128.70319	.02667	.00000	.00000	.00000	22.10000	.00000	8
	29	-.00774	1.86838	95.72813	-.00021	13.03123	3.21549	482.98131	-30.04718	27.52211	21
	30				-.00957	.00000	.00000	.00000		.00000	0
SUP FLOOR		.00677	-.03460	107.93964					.00000		
PCRV		-.01731	1.19245	-48.62445							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALL FULL ARRAY TEST SHOCK 2 .25 G

TIME = 1.80000 SEC. ENERGY = 1.01 LB-IN. LUMPING = 7.93 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	-.13030	.80690	173.13424	-.00717	.00000	.00000	.00000	5.73425	.00000	0
2	-.12723	-.33831	-311.00034	.01116	.00000	1.03409	155.55094	22.10000	2.37392	21
3	-.12764	-.12822	-33.00798	.03959	.00000	.00000	.00000	2.25000	.00000	14
4	-.12480	.01661	-70.59119	.05084	.00000	.00000	.00000	2.25000	.00000	6
5	-.11135	.24444	-69.23064	.06145	.00000	.00000	.00000	2.25000	.00000	2
6	-.12750	-.97381	-31.30713	.03185	.00000	.00000	.00000	2.25000	.00000	0
7	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
8	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
9	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
10	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
11	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
12	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
13	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
14	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
15	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
16	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
17	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
18	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
19	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
20	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
21	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
22	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
23	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
24	-.12750	-.97381	-31.30713	.04800	.00000	.00000	.00000	2.25000	.00000	0
25	-.12750	-.98363	-31.31172	.04800	.00000	.00000	.00000	2.25000	.00000	0
26	-.10691	-2.15531	-59.63167	.06859	.00000	.00000	.00000	2.25000	.00000	1
27	-.14157	-2.95921	75.53600	.01334	.00000	2.00546	346.20787	2.25000	11.94288	6
28	-.13420	-.43356	253.52966	.04737	.00000	2.97893	457.23649	22.10000	10.20040	11
29	-.13428	-.41017	245.18699	-.00008	.00000	1.38650	221.07620	-43.05355	45.78607	25
30				.00306	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.13072	-.51911	62.61346					.00000		
PCRV	-.13172	.79032	93.26791							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK R .25 G

TIME = 2.00000 SEC.

ENERGY = 1.04 LB-IN.

LUMPING = 0.40 PERCENT

	I	X	XD	XPD	GAP	IMPULSF FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
	1	-.09635	.56256	-163.52062	-.00580	.00000	.00000	.00000	34.23745	.00000	0
	2	-.09652	.56290	-175.75684	-.00019	.00000	3.60301	540.55756	22.10000	32.98164	29
	3	-.10040	1.13003	-17.30232	.03612	.00000	2.36305	364.05417	2.25000	3.16035	15
	4	-.11979	1.92813	61.46450	.02861	.00000	.27423	31.14819	2.25000	.39115	7
	5	-.12361	1.40521	62.85617	.04418	.00000	.00000	.00000	2.25000	.00000	2
	6	-.10401	.29059	28.53406	.06760	.00000	.00000	.00000	2.25000	.00000	0
	7	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	8	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	9	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	10	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	11	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	12	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	13	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
96	14	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	15	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	16	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	17	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	18	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	19	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	20	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	21	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	22	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	23	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	24	-.10401	.29059	28.53406	.04800	.00000	.00000	.00000	2.25000	.00000	0
	25	-.10409	.29324	29.39333	.04793	.00000	.00000	.00000	2.25000	.00000	0
	26	-.13861	1.10699	64.36906	.01342	.00000	.00000	.00000	2.25000	.00000	1
	27	-.12007	2.35127	59.39193	.06654	.00000	.00000	.00000	2.25000	.00000	6
	28	-.10293	.55451	122.50478	.05715	.00000	1.62957	252.99313	22.10000	6.47382	12
	29	-.09212	-.07380	50.41856	.01081	.00000	2.87377	435.39947	-0.32202	10.17247	30
	30				.00157	.00000	.00000	.00000		.00000	0
SUP FLOOP		-.10171	.65514	-41.54656					.00000		
PCRV		-.09055	.28613	48.36060							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 9 .25 G

TIME = 2.20000 SEC.

ENERGY = .60 LB-IN.

LUMPING = 7.96 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRLK	HITS
1	.04209	-.77738	-40.73485	.00257	.00000	.00000	.00000	32.26444	.00000	0
2	.05072	1.03039	77.52140	.01063	.00000	3.14757	471.08463	22.10000	29.09612	35
3	.05616	-.27883	43.66030	.03744	.00000	.01492	123.19543	2.25000	.05027	16
4	.03836	.52210	66.94322	.03020	.00000	.00000	.00000	2.25000	.00000	7
5	.04211	1.12254	64.54148	.05175	.00000	.00000	.00000	2.25000	.00000	2
6	.06192	.33225	-26.56234	.06782	.00000	.00000	.00000	1.80631	.00000	0
7	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
8	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
9	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
10	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
11	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
12	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
13	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
14	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
15	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
16	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
17	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
18	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
19	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
20	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
21	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
22	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
23	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
24	.06192	.33225	-26.56234	.04800	.00000	.00000	.00000	1.80631	.00000	0
25	.06197	.33213	-27.17377	.04805	.00000	.00000	.00000	1.81090	.00000	0
26	.04734	1.28505	63.89144	.03357	.00000	.00000	.00000	2.25000	.00000	1
27	.05400	-1.23022	72.09463	.05446	.00000	.00000	.00000	2.25000	.00000	6
28	.05900	.60250	-57.39828	.04499	.00000	.00000	.00000	18.64307	.00000	12
29	.05805	.60238	-109.99971	-.00014	.00000	1.03667	154.48673	-10.66798	7.88425	37
30				-.01333	.00000	.00000	.00000		.00000	0
SUP FLOOR	.05954	.71370	-19.72917					.00000		
PCRV	.04552	-.14653	22.02216							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK B .25 G

TIME = 2.40000 SEC.

ENERGY = .29 LB-IN.

LUMPING = 2.16 PERCENT

	I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRPLX	HITS
	1	.17464	-1.52931	-298.40276	.01719	.00000	.00000	.00000	33.57796	.00000	0
	2	.18415	-.56529	-20.13694	.00951	.00000	1.61896	245.75813	22.10000	29.98077	39
	3	.20112	1.81821	-71.97954	.05697	.00000	1.23197	190.45103	2.25000	3.78652	17
	4	.16596	.60193	65.23851	.01264	.00000	.00000	.00000	2.25000	.00000	7
	5	.16846	.25280	66.63594	.05950	.00000	.00000	.00000	2.25000	.00000	2
	6	.18590	.86904	-26.25062	.06544	.00000	.00000	.00000	1.80791	.00000	0
	7	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	8	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	9	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	10	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	11	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
95	12	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	13	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	14	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	15	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	16	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	17	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	18	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	19	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	20	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	21	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	22	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	23	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	24	.18590	.86904	-26.25062	.04800	.00000	.00000	.00000	1.80791	.00000	0
	25	.18597	.86900	-25.85366	.04797	.00000	.00000	.00000	1.81628	.00000	0
	26	.16244	.56166	65.39962	.02457	.00000	.00000	.00000	2.25000	.00000	1
	27	.17233	1.29064	62.48368	.05789	.00000	.00000	.00000	2.25000	.00000	6
	28	.17958	.45367	112.30461	.04725	.00000	.00000	.00000	22.10000	.00000	12
	29	.17932	.47006	-50.90051	-.00026	21.76684	1.02441	154.56886	-13.98070	14.16995	40
	30				-.01687	.00000	.00000	.00000		.00000	0
	SUP FLOOR	.18384	.36744	-26.02564					.00000		
	PCR V	.16245	-1.61630	-54.17383							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 8 .25 G

TIME = 2.60000 SEC. ENERGY = 115.13 LB-IN. LUMPING = 21.58 PERCENT

	I	X	X0	XDU	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTBLK	HITS
	1	.28410	4.40757	-91.72355	-.00290	.00000	.00000	.00000	65.26896	.00000	0
	2	.28366	4.42918	-114.34124	-.00043	.00000	4.64590	711.69755	-22.10000	74.61084	42
	3	.24350	4.56133	-238.70000	-.00016	69.27542	4.56645	703.60432	2.25000	48.14088	22
	4	.19514	4.49414	-134.03916	-.00037	.00000	5.86778	677.54678	2.25000	17.56412	12
	5	.14678	4.10530	-7.76001	-.00036	.00000	5.59835	651.26839	2.25000	23.60271	4
	6	.09848	4.03034	427.18032	-.00030	.00000	4.25091	493.30724	2.25000	13.79794	1
	7	.09635	.76200	69.41143	.04587	.00000	.00000	.00000	2.25000	.00000	0
	8	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	9	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	10	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	11	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	12	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	13	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
96	14	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	15	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	16	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	17	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	18	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	19	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	20	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	21	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	22	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	23	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	24	.09635	.76200	69.41143	.04600	.00000	.00000	.00000	2.25000	.00000	0
	25	.09206	.15972	71.82057	.04373	.00000	.00000	.00000	2.25000	.00000	0
	26	.04733	.53313	70.32604	.00325	.00000	1.13208	129.25594	2.25000	2.12605	3
	27	.06362	.37702	70.95135	.00429	.00000	3.64388	423.64219	2.25000	12.96479	8
	28	.10819	2.69142	273.86056	.06457	.00000	3.51726	542.22522	22.10000	25.96114	15
	29	.31715	2.16879	-90.84761	.20897	.00000	1.52040	262.17714	-41.62825	42.89864	40
	30				-.00316	.00000	.00000	.00000		.00000	0
SUP FLOOR		.11105	1.57074	10.57704					62.35221		
PCRV		.31309	1.75201	-65.73376							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK B .25 G

TIME = 2.80000 SEC.

ENERGY = 23.00 LB-IN.

LUMPING = 20.90 PERCENT

	I	X	XD	XDU	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSF	MAX SPRING	MAX INTKPLK	HITS
	1	.49910	.18014	-113.30993	.00415	.00000	.00000	.00000	48.02137	.00000	0
	2	.66606	-2.66846	-22.01745	.16697	.00000	2.56086	428.44563	22.10000	45.29870	42
	3	.71737	4.02672	-78.18139	.09130	.00000	5.93010	921.35897	2.25000	21.06080	25
	4	.67402	.69085	-64.83791	.00465	.00000	5.34521	613.29099	2.25000	14.43254	16
	5	.65908	.69510	67.48801	.03307	.00000	3.04750	450.56956	2.25000	18.07951	9
	6	.78011	.58602	-64.41860	.16903	.00000	1.26033	145.36733	2.25000	14.08486	4
	7	.73504	.89003	-65.63462	.00293	.00000	2.45240	276.02765	2.25000	1.98500	2
	8	.69945	.75800	-65.10651	.01241	.00000	1.54736	178.68278	2.25000	4.81413	1
	9	.66446	.07318	15.15218	.01301	.00000	.00000	.00000	2.25000	.00000	0
	10	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	11	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	12	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	13	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	14	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	15	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	16	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	17	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	18	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	19	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	20	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	21	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	22	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	23	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	24	.66446	.07318	15.15218	.04800	.00000	.00000	.00000	2.25000	.00000	0
	25	.64123	-.76673	73.34536	.02477	.00000	.00000	.00000	2.25000	.00000	0
	26	.59527	-.54787	72.46992	.00205	.00000	2.94958	339.68988	2.25000	9.57694	4
	27	.54896	-.36729	71.74759	.00159	.00000	2.34816	267.98971	2.25000	10.22144	14
	28	.51067	-.00463	103.03257	.00181	.00000	3.74359	578.89095	22.10000	10.84645	19
	29	.51079	-.00617	95.40643	-.00028	.00000	5.75632	859.62366	-50.76364	66.79951	43
	30				-.01544	.00000	.00000	.00000		.00000	0
	SUP FLOOR	.66542	1.02549	-149.68119					-36.38234		
	PCRV	.49494	-.18838	-45.07147							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALL FULL ARRAY TEST SHOCK R .25 0

TIME = 3.00000 SEC. ENERGY = 66.80 LB-IN. LUMPING = 17.61 PERCENT

	I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTBLK	HITS
	1	-.00400	-4.13564	3.32556	-.00024	.00000	.00000	.00000	-4.06357	.00000	0
	2	.16107	-4.35035	-62.92892	.16587	.00000	.00000	.00000	22.10000	.00000	42
	3	.17528	-2.24986	-71.01743	.05491	.00000	1.93010	292.96158	2.25000	2.16990	28
	4	.16259	-.34014	-38.95718	.03461	.00000	3.31724	373.94113	2.25000	5.90933	18
	5	.15312	-.25650	56.16609	.03922	.00000	.96517	112.24030	2.25000	3.87980	10
	6	.16294	-.59209	-41.99180	.05711	.00000	.00000	.00000	2.25000	.00000	4
	7	.19876	-2.52580	-69.90966	.08382	.00000	.00000	.00000	2.25000	.00000	2
	8	.17124	-3.40786	-66.30141	.02048	.00000	.00000	.00000	2.25000	.00000	1
	9	.16214	-3.62804	-20.44638	.03982	.00000	.00000	.00000	-2.25000	.00000	0
	10	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	11	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
86	12	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	13	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	14	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	15	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	16	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	17	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	18	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	19	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	20	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	21	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	22	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	23	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	24	.16214	-3.62804	-20.44638	.04800	.00000	.00000	.00000	-2.25000	.00000	0
	25	.14952	-2.65999	62.98006	.03568	.00000	.00000	.00000	2.25000	.00000	0
	26	.10352	-4.59790	70.45679	.00169	.00000	1.57223	180.78846	2.25000	4.75348	7
	27	.05552	-4.59705	71.00316	-.00000	.00000	2.50710	289.98945	2.25000	15.05947	19
	28	.01552	-4.59376	74.69208	.00000	.00000	4.18651	636.56121	22.10000	20.82773	26
	29	.01520	-4.58766	72.79915	-.00032	.00000	1.81078	310.58370	-53.60462	46.76545	43
	30				-.01975	.00000	.00000	.00000		.00000	0
	SUP FLOOR	.16034	-3.45910	2.91840					-31.92176		
	PCRV	-.00456	-4.20676	2.17792							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK C .25 C

