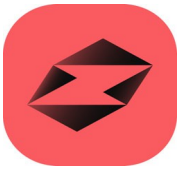

Adams 2024.2

Release Guide

HEXAGON

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Adams 2024.2 Release Guide

Preface

Welcome to Adams 2024.2

Thank you for purchasing Adams 2024.2. Adams is motion simulation software for analyzing the complex behavior of mechanical assemblies. With it, you can test virtual prototypes and optimize designs for performance, safety, and comfort, without having to build and test numerous physical prototypes.

About Hexagon

Overview

Hexagon is the leading global provider of virtual product development (VPD) tools, including simulation software and professional services. Hexagon helps companies make money, save time, and reduce costs associated with designing, testing, producing, and supporting manufactured products.

Hexagon works with thousands of companies worldwide, in hundreds of industries, to develop better products faster by using information technology, software, and services to enhance and automate the product design and manufacturing process. Simulating your product performance reduces development costs, time to market, and warranty costs.

About Virtual Product Development and Adams

You've heard it before: manufacturing companies today face intense global competition, demanding customers, fragmented markets, increasing product complexity, compressed product cycles, price and profit pressures, strict regulatory and liability environments, systems integration and supply chain issues, skyrocketing costs of testing and physical prototyping, and on and on…

What you don't often hear, though, is a strategy for enabling your company to improve your new product development process to meet these challenges.

Whether you are delivering airplanes, automobiles, ships, biomedical devices, golf clubs or children's toys to your customers, Hexagongoal is to help you improve your new product development process, allowing you to be significantly better at your concept development, design, testing, and production activities through the application of VPD.

VPD is an environment that uses an integrated combination of both simulation software technology and traditional techniques to design, test, manufacture, and support products. The result is that cost-effective designs that meet all performance, safety, durability, and reliability requirements can be brought to market in less time and for less cost.

Adams, as part of VPD, is focused on enhancing your ability to make better product development decisions, explore innovative design alternatives, and consistently get the product right. It is the world's most widely used mechanical system simulation software. It enables you to produce virtual prototypes, realistically simulating the full-motion behavior of complex mechanical systems on your computers and quickly analyzing multiple design variations until an optimal design is achieved. This reduces the number of costly physical prototypes, improves design quality, and dramatically reduces product development time.

Technical Support

For help with installing or using an Hexagon product, contact Hexagon technical support. Our technical support provides technical assistance on questions related to installation and use of the software. For further details please see the Technical Support Usage Guide, which is accessible via our support web site.

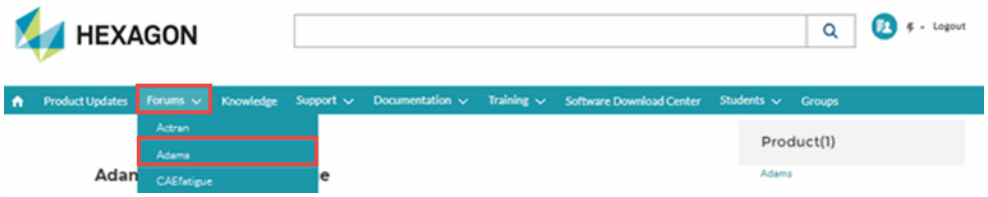
You can reach Hexagon technical support on the web, by telephone, or e-mail.

Web

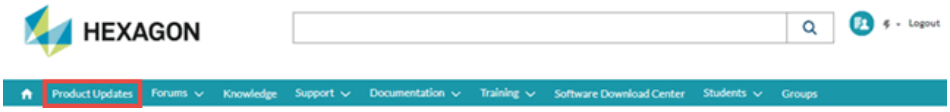
Go to the Hexagon web site at www.hexagon.com, and click on *Support,* then *Manufacturing Intelligence*, then *Design and engineering support.* Here, you can find a wide variety of support resources including Product Updates, Discussions, Technical Articles, and Documentation updates.

In addition, we provide several excellent sources of online information:

- *SimCompanion*: Find solutions to problems in this repository of troubleshooting tips, examples, and frequently asked questions. To access the SimCompanion, go to: https://simcompanion.hexagon.com/
- **VPD** *Community*: The VPD community is where to go when you are looking for peer support, as well as technical expertise. Many of our consultants, developers, and technical support staff monitor the forums. To sign up for the forums, go to Adams Support Home Page.
  Then,
  - To view the Adams discussions, select Adams from the *Forums* menu.



