R16.3.0 Release Notes

October 8, 2026

Contents

1 Release notes revision **2**

2 License **2**

3 Documentation **2**

4 Notes **2**

5 New **3**
- 5.1 Airbags . . . 3
- 5.2 Elements . . . 3
- 5.3 Forming Analysis . . . 3
- 5.4 MPP . . . 3

6 Improvements and Enhancements **4**
- 6.1 Airbags . . . 4
- 6.2 Constraint Cards . . . 4
- 6.3 Contact . . . 4
- 6.4 Control Cards . . . 5
- 6.5 Elements . . . 5
- 6.6 EM (Electromagnetic Solver) . . . 5
- 6.7 Implicit (Mechanical) Solver . . . 6
- 6.8 Isogeometric Analysis (IGA) . . . 6
- 6.9 Materials and Equations-of-State . . . 6
- 6.10 Output . . . 6
- 6.11 SPH . . . 6
- 6.12 Miscellaneous . . . 7

7 Bug Fixes **7**
- 7.1 Acoustics, NVH, and Frequency Domain . . . 7
- 7.2 Adaptivity . . . 7
- 7.3 Airbags . . . 7

7.4 Constraint Cards 8
7.5 Contact 8
7.6 Control Cards 8
7.7 Elements 9
7.8 EM (Electromagnetic Solver) 9
7.9 Fatigue Cards 9
7.10 ICFD (Incompressible Fluid Solver) 9
7.11 Implicit (Mechanical) Solver 9
7.12 Materials and Equations-of-State 10
7.13 Output 10
7.14 Restarts 11
7.15 Miscellaneous 11

1 Release notes revision

This file constitutes revision 0 of the release notes for Ansys LS-DYNA® version R16.3.0.

2 License

The string "REVISION 16" must appear in the license file to run version R16.3.0. Please contact your distributor or your Ansys sales representative if you need to have your license updated.

3 Documentation

The R16.0 User's Manuals provide documentation for R16.3.0. To download these manuals, go to https://lsdyna.ansys.com/manuals-download/. For features mentioned in these notes missing from the R16.0 User's Manuals, please refer to the DRAFT User's Manuals at https://lsdyna.ansys.com/manuals-download/. Please note that not all features in the DRAFT User's Manuals are available in version R16.3.0.

4 Notes

The remainder of this file briefly describes new features, enhancements, and bug fixes in version R16.3.0. Other recent releases may also include some of these updates.

We arranged the items by category. Understand that, in many cases, a particular item may pertain to more than one category. In the interest of brevity, we list each item only once, under a single category.

5 New

5.1 Airbags

1. Added keyword ***DEFINE_CPG_VENT** to provide extended vent options. The extended options include C23UP for specifying a discharge coefficient when the airbag is switched to uniform pressure, and TOPEN for providing a given time for opening the vents.
2. Added ***CONTROL_CPG_OUTPUT** to control which variables are output to `d3dat`.
3. Added ability to specify an optional part set (SPSID) in ***AIRBAG_CPG** to trigger a new surface sampling that can reduce the number of boundary particles in the case of a large mesh-size-to-particle-size ratio.

5.2 Elements

1. Added the ability to initialize material history variables for a part with fields of data through the FIELD keyword option of ***PART**. This is supported for all material types but is limited to certain element formulations.

5.3 Forming Analysis

1. Added ***INCLUDE_COMPENSATION_NODE_SET** to include a file that contains node sets used during the compensation process. In this release, three different kinds of node sets can be contained in the file. One kind of node set gives all the nodes that will be fixed during compensation, another gives all the nodes that will be compensated, and the third specifies the fixed draft region. In the fixed draft region, the nodes will mostly move in the z-direction, and the slope of the geometry will be maintained. This last type of node set is intended for cases where modifying the binder during springback compensation is unavoidable. The order of these node sets is arbitrary, and not every kind needs to be included. The solver determines the kind of node set based on the elements to which the nodes belong.