TIME = 3.20000 SEC. ENERGY = 162.57 LB-IN. LUMPING = 24.75 PERCENT

	I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRPLK	HITS
	1	-.43431	4.27828	208.85286	-.06333	.00000	.00000	.00000	82.99154	.00000	0
	2	-.43559	4.26743	78.79638	-.00070	.00000	5.97922	912.92749	-22.10000	78.76050	45
	3	-.47595	4.30138	167.08563	-.00026	.00000	2.56577	400.48567	2.25000	40.65692	33
	4	-.52397	4.39207	-30.35084	-.00012	.00000	4.12607	478.70174	2.25000	34.34342	20
	5	-.57203	4.50966	-12.74596	-.00006	.00000	5.12511	507.30916	2.25000	28.40860	13
	6	-.61976	4.56559	-2.19628	.00007	.00000	6.45725	740.90282	2.25000	16.91820	7
	7	-.66778	4.78989	49.25947	.00010	.00000	6.82668	785.99590	2.25000	13.09625	6
	8	-.67732	-.03391	72.15467	.03976	.00000	.19792	22.65895	2.25000	.46266	2
	9	-.66687	-.69673	71.20595	.05815	.00000	.00000	.00000	2.25000	.00000	0
	10	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	11	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	12	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	13	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	14	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	15	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	16	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	17	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	18	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	19	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	20	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	21	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	22	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	23	-.66687	-.69673	71.20595	.04800	.00000	.00000	.00000	2.25000	.00000	0
	24	-.71457	-1.45069	74.27179	.00029	.00000	.00000	.00000	2.25000	.00000	0
	25	-.67936	-1.42538	74.40056	.08322	.00000	1.56328	175.80968	2.25000	1.82715	2
	26	-.64288	-1.29657	64.40186	.08448	.00000	1.93099	219.09159	2.25000	7.25308	11
	27	-.60225	.84735	65.02962	.02867	.00000	1.28144	148.47261	2.25000	11.29288	22
	28	-.68465	2.27007	206.25124	.01759	.00000	.85032	132.20534	22.10000	16.79025	28
	29	-.38355	3.80222	286.57713	.30110	.00000	.37114	74.51885	-49.90515	46.38014	43
	30				.01212	.00000	.00000	.00000		.00000	0
SUP FLOOR		-.63804	.56064	145.86786					113.28894		
PCRV		-.37143	3.64735	117.98071							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK B .25 G

TIME = 3.40000 SEC. ENERGY = 198.05 LB-IN. LUMPING = 24.49 PERCENT

I	X	YD	XDD	GAP	IMPULSF FORCE	MAX PLL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	.36861	-7.20347	100.16033	-.00267	.00000	.00000	.00000	80.60382	.00000	0
2	.44739	2.92286	320.66233	.07878	.00000	5.59987	836.44650	22.10000	76.51155	48
3	.65105	1.13771	-57.29753	.24366	.00000	.71522	131.48862	-2.25000	46.83196	33
4	.61536	1.21721	-57.61556	.01231	.00000	1.05026	135.67234	-2.25000	43.41694	20
5	.57353	1.25892	-57.78239	.00648	.00000	1.52180	169.69530	-2.25000	35.92870	14
6	.53012	1.28668	-57.89343	.00428	.00000	2.26681	267.13337	-2.25000	32.24578	10
7	.51447	1.50551	-58.76876	.03235	.00000	3.30055	383.48051	2.25000	29.56890	7
8	.69163	3.18384	-65.48204	.22516	.00000	5.55736	635.65174	2.25000	21.42487	10
9	.75819	4.26157	-69.79300	.11456	.00000	4.32191	503.23346	2.25000	20.86160	7
10	.76716	4.87778	-72.25780	.05699	.00000	4.05348	470.94806	2.25000	25.52783	4
11	.77380	5.60437	-75.16417	.05961	.00000	4.43192	502.71301	2.25000	17.26204	7
12	.75891	6.00033	-76.74803	.02811	.00000	4.74393	543.30575	2.25000	15.19120	11
13	.75552	6.69466	-79.52534	.04461	.00000	4.62762	526.79861	2.25000	9.28193	16
14	.74589	7.36963	-82.22523	.03837	.00000	4.22524	486.50482	2.25000	9.90912	14
15	.73249	8.06014	-84.89724	.03461	.00000	3.31802	383.23470	2.25000	9.45642	10
16	.69094	8.17670	-85.45352	.00645	.00000	2.80323	322.85369	2.25000	7.30105	5
17	.67845	9.12813	-89.25923	.03551	.00000	2.15476	246.67167	2.25000	4.76407	2
18	.65182	9.08354	-92.78084	.02138	.00000	1.74027	200.50946	2.25000	4.90946	2
19	.61357	9.15479	-98.31595	.00974	.00000	.00000	.00000	2.25000	.00000	0
20	.61317	9.15479	-89.36595	.04900	.00000	.00000	.00000	2.25000	.00000	0
21	.61317	9.15479	-89.36595	.04800	.00000	.00000	.00000	2.25000	.00000	0
22	.60373	9.18603	-89.49093	.03816	.00000	.00000	.00000	2.25000	.00000	0
23	.57512	10.00718	-92.77540	.01939	.00000	.30567	34.87289	2.25000	.58738	1
24	.55250	10.44845	-94.54049	.02538	.00000	.75276	84.76647	2.25000	.28179	1
25	.51768	10.84029	-96.10786	.01310	.00000	.00000	.00000	2.25000	.00000	2
26	.52216	4.34042	-70.10837	.05248	.00000	.00000	.00000	2.25000	.00000	11
27	.49502	.65631	-55.37196	.02086	.00000	8.21661	970.38160	2.25000	26.79500	23
28	.45597	1.46768	31.89977	.00095	.00000	7.94545	1232.93321	22.10000	35.36260	30
29	.45558	3.00363	-1597.01930	-.00039	.00000	6.52822	976.43739	-66.64111	102.14569	46
30				-.08330	.00000	.00000	.00000		.00000	0
SUP FLOOR	.48288	3.35744	-38.70265					.00000		
PCRVR	.37228	-3.57471	-109.65649							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARMY TEST SHOCK P .25 G

TIME = 3.60000 SEC.

ENERGY = 133.05 LB-IN.

LUMPING = 12.87 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VLL	MAX IMPULSE	MAX SPRING	MAX INTRPLK	HITS
1	-.36215	-2.61559	971.49541	-.03736	.00000	.00000	.00000	29.98462	.00000	0
2	-.36014	-3.35758	145.24919	.00701	.00000	5.63883	865.75434	27.10000	25.25699	50
3	-.32857	-7.15573	80.91807	.00157	.00000	7.44854	1167.55515	2.25000	31.32904	34
4	-.44432	-5.02701	72.40298	.00226	.00000	6.21792	714.10683	2.25000	10.74125	21
5	-.47234	-8.46502	86.15409	.00598	.00000	.00000	.00000	2.25000	.00000	14
6	-.47907	-7.98105	84.21914	.04126	.00000	.00000	.00000	2.25000	.00000	10
7	-.37995	-9.05576	92.11707	.14712	.00000	.00000	.00000	2.25000	.00000	7
8	-.24250	-13.07591	-27.75438	.18545	.00000	.00000	.00000	-2.25000	.00000	10
9	-.29041	-13.07284	-27.76665	.00002	.00000	3.96624	449.65910	-2.25000	2.44392	11
10	-.33833	-13.06976	-27.77896	.00008	.00000	5.95870	675.02384	-2.25000	4.61647	9
11	-.38569	-12.69374	103.06990	.00064	.00000	7.46257	854.46885	2.25000	15.66350	16
12	-.42977	-12.02038	100.37646	.00392	.00000	8.72949	1006.55688	2.25000	20.51402	21
13	-.47058	-11.32875	97.60993	.00767	.00000	9.44480	1091.83476	2.25000	29.25647	24
14	-.50679	-10.63101	94.81897	.01162	.00000	9.86890	1163.55200	2.25000	41.07159	23
15	-.53782	-9.90901	91.93098	.01657	.00000	10.25169	1175.95036	2.25000	61.20242	19
16	-.57110	-9.49097	90.25882	.01477	.00000	9.43563	1102.55817	2.25000	49.52975	14
17	-.58750	-8.71066	87.13757	.03160	.00000	11.15303	1316.42599	2.25000	62.62912	7
18	-.59814	-7.89517	83.87562	.03736	.00000	10.31803	1179.71095	2.25000	85.18039	9
19	-.59876	-7.02579	80.39808	.04738	.00000	8.15812	937.68324	2.25000	78.73272	7
20	-.58169	-6.01486	76.35477	.06506	.00000	10.94505	1256.20876	2.25000	76.87214	8
21	-.53189	-4.74752	71.28501	.09781	.00000	10.04121	1161.90351	2.25000	85.34679	2
22	-.51344	-4.04743	68.48463	.06644	.00000	9.01826	1024.22159	2.25000	96.50657	2
23	-.40186	-2.64429	62.87209	.15958	.00000	8.29839	972.04044	2.25000	106.60355	2
24	-.36259	-4.47501	50.00288	.08727	.00000	8.94821	1030.51532	2.25000	111.90382	2
25	-.35986	-1.05476	6.08995	.05077	.00000	9.80778	1126.17395	2.25000	115.42438	4
26	-.39857	-1.52537	50.34640	.00929	.00000	10.89407	1262.92134	2.25000	117.85415	12
27	-.43780	-1.46118	58.13965	.00876	.00000	6.92174	818.55042	2.25000	123.67944	25
28	-.31754	-3.75403	-312.48493	.16027	.00000	5.03459	797.96873	22.10000	127.30956	33
29	-.31702	-3.37160	-96.52095	.00051	.00000	2.23664	414.21589	-162.98486	157.50905	48
30				-.00777	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.35867	-3.47039	-4.28350					.00000		
PCRV	-.32479	-.69105	-35.04626							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALL FULL ARRAY TEST SHOCK B .25 U

TIME = 3.80000 SEC.

ENERGY = 257.95 LB-IN.

LUMPING = 46.45 PERCENT

	I	X	XD	XDD	GAP	IMPULSE FORCE	MAX PEL VEL	MAX IMPULSE	MAX SPRING	MAX INTROLK	HITS
	1	-.11628	-.50397	244.58942	-.01014	.00000	.00000	.00000	139.09274	.00000	0
	2	-.08485	1.39179	311.12313	.03142	.00000	3.25453	485.61599	22.10000	133.39843	53
	3	.29270	2.92585	-72.92571	.41755	.00000	3.82681	597.40723	2.25000	100.25482	36
	4	.26807	3.19311	-74.99472	.02337	.00000	3.58111	425.68746	2.25000	90.32976	24
	5	.23217	3.33012	-75.54283	.01211	.00000	5.24403	604.55756	2.25000	82.62076	20
	6	.20201	3.53776	-76.37372	.01043	.00000	5.13153	600.84180	2.25000	78.51423	14
	7	.21318	4.21789	-79.09285	.05858	.00000	7.69422	921.31139	2.25000	74.81218	9
	8	.25676	5.44053	-83.98440	.09157	.00000	11.44516	1338.69409	2.25000	71.24653	11
	9	.26640	6.41015	-87.86291	.05764	.00000	9.25768	1068.92119	2.25000	67.34310	15
	10	.24711	6.96937	-90.09976	.02071	.00000	8.28670	967.96194	2.25000	59.08741	12
	11	.21915	7.48070	-92.14510	.02004	.00000	7.79487	885.42892	2.25000	54.89379	25
	12	.19821	8.30495	-95.44209	.02706	.00000	6.67251	758.67555	2.25000	51.35115	28
	13	.17019	9.07465	-98.52088	.02038	.00000	5.26561	621.39899	2.25000	45.76068	33
102	14	.13665	9.77205	-101.31447	.01406	.00000	6.33195	720.92828	2.25000	50.02896	28
	15	.09955	10.45765	-104.13706	.01120	.00000	6.87264	804.75415	2.25000	37.74854	23
	16	.05954	11.09113	-106.58683	.00719	.00000	7.34749	843.76548	2.25000	53.07208	17
	17	.01442	11.69310	-108.92468	.00329	.00000	8.31585	949.13862	2.25000	48.82776	15
	18	-.03079	12.01627	-22.06558	.00279	.00000	8.34868	981.40859	2.25000	34.14027	14
	19	-.07645	12.07831	-21.81741	.00233	.00000	7.77593	889.35059	2.25000	11.81325	11
	20	-.12270	12.12357	-21.62677	.00169	.00000	5.68183	655.74085	2.25000	13.50699	9
	21	-.12004	5.24929	27.13067	.05074	.00000	.00000	.00000	2.25000	.00000	2
	22	-.13785	7.26698	41.06272	.03018	.00000	.00000	.00000	2.25000	.00000	2
	23	-.17737	6.83894	42.77491	.00948	.00000	2.72327	312.71198	2.25000	6.19511	3
	24	-.22368	6.95760	42.30026	.00160	.00000	1.56850	184.39987	2.25000	5.89823	4
	25	-.26782	6.79628	42.94554	.00387	.00000	1.41993	159.68535	2.25000	4.82906	6
	26	-.31087	6.90267	42.27995	.00494	.00000	1.21477	138.77833	2.25000	2.34641	14
	27	-.16691	7.23844	41.17620	.19196	.00000	.96864	112.08624	2.25000	3.33534	26
	28	-.05462	-1.36242	-154.98253	.15229	.00000	3.06005	478.12337	22.10000	14.25236	34
	29	-.05525	-1.35692	-150.40337	-.00063	.00000	3.93760	587.34994	-42.93857	36.40850	51
	30				-.05089	.00000	.00000	.00000		.00000	0
SUP FLOOR		-.00711	.98854	-45.53636					.00000		
PCPV		-.10614	-.54023	-63.16016							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK P .25 G

TIME = 4.00000 SEC.

ENERGY = 179.15 FT-IN.