  - To view product alerts and company news and events, select Product Updates.



Phone and Email

For a current list of phone numbers and language based email addresses please visit our support web site.

Training

Hexagon training provides comprehensive training in Virtual Product Development. We offer standard and customized training courses in the application of CAE tools to solve from basic to complex problems within any industry. We offer over 100 courses in our state-of-the-art classroom facilities and individual computer

graphics laboratories at training centers throughout the world. All of our courses emphasize hands-on computer laboratory work to facilitate skills development. We are uniquely positioned to optimize your investment in design and simulation software tools.

Our industry experienced expert staff is available to customize our course offerings to meet your unique training requirements. For the most effective training, we also offer many of our courses at our customer's facilities.

We specialize in customized training based on our evaluation of your design and simulation processes, which yields courses that are geared to your business. In addition to traditional instructor-led classes, we also offer video courses, interactive multimedia training, web-based training, and a specialized instructor's program.

Course Information and Registration

For detailed course descriptions, schedule information, and registration call the Training Specialist at +1 800 426-1066 or visit www.hexagon.com.

What's New

General

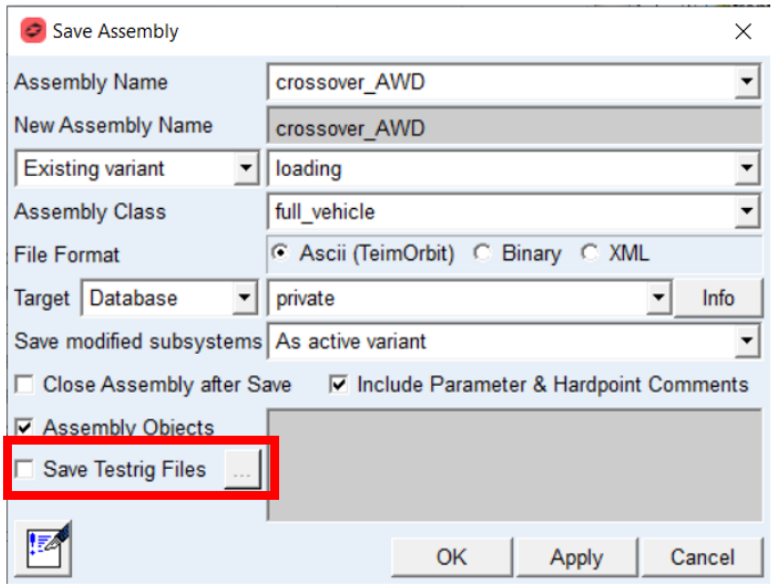
Issue Resolved

ADMS-113926	Wrong description for option NODAMPIN in LINEAR command for FORTRAN Solver
ADMS-113713	Adams Help says Import CAD density instead of Ignore
ADMS-112480	PTCV constraint typo
ADMS-110038	Frequency Bushing Stiffness and Damping are represented by letters 'C' and 'd' respectively instead of 'K' and 'C' in Adams help documentation
ADMS-103901	Linux Software Dependencies missing in Adams install guide

Adams Car

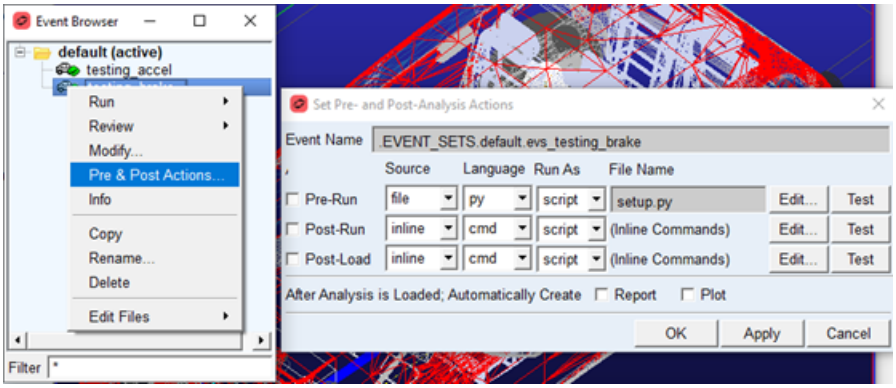
Testrig Subsystems

Changes to testrig hardpoints and parameters can now be saved to subsystem files. These subsystems can have variants, allowing for greater flexibility when working with testrigs:



