



ACTIVATING THE IMPLICIT SOLVER

Chapter 3





- There are many implicit cards in the later versions of LS-DYNA®. However, only one is necessary to activate the implicit solver:
- *CONTROL_IMPLICIT_GENERAL

1 2 3 4 5 6 7 8

Variable	IMFLAG	DT0	IMFORM	NSBS	IGS	CNSTN	FORM	ZERO_V
Type	I	F	I	I	I	I	I	I
Default	0	none	2	1	2	0	0	0

IMFLAG: **1=Implicit**

DT0 : **Initial step size for implicit**



- In LS-971 there are in total 12 implicit cards:
- *CONTROL_IMPLICIT_AUTO
- *CONTROL_IMPLICIT_BUCKLE
- *CONTROL_IMPLICIT_DYNAMICS
- *CONTROL_IMPLICIT_EIGENVALUE
- *CONTROL_IMPLICIT_GENERAL
- *CONTROL_IMPLICIT_INERTIA_RELIEF
- *CONTROL_IMPLICIT_JOINTS
- *CONTROL_IMPLICIT_MODES
- *CONTROL_IMPLICIT_SOLUTION
- *CONTROL_IMPLICIT_SOLVER
- *CONTROL_IMPLICIT_STABILIZATION
- *CONTROL_IMPLICIT_TERMINATION



- There are different options for the implicit solver that not are relevant for the explicit solver:
 - Linear implicit
 - There is nothing in the model that can't be modeled as linear, i.e. the material, geometry etc. is linear. The element has to be selected as linear, the same with the material. Further, the solver should be linear, see NSOLVR=1 at *CONTROL_IMPLICIT_SOLUTION.
 - Non-linear implicit
 - There is some non-linear behaviour in the model, it can be the material, the geometry etc. If contact is specified, it is always a non-linear problem.
 - Static or dynamic implicit
 - By default the implicit solver consider the problem as static, not dynamic. To activate a dynamic simulation set IMASS=1 at *CONTROL_IMPLICIT_DYNAMICS.

- When running the implicit solver, the printout to the screen, the *d3hsp* and the *message* file is different. The information can be used for investigating and to follow the simulation. It is also the easiest way to judge if the simulation runs in implicit mode:

```

BEGIN time step      1
=====
                time = 1.00000E+00
                current step size = 1.00000E+00

Iteration:   1      *|du|/|u| = 2.5517753E+00      *Ei/E0 = 1.0000000E+00

DIVERGENCE (increasing residual norm) detected:
  |(Fe)-(Fi)| ( 7.5426269E+03) exceeds |(Fe)| ( 5.0000000E+00)
  automatically REFORMING stiffness matrix...

Iteration:   2      *|du|/|u| = 6.0812935E-01      *Ei/E0 = 4.0526413E-01

DIVERGENCE (increasing residual norm) detected:
  |(Fe)-(Fi)| ( 4.3747811E+04) exceeds |(Fe)| ( 7.5426269E+03)
  automatically REFORMING stiffness matrix...

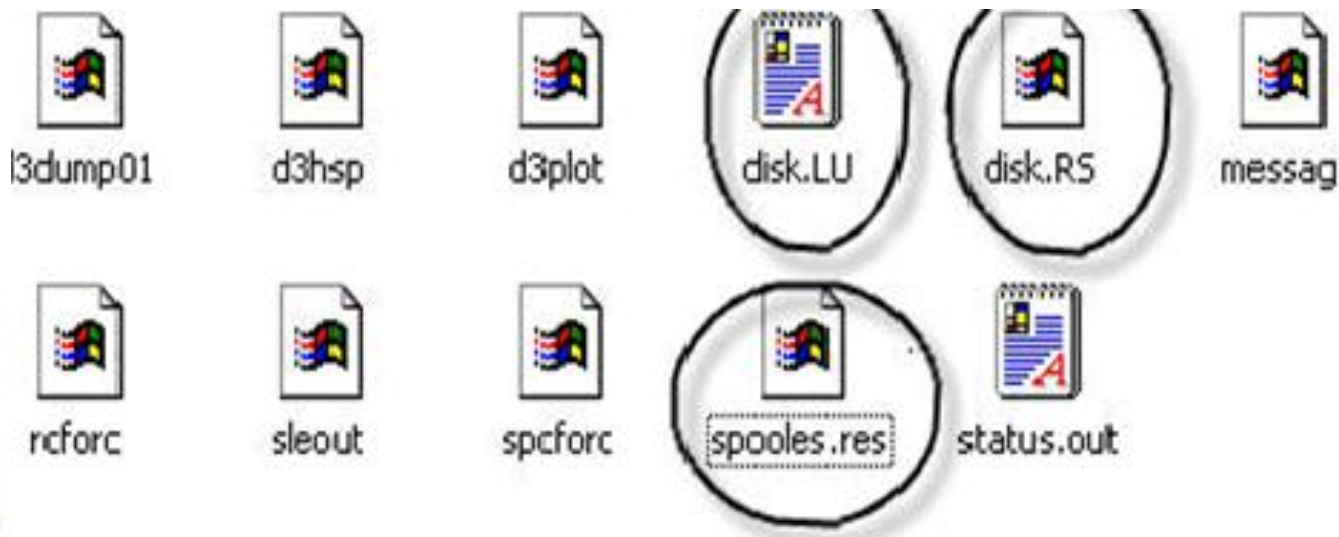
Iteration:   4      *|du|/|u| = 1.0974191E-02      *Ei/E0 = 2.3907781E-04
Iteration:   5      *|du|/|u| = 1.0978787E-02      *Ei/E0 = 1.7910795E-04
Iteration:   6      *|du|/|u| = 4.2201181E-03      *Ei/E0 = 4.2557768E-05
Iteration:   7      *|du|/|u| = 4.1142219E-03      *Ei/E0 = 3.0658711E-05
Iteration:   8      *|du|/|u| = 1.9794757E-03      *Ei/E0 = 9.1215551E-06
Iteration:   9      *|du|/|u| = 1.7957653E-03      *Ei/E0 = 6.1669480E-06
Iteration:  10      *|du|/|u| = 1.2022830E-03      *Ei/E0 = 2.9031284E-06

ITERATION LIMIT reached, automatically REFORMING stiffness matrix...

Iteration:  11      *|du|/|u| = 5.4011414E-04      *Ei/E0 = 1.0553019E-06

```

- There are a few extra files that are generated when using the implicit solver: (For postprocessing the usual files from explicit are used)
- There are other files generated when running eigenvalue analyses – see Eigenvalue Analysis section.





Notes

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Notes

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