LOADING = 67.11 PERCENT

	I	X	XD	XDU	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTREPK	HITS
	1	-.66295	8.65672	330.44955	-.00205	.00000	.00000	.00000	79.39004	.00000	0
	2	-.66390	5.67812	334.47629	-.00096	.00000	5.82125	895.26051	22.10000	62.07877	56
	3	-.57956	-13.18005	-16.42612	.12435	.00000	.00000	.00000	-2.25000	.00000	36
	4	-.62755	-13.18442	-16.40862	.00001	.00000	3.91721	447.32024	-2.25000	6.11759	27
	5	-.67555	-13.18392	-16.41034	.00000	.00000	4.72935	552.66195	-2.25000	19.01874	28
	6	-.72354	-13.18389	-16.41074	.00000	.00000	5.43668	615.48136	-2.25000	13.27961	23
	7	-.77154	-13.18316	-16.41369	.00000	.00000	6.18444	702.38165	-2.25000	12.87153	20
	8	-.81979	-13.09388	115.18216	.00015	.00000	7.89083	924.25970	2.25000	29.52347	21
	9	-.86651	-13.05102	114.61029	.00010	.00000	10.50523	1213.70772	2.25000	18.99168	27
	10	-.90904	-12.22585	112.11071	.00577	.00000	11.23508	1319.62827	2.25000	39.62187	25
	11	-.94985	-11.59224	109.57560	.00799	.00000	11.42641	1326.01283	2.25000	98.18178	34
	12	-.98927	-11.11520	107.66741	.00777	.00000	11.38729	1307.70219	2.25000	99.02949	38
	13	-1.03245	-10.68736	106.75675	.00483	.00000	10.59751	1239.70296	2.25000	71.97248	41
103	14	-1.07653	-10.73833	106.15993	.00392	.00000	9.35763	1100.51009	2.25000	66.26786	34
	15	-1.11005	-10.28227	104.33576	.00448	.00000	7.53615	870.39327	2.25000	61.86958	30
	16	-1.15610	-10.25104	104.21081	.00195	.00000	5.65362	644.48095	2.25000	64.02891	23
	17	-1.17936	-9.68231	101.93786	.00245	.00000	6.25862	732.26631	2.25000	78.95091	22
	18	-1.20443	-9.21480	100.06594	.00293	.00000	5.47970	641.00391	2.25000	80.04683	17
	19	-1.24186	-9.10065	99.60921	.00957	.00000	3.73061	464.42286	2.25000	89.17542	16
	20	-1.23046	-8.36355	96.66004	.00938	.00000	2.47447	328.02613	2.25000	105.71089	17
	21	-1.21571	-7.56865	93.56121	.00277	.00000	3.20404	362.62593	2.25000	108.45963	10
	22	-1.20066	-6.80212	90.41510	.00705	.00000	2.92786	341.42464	2.25000	126.11046	7
	23	-1.17334	-5.90389	86.82220	.00532	.00000	4.33215	506.95223	2.25000	132.85329	7
	24	-1.11384	-4.77541	82.30876	.10750	.00000	6.47435	742.43712	2.25000	136.09279	7
	25	-1.14959	-4.65836	81.84085	.00125	.00000	6.01330	927.47115	2.25000	144.80675	8
	26	-1.18627	-4.55292	81.41629	.00132	.00000	8.79342	1030.81294	2.25000	155.44992	15
	27	-1.21052	-4.33096	80.57047	.00375	.00000	12.41938	1431.07480	2.25000	166.60680	28
	28	-.74043	-4.58577	-271.95550	.51010	.00000	10.60697	1631.65619	22.10000	179.58616	37
	29	-.58885	4.15640	294.99571	.15158	.00000	4.64857	745.63271	-228.74880	218.86816	52
	30				.00975	.00000	.00000	.00000		.00000	0
SUP FLOOR		-.80123	-.74246	150.69383					77.70349		
PCRV		-.57910	5.86648	148.16144							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 2 .25 G

TIME = 4.20000 SEC. ENERGY = 1100.07 LB-IN. LUMPING = 47.03 PERCENT

	I	X	XP	XDP	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRELM	HITS
	1	.59324	-1.79409	-375.29131	.01552	.00000	.00000	.00000	326.11186	.00000	0
	2	.76521	8.16479	268.46542	.17197	.00000	10.40872	1663.41444	22.10000	314.34276	56
	3	1.27202	7.44153	-75.86291	.54681	.00000	23.38781	3674.51263	-2.25000	267.69096	38
	4	1.24274	7.61558	-80.57901	.01972	.00000	21.53063	2565.38660	2.25000	253.64325	29
	5	1.22354	7.88711	-81.64910	.02860	.00000	14.85225	1763.63200	2.25000	241.37217	31
	6	1.21549	8.25275	-83.12767	.03995	.00000	10.18502	1201.12105	2.25000	234.17616	25
	7	1.21743	8.71320	-84.96948	.04094	.00000	6.55313	763.00653	2.25000	216.37985	21
	8	1.28035	9.75832	-89.14997	.11092	.00000	6.00419	703.19741	2.25000	209.76275	22
	9	1.34654	10.89698	-93.72450	.11419	.00000	4.16676	524.27867	2.25000	197.02761	29
	10	1.38612	11.80865	-97.35126	.06758	.00000	6.29244	712.30882	2.25000	185.42399	27
	11	1.41319	12.60682	-100.54395	.07507	.00000	6.75055	788.63342	2.25000	173.75785	35
	12	1.42846	13.30216	-103.32530	.06227	.00000	6.57103	764.53721	2.25000	162.88049	39
	13	1.43368	13.91490	-105.77628	.05322	.00000	5.62612	655.16090	2.25000	155.82321	42
104	14	1.43290	14.49019	-108.03744	.04729	.00000	4.75272	542.31482	2.25000	133.81748	36
	15	1.42791	15.00644	-110.14244	.04204	.00000	5.11514	507.00278	2.25000	122.96780	31
	16	1.41666	15.50797	-112.12616	.03765	.00000	4.88323	589.67030	2.25000	121.48294	24
	17	1.40060	15.96687	-113.98415	.03194	.00000	7.24467	641.32027	2.25000	127.01804	23
	18	1.37672	9.32101	-235.10363	.02412	.00000	9.80932	1012.85202	2.25000	131.93730	18
	19	1.32860	9.63097	-2014.24918	-.00010	.00000	9.03996	1047.05118	2.25000	136.37882	20
	20	1.27801	9.57508	-86.24657	-.00169	.00000	12.09631	1398.10971	2.25000	140.41413	20
	21	1.22900	9.10942	-575.95859	-.00169	.00000	14.00730	1642.66545	2.25000	143.01155	12
	22	1.17913	7.83500	-894.88485	-.00209	.00000	15.30975	1775.30997	2.25000	140.82189	11
	23	1.12837	8.39382	-433.65626	-.00275	309.58542	16.39947	1884.68025	2.25000	137.34053	11
	24	1.07733	7.15092	94.67026	-.00304	.00000	17.40672	2056.53476	2.25000	126.88306	9
	25	1.02644	6.78989	-1350.15503	-.00299	.00000	14.99260	1761.83028	2.25000	120.98778	10
	26	.97470	6.95638	-769.87444	-.00394	188.58567	13.50556	1549.50290	2.25000	164.53766	20
	27	.92121	6.51342	2.28062	-.00522	.00000	10.92159	1946.68658	2.25000	186.54641	33
	28	.87724	6.63433	-518.25504	-.00387	242.51685	18.64946	2923.40454	22.10000	185.40833	39
	29	.87377	6.32879	-1469.28064	-.00357	.00000	8.34782	1315.19672	-236.83775	197.50134	58
	30				-.29605	.00000	.00000	.00000		.00000	0
SUP FLOOR		.82695	4.01495	-139.87658					-100.98299		
PCRV		.57772	-1.76643	-130.91539							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK P .25 G

TIME = 4.40000 SEC.

ENERGY = 1615.17 LB-IN.

LUMPING = 73.00 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTAPLK	HITS
1	.37545	7.56253	325.21597	-.37126	.00000	.00000	.00000	298.06476	.00000	0
2	.37030	7.56965	354.45009	-.00515	.00000	14.45248	2240.37183	22.10000	285.27722	61
3	.32534	7.56853	373.47806	-.00496	.00000	22.12459	3456.44638	2.25000	237.76141	41
4	.27085	7.57171	344.06356	-.00632	228.25331	20.21583	2384.44730	2.25000	227.13553	32
5	.21774	7.57290	309.41973	-.00521	.00000	14.97174	1752.40913	2.25000	217.61441	33
6	.16480	7.56642	273.87703	-.00495	.00000	15.83926	1649.25792	2.25000	206.49561	29
7	.11210	7.56537	532.81812	-.00468	.00000	17.42244	2065.78912	2.25000	196.69613	23
8	.05979	7.60355	395.84406	-.00431	186.17724	17.99183	2091.60428	2.25000	179.96517	26
9	.00775	7.58032	470.57476	-.00404	.00000	18.48776	2166.89548	2.25000	168.70691	31
10	-.04396	7.57130	444.71351	-.00371	.00000	19.10794	2208.67258	2.25000	158.94695	31
11	-.09535	7.59137	538.62569	-.00340	.00000	18.36765	2172.29871	2.25000	142.06992	38
12	-.14637	7.66376	656.53804	-.00301	.00000	17.16745	1999.65970	2.25000	127.13550	41
13	-.19639	7.88556	976.65617	-.00253	.00000	15.91493	1870.40105	2.25000	110.12380	45
14	-.24067	8.34570	922.50314	-.00178	.00000	14.73121	1736.75935	2.25000	114.23469	39
15	-.29570	8.52635	660.13847	-.00102	.00000	13.74632	1610.33977	2.25000	122.26736	33
16	-.34423	8.57387	713.57945	-.00053	.00000	12.90838	1519.67212	2.25000	132.39016	26
17	-.39151	-5.29050	114.66006	.00072	.00000	10.94628	1254.67222	2.25000	150.16432	25
18	-.37322	-4.61667	111.97325	.06629	.00000	9.83770	1121.28966	2.25000	166.38270	20
19	-.34739	-3.29271	109.02741	.07414	.00000	6.65707	618.04121	2.25000	180.67642	20
20	-.31080	-3.11747	105.96847	.08509	.00000	4.30645	564.00749	2.25000	193.69740	20
21	-.25535	-2.23514	102.43915	.10266	.00000	2.84707	424.64967	2.25000	206.25681	12
22	-.18808	-1.71907	98.77408	.11527	.00000	1.96714	349.74094	2.25000	218.31423	11
23	-.23086	-1.27316	98.55124	.00602	.00000	1.43213	300.21593	2.25000	231.15232	11
24	-.27270	-1.23195	98.42640	.00537	.00000	1.19006	271.07591	2.25000	243.33353	9
25	-.31084	-1.12601	98.29262	.00465	.00000	1.43003	280.66407	2.25000	254.90884	10
26	-.36016	-1.16605	98.16278	.00386	.00000	.81482	279.24811	2.25000	266.52832	20
27	-.40567	-1.14649	98.00456	.00251	.00000	.70552	285.18072	2.25000	277.41657	34
28	.23907	4.78148	339.04418	.68474	.00000	.58366	299.41395	22.10000	288.85527	39
29	.75014	5.53792	-48.60257	.51107	.00000	.49058	314.51463	-313.44524	300.40730	58
30				-.00343	.00000	.00000	.00000		.00000	0
SUP FLOOR	.35000	6.83053	128.18542					216.65013		
PCFV	.74671	6.52587	-34.71216							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROFILE 1/3 SCALE FULL ARRAY TEST SHOCK P .25 C

TIME = 4.6000 SEC. ENERGY = 2459.81 LB-IN. LUMPING = 100.94 PERCENT

I	X	XD	XDL	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTERLK	HITS
1	-.15289	-7.57125	326.47624	-.01406	.00000	.00000	.00000	296.92232	.00000	0
2	.28694	-21.06318	-260.17630	.43924	.00000	.00000	.00000	22.10000	285.12962	61
3	1.36619	-24.18350	-1021.75250	1.12125	.00000	.06284	44.16539	2.25000	237.68075	41
4	1.31918	-24.16521	-969.00367	-.00101	.00000	16.16556	1857.16232	2.25000	227.22024	37
5	1.26956	-23.78467	-824.33324	-.00162	.00000	17.23552	1990.63432	2.25000	217.57102	35
6	1.21924	-23.32060	-1376.35268	-.00232	.00000	19.45037	2178.15955	2.25000	206.52080	31
7	1.16786	-22.29724	-1226.79207	-.00338	.00000	20.47564	2367.60989	2.25000	196.60305	25
8	1.11546	-21.68996	-740.28092	-.00440	.00000	22.17256	2657.07736	2.25000	204.90321	27
9	1.06249	-21.37665	-459.52095	-.00497	.00000	22.12242	2611.49985	2.25000	216.99297	32
10	1.00918	-21.22576	-236.89597	-.00531	.00000	20.95483	2474.56229	2.25000	224.33640	32
11	.95572	-21.22726	-74.95284	-.00546	.00000	19.22160	2210.52460	2.25000	228.04513	40
12	.90224	-21.28296	19.44816	-.00549	.00000	17.07519	2014.28226	2.25000	229.08677	42
13	.84880	-21.24363	95.74952	-.00543	240.57476	15.64896	1823.05963	2.25000	226.76213	46
14	.79549	-21.44872	117.31744	-.00532	.00000	14.43934	1695.84901	2.25000	221.94458	40
15	.74270	-21.58702	152.98963	-.00518	.00000	13.00472	1526.15089	2.25000	216.42161	34
16	.68928	-21.71470	74.69154	-.00502	.00000	11.58043	1336.33218	2.25000	210.21997	28
17	.63675	-21.59305	610.99249	-.00493	246.35002	13.92435	1620.45517	2.25000	214.87299	28
18	.58397	-22.00229	-706.49826	-.00439	.00000	14.63091	1714.65721	2.25000	231.38746	23
19	.53184	-22.04457	529.95929	-.00493	222.44462	15.40258	1770.47597	2.25000	246.31250	24
20	.47858	-22.16554	-207.73754	-.00446	.00000	15.97071	1843.42494	2.25000	263.20465	23
21	.42508	-22.31024	491.10048	-.00460	.00000	16.16585	1861.37389	2.25000	285.88873	15
22	.37302	-22.43364	268.35247	-.00417	.00000	15.36132	1801.86185	2.25000	295.78572	13
23	.32192	-22.50269	183.67677	-.00389	.00000	11.79036	1350.98558	2.25000	313.68064	14
24	.27071	-22.03495	167.58307	-.00371	178.66236	9.91292	1148.35052	2.25000	328.79602	13
25	.21867	-22.60262	305.19801	-.00354	.00000	12.98638	1510.31540	2.25000	338.48244	13
26	.16732	-22.55578	174.08039	-.00345	.00000	14.80820	1742.11053	2.25000	354.43645	22
27	.11526	-22.70447	176.97654	-.00397	.00000	21.90083	2580.73883	2.25000	365.60877	37
28	.07237	-22.67073	121.11110	-.00289	154.20170	23.79178	3742.26004	22.16000	371.73217	41
29	.06974	-22.68349	275.10660	-.00284	.00000	10.66484	1692.72073	-415.36658	402.12915	62
30				-.20776	.00000	.00000	.00000		.00000	0
SUP FLOOR	.23572	-16.18532	27.95222					-199.16185		
PCRV	-.13823	-7.70195	104.13443							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK P .75 G