Event Pre- and Post-Actions

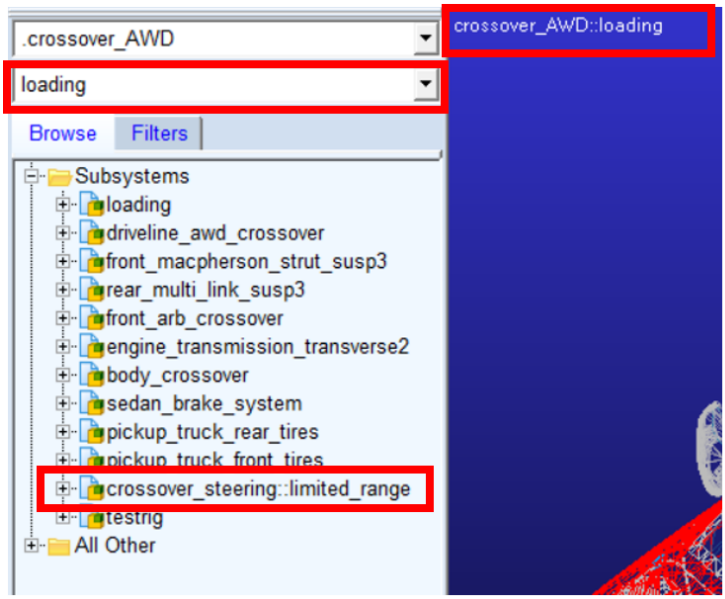
Simulation Events in Adams Car now allow for pre- and post-actions. These are used to execute custom logic before or after the simulation Event. Scripting commands can be written in either cmd language or Python and may be stored 'inline' with the model or as file references. Access this functionality by right-clicking an Event in the Event Browser, as shown:



This new dialog box makes it easy to associate custom actions with specific events and to test these commands before applying.

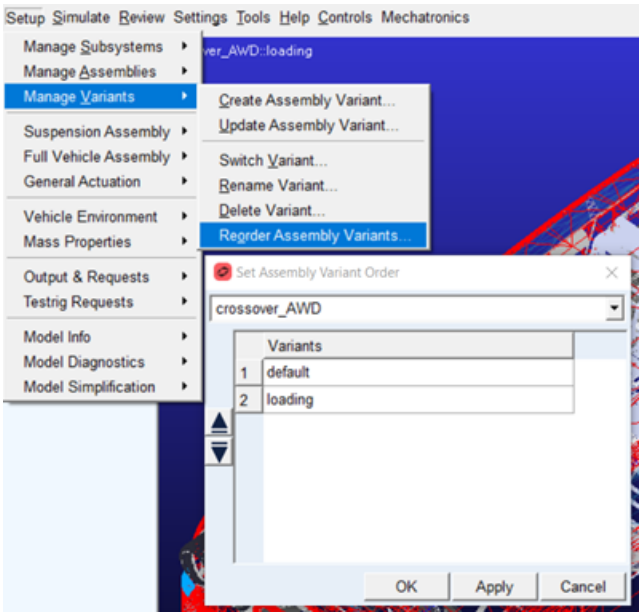
Variant Improvements

Identifying the active Assembly and Subsystem variants is simpler now, as the variant name is displayed in both the display window and the Model Browser, as shown:



Reordering Variants

The order in which variants are presented can now be controlled using the Reorder Assembly Variants menu:



Leafspring Support for True Batch Mode

Previously, running Adams Car in batch mode without a valid graphical display (ex: a Linux compute node lacking graphics display libraries) would cause errors when trying to change/regenerate some models containing leafsprings. It is now possible to regenerate leafsprings in a vehicle model in batch mode whether a valid graphical display environment exists or not.