5.4 MPP

1. Made it possible for ***CONTROL_MPP_DECOMPOSITION_OUTDECOMP** and its `pfile` equivalent command `decomposition { outdecomp` *`itype`* `}` to behave similarly to ***CONTROL_MPP_DECOMPOSITION_SHOW** (and `decomposition { show }`). This feature produces an LS-PrePost viewable file with the final decomposition. To use this feature, include ***CONTROL_MPP_DECOMPOSITION_OUTDECOMP** in the input deck or the equivalent command in the `pfile` with ITYPE set to 1 or 3, and run the job on a single processor. To specify the number of domains, n, for the decomposition, use ***CONTROL_MPP_DECOMPOSITION_NUMPROC** or `pfile` command

`decomposition { numproc n }`. This method was added to replace ***CONTROL_MPP_DECOMPOSITION_SHOW** because ***CONTROL_MPP_DECOMPOSITION_SHOW** changes `d3plot` data, which is version dependent and hard to maintain.

6 Improvements and Enhancements

6.1 Airbags

1. Added BLOCK = 11 to ***AIRBAG_CPG**. With this option, venting leakage is set to zero for vent elements with nonzero contact forces, and porosity leakage is scaled by the ratio of contact pressure to gas pressure.
2. Added inflator mass, inflator energy, inflator mass flow rate, and inflator energy rate as airbag results to `abstat_cpg`.
3. Added the area-weighted total temperature average and the mass flow rate per gas species as part results in `abstat_cpg`.
4. Replaced heat transfer in `abstat_cpg` with heat convection and energy leakage for part results.
5. Replaced heat transfer rate in `abstat_cpg` with heat convection rate and energy leakage rate for part results.
6. Added "velocity_leakage" as a scalar quantity output to `d3dat` for boundary particles to help visualize areas of large leakage. This quantity is a scalar because it is the component of the velocity normal to the boundary elements.

6.2 Constraint Cards

1. Added flag FAILBM to ***CONSTRAINED_INTERPOLATION_SPOTWELD** to erode the base material if the spot weld fails. This flag can trigger erosion of the nearest shell/solid element when the spot weld fails. It is used to depict nugget pullout and potential crack initiation.

6.3 Contact

1. Improved the reliability of segment-to-segment (SOFT = 2) contact when shell segments come into contact with solid segments.
2. Automatically convert the type of tied contact when all the nodes of the segment on the tracked side are tied for TIEOPT = 2 on ***CONTROL_CONTACT**. For this case, the tied contact for the segment is converted to a nodes-to-surface tie to avoid spurious mass effects from rotations.

6.4 Control Cards

1. Added parameter DRTMIN to ***CONTROL_DYNAMIC_RELAXATION** to specify the minimum time for the dynamic relaxation phase. Even if convergence is reached, the dynamic relaxation phase will not terminate until DRTMIN has elapsed. This parameter is only available when IDRFLG = 1.
2. Improved the efficiency of selective mass scaling (***CONTROL_TIMESTEP**).

6.5 Elements

1. Added the ability to define an adaptive load limiter (LCFL on ***ELEMENT_SEATBELT_RETRACTOR**) for a retractor using a ***DEFINE_CURVE_FUNCTION**. In this case, LCFL refers to a ***DEFINE_CURVE_FUNCTION** with the SENSORD option used in the function. The SENSORD function must have the value of n set such that it refers to a ***SENSOR_DEFINE_FUNCTION**. Then, through ***SENSOR_DEFINE_FUNCTION**, the flexible ***DEFINE_FUNCTION** controls the adaptive load limiter.
2. Added a check to determine if the box specified by BOXID in ***DEFINE_SHELL_SWITCH** exists. If the box does not exist (BOXID is 0 or does not refer to an existing ***DEFINE_BOX**), the keyword reader outputs error message KEY+1694 (`Box ID [ID] does not exist in *DEFINE_SHELL_SWITCH [#] based on order of input`).
3. Added flag percelin to ***DEFINE_SHELL_SWITCH** to specify the minimum percentage of a part's elements that must be inside the box for the switch to occur. By default, the entire part must be inside the box.
4. For rigid and composite shells, skip switching the element formulation and the number of integration points when using ***DEFINE_SHELL_SWITCH**.
5. Shortened `d3hsp` output from ***DEFINE_SHELL_SWITCH** by no longer listing parts in the box that already have the shell formulation and number of integration points specified in ***DEFINE_SHELL_SWITCH**.
6. Support using the FIELD keyword option of ***PART** for solid element formulations 2, 10, 13, 15, and 98.
7. Extended the list of material types supported for specifying the baseline orientation vectors with fields of data through the FIELD keyword option of ***PART**. See the manual for the complete list.
8. Improved the interpolation algorithms used for the FIELD keyword option of ***PART**.