TIME = 4.00000 SEC. ENERGY = 1060.87 LB-IN. LUMEN = 77.22 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTERLK	HITS
1	.64706	-2.48472	304.21645	-.00007	.00000	.00000	.00000	518.05814	.00000	0
2	.95141	14.07669	-377.87941	.30435	.00000	14.06764	2233.62390	22.10000	497.39740	65
3	.98302	20.13056	-98.21497	.07161	.00000	31.05127	4961.20064	2.25000	477.65613	43
4	.93772	20.26603	-98.72000	.00260	.00000	25.95179	3423.81223	2.25000	458.99852	41
5	.88985	20.27323	-98.74967	.00013	.00000	19.99234	2371.25299	2.25000	440.28835	39
6	.87344	21.00136	-101.66219	.03159	.00000	13.76629	1628.69179	2.25000	423.68896	32
7	.86875	22.33499	-106.95670	.04331	.00000	9.47718	1096.66383	2.25000	406.18620	26
8	.85440	23.42693	-111.36447	.03365	.00000	8.73866	994.64567	2.25000	385.71555	29
9	.83828	24.46336	-115.51010	.03168	.00000	9.38977	1100.56500	2.25000	367.55478	33
10	.81727	25.37177	-119.14305	.02699	.00000	8.43542	970.70210	2.25000	350.47205	33
11	.79250	26.18240	-122.41033	.02323	.00000	8.55403	977.58719	2.25000	332.95948	42
12	.76347	26.91210	-125.20513	.01097	.00000	8.61402	1012.86739	2.25000	315.10135	44
13	.73231	27.59027	-126.01781	.01663	.00000	9.04030	928.12849	2.25000	296.67838	47
14	.69282	28.23775	-130.68776	.01551	.00000	7.66191	872.84177	2.25000	290.75200	42
15	.66679	28.86972	-133.11561	.01497	.00000	8.96892	1343.96933	2.25000	289.91346	35
16	.63047	29.38577	-2.84697	.01169	.00000	11.07960	1272.32954	2.25000	289.82607	30
17	.59181	29.61902	-3.77998	.00933	.00000	13.56646	1597.61610	2.25000	289.18970	29
18	.55002	29.79617	-4.48647	.00712	.00000	15.74470	1952.07503	2.25000	287.69177	24
19	.50644	29.98313	-4.87632	.00502	.00000	18.46415	2150.10937	2.25000	284.89219	26
20	.45980	29.91641	-4.96944	.00136	.00000	20.84648	2434.45349	2.25000	279.91819	25
21	.41312	29.94819	-5.00656	.00132	.00000	23.14475	2758.98990	2.25000	271.72377	16
22	.36624	29.97437	-5.20128	.00112	.00000	25.11758	2978.81076	2.25000	259.43496	14
23	.31869	29.99457	-5.24207	.00045	.00000	26.92676	3195.10919	2.25000	242.16965	15
24	.27205	30.01466	-5.34246	.00136	.00000	27.84742	3352.65781	2.25000	217.77739	14
25	.22610	30.06031	-5.54525	.00205	.00000	27.10285	3251.21713	2.25000	185.91728	14
26	.17900	30.10002	-5.70389	.00170	.00000	26.40043	3176.29202	2.25000	149.00985	23
27	.13262	30.11586	-5.76723	.00072	.00000	25.27271	3024.00180	2.25000	145.93848	38
28	.71841	11.13164	-304.34808	.62580	.00000	.09166	152.69963	22.10000	140.04844	41
29	.73809	8.56147	-2449.68235	.02047	.00000	18.26027	2861.71884	-165.01268	157.04774	63
30				-.09175	.00000	.00000	.00000	.00000	.00000	0
SUP FLOPP	.63675	12.12997	-87.73022							
PCRV	.64713	1.97472	-131.17377							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 0 .25 G

TIME = 5.00000 SEC. ENERGY = 2552.07 LB-IN. LUMPING = 65.52 PERCENT

	I	X	XP	XDP	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTBLK	HITS
	1	-.56824	-15.11846	1477.64929	-.38107	.00000	.00000	.00000	304.85341	.00000	0
	2	-.57324	-14.99061	1044.37100	-.00500	339.67450	15.04657	2396.19946	22.10000	276.50468	68
	3	-.61710	-15.56246	204.98016	-.00427	.00000	32.81847	5345.10931	2.25000	204.48658	44
	4	-.67118	-15.72570	394.53572	-.00550	.00000	31.13336	3752.56299	2.25000	199.37290	44
	5	-.72371	-15.84881	75.04852	-.00452	.00000	21.89265	2616.64310	2.25000	213.47101	43
	6	-.77626	-15.76111	441.70459	-.00455	220.81951	24.99010	2964.36819	2.25000	286.28996	35
	7	-.82824	-15.86015	505.33949	-.00429	.00000	25.05402	3004.40189	2.25000	284.77586	29
	8	-.88024	-16.04413	352.82996	-.00390	.00000	22.95659	2705.64448	2.25000	301.85393	32
	9	-.93214	-16.01340	652.27266	-.00370	105.21142	21.48065	2526.78101	2.25000	299.06025	36
	10	-.98340	-16.05747	469.95871	-.00326	.00000	19.27302	2277.48132	2.25000	347.52939	38
	11	-1.03476	-16.12044	563.46758	-.00297	.00000	17.41346	2002.58976	2.25000	356.98970	50
	12	-1.08494	-16.10592	640.44189	-.00259	112.92243	15.17168	1766.26959	2.25000	365.52873	59
	13	-1.13510	-16.11254	627.12205	-.00215	.00000	13.34411	1524.88976	2.25000	374.75639	59
	14	-1.18493	-16.12225	761.58960	-.00173	.00000	11.36700	1315.12375	2.25000	384.29756	53
	15	-1.23403	-16.10724	973.39624	-.00120	.00000	9.49759	1095.72636	2.25000	393.81261	45
	16	-1.28254	-16.08231	725.31420	-.00050	29.71862	8.69531	1000.58902	2.25000	402.72425	34
	17	-1.32016	-16.38080	141.02726	.01035	.00000	9.33192	1062.61853	2.25000	412.62871	32
	18	-1.34966	-20.02820	139.61968	.01552	.00000	9.18385	1044.10814	2.25000	415.94430	27
	19	-1.36852	-22.54455	177.69229	.02914	.00000	9.63551	928.94019	2.25000	430.43770	30
	20	-1.37756	-21.92073	135.12701	.03945	.00000	7.66235	871.32688	2.25000	431.59100	28
	21	-1.39061	-21.40772	173.11899	.03447	.00000	7.24561	901.66193	2.25000	441.15877	20
	22	-1.40826	-20.95636	171.32951	.03035	.00000	7.72855	878.73854	2.25000	443.55386	18
	23	-1.42013	-20.45457	129.32235	.03613	.00000	6.97243	792.12161	2.25000	445.42191	17
	24	-1.45039	-20.21385	128.35948	.01774	.00000	10.78856	1231.00502	2.25000	447.23024	16
	25	-1.48453	-20.02660	127.61049	.01366	.00000	15.87730	1879.93146	2.25000	449.24230	15
	26	-1.50793	-19.69569	126.28765	.02460	.00000	23.22106	2774.87912	2.25000	458.32222	24
	27	-1.52546	-19.42190	125.10167	.02046	.00000	33.19932	3981.12860	2.25000	474.20594	40
	28	-.99794	-3.69692	304.05553	.57753	.00000	35.41590	5679.40338	22.10000	491.35795	43
	29	-.17579	8.77794	-477.96576	.92214	.00000	16.03029	2564.85031	-526.71982	508.57174	65
	30				-.01149	.00000	.00000	.00000		.00000	0
	SUP FLOOR	-.57476	-4.66810	286.21230					209.66649		
	PCRV	-.18727	2.94678	135.13644							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROFLM 1/5 SCALE FULL ARRAY TEST SHOCK R .25 L

TIME = 9.200 0 SEC.

ENERGY = 4790.36 LB-IN.

LIMPLING = 117.54 PERCENT

	I	X	XD	XDD	GAP	IMPULSE FORCE	MAX PEL VEL	MAX IMPULSE	MAX SPRING	MAX INTRPLK	HITS
	1	.46871	-10.14565	9.24179	.00430	.00000	.00000	.00000	552.13695	.00000	0
	2	1.30600	-7.45418	-308.17797	.83775	.00000	.30108	552.35233	22.10000	549.74896	68
	3	2.50782	-3.11978	-576.00710	1.24176	.00000	.08170	567.15014	2.25000	547.15173	44
	4	2.45975	-3.54089	-5698.64777	-.00047	.00000	19.42095	2296.32913	2.25000	536.08578	46
	5	2.40627	-3.11945	924.18118	-.00498	.00000	19.99723	2210.02203	2.25000	529.42941	45
	6	2.35421	-4.46474	-223.95496	-.00416	.00000	18.87598	2239.92197	2.25000	523.37737	36
	7	2.30144	-4.74051	-2151.20859	-.00477	.00000	19.70163	2311.99149	2.25000	513.44396	30
	8	2.24697	-4.33571	-59.44558	-.00646	411.25587	10.92009	2420.38083	2.25000	500.74678	34
	9	2.19212	-5.64211	-501.04058	-.00645	.00000	19.90111	2274.57022	2.25000	493.10725	37
	10	2.13766	-5.91824	-565.76701	-.00686	.00000	19.17034	2237.14337	2.25000	477.36973	39
	11	2.08239	-6.15615	-565.12809	-.00727	.00000	17.80069	2087.96011	2.25000	469.39491	51
	12	2.02672	-5.81475	-359.87630	-.00767	439.73556	17.24046	2050.93649	2.25000	457.06689	60
	13	1.97091	-6.68953	-397.65267	-.00791	.00000	16.36555	1898.26526	2.25000	446.81284	61
109	14	1.91463	-6.88027	-385.74755	-.00818	.00000	14.93634	1747.28650	2.25000	421.47940	54
	15	1.85819	-7.05913	-437.35054	-.00844	.00000	14.56060	1716.84700	2.25000	411.12519	46
	16	1.80145	-6.88260	-274.86497	-.00874	426.85585	14.31027	1675.17924	2.25000	394.22939	35
	17	1.74454	-7.44658	-383.72017	-.00891	.00000	13.30084	1551.54843	2.25000	376.85086	36
	18	1.68730	-7.60759	-306.58892	-.00917	.00000	12.65020	1458.59798	2.25000	383.10756	30
	19	1.62902	-7.75078	-397.24815	-.00944	.00000	12.83754	1511.38304	2.25000	394.72828	33
	20	1.57221	-7.99037	-312.85045	-.00971	461.60569	12.50728	1457.74554	2.25000	405.35371	31
	21	1.51430	-8.05719	-362.17675	-.00991	.00000	13.33740	1562.14038	2.25000	413.85044	23
	22	1.45614	-8.10647	-391.30419	-.01016	.00000	14.11037	1655.79256	2.25000	424.22393	21
	23	1.39771	-8.20667	-208.35992	-.01043	.00000	15.57012	1839.91412	2.25000	435.90935	19
	24	1.33910	-8.10217	-500.37820	-.01061	487.46877	15.89461	1852.41064	2.25000	443.08794	18
	25	1.28000	-8.42007	-318.04119	-.01104	.00000	19.19747	2227.66763	2.25000	461.18370	18
	26	1.22091	-8.40053	-361.10695	-.01120	.00000	26.00073	3074.23148	2.25000	469.81604	26
	27	1.15933	-8.41603	-296.41492	-.01348	498.25620	35.50367	4307.34869	2.25000	479.81844	44
	28	1.10915	-8.52335	-403.35245	-.01018	.00000	28.24944	6170.26917	22.10000	488.06500	46
	29	1.10000	-8.50553	-353.74463	-.00895	.00000	20.50031	3241.29468	-513.92615	495.95149	69
	30				-.63629	.00000	.00000	.00000		.00000	0
SUP FLOOD		1.02370	-6.78787	-324.15291					-347.82743		
PCRV		.46392	-6.76688	-92.34363							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/8 SCALE FULL ARRAY TEST SHOCK 9 .25 G

TIME = 5.4000 SEC. ENERGY = 2793.10 LB-IN. LUMPING = 100.76 PERCENT

I	X	YD	XDD	GAP	IMPULSE FORCE	MAX ELL VLL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	-.00272	23.52202	99.59951	-.35763	.00000	.00000	.00000	470.72707	.00000	0
2	-.00751	23.86649	241.25154	-.00475	.00000	16.65426	2578.85681	22.10000	452.46832	73
3	-.05285	23.99465	220.57281	-.00454	.00000	35.72218	5672.88928	2.25000	457.01811	47
4	-.10576	24.19665	220.26435	-.00571	.00000	33.16259	3985.90555	2.25000	456.04406	48
5	-.15847	24.35282	112.64297	-.00471	.00000	24.13348	2179.48483	2.25000	452.99768	48
6	-.21110	24.55831	532.27606	-.00467	.00000	18.08127	2136.95087	2.25000	449.59127	39
7	-.26332	24.57207	144.47564	-.00422	.00000	17.72711	1588.14183	2.25000	445.86637	32
8	-.31543	24.44338	685.68396	-.00417	.00000	12.39889	1425.97153	2.25000	441.74024	36
9	-.36751	24.29825	570.93007	-.00355	.00000	11.62422	1352.61674	2.25000	437.19800	38
10	-.41814	24.39932	865.19328	-.00713	165.89957	10.97157	1211.23083	2.25000	432.22613	40
11	-.46859	23.95357	-195.62436	-.00244	.00000	9.61384	1129.98691	2.25000	426.76785	52
12	-.51920	24.01826	746.37124	-.00267	131.28754	10.01376	1154.68098	2.25000	420.66450	61
13	-.56923	23.64011	773.26517	-.00203	.00000	8.78109	1113.53471	2.25000	413.68248	63
14	-.61865	23.68010	-46.71651	-.00142	.00000	10.85727	1115.73528	2.25000	399.98843	55
15	-.66812	23.30635	572.42123	-.00149	.00000	11.28246	1296.71704	2.25000	397.69800	48
16	-.71715	23.39882	108.05773	-.00103	.00000	12.17127	1436.88228	2.25000	399.14678	36
17	-.76612	23.05597	452.85156	-.00097	.00000	13.60071	1562.50429	2.25000	410.28106	38
18	-.81474	22.96962	235.81230	-.00062	.00000	14.70376	1702.69252	2.25000	420.59047	32
19	-.86319	22.07276	309.81562	-.00045	46.35165	15.03754	1778.55688	2.25000	430.23056	34
20	-.91149	22.96382	141.41057	-.00030	.00000	16.94948	1973.32776	2.25000	439.24049	32
21	-.95970	22.85785	114.06121	-.00021	.00000	18.05253	2124.95252	2.25000	447.63769	24
22	-1.00785	22.83060	113.90577	-.00014	.00000	19.91491	2212.63179	2.25000	455.32886	22
23	-1.05592	22.95433	73.62555	-.00007	11.37429	17.74405	2053.35666	2.25000	463.13324	21
24	-1.10395	22.85712	48.54898	-.00004	.00000	17.16153	1966.98279	2.25000	468.59058	21
25	-1.15187	22.80063	52.01117	-.00002	.00000	15.41868	1804.62867	2.25000	478.59332	19
26	-1.19997	22.87297	28.63452	.00000	.00000	15.92797	1678.63812	2.25000	483.77322	28
27	-1.24747	22.87564	28.62395	.00000	.00000	16.01489	1878.35974	2.25000	488.86611	46
28	-.11408	15.90562	254.02490	1.17329	.00000	.43244	507.36651	22.10000	492.94339	46
29	.35696	9.21467	-100.31493	.47164	.00000	.20712	498.93633	-508.88289	495.39325	69
30				-.00184	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.06977	13.46740	133.23887					239.90421		
PCRV	.35511	7.59972	-34.78979							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK C .25 G

TIME = 5.60000 SEC.

ENERGY = 1466.27 LB-IN.