Issues Resolved

ADMS-115553	Error message when user specified the more than one node on flexbody for attachment
ADMS-114792	Suspension Analysis Tutorial not updated since the Setup menu change
ADMS-114785	Wrong type when selecting Analyses when importing Plot Template
ADMS-114697	Group activity expression isn't evaluated prior to communicator matching process
ADMS-114470	Adams Car automatically terminates after running the driving analysis
ADMS-114386	If your subsystem is in TeimOrbit format, subsystem variants may not work with a General Spline if it contains a COMMENT block.
ADMS-114265	Adams Car 'Demo_Vehicle_Variants.asy' assembly with "Open all subsystems in session" toggle button fails to open.
ADMS-113977	Environment variable MDI_ACAR_ANL_LOG conflicts with Adams Car Preferences feature
ADMS-113976	Environment variables in the config file of a plugin are saved to the personal .acar.cfg file.
ADMS-113789	Model Auditor issues error messages for non-Car bushings.
ADMS-113725	The "Beam Calculator" for torsional springs in Car fills the stiffness and damping fields using a values per radians instead of per degrees, regardless of modeling units, and the materials drop-down only contains 2 choices (steel and aluminum). If you used that wizard to calculate stiffness and damping values for your torsional springs, please double-check those numbers in your subsystems (they could be too high by a factor of 57.3).
ADMS-113563	issue with Adams re-attaching markers on flex bodies despite explicityly setting the option preserve_location = true
ADMS-113520	Documentation for Request 907 within the Appendix does not match the Reviewing Results > Requests section
ADMS-113493	Error message appears when opened "Create Joint Motion Actuator" dialog box in template builder
ADMS-113468	MSC_ADAMS_SD_CENTERLINE_SPACING, MSC_SD_SDB_MIN_ITERATIONS and MSC_SD_PATH_CLOSED environment variables documentation is missing
ADMS-113351	For gse based powertrain, the powertrain configuration design option (pvs_ powertrain_config) documented in Adams online help however it is missing from the template
ADMS-113138	Documentation missing for the details of the "Lock" option in SPMM
ADMS-112976	In Adams Car, after a replacing the assemblies of one or more events / or an event set, the icon is not updated, and the tooltip still shows the old model.

ADMS-112860	Errors while generating a leaf spring with the given ltf file
ADMS-112847	Adams Car help not completely updated to flex bodies as I/J Parts
ADMS-112722	Environment variables changed in a Car session (e.g. in the Custom Environment table in the preferences dialog) without being saved to the config file, were ineffective for external solver analyses (analysis_mode = interactive or background), because the
ADMS-112692	In Template Builder, if you open the Modify Flexible Body dialog box and try to modify a part that was previously a general part (i.e. ge[lrs]_*_flex), Adams Car produces warning messages.
ADMS-112666	Preferences dialog help does not cover "Reset" and "Save" buttons
ADMS-112638	Adams Car session crashes while opening subsystem file with whitespace character before variant name.
ADMS-112619	When modifying an object in the Template Builder that is oriented relative to another construction frame, the angles shown on the dialog differ slightly from the existing orientation expression.
ADMS-112552	Wrong definition of camber angle mentioned in generated SVC report
ADMS-112296	The Driving Machine Testrig Request utility (under Setup) produced errors and wrongly displayed the requests of the active (non-driving-machine) testrig if the driving-machine testrig was an inactive child of the assembly. This has now been corrected.
ADMS-112225	An adjustable force, set up to control ride height, and saved in an ASCII template, may show the desired value in angle units rather than length units.
ADMS-111324	Some menu references in the documentation (e.g. about how to access Database Management) are outdated, i.e. do not reflect the new menu organization. This will be corrected in a future release soon.
ADMS-111180	Update help documentation for Overall Steer Ratio output
ADMS-110310	In the Isolator Parameter Identification dialog, the "Start Optimization" button reactivates after switching tabs, even though optimization is still in progress.
ADMS-110063	Car Getting Started guides need to be updated to new menu layout
ADMS-109295	Updated CDB_SEARCH_FILE function descriptions in online help
ADMS-104970	Information provided in online help where comments on analyses can be found
ADMS-90443	Incorrect behavior when an ARB is regenerated if a switch part refers to one of its component parts.
ADMS-79925	The following commands now properly support the previously introduced file back-up paradigm: * acar files assembly info * acar files subsystem info * acar assembly communicator export