6.6 EM (Electromagnetic Solver)

1. Improved continuity of polynomial curves generated when POLY = 1 in ***EM_EOS_PERMEABILITY**.

6.7 Implicit (Mechanical) Solver

1. Fixed issue when only outputting a subset of the entries for each eigenvector with IPARM3 when using EIGMTH = 2, 3, 5, 6, 102, or 103 on ***CONTROL_IMPLICIT_EIGENVALUE**. The issue occurred for input decks that also included ***DATABASE_ADAMS**, and it corrupted the LSDA database containing the partial eigenvectors. The corruption was easily identifiable.

6.8 Isogeometric Analysis (IGA)

1. Added support for defining multiple parts on a single unstructured patch. The LIST and RANGE options can be used to list local element IDs in ***IGA_FACE_XYZ_BASIS_TRANSFORM** and ***IGA_VOLUME_XYZ_BASIS_TRANSFORM** for each part.
2. Modified the IGA solid element cost estimate to improve load balancing of the MPP decomposition.

6.9 Materials and Equations-of-State

1. Properly account for anisotropy in ***MAT_036** and ***MAT_133** when computing α for the MSFLD and FLD damage initiation types (DITYP = 2 and 3) for the DIEM model (***MAT_ADD_DAMAGE_DIEM**).
2. Added support for 10-node tetrahedra (ELFORM = 16 and 17 on ***SECTION_SOLID**) for ***MAT_ARRUDA_BOYCE_RUBBER** (***MAT_127**).
3. Added a user-defined failure model subroutine for ***MAT_240**. USRFAIL invokes calling `subroutine ucohfail` in `dyn21umatc.F`. It allows the definition of up to 16 user constants. This is a similar approach to the `uweldfail` routines of ***MAT_100**.
4. Improved performance of ***MAT_251** with VP = 1 for shell elements when LCSS refers to a ***DEFINE_TABLE_3D** or ***DEFINE_TABLE_4D**.

6.10 Output

1. Adjusted the output timing for the interface force file to use the same output scheme as `d3plot`.

6.11 SPH

1. Added a warning when IHTC in ***CONTROL_SPH_INCOMPRESSIBLE** is overwritten to 1 by the keyword reader because of invalid input.
2. Added an error message when MU = 0.0 is provided in ***MAT_SPH_INCOMPRESSIBLE_FLUID**. Inviscid flow is not supported for FORM = 13 in ***CONTROL_SPH**.

3. Added a warning when NMNEIGH in ***CONTROL_SPH** is set to a value greater than 300. Values greater than 300 may cause out-of-memory issues for large models.

6.12 Miscellaneous

1. Added support for thermal coupling in convection cosimulation analyses with the Ansys System Coupling™ software (see ***COSIM_SYC_INTERFACE**). LS-DYNA can import nodal heat transfer coefficients, reference temperatures, and heat flux values from other solvers, and export nodal temperature results to external solvers.
2. Added support for simple restarts when using the System Coupling software for cosimulation. You can resume a cosimulation from restart files generated in a previous run.
3. Added flag ISHLFLG to ***DEFINE_STOCHASTIC_VARIATION**. Setting ISHLFLG = 1 causes the same random number to be used for all in-plane integration points in a shell layer, such as for shell type 16.

7 Bug Fixes

7.1 Acoustics, NVH, and Frequency Domain

1. Fixed a bug that caused an error termination when reading the stresses from a previous analysis' `d3plot` files during a random vibration analysis (***FREQUENCY_DOMAIN_RANDOM_VIBRATION**). This bug only occurred when PENOUT in ***CONTROL_OUTPUT** was nonzero in the previous analysis. Note that stresses from `d3plot` are only read for random vibration analysis when BINARY = 3 on ***DATABASE_FREQUENCY_BINARY_D3RMS**.
2. Fixed an issue where the mass matrix was not updated for each frequency when performing steady-state dynamic analysis with a direct method (***FREQUENCY_DOMAIN_SSD_DIRECT**). This issue produced incorrect results.

7.2 Adaptivity

1. Fixed *r*-adaptive remeshing failures in MPP with more than one processor that prevented remeshing needed for contact.