LUMPING = 95.92 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX PEL VEL	MAX IMPULSE	MAX SPRING	MAX INTPLK	HITS
1	.07122	-4.59935	57.11859	-.00143	.00000	.00000	.00000	284.98930	.00000	0
2	.19510	-10.83980	304.59100	.12389	.00000	.00000	.00000	22.10000	262.99116	73
3	1.00836	-25.97974	-9.52446	.85316	.00000	.00000	.00000	-2.25000	217.54221	47
4	.96045	-25.88275	-9.91246	.00019	.00000	16.68191	1927.15195	2.25000	202.11277	52
5	.91279	-25.70687	-10.61597	.00034	.00000	15.77371	1839.39253	2.25000	195.84688	52
6	.86542	-25.43518	-11.78273	.00063	.00000	17.34667	2003.04881	2.25000	192.36518	43
7	.81612	-25.16310	-12.71104	.00071	.00000	17.39569	2055.36508	2.25000	230.55453	34
8	.77129	-24.93615	-14.02803	.00117	.00000	12.44657	2253.69452	2.25000	248.97624	39
9	.72429	-24.56272	-15.19255	.00101	.00000	20.25116	2344.70447	2.25000	276.80104	41
10	.67694	-24.41585	-15.71005	.00054	.00000	19.32798	2256.69852	2.25000	309.15568	42
11	.62941	-24.27776	-16.33240	.00057	.00000	19.01289	2115.35117	2.25000	323.21675	55
12	.58193	-24.17815	-16.73003	.00052	.00000	17.19783	2002.17892	2.25000	342.82288	64
13	.53395	-24.18234	-16.71406	.00002	.00000	15.94060	1846.09772	2.25000	351.23501	67
14	.48605	-24.17749	-16.73348	.00010	.00000	14.93015	1768.48822	2.25000	352.28256	58
15	.43838	-24.14591	-16.65989	.00033	.00000	13.46420	1559.22554	2.25000	377.99919	51
16	.39069	-24.11264	-16.99206	.00031	.00000	13.37253	1530.32074	2.25000	381.60279	38
17	.34346	-24.03478	-17.52431	.00077	.00000	12.25145	1437.56931	2.25000	380.87996	40
18	.29670	-23.91284	-17.79210	.00124	.00000	10.81492	1257.11591	2.25000	398.55707	34
19	.24952	-23.84176	-18.07678	.00081	.00000	9.81886	1147.45674	2.25000	398.89982	36
20	.20310	-23.57366	-113.20415	.00158	.00000	9.57169	1046.96631	2.25000	400.21424	34
21	.15971	-23.01378	-110.16462	.00461	.00000	9.41467	1092.70425	2.25000	401.89069	26
22	.11837	-22.06525	-107.17850	.00666	.00000	9.30623	1073.33392	2.25000	404.35965	23
23	.07938	-21.34465	-104.26809	.00901	.00000	9.04657	1037.73553	2.25000	403.19827	23
24	.03437	-21.12520	-103.45066	.00299	.00000	10.94745	1275.01662	2.25000	412.06015	23
25	-.00972	-20.87248	-102.39905	.00391	.00000	13.90952	1592.28183	2.25000	412.45765	21
26	-.05369	-20.60041	-101.32713	.00404	.00000	16.41864	1934.79634	2.25000	409.75043	30
27	-.09661	-20.26858	-99.92384	.00508	.00000	24.10691	2878.22906	2.25000	407.58719	49
28	-.10170	-19.99195	-96.11304	.03473	.00000	26.38102	4173.13513	22.10000	414.30027	49
29	-.00574	1.60254	1710.26996	.09615	.00000	11.91768	1893.71967	-441.39069	423.74519	72
30				.07638	.00000	.00000	.00000		.00000	0
SUP FLOOR	.21649	-11.81674	123.27422							
PCRV	.07265	-3.94372	105.56177					-15.07864		

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SPOCK 9 .25 G

TIME = 5.80000 SEC. ENERGY = 1122.57 LB-IN. LUMPING = 80.04 PERCENT

I	X	XD	XPD	GAP	IMPULSE FORCE	MAX PEL VEL	MAX IMPULSE	MAX SPEED	MAX INTPLK	HITS
1	.72263	6.42352	-857.77202	.02696	.00000	.00000	.00000	421.58715	.00000	0
2	1.13040	5.59358	-251.39943	.40737	.00000	12.20599	1951.89915	22.10000	406.51903	77
3	1.37575	16.85622	-89.15358	.28575	.00000	27.03945	4341.95621	2.25000	396.19995	48
4	1.34057	17.11306	-100.19833	.01082	.00000	25.29196	2971.73645	2.25000	391.04253	54
5	1.30140	17.28701	-100.89472	.00887	.00000	16.89456	1966.38174	2.25000	387.77691	53
6	1.26642	17.54667	-101.93320	.01307	.00000	14.20040	1683.11797	2.25000	384.83813	44
7	1.22456	17.66974	-102.47165	.00614	.00000	11.28320	1286.65955	2.25000	382.13776	36
8	1.20453	18.25447	-104.76456	.02797	.00000	10.74438	1247.55106	2.25000	379.44159	41
9	1.18127	18.83035	-107.06811	.02475	.00000	9.66719	1099.28419	2.25000	376.33580	43
10	1.15386	19.37461	-109.24514	.02069	.00000	8.75716	1000.02534	2.25000	368.47046	44
11	1.12229	19.87251	-111.22873	.01633	.00000	5.40125	968.10018	2.25000	366.46680	57
12	1.09056	20.40047	-113.35659	.01627	.00000	5.44089	982.66282	2.25000	356.00466	65
13	1.05651	20.82521	-115.44755	.01425	.00000	8.07061	916.82458	2.25000	352.31118	71
14	1.02105	21.42622	-117.49158	.01224	.00000	8.21186	948.79669	2.25000	338.99844	61
15	.98133	21.80575	-119.37969	.00829	.00000	9.90158	1027.48676	2.25000	332.96881	53
16	.93890	22.33167	-121.07338	.00557	.00000	9.75663	1149.56027	2.25000	322.33934	44
17	.89469	22.76723	-122.81562	.00382	.00000	11.13145	1289.72257	2.25000	312.16832	43
18	.85299	23.25970	-124.71549	.00610	.00000	12.00851	1386.21846	2.25000	300.85303	38
19	.81092	23.76360	-126.80109	.00593	.00000	12.95546	1468.16167	2.25000	288.55613	40
20	.76667	24.01497	-4.54655	.00376	.00000	14.29988	1658.42900	2.25000	274.97342	38
21	.72524	24.19687	3.85879	.00656	.00000	15.77130	1860.94777	2.25000	259.56061	28
22	.68474	24.37895	3.17244	.00701	.00000	17.02285	1975.39922	2.25000	241.56501	28
23	.64413	24.58140	2.20060	.00789	.00000	17.83177	2098.54700	2.25000	220.56609	25
24	.60470	24.80479	1.35700	.00925	.00000	18.66852	1857.45511	2.25000	195.07838	26
25	.56157	24.95611	.73132	.00549	.00000	15.32982	1760.73547	2.25000	170.64444	25
26	.51843	25.28273	.27535	.00456	.00000	15.35980	1816.60715	2.25000	96.70500	34
27	.47375	25.16513	-.05425	.00292	.00000	16.12394	1870.88712	2.25000	47.07999	51
28	.74156	2.29815	-6.97194	.30822	.00000	.00000	.00000	22.10000	.00000	49
29	.74106	2.29919	-326.55395	-.00050	.00000	6.34066	950.50598	62.24964	27.62231	75
30				-.04540	.00000	.00000	.00000		.00000	0
SUP FLOOR	.79212	8.60745	-86.75042					.00000		
PCRV	.69567	.46334	-104.69217							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK P .25 C

TIME = 6.00000 SEC.

ENERGY = 1756.77 LB-IN.

LUMPING = 75.44 PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	-.11845	-2.98958	1534.25964	-.30780	.00000	.00000	.00000	246.23777	.00000	0
2	-.12186	-10.98947	225.87397	-.00381	.00000	11.17084	1776.93356	22.10000	225.08567	80
3	-.16550	-10.35678	1066.85420	-.00364	.00000	24.67642	3937.38586	2.25000	174.60989	51
4	-.21740	-10.59257	340.80190	-.00398	.00000	22.94761	2703.21310	2.25000	142.22352	59
5	-.26868	-10.44258	279.33211	-.00319	183.49048	15.68776	1846.55139	2.25000	133.33508	56
6	-.31972	-10.63478	451.02921	-.00305	.00000	15.20944	1792.43022	2.25000	148.60917	47
7	-.37048	-10.74842	408.81328	-.00276	.00000	14.47395	1707.15631	2.25000	185.12789	41
8	-.42099	-10.85930	413.51572	-.00251	.00000	17.16213	2026.81808	2.25000	213.68547	44
9	-.47124	-10.95369	662.57386	-.00225	95.93246	16.37464	1891.50334	2.25000	236.33721	49
10	-.52193	-10.77212	573.64897	-.00179	.00000	14.96193	1744.58899	2.25000	254.37449	48
11	-.57047	-12.64243	452.93141	-.00144	.00000	14.11213	1624.16231	2.25000	269.11547	63
12	-.61963	-11.69932	629.61446	-.00116	375.45021	13.19700	1552.01306	2.25000	281.78934	68
13	-.66875	-12.03754	997.66951	-.00077	.00000	11.88440	1396.92709	2.25000	293.10526	76
14	-.71633	-12.93200	107.63504	.00002	.00000	10.75502	1226.05974	2.25000	303.27098	65
15	-.74597	-17.90661	123.97325	.01226	.00000	9.26843	1086.35411	2.25000	312.81465	56
16	-.76891	-16.56650	122.21250	.02416	.00000	8.20852	951.75980	2.25000	321.09988	47
17	-.79022	-16.11517	120.40751	.02670	.00000	7.74088	896.67493	2.25000	328.53600	45
18	-.81126	-15.67543	118.64051	.02716	.00000	7.70373	894.78994	2.25000	336.46790	40
19	-.82961	-15.72891	116.66244	.02945	.00000	7.41923	841.38062	2.25000	340.67490	44
20	-.84585	-14.77665	115.85342	.03176	.00000	7.20961	831.38478	2.25000	350.61544	41
21	-.85611	-14.27913	113.06335	.03774	.00000	7.64007	872.50908	2.25000	354.85789	30
22	-.86287	-13.75944	110.98455	.04204	.00000	8.26601	939.51543	2.25000	358.38187	30
23	-.86910	-13.28119	109.07153	.04097	.00000	9.12752	1062.02557	2.25000	361.59793	27
24	-.88851	-12.96377	107.80189	.02659	.00000	10.43025	1201.73044	2.25000	364.76484	28
25	-.92140	-12.79805	107.13920	.01511	.00000	12.38967	1462.03078	2.25000	367.91869	26
26	-.95286	-12.61631	106.41206	.01654	.00000	15.65317	1796.27156	2.25000	371.12604	36
27	-.98193	-12.40962	105.50527	.01093	.00000	23.08283	2698.47556	2.25000	374.63337	55
28	-.29925	3.72888	244.14029	.72268	.00000	25.19130	3943.49283	22.10000	382.33877	52
29	.20643	.40582	-303.23260	.50568	.00000	11.26355	1615.49277	-405.51264	388.83563	75
30				-.01668	.00000	.00000	.00000		.00000	0
SUP FLOOR	-.15426	-2.55742	231.81465					175.76454		
PCRV	.18975	3.38073	86.17187							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK B .25 G

TIME = 6.20000 SEC.

ENERGY = 3142.59 LB-IN.

LUMPING = 92.7% PERCENT

I	X	XD	XPD	GAP	IMPULSE FORCE	MAX ELL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	.54924	-6.24422	222.47021	-.00955	.00000	.00000	.00000	396.57535	.00000	0
2	.95462	-2.10332	207.69876	.40517	.00000	.44872	392.27668	27.10000	383.09838	80
3	2.11523	8.40693	-118.03995	1.20101	.00000	.65639	389.65803	2.25000	377.99220	51
4	2.09371	8.59618	-118.21086	.02588	.00000	1.07346	387.60626	2.25000	363.06799	59
5	2.06469	8.73513	-119.37267	.01099	.00000	1.09748	369.71880	2.25000	352.31973	56
6	2.04022	8.96671	-120.29898	.03154	.00000	.82196	360.95535	2.25000	347.15335	47
7	2.05177	8.34918	-121.82856	.05154	.00000	.70826	360.90942	2.25000	343.83746	41
8	2.07661	8.90718	-124.06098	.07284	.00000	.80544	360.37516	2.25000	340.58641	45
9	2.04726	-4.22772	-1168.71505	.01065	.00000	.83028	359.05196	2.25000	337.30830	51
10	1.99836	-4.22511	-1204.75096	-.00090	.00000	14.51875	1682.00728	2.25000	333.96193	52
11	1.94854	-4.00791	-987.21246	-.00182	.00000	13.25971	1546.70951	2.25000	330.29581	66
12	1.89797	-4.08274	-826.41199	-.00257	.00000	11.71944	1372.33336	2.25000	325.93081	71
13	1.84678	-4.21838	-411.21055	-.00719	.00000	10.45238	1224.34312	2.25000	316.43535	80
14	1.79531	-4.23640	-1427.11098	-.00347	.00000	8.42546	982.60531	2.25000	312.35339	68
15	1.74273	-4.21986	-208.26977	-.00458	197.14284	7.42040	863.10510	2.25000	304.77793	64
16	1.69074	-4.40573	-361.92241	-.00469	.00000	8.00667	909.51567	2.25000	297.47493	56
17	1.63711	-4.30077	-403.37992	-.00493	242.77352	9.27920	1066.47762	2.25000	289.24009	55
18	1.58301	-4.59794	-923.78955	-.00521	.00000	10.70253	1227.75536	2.25000	280.12813	48
19	1.53000	-4.56125	-252.42127	-.00590	259.34931	11.89353	1392.91136	2.25000	270.11450	51
20	1.47505	-4.76958	-407.65207	-.00606	.00000	13.26073	1519.89398	2.25000	259.05581	48
21	1.42161	-4.84747	-453.17129	-.00637	.00000	14.68514	1708.96004	2.25000	264.45437	36
22	1.36608	-4.90669	-475.34747	-.00665	.00000	16.18821	1871.95943	2.25000	277.95434	34
23	1.31198	-4.84009	-435.30790	-.00698	314.97256	16.49522	1896.50955	2.25000	291.58619	31
24	1.25669	-5.03488	-477.37700	-.00729	.00000	16.11082	1851.29915	2.25000	304.17422	33
25	1.20107	-5.08525	-330.55291	-.00762	.00000	14.86309	1741.71448	2.25000	318.31118	30
26	1.14523	-5.03533	-521.45236	-.00784	.00000	14.84218	1759.28137	2.25000	327.48720	38
27	1.08759	-5.14925	-536.57713	-.00963	.00000	21.88413	2547.72813	2.25000	342.82230	58
28	1.04010	-5.11320	-401.35648	-.00749	.00000	23.57765	3751.74033	22.10000	360.63373	53
29	1.03350	-5.12300	-415.21255	-.00660	.00000	10.61030	1689.96303	-379.60644	365.32840	78
30				-.47430	.00000	.00000	.00000		.00000	0
SUP FLOOR	.99155	-4.56392	-237.86328					-245.86439		
PCRV	.55920	-4.75881	-30.61475							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 1 .25 G

TIME = 0.40000 SEC. ENERGY = 2892.10 LB-IN. LUMPING FIDELITY PERCENT

I	X	XD	XDD	GAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTREPLK	HITS
1	.32770	10.93656	-120.27728	-.29972	.00000	.00000	.00000	343.32862	.00000	0
2	.32344	11.03232	-134.83416	-.00426	.00000	10.37471	1647.41513	22.10000	332.52998	84
3	.27892	11.12375	-118.83452	-.00462	.00000	23.04063	3669.51349	2.25000	328.91346	55
4	.22452	11.24132	-90.06247	-.00637	.00000	21.41739	2592.44098	2.25000	320.84327	63
5	.17104	11.25905	.80081	-.00540	.00000	15.74355	1841.76724	2.25000	311.59661	60
6	.11750	11.33191	-.60806	-.00553	.00000	16.11501	1856.35990	2.25000	302.80595	51
7	.06392	11.33780	81.28746	-.00559	.00000	17.40296	2014.30319	2.25000	293.39203	45
8	.01036	11.32463	74.06580	-.00556	.00000	17.30532	2051.60715	2.25000	283.63570	47
9	-.04310	11.32297	63.02994	-.00554	.00000	15.47674	1801.77632	2.25000	273.40583	53
10	-.09672	11.32802	50.66655	-.00554	232.96018	10.39068	1261.16951	2.25000	262.65568	54
11	-.15026	11.33737	145.32616	-.00554	.00000	7.89832	911.14898	2.25000	251.55811	67
12	-.20372	11.49765	323.23591	-.00546	.00000	9.05023	1061.61209	2.25000	251.04957	72
13	-.25697	11.79151	541.42427	-.00525	.00000	9.23339	1065.42499	2.25000	258.70404	81
14	-.30981	12.36220	819.75023	-.00485	.00000	10.65135	1241.71346	2.25000	265.31779	69
15	-.36204	13.11440	887.75661	-.00422	.00000	10.79556	1183.60030	2.25000	271.15956	66
16	-.41358	13.80205	710.19348	-.00354	.00000	10.75672	1258.59085	2.25000	276.35813	62
17	-.46458	14.36892	742.35437	-.00300	.00000	11.49456	1329.49992	2.25000	280.98191	62
18	-.51501	15.07347	813.05829	-.00243	.00000	12.28989	1436.04594	2.25000	285.08005	55
19	-.56401	15.66479	434.24530	-.00180	.00000	13.13512	1506.45441	2.25000	288.71662	58
20	-.61429	15.99034	415.16296	-.00148	.00000	13.56069	1550.53885	2.25000	291.96627	53
21	-.66346	16.41063	353.87946	-.00117	.00000	14.14152	1642.60257	2.25000	294.90924	40
22	-.71237	16.55492	161.88174	-.00091	.00000	16.16913	1864.60594	2.25000	297.66621	37
23	-.76118	16.80870	364.05142	-.00081	.00000	17.17079	2031.50026	2.25000	302.39388	34
24	-.80972	16.91243	86.89249	-.00054	.00000	17.58659	2026.59153	2.25000	313.23143	36
25	-.85821	17.01632	285.06203	-.00050	.00000	13.45068	1576.07196	2.25000	324.39618	33
26	-.90651	17.06362	191.26439	-.00029	.00000	13.29274	1571.35545	2.25000	334.65646	40
27	-.95470	17.12819	231.64109	-.00019	.00000	13.98227	1644.18725	2.25000	346.50935	59
28	.19995	9.40906	308.22644	1.19465	.00000	.47330	362.28831	22.10000	358.75419	53
29	.62369	5.90123	23.04408	.42374	.00000	.07264	367.04528	-379.40974	365.54362	78
30				.00273	.00000	.00000	.00000		.00000	0
SUP FLOOR	.27650	8.75142	73.62487					179.93512		
PCRV	.62642	4.63850	-41.80904							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 175 SCALE FULL ARRAY TEST SHOCK B .25 G

TIME = 0.60000 SEC. ENERGY = 1567.42 LF-IN. LUMPING = 93.54 PERCENT

I	X	XD	XDD	CAP	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX SPRING	MAX INTBLK	HITS
1	.36772	-1.45512	-28.32153	.00083	.00000	.00000	.00000	239.47122	.00000	0
2	.51698	-10.35012	346.54471	.12026	.00000	.21792	142.77427	22.10000	235.31386	84
3	1.52393	-16.85233	-29.37061	1.04694	.00000	.70039	143.16515	-2.25000	220.89869	55
4	1.47607	-16.84503	-29.36264	.00014	.00000	12.54908	1457.26628	2.25000	223.70779	65
5	1.42896	-16.80424	-29.50827	.00089	.00000	10.53576	1217.20949	2.25000	228.99813	64
6	1.30175	-16.78544	-29.60418	.00039	.00000	15.49280	1809.01944	2.25000	230.68611	53
7	1.33477	-16.71829	-29.07272	.00142	.00000	17.04439	1972.34624	2.25000	232.85277	49
8	1.28778	-16.70259	-29.93557	.00732	.00000	17.28900	1994.22264	2.25000	232.18468	51
9	1.24092	-16.61619	-30.28110	.00184	.00000	16.43501	1972.51912	2.25000	231.53212	55
10	1.19476	-16.54990	-30.54673	.00134	.00000	15.22194	1803.68822	2.25000	231.16729	55
11	1.14669	-16.53232	-30.61664	.00043	.00000	15.05501	1853.37975	2.25000	231.08067	68
12	1.10074	-16.43906	-30.98972	.00196	.00000	14.58374	1600.92734	2.25000	227.37198	74
13	1.05422	-16.35400	-31.32675	.00167	.00000	12.03346	1506.74559	2.25000	217.68206	82
14	1.00802	-16.26731	-31.69271	.00170	.00000	11.01027	1316.96736	2.25000	199.92719	71
15	.96209	-16.14420	-32.16915	.00207	.00000	9.29101	1072.09615	2.25000	189.33364	67
16	.91635	-16.00752	-32.71586	.00226	.00000	7.64117	892.74034	2.25000	188.71905	63
17	.87035	-15.88457	-33.27766	.00200	.00000	5.66031	642.13355	2.25000	196.51907	64
18	.82517	-15.68332	-34.01266	.00322	.00000	5.50155	634.43189	2.25000	204.09204	57
19	.78208	-15.43589	-35.48237	.00631	.00000	5.97001	676.46124	2.25000	211.39318	60
20	.74139	-14.89269	-37.17520	.00651	.00000	6.06437	710.85202	2.25000	218.41438	54
21	.70060	-14.36500	-39.28560	.00741	.00000	5.93252	608.92267	2.25000	225.33294	41
22	.66093	-13.77087	-41.66262	.00803	.00000	5.77555	670.81950	2.25000	232.49411	38
23	.61979	-13.22944	-43.78817	.00696	.00000	5.78077	673.96599	2.25000	242.09500	36
24	.57819	-12.74131	-45.78071	.00647	.00000	6.14937	702.73367	2.25000	254.26065	41
25	.53976	-11.40295	-51.21880	.00907	.00000	9.49093	1117.24545	2.25000	266.02320	39
26	.50113	-11.13200	-50.13499	.00987	.00000	13.94975	1653.33281	2.25000	277.27132	44
27	.45314	-11.12271	-68.60413	.00001	.00000	20.26719	2406.15140	2.25000	291.11348	64
28	.41313	-11.06745	-159.09890	-.00001	.00000	21.86274	3490.21820	22.10000	301.10371	55
29	.41288	-10.90665	-110.80870	-.00025	.00000	9.84142	1597.18742	-321.94788	306.05569	81
30				-.02599	.00000	.00000	.00000		.00000	0
SUP FLOOR	.56460	-7.64237	42.42604					-42.16736		
PCRV	.38619	-1.69806	75.30240							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 9 .25 G

TIME = 0.00070 SEC.

ENERGY = 774.73 LB-IN.

LUMPING = 85.24 PERCENT

I	X	XD	XFD	CAP	IMPULSE FORCE	MAX PEL VEL	MAX IMPULSE	MAX SPRING	MAX INTRLK	HITS
1	.62318	3.75914	248.79888	-.01619	.00000	.00000	.00000	296.74995	.00000	0
2	1.01698	.38210	-263.19583	.19360	.00000	9.72928	1559.27733	22.10000	284.84401	87
3	1.16051	9.18025	-82.91241	.18353	.00000	21.62889	3457.11469	2.25000	275.59104	56
4	1.12227	9.40533	-83.81873	.00976	.00000	20.85563	2366.19278	2.25000	265.12849	68
5	1.08231	9.59151	-84.56347	.00904	.00000	13.79726	1610.44547	2.25000	256.75660	65
6	1.03676	9.63193	-84.72512	.00175	.00000	9.30396	1870.86024	2.25000	245.51199	55
7	1.03530	10.78672	-89.34431	.04724	.00000	8.79250	959.96516	2.25000	231.59440	51
8	1.02441	11.81221	-93.44626	.03711	.00000	5.19985	588.54490	2.25000	219.57282	53
9	.98316	11.70830	-93.03064	.00675	.00000	6.93259	787.69886	2.25000	206.91941	58
10	.93588	11.77712	-93.30589	.00072	.00000	6.70585	760.62665	2.25000	194.84923	62
11	.89446	12.47793	-96.10915	.00660	.00000	5.90705	696.60559	2.25000	181.61029	72
12	.85212	13.45819	-100.03019	.00564	.00000	5.95311	683.69389	2.25000	168.25961	77
13	.80800	13.24407	30.37923	.00408	.00000	5.99778	693.94420	2.25000	153.67546	84
14	.76305	14.18052	29.43346	.00284	.00000	6.85730	785.81899	2.25000	138.07129	74
15	.71673	14.70862	28.92103	.00169	.00000	8.19927	944.65041	2.25000	124.01722	71
16	.67098	14.39483	28.57619	.00136	.00000	9.58810	1111.70396	2.25000	112.55606	66
17	.62279	14.39830	28.56233	.00001	.00000	11.07594	1289.22400	2.25000	101.86289	68
18	.57510	14.44820	28.36271	.00101	.00000	12.70488	1451.81842	2.25000	116.99866	61
19	.52935	14.56011	27.91506	.00195	.00000	14.34622	1645.35478	2.25000	73.78765	63
20	.48224	14.62115	27.67002	.00119	.00000	15.75104	1855.64159	2.25000	104.62322	57
21	.43488	14.64097	27.59179	.00034	.00000	16.66849	1974.42346	2.25000	138.02106	46
22	.38807	14.72316	27.26287	.00149	.00000	16.20672	1913.24182	2.25000	58.17356	43
23	.34299	14.87558	26.65319	.00292	.00000	15.90508	1857.57068	2.25000	68.64802	40
24	.29685	14.96620	26.29072	.00186	.00000	15.23389	1781.15184	2.25000	72.33357	43
25	.25204	15.11213	25.71501	.00319	.00000	13.27837	1540.42822	2.25000	74.11645	41
26	.20474	15.12028	25.67479	.00021	.00000	11.29544	1330.19377	2.25000	86.07756	46
27	.15711	15.15960	25.51690	.00086	.00000	7.76270	891.07113	2.25000	22.47287	66
28	.85103	3.25989	-295.96147	.73392	.00000	.00000	.00000	22.10000	.08905	55
29	.85492	5.52540	-581.06928	.00362	.00000	7.43691	1125.17719	40.36344	13.42010	82
30				-.01555	.00000	.00000	.00000		.00000	0
SUP FLOOR	.84289	4.99476	-6.25758					.00000		
PCR V	.83937	-.43663	-70.19165							

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NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PROBLEM 1/5 SCALE FULL ARRAY TEST SHOCK 5 .25 G

TIME = 7.00000 SEC. ENERGY = 375.20 LB-IN. LUMPING = 60.00 PERCENT

	I	X	XD	XDD	DD	IMPULSE FORCE	MAX REL VEL	MAX IMPULSE	MAX LUMPING	MAX INTERLK	HITS
	1	.49146	3.62541	283.38827	-.07275	.00000	.00000	.00000	58.04293	.00000	0
	2	.49059	3.64162	306.57726	-.00086	.00000	8.76242	1263.82578	22.10000	47.85614	90
	3	.91527	-12.02537	-20.16127	.40515	.00000	.00000	.00000	-2.25000	.00000	56
	4	.86857	-12.08822	-20.22169	.00017	.00000	8.78341	1016.49225	-2.25000	20.37713	70
	5	.82276	-12.03974	-20.38359	.00219	.00000	2.45306	1104.39351	-2.25000	31.73756	66
	6	.77930	-12.05749	-20.71260	.00454	.00000	8.65733	1006.04823	-2.25000	39.46605	56
	7	.73821	-12.03300	-21.21057	.00691	.00000	11.42118	1320.42390	-2.25000	54.43097	52
	8	.69134	-12.03310	-21.21017	.00117	.00000	12.61391	1442.47018	-2.25000	59.63514	56
	9	.64355	-12.82086	-21.25911	.00051	.00000	5.45992	999.57865	-2.25000	52.71906	62
	10	.59665	-12.80209	-21.33410	.00080	.00000	2.76026	1120.99469	-2.25000	66.67687	70
	11	.54904	-12.77894	-21.42679	.00107	.00000	12.77742	1497.65869	-2.25000	132.53573	74
	12	.50259	-12.74807	-21.55027	.00135	.00000	12.68698	1462.96394	-2.25000	127.56359	81
	13	.45534	-12.72936	-21.62512	.00065	.00000	12.12126	1400.52716	2.25000	126.37545	87
118	14	.40979	-12.39300	-19.38238	.00195	.00000	10.39758	1200.65373	2.25000	127.04977	77
	15	.36682	-11.78070	-10.93317	.00503	.00000	9.12167	1063.85643	2.25000	127.71973	73
	16	.33134	-11.07922	-10.12725	.01252	.00000	7.54963	871.36660	2.25000	129.39867	70
	17	.30356	-10.26425	-10.16737	.02021	.00000	6.23613	720.04976	2.25000	125.09525	72
	18	.27385	-9.48755	-9.76059	.01029	.00000	5.50834	643.01253	2.25000	132.98423	63
	19	.24955	-8.65991	-9.45004	.02370	.00000	5.21784	617.63961	2.25000	131.68381	66
	20	.22516	-7.88451	-9.13483	.02417	.00000	5.22447	596.57706	2.25000	130.37904	60
	21	.20811	-7.07307	-8.10238	.03045	.00000	5.46977	624.57426	2.25000	128.27523	50
	22	.19015	-6.65865	-8.44426	.02004	.00000	6.67100	756.98913	2.25000	137.84999	49
	23	.13515	-6.57223	-8.09928	.00307	.00000	7.82118	899.57407	2.25000	147.49941	44
	24	.16583	-5.56493	-8.07011	.07788	.00000	8.68793	995.31262	2.25000	159.77267	45
	25	.23492	-4.97562	-7.61248	.11692	.00000	11.35316	1335.90228	2.25000	166.93820	42
	26	.21432	-3.73298	-7.47702	.02830	.00000	13.63103	1589.95599	2.25000	181.94915	48
	27	.17878	-3.61416	-7.46670	.01247	.00000	12.28291	2347.38354	2.25000	188.48755	67
	28	.50081	.77357	-342.04250	.36207	.00000	21.29261	3408.51556	22.10000	198.54907	57
	29	.55972	5.36150	-25.69382	.05892	.00000	9.56732	1516.49432	-246.57501	234.20232	84
	30				.00451	.00000	.00000	.00000		.00000	0
SUP FLOOP		.43514	-1.59152	80.92091					3.27709		
PCRV		.56424	2.91660	44.37623							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

SAMPLE PRO-LEM 175 SCALE FULL ARRAY TEST CROCK 7 .00

TIME = 7.15000 SEC.