7.3 Airbags

1. Fixed bug in CPG airbags (***AIRBAG_CPG**) that in rare occasions caused coincident particles to be created at the boundary between processors, leading to numerical issues.
2. Fixed bug in ***AIRBAG_PARTICLE_SEGMENT** that could lead to incorrect results or a segmentation fault.

3. Made placing initial CPM (***AIRBAG_PARTICLE**) particles consistent upon changing the airbag/chamber input order for the case of multiple airbags and/or multiple chambers.

4. Fixed bug that caused the header information for ***AIRBAG_PARTICLE** to not be sorted with the airbag if SRTFLG = 1 on ***CONTROL_ACCURACY**.

7.4 Constraint Cards

1. Fixed an issue when using ***INCLUDE_TRANSFORM** to include a file that contains ***CONSTRAINED_SPR2** or ***CONSTRAINED_INTERPOLATION_SPOTWELD**. The issue caused the material ID offset IDMOFF to be ignored for FN < 0 (***CONSTRAINED_SPR2**) and STIFF < 0 (***CONSTRAINED_INTERPOLATION_SPOTWELD**).

2. Fixed bug that caused large IDs ($> 2^{24}$) in ***CONSTRAINED_SPR2** and ***CONSTRAINED_INTERPOLATION_SPOTWELD** to be read incorrectly in single precision.

7.5 Contact

1. Fixed a bug that could cause a segmentation fault when all beams in a ***CONTACT_AUTOMATIC_GENERAL** interface have zero thickness.

2. Fixed an issue in MPP that could cause the job to hang when IPBACK on Card E of ***CONTACT_...** was set to a nonzero value.

3. Fixed an issue with eroding segment-to-segment (SOFT = 2) contact when edge-to-edge contact checking or the sliding option is used. Due to a lack of neighbor data for adjacent segments, these options were not effective.

4. Fixed a bug in MPP segment-to-segment (SOFT = 2) eroding contact that, on rare occasions, caused a failure to initialize data correctly. This issue could happen when edge-to-edge checking or the sliding option were enabled. It could also occur for a single surface eroding contact that used thick and short shell segments.

7.6 Control Cards

1. Fixed a synchronization problem in the SMP and hybrid versions during the interaction between selective mass scaling (***CONTROL_TIMESTEP**) and deformable-to-rigid switches for tetrahedral elements. This led to inconsistent mass states across processors.

2. Fixed a bug that caused the initial energy to be incorrect when using selective mass scaling (***CONTROL_TIMESTEP**).

3. Fixed an incorrect mass increase at termination when using selective mass scaling (***CONTROL_TIMESTEP**).

7.7 Elements

1. Fixed a bug in the plane strain shell formulation (ELFORM = 12 on ***SECTION_SHELL**) when invariant node numbering (INN = -2, 2, -4, or 4 on ***CONTROL_ACCURACY**) was enabled. Transformations were performed incorrectly, leading to erroneous stress and strain.
2. Fixed a bug that caused random segmentation faults when using ***DEFINE_SHELL_SWITCH**.
3. Fixed a bug that occurred if a pulley (***ELEMENT_BEAM_PULLEY**) connected beam elements with material model ***MAT_CABLE_DISCRETE_BEAM** for which a nonzero ramp-up time for the pretension force is set (TRAMP). The bug caused incorrect forces that appeared suddenly at the end of the ramp-up time in the cable elements attached to the pulley.

7.8 EM (Electromagnetic Solver)

1. Fixed issue when ***EM_RANDLES_BATMAC** was combined with ***EM_RANDLES_MESHLESS**. The results of the latter were incorrect.
2. Fixed memory leak in the LLT factorization preconditioner (PRECON = 4 on ***EM_SOLVER_BEM**).

7.9 Fatigue Cards

1. Fixed a bug that caused a memory leak in the fatigue solver when using ***FATIGUE_D3PLOT**. The issue incorrectly caused memory usage to increase during the job.

7.10 ICFD (Incompressible Fluid Solver)

1. Fixed missing multiplication factor (fluid density) applied to the volumetric force when using ***ICFD_DEFINE_SOURCE** in the level set case.