ENERGY = 594.72 LB-IN.

LUMPING = 61.96 PERCENT

I	X	XD	XPD	GAP	IMPULSE FORCE	MAX PEL VEL	MAX IMPULSE	MAX SPRING	MAX INTRBLK	HITS
1	.86987	2.15033	142.41367	-.01799	.00000	.00000	.00000	215.35835	.00000	0
2	.99862	-2.74927	-248.59642	.12075	.00000	8.52482	1329.61067	-22.10000	204.13429	90
3	1.14452	6.13748	-78.14028	.19390	.00000	19.13235	3620.67654	2.25000	160.69696	57
4	1.10623	6.38039	-79.11192	.01171	.00000	17.59771	2043.90056	2.25000	150.82111	72
5	1.06671	6.51322	-79.64246	.00649	.00000	11.90909	1576.27290	2.25000	141.97504	69
6	1.05549	7.38381	-83.12558	.03697	.00000	9.76740	1134.72505	2.25000	134.06258	57
7	1.02651	7.82671	-84.69719	.01882	.00000	8.17144	928.97743	2.25000	126.13099	54
8	.97972	7.98583	-85.13006	.00121	.00000	5.81831	677.52403	2.25000	114.02910	58
9	.94849	8.90744	-89.22014	.01696	.00000	5.04205	576.37614	2.25000	105.05182	65
10	.91126	9.97005	-93.47057	.01117	.00000	4.63464	537.75514	2.25000	94.42608	74
11	.86944	10.82264	-35.47222	.00579	.00000	4.48696	509.72089	2.25000	85.31553	77
12	.82690	11.07127	34.47749	.00526	.00000	3.89778	443.42493	2.25000	78.22170	84
13	.78135	11.18196	34.03475	.00245	.00000	4.14416	469.20272	2.25000	70.96400	90
14	.73677	11.29893	33.56076	.00272	.00000	5.79645	631.07294	2.25000	63.23347	79
15	.69034	11.39313	33.10007	.00231	.00000	6.74647	788.26762	2.25000	57.80604	76
16	.64359	11.45629	32.93742	.00161	.00000	8.34693	961.90646	2.25000	61.07459	75
17	.59885	11.56876	32.49254	.00286	.00000	9.76470	1120.91656	2.25000	76.81370	77
18	.55021	11.01936	34.72115	.00007	.00000	10.56716	1215.40733	2.25000	95.45540	69
19	.50226	10.96282	-70.10509	.00005	.00000	10.92706	1257.04410	2.25000	38.91117	72
20	.45491	11.12276	99.25991	-.00004	55.50470	10.73426	1254.11780	2.25000	40.75714	65
21	.40692	10.81595	35.42917	.00000	.00000	9.64653	1098.54411	2.25000	42.43351	58
22	.35895	10.83956	35.40935	.00002	.00000	8.43965	964.32899	2.25000	49.89177	58
23	.31074	10.92111	35.47814	.00001	.00000	6.89782	800.18106	2.25000	19.14776	49
24	.26379	10.80927	35.16950	.00074	.00000	6.16250	712.05147	2.25000	15.05932	46
25	.46849	6.68170	52.03595	.05270	.00000	.00000	.00000	2.25000	.00000	42
26	.46678	6.96753	51.29247	.06649	.00000	.00000	.00000	2.25000	.00000	48
27	.46593	6.93657	51.01631	.02665	.00000	.00000	.00000	2.25000	.00000	67
28	.86496	1.27559	337.01622	.43844	.00000	.00000	.00000	22.10000	.00000	57
29	.88201	-1.59549	-23.52306	.01704	.00000	.00000	.00000	-9.77785	.00000	84
30				-.00115	.00000	.00000	.00000		.00000	0
SUP FLOOR	.67777	3.14653	-81.07019					.00000		
PCRV	.88005	-1.46809	-23.92393							

NO. OF RIGID LINK HITS = 0 TIME RIGID LINK IN CONTACT = .00000 SEC MAX RIGID LINK FORCE = .000 LB

CRUNCH
OUTPUT SUMMARY

BLOCK	X (MAX)	TIME	X (MIN)	TIME	X (MAX)	TIME	X (MIN)	TIME
1	1.02424	4.45670	-1.74791	2.98140	26.67063	5.07490	-19.56768	5.27660
2	1.39794	5.17510	-1.74885	3.98140	26.79191	5.07420	-25.21351	5.26640
3	2.50912	5.12040	-1.73427	5.02230	27.14573	5.07510	-31.63289	5.25990
4	2.46527	5.19680	-1.84478	5.02350	27.65700	5.07580	-31.44939	5.25970
5	2.41942	5.19490	-1.95222	5.02410	28.09514	5.07660	-31.21642	5.25260
6	2.37234	5.19290	-1.96107	5.02410	28.46128	5.07800	-30.95094	5.25900
7	2.32500	5.19160	-1.01890	5.02430	28.74761	5.07890	-30.68976	5.26330
8	2.28253	5.18730	-1.07605	5.02490	29.12215	5.07950	-30.42069	5.25910
9	2.23324	5.18730	-1.13316	5.02520	29.43558	5.08020	-30.14004	5.25810
10	2.18370	5.18460	-1.18945	5.02540	29.70256	5.08130	-29.87354	5.25710
11	2.13270	5.18470	-1.24561	5.02570	29.95085	5.08210	-29.89678	4.94670
12	2.08110	5.18470	-1.30143	5.02600	30.26103	5.08340	-30.45397	4.94120
13	2.02879	5.18460	-1.35720	5.02670	30.53763	5.08340	-30.33549	4.94130
14	1.97598	5.18450	-1.41238	5.02650	30.88190	5.08470	-30.27229	4.93700
15	1.92266	5.18430	-1.46627	5.02710	31.19039	5.08580	-30.28421	4.93710
16	1.86811	5.18410	-1.52186	5.02920	31.57065	5.08660	-30.17065	4.93720
17	1.81356	5.18340	-1.57623	5.02960	31.96270	5.08770	-29.90177	4.93630
18	1.75871	5.18310	-1.63096	5.03010	32.36342	5.08880	-29.69026	4.93380
19	1.70344	5.18280	-1.68570	5.03040	32.77171	5.08980	-29.68981	4.93390
20	1.64776	5.18290	-1.73917	5.03140	33.18557	5.09080	-29.52900	4.93330
21	1.59169	5.18260	-1.79285	5.03170	33.60147	5.09170	-29.39796	4.93220
22	1.53526	5.18230	-1.84611	5.03200	34.01679	5.09260	-29.24794	4.93100
23	1.47844	5.18200	-1.89866	5.03230	34.42956	5.09350	-29.11889	4.92870
24	1.42138	5.18180	-1.95075	5.03280	34.84423	5.09440	-28.86784	4.92760
25	1.36366	5.18150	-2.00248	5.03310	35.24229	5.09510	-28.66919	4.92660
26	1.30560	5.18120	-2.05368	5.03300	35.60105	5.09580	-28.44927	4.92770
27	1.24556	5.18090	-2.10225	5.03330	35.86113	5.09600	-28.24466	4.92700
28	1.19642	5.18100	-1.02074	5.03220	27.27753	5.11730	-28.02056	4.92550
29	1.18615	5.18070	-1.71543	3.96600	23.52677	5.11910	-27.77951	4.92490
PCPV	.95515	4.45660	-1.69084	3.96050	10.23735	4.72820	-12.16364	4.56230

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CRUNCH
OUTPUT SUMMARY

BLOCK	XDD (MAX)	TIME	XDD (MIN)	TIME	GAP (MAX)	TIME	GAP (MIN)	TIME	VREL (MAX)	TIME
1	2628.890	5.28910	-4806.307	5.98390	.10700	5.10810	-.69892	5.04480	.00000	.00000
2	2867.763	5.98390	-3467.854	4.66490	.04575	5.20540	-.00993	5.04340	16.65426	5.27660
3	6345.430	6.66860	-5125.286	5.35470	1.44630	5.87380	-.01142	5.04730	35.72218	5.30360
4	5086.551	5.30470	-6652.960	5.19920	.14562	7.07120	-.01512	5.04790	33.16259	5.30390
5	6241.133	4.98350	-6826.814	4.98550	.10620	1.37680	-.01268	5.04690	24.13348	5.30440
6	4131.236	5.64770	-4200.583	4.59130	.16900	2.79910	-.01254	5.04470	24.99010	4.88470
7	3434.387	5.30780	-4524.167	5.53130	.16922	3.58120	-.01230	5.04390	25.05402	4.88090
8	3010.377	5.65200	-5973.011	5.52720	.30397	3.55870	-.01200	5.04570	22.95659	4.87470
9	4096.257	4.26300	-3278.927	5.42970	.28989	7.50920	-.01181	5.04360	22.13942	4.57770
10	2890.810	4.26330	-3621.410	5.05730	.11054	4.23650	-.01144	5.04460	20.95483	4.57070
11	2818.922	4.67270	-3642.133	4.23670	.10791	3.47730	-.01124	5.04280	19.02160	4.56460
12	2456.910	4.23670	-2755.022	5.51220	.08130	3.87970	-.01095	5.04150	17.24546	5.17560
13	2645.805	4.38660	-3937.130	5.04680	.08246	3.46180	-.01070	5.03930	16.36555	5.17200
14	2389.470	4.69050	-3020.596	6.86690	.07080	3.45340	-.01010	5.04240	14.93634	5.16840
15	3565.544	6.35320	-4363.050	5.50130	.06370	3.44630	-.00985	5.04100	14.56860	5.16570
16	3052.558	6.01170	-2733.341	4.71110	.04436	4.39050	-.00965	4.89740	14.31027	5.16300
17	2420.640	5.73770	-4550.515	5.16000	.08709	3.66370	-.00958	4.89820	13.92435	4.40010
18	4271.644	5.67820	-3981.878	4.83040	.10236	3.69600	-.01000	5.20860	15.74470	4.69860
19	4268.699	6.02700	-3216.264	5.48930	.12430	3.70940	-.01031	4.89780	10.46415	4.70400
20	4528.520	6.02710	-3764.276	6.73350	.10497	3.72580	-.01052	5.20880	20.84648	4.70940
21	4113.393	6.73350	-3232.880	5.14990	.24320	3.75370	-.01072	5.20890	23.14475	4.71530
22	3268.600	5.35950	-2596.568	5.14760	.13822	4.42640	-.01091	5.20940	25.11758	4.72150
23	5609.579	5.35700	-2876.162	5.01780	.20095	3.63610	-.01109	5.20900	26.90676	4.72820
24	4749.466	6.03970	-3744.748	4.82250	.17901	4.07310	-.01122	5.21040	27.84742	4.73410
25	5100.811	5.70060	-2549.092	6.49760	.27931	7.14360	-.01146	5.20740	27.10885	4.73770
26	4167.300	5.03280	-3792.846	5.14020	.11034	3.78760	-.01159	5.20750	26.40043	4.74090
27	3222.383	5.14020	-6973.746	4.42260	.27709	3.35760	-.01374	5.20760	35.58367	5.14020
28	3690.807	4.82300	-3197.863	5.47220	1.45275	5.70410	-.01029	5.20770	38.24944	5.13980
29	4740.339	5.47220	-3530.153	5.14050	.95339	5.04490	-.00919	4.87590	20.58531	5.11890
					.11342	4.94600	-.65840	4.87450	.00000	.00000
PCRV	194.386	4.67570	-176.599	3.82190						

CRUNCH
OUTPUT SUMMARY

BLOCK	MAX IMPULSE	TIME	MAX SPRINGS	TIME	MIN SPRINGS	TIME
1	.000	.00000	559.13625	5.09482	-89.62377	5.10910
2	2578.857	5.30770	22.15050	.41580	-22.10000	.29090
3	5672.829	5.30360	2.25000	.41020	-2.25000	.30460
4	3985.956	5.30390	2.25000	1.34150	-2.25000	1.26760
5	2879.455	5.30440	2.25000	1.32600	-2.25000	1.28120
6	2964.368	4.88470	2.25000	1.57740	-2.25000	1.43330
7	3004.422	4.88090	2.25000	1.57740	-2.25000	1.43330
8	2705.644	4.87470	2.25000	1.57740	-2.25000	1.43330
9	2611.500	4.57770	2.25000	1.57740	-2.25000	1.43330
10	2474.582	4.57070	2.25000	1.57740	-2.25000	1.43330
11	2210.525	4.56460	2.25000	1.57740	-2.25000	1.43330
12	2050.936	5.17560	2.25000	1.57740	-2.25000	1.43330
13	1868.266	5.17200	2.25000	1.57740	-2.25000	1.43330
14	1768.408	5.50450	2.25000	1.57740	-2.25000	1.43330
15	1716.847	5.16570	2.25000	1.57740	-2.25000	1.43330
16	1675.179	5.16300	2.25000	1.57740	-2.25000	1.43330
17	1620.455	4.40010	2.25000	1.57740	-2.25000	1.43330
18	1652.076	4.69860	2.25000	1.57740	-2.25000	1.43330
19	2150.159	4.70400	2.25000	1.57740	-2.25000	1.43330
20	2434.453	4.70940	2.25000	1.57740	-2.25000	1.43330
21	2758.920	4.71530	2.25000	1.57740	-2.25000	1.43330
22	2978.811	4.72150	2.25000	1.57740	-2.25000	1.43330
23	3195.109	4.72820	2.25000	1.57740	-2.25000	1.43330
24	3352.658	4.73410	2.25000	1.57740	-2.25000	1.43330
25	3251.217	4.73770	2.25000	.71660	-2.25000	1.43330
26	3136.292	4.74090	2.25000	.53600	-2.25000	.60790
27	4307.349	5.14020	2.25000	.51110	-2.25000	.62390
28	6170.269	5.13980	22.10000	.12380	-22.10000	.67440
29	3241.295	5.11890	99.77303	4.94600	-926.71982	4.87450
30	.000	.00000				