7.11 Implicit (Mechanical) Solver

1. Corrected logic for using the implicit intermittent eigenvalue computation with an explicit time simulation (***CONTROL_IMPLICIT_GENERAL** with IMFLAG = 6) to properly handle the eigenvalue computation at the end time. Explicit time stepping may not hit the end time exactly, previously leading to skipping the intermittent eigenvalue computation and failure occurring.
2. Fixed an issue with the BFGS method (see ***CONTROL_IMPLICIT_SOLUTION**) that occurred when the quasi-Newton step diverged (the residual norm exploded). Now, if divergence occurs, the solver automatically reverts to a full Newton update for that step and logs a warning to the output files, allowing the analysis to continue. Previously, the solver could fail to recover from such a divergence.

7.12 Materials and Equations-of-State

1. Fixed a bug that caused spurious element deletion for ***MAT_ADD_DAMAGE_DIEM**.
2. Fixed a bug in ***MAT_ADD_EXTVAR_EXPANSION** that could cause an error termination due to negative volumes for orthotropic expansion when using solid elements.
3. Fixed a bug that occurred if ***MAT_ADD_PERMEABILITY** referenced a ***DEFINE_CURVE**, and the ***MAT** card associated with this ***MAT_ADD_PERMEABILITY** definition was referenced by more than one ***PART**. The bug caused the solver to terminate with error KEY+141 (`Load curve id undefined`). Workaround in previous versions: have each ***PART** reference its own copy of ***MAT** associated with its own copy of ***MAT_ADD_PERMEABILITY**, with each ***MAT_ADD_PERMEABILITY** referencing a separate ***DEFINE_CURVE**.
4. Fixed bug in ***MAT_005** with REF = 1 (using the reference geometry provided with ***INITIAL_FOAM_REFERENCE_GEOMETRY** to initialize the pressure). The pressure initialization was not working correctly, potentially leading to issues in the initial energy calculation.
5. Fixed an issue with parts that used ***MAT_020** (***MAT_RIGID**) when damping was active. Structural damping could cause the rigid body to erroneously deform.
6. Fixed a bug in ***MAT_030** for plane stress elements that could cause floating point exceptions.
7. Fixed the number of history variables for thick shell types 3, 5 and 7 with material type ***MAT_054**. They should have 21 history variables, like the other element types. Previously they had 20.
8. Fixed a problem in the keyword reader for ***MAT_187L** when using the long format. Card 1 was not read correctly.
9. Fixed an issue in ***MAT_254** to correctly account for the thermal time scale factor (parameter TSF) in the JMAK equations when evaluating $f(\dot{T})$ and $f'(\dot{T})$.
10. Fixed a problem with `long=s` for ***MAT_THERMAL_ISOTROPIC_TD_LC**. The format written to the structured input was wrong, leading to an error termination.
11. Fixed a bug in ***EOS_HVRB** (***EOS_041**) for 2D S-ALE that caused unpredictable behavior.

7.13 Output

1. Added missing legend entries for the joint stiffness output (`jntforc`).
2. Fixed the strain output in the material coordinate system for anisotropic materials when used with thick shell elements that use 2D stress update routines, namely 1, 2, and 6. The strain values in `elout`, `elout_det`, and `d3plot` were transformed incorrectly.

3. Fixed an issue in writing the `dynain` (see ***CONTROL_STAGED_CONSTRUCTION** and ***INTERFACE_SPRINGBACK_LSDYNA**) in long format. The ***INITIAL_STRESS_BEAM** and ***INITIAL_STRAIN_BEAM** cards were written in the wrong format such that they could not be read back in during a subsequent analysis.

4. Fixed issue with the combination of ***ELEMENT_BEAM_PULLEY** and ***INTERFACE_SPRINGBACK_LSDYNA**. The beam element connectivity that was written to `dynain` was incorrect.

7.14 Restarts

1. Fixed a bug that resulted in a segmentation fault during a full restart when using more than one ***CHANGE_VELOCITY_RIGID_BODY**.

2. Fixed a bug in reading full deck restart files that could cause joint data from a previous run to be ignored or corrupted.

7.15 Miscellaneous

1. Fixed incorrect velocity transformations after a deformable-to-rigid (***DEFORMABLE_TO_RIGID**) switch with selective or consistent mass scaling present. When elements switched from deformable to rigid (or vice versa) in a model that used selective mass scaling or consistent mass scaling, the velocities and inertia computed at the switch point were incorrect, leading to incorrect motion of the newly formed rigid or deformable body.