CONVER
OUTPUT SUMMARY

MAX SYSTEM ENERGY =	.472+04 LB-IN	AT TIME =	5.2000
MIN SYSTEM ENERGY =	.000 LB-IN	AT TIME =	.0000
MAX LUMPING =	117.542 PERCENT	AT TIME =	5.2000
MIN LUMPING =	.000 PERCENT	AT TIME =	.0000
MAX LEFT SPRING BACK FORCE =	559.137 LBS	AT TIME =	5.0442
MAX RIGHT SPRING BACK FORCE =	524.720 LBS	AT TIME =	4.8745
MAX LEFT CSF SPRING FORCE =	367.264 LBS	AT TIME =	4.7236
MAX RIGHT CSF SPRING FORCE =	367.144 LBS	AT TIME =	4.8821
MAX RIGID LINK FORCE =	.000 SEC	AT TIME =	.0000
TOTAL RIGID LINK CONTACT TIME =	.0000 SEC		
NO. OF RIGID LINK HITS =	0		

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EXIT LOC022464

@FIN

CR

Word	1	
Column	1-80	
Format	A	
Card 1	Title	
Symbol	TITLE

Word	1	2	3
Column	1-5	6-10	11-15
Format	I	I	I
Card 2	No. of masses (do not include core support floor) $1 < N \leq 37$	0 - No spring pack 1 - Single mass spring pack 2 - Massless spring pack 3 - Two mass spring pack	0 - No rigid link 1 - Reflector blocks connected with rigid link
Symbol	N	IB	NRL

Word	N	5	66
Column	16-20	21-25	26-30
Format	I	I	I
Card 2 (continued)	0 - No PCRV motion 1 - Time history 2 - Sinusoidal dwell 3 - Sinusoidal sweep	Print interval $NPRT \geq 1$	No. of points in block-on-block coefficient-of-restitution table $2 \leq KP \leq 25$ If $KP = 0$, no impulses will be computed
Symbol	IGM	NPRT	KP

Word	7	8	9
Column	31-35	36-40	41-45
Format	I	I	I
Card 2 (continued)	No. of points in spring pack force-deflection table. $2 \leq K5 \leq 10$ If IB = 0, K5 is not used.	No. of points in core support floor spring pack force-deflection table. $2 \leq NCSB \leq 10$ If NCSB = 0, there is no core support floor.	Integration Method 1 - Euler's 2 - Fourth-order Runge-Kutta 3 - Second-order Runge-Kutta 4 - Central difference
Symbol	K5	NCSB	IMETH

Word	10	11	12	13
Column	46-50	51-55	56-60	61-65
Format	I	I	I	I
Card 2 (continued)	No. of points in block-on-PCRV coefficient-of-restitution table $2 \leq NORGB \leq 10$ If NORGB = 0, no block-on-PCRV impulses are computed	NOFIBR + 1 = No. of brackets for impulse distribution. $0 < NOFIBR \leq 9$	0 - Input damping ratios 1 - Input damping coefficients	Minimum no. of integration time steps allowed per cycle of motion. Default: NCON = 20
Symbol	NORGB	NOFIBR	IDAMP	NCON

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 3 Use only if NOFIBR > 0	Max. impulse force included in bracket 1. (1b)	Bracket 2 (1b)	Bracket 3	Bracket 4	Bracket 5	Bracket 6	Bracket 7
Symbol	FB(1)	FB(2)	FB(3)	FB(4)	FB(5)	FB(6)	FB(7)

Enter NOFIBR values. Use two cards if required.

Word	1	2	3	4	5
Column	1-10	11-20	21-30	31-40	41-50
Format	F	F	F	F	F
Card 4	Starting time (sec)	Integration time step (sec)	End time (sec)	Contact time used for impulse force calculation (sec)	Minimum time between impulse calculations (sec)
Symbol	T	DT	TEND	CT	CTM

Word	1	2	3	4
Column	1-10	11-20	21-30	31-40
Format	F	F	F	F
Card 5	Frequency used for automatic selection of interblock springs (Hz) optional	Damping ratio associated with automatically selected springs optional	* Spring pack damping	Initial gap for impulse calculations between first block and PCRV (in.) Required only if NORGB > 0
Symbol	CGE	CGDR	CBD	GAP5

* If IDAMP = 0, damping ratios are input (i.e., actual damping divided by critical damping). If IDAMP = 1, damping coefficient is input. (lb-sec/in.)

Word	1	3
Column	1-10	21-30
Format	F	F
Card 6 Use only if IB = 3.	Stiffness of spring connecting the first and second mass of two mass spring pack. (lb/in.)	* Damping associated with CSPA Coefficient-of-restitution for hits between first and second mass of the two mass spring pack.
Symbol	CSPA	CRSP

* See note on Card 5

Word	1	2	3	4
Column	1-10	11-20	21-30	31-40
Format	F	F	F	F
Card 7 Use only if NCSB > 0	Weight of core support floor. (lb)	Initial gap between the core support floor and core support floor spring pack (in.)	*Core Support floor spring pack damping	Core support floor to ground damping coefficient. (lb-sec/in.)
Symbol	WFSB	GAP6	CSD	CCSGD

* See note on
Card 5

Word	1	2	3	4
Column	1-5	6-10	11-20	21-30
Format	I	I	F	F
Card 8 Use only if NRL = 1	Block no. of first reflector block.	Block no. of last reflector block.	Initial gap between reflector blocks before rigid link takes effect. (in.)	Force pushing reflector blocks toward each other. (lb)
Symbol	K1	K4	GAP4	PL0AD

Word	5	6	
Column	31-40	41-50	
Format	F	F	
Card 8 (continued)	Stiffness of rigid link interblock spring (lb/in.)	Damping Coefficient of rigid link inter- block spring (lb-sec/in.)	
Symbol	SRL	DRL	

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 9 Use only if KP > 0	Block-on-block coefficient-of- restitution table. Velocity 1 (in./sec)	Velocity 2	Velocity 3	Velocity 4	Velocity 5	Velocity 6	Velocity 7
Symbol	VP(1)	VP(2)	VP(3)	VP(4)	VP(5)	VP(6)	VP(7)

Use additional
cards if neces-
sary. Total of
KP values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 10 Use only if KP > 0	Block-on-block coefficient-of- restitution table. Coefficient 1	Coefficient 2	Coefficient 3	Coefficient 4	Coefficient 5	Coefficient 6	Coefficient 7
Symbol	EP(1)	EP(2)	EP(3)	EP(4)	EP(5)	EP(6)	EP(7)

Use additional
cards if neces-
sary. Total of
KP values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 11 Use only if NORGB > 0	Block-on-PCRV coefficient-of- restitution table. Velocity 1 (in./sec)	Velocity 2	Velocity 3	Velocity 4	Velocity 5	Velocity 6	Velocity 7
Symbol	VPB(1)	VPB(2)	VPB(3)	VPB(4)	VPB(5)	VPB(6)	VPB(7)

Use additional
cards if neces-
sary. Total of
NORGB values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 12 Use only if NORGB > 0	Block-on-PCR coefficient-of- restitution table. Coefficient 1	Coefficient 2	Coefficient 3	Coefficient 4	Coefficient 5	Coefficient 6	Coefficient 7
Symbol	EPB(1)	EPB(2)	EPB(3)	EPB(4)	EPB(5)	EPB(6)	EPB(7)

Use additional
cards if neces-
sary. Total of
NORGB values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 13 Use only if IB > 0	Spring pack force-deflec- tion table. Deflection 1 (in.)	Deflection 2	Deflection 3	Deflection 4	Deflection 5	Deflection 6	Deflection 7
Symbol	CBS(1,1)	CBS(1,2)	CBS(1,3)	CBS(1,4)	CBS(1,5)	CBS(1,6)	CBS(1,7)

Use additional
cards if neces-
sary. Total of
K5 values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 14 Use only if IB > 0	Spring pack force deflection table. Force 1 (lbs)	Force 2	Force 3	Force 4	Force 5	Force 6	Force 7
Symbol	CBS(2,1)	CBS(2,2)	CBS(2,3)	CBS(2,4)	CBS(2,5)	CBS(2,6)	CBS(2,7)

Use an additional
card if necessary.
Total of K5
values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 15 Use only if NCSB > 0	Core support floor spring pack force- deflection table. Deflection 1 (in.)	Deflection 2	Deflection 3	Deflection 4	Deflection 5	Deflection 6	Deflection 7
Symbol	CSS(1,1)	CSS(1,2)	CSS(1,3)	CSS(1,4)	CSS(1,5)	CSS(1,6)	CSS(1,7)

Use additional
cards if neces-
sary. Total of
NCSB values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 16 Use only if NCSB > 0	Core support floor spring pack force- deflection table. Force 1 (lbs)	Force 2	Force 3	Force 4	Force 5	Force 6	Force 7
Symbol	CSS(2,1)	CSS(2,2)	CSS(2,3)	CSS(2,4)	CSS(2,5)	CSS(2,6)	CSS(2,7)

Use an additional
card if necessary.
Total of NCSB
values.

Word	1	2	3	4
Column	1-10	11-20	21-25	26-30
Format	F	F	I	I
Card 17 Use only if IGM = 1	Time step between PCRv acceleration points (sec)	Scale factor for PCRv accelerations	No. of points in acceleration table	Format for reading LAT(I) 0 - (8F9.0) 1 - (8F10.0)
Symbol	GMDT	LSF	NGMPTS	NFORMT

Word	1	2	3	4	5	6	7
Column	1-9	10-18	19-27	28-36	37-45	46-54	55-63
Format	F	F	F	F	F	F	F
Card 18A Use only if IGM = 1 and NFORMT = 0	PCRV accel- eration table. Acceleration 1. (in./sec ²)	Acceleration 2	Acceleration 3	Acceleration 4	Acceleration 5	Acceleration 6	Acceleration 7
Symbol	LAT(1)	LAT(2)	LAT(3)	LAT(4)	LAT(5)	LAT(6)	LAT(7)

Word	8	
Column	64-72	
Format	F	
Card 18A (continued)	Acceleration 8	
Symbol	LAT(8)	

Use additional
cards if necessary.
Total of NGMPTS
values.

Word	1	2	3	4	5	6	7
Column	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Format	F	F	F	F	F	F	F
Card 18B Use only if IGM = 1 and NFORMT = 1	PCRV accel- eration table. Acceleration 1. (in./sec ²)	Acceleration 2	Acceleration 3	Acceleration 4	Acceleration 5	Acceleration 6	Acceleration 7
Symbol	LAT(1)	LAT(2)	LAT(3)	LAT(4)	LAT(5)	LAT(6)	LAT(7)

Word	8	
Column	71-80	
Format	F	
Card 18B (continued)	Acceleration 8	
Symbol	LAT(8)	

Use additional
cards if necessary
Total of NGMPTS
values

Word	1	2	3	
Column	1-10	11-20	21-30	
Format	F	F	F	
Card 19 Use only if IGM = 2	Frequency of PCRV acceleration (Hz)	Phase Angle (degrees)	Peak sinusoidal acceleration (in./sec ²)	i.e., .. $\ddot{x} = LSF * \sin(\text{OMEG} * T + \text{PHI})$ where T = time
Symbol	OMEG	PHI	LSF	

Word	1	2	3	4	5
Column	1-10	11-20	21-30	31-40	41-50
Format	F	F	F	F	F
Card 20 Use only if IGM = 3	Lower frequency (Hz)	Upper frequency (Hz)	Sweep rate (decades per minute)	Print interval (Hz)	Peak sinusoidal acceleration for all frequencies (in./sec ²)
Symbol	SWBG	SWDN	SWR	SPF	LSF

Word	1	2	3	4	5	6	7
Column	1	2-10	11-20	21-30	31-40	41-45	46-50
Format	1	F	F	F	F	I	I
Card 21	Enter a "1"	Weight (lb)	Column stiff- ness (lb/in.)	Column breaking force.(lb) If BF = 0, the column is treated as a linear spring.	If IDAMP = 0, input column damping ratio. If IDAMP = 1, input column damping coefficient. (lb-sec/in.)	First block of a series that has these properties.	Last block of the series that has these properties.
Symbol	I	W(J)	STIF(J)	BF(J)	DAMP(J)	IF	IL

Word	8	9	10	11	
Column	51-55	56-60	61-65	66-70	
Format	I	I	I	I	
Card 21 (continued)	Additional blocks with these properties. Start with I1 and continue to I4. Leave unused words blank.			These properties will be assigned to blocks J = IF to IL and to blocks J = I1, I2, I3, I4.	
Symbol	I1	I2	I3	I4	

Use as many cards
as required to
define the mass
and stiffness of
all the blocks

Word	1	2	3	4	5, 6, 7, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 31-35, 66-70
Format	1	F	I	I	I
Card 22 (optional)	Enter a "2"	Initial gap between block J and J-1 (in.)	First gap in a series	Last gap in the series.	Additional gaps with this initial condition.
Symbol	I	GI(J)	IF	IL	I1, I2, I3, I10

See notes on
Card 21. Only
nonzero gaps
need to be
entered.

Word	1	2	3	4	5, 6, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 66-70
Format	1	F	I	I	I
Card 23 This card is used only for special modeling	Enter a "3"	Additional gap added to GI(J) before inter- block springs engage. (in.)	First gap in a series.	Last gap in the series.	Additional gaps with this gap spring offset.
Symbol	I	GSD(J)	IF	IL	I1, I2, I10

See notes on
Card 21.

Word	1	2	3	4	5, 6, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 66-70
Format	1	F	I	I	I
Card 24 This card is used only for special model- ing	Enter a "4"	Additional gap added to GI(J) before inter- block impulse acts. (in.)	First gap in a series.	Last gap in the series.	Additional gaps with this impulse offset.
Symbol	I	GID(J)	IF	IL	I1, I2, I10

See notes on
Card 21

Word	1	2	3	4	5, 6, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 66-70
Format	I	F	I	I	I
Card 25 (optional)	Enter a "5"	Block initial displacement. (in.)	First block in a series.	Last block in a series.	Additional blocks with this initial displacement.
Symbol	I	X(J)	IF	IL	I1, I2, I10

See notes on
Card 21.

Word	1	2	3	4	5, 6, 14
Column	1	2-10	11-15	16-20	21-25, 26-30, 66-70
Format	I		I	I	
Card 26 (optional)	Enter a "6"	Block initial velocity. (in./sec)	First block in a series.	Last block in the series.	Additional blocks with this initial velocity.
Symbol	I	XD(J)	IF	IL	I1, I2, I10

See notes on
Card 21

Word	1	2	3	4	5	6, 7, 14
Column	1	2-10	11-20	21-25	26-30	31-35, 36-40, 66-70
Format	I	F	F	I	I	I
Card 27 (optional)	Enter a "7"	Interblock spring stiffness. (lb/in.)	Interblock spring damp- ing coeffic- ient (lb-sec/in.)	First spring in a series	Last spring in the series	Additional springs with these properties
Symbol	I	CGS(J)	CGD(J)	IF	IL	I1, I2, I9

See notes on
Card 21

Word	
Column	
Format	
Card	
Symbol	