ADMS-79923	The following commands now properly support the previously introduced file back-up paradigm: * acar toolkit info * acar toolkit files copy/rename * list_info
ADMS-76119	Using the same road (3d_road_smooth_oval.xml) in different formats (OpenCRG and 3D Spline) the speed profile computed by SmartDriver is too low for the OpenCRG road. This has been resolved by correcting the bank angle passed to SmartDriver for OpenCRG roa
ADMS-69955	SVC Track Width definition updated in Adams online help
ADMS-69599	If a Parameter Variable has an associated macro, the macro will not be executed if the PV is modified in the Template Builder - only in Standard Interface.
ADMS-69598	If you create a parameter variable in your template and connect it to a macro, but do not create a "choices" variable through the Design Option utility, then the macro will not be executed automatically when the subsystem is opened.
ADMS-57138	Enhance routine to output additional output such as longitudinal velocity, lateral acceleration, yaw rate based on type as input in the var911.
ADMS-16820	Name of the Filter is also added to Group if user creates a Group by using 'Add to Group' option (Template Builder Mode)

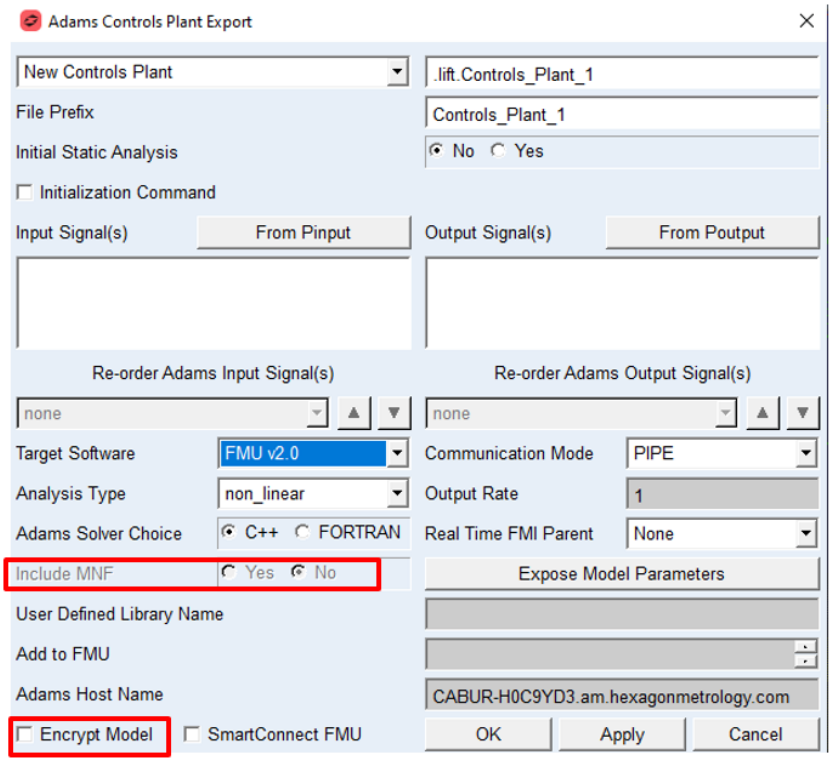
Known Issues

ADMS-114799	XML saved in Tire Testrig with numbers entered in dialog boxes end up with trailing numerals
ADMS-114742	Suspension analysis simulation failed when executed for 'External files' event with two lcf with different coordinate system modes
ADMS-113473	Issue with prefix added to the marker created on the mount part
ADMS-86548	Repeated and rapid modification of Communicator in Template Builder can lead to unresponsive Communicator dialog box
ADMS-85240	The suspension level compliance event does not use or populate a loadcase spline. Instead, point force actuators are created to apply loads on the wheel (e.g. pfl_ inboard_lateral_force_cp). The til_wheel force request has zero lateral and longitudinal force, however vertical (normal) force returns correct force values. The point force actuator's request gives correct force for lateral & longitudinal direction and can be used as a workaround for lateral and longitudinal force output.
ADMS-72303	Under some conditions, Adams Car is reporting incorrect wheel/spring, wheel/shock ratio and wheel rate for suspension and full vehicle SVC analyses.
ADMS-71370	Defining a large Initial Steer angle (e.g. 5 radians) as defined under Static Set-up in the Event, the static solution should return with a 5 radians initial steer angle applied to the steering wheel but returns with an incorrect steer angle instead.
ADMS-63369	When opening a template containing an Fe_Part, an Fe_Part is created based on the configuration saved in the template file. Whereas, when a Subsystem is opened then it is updated based on subsystem parameters. This updating may cause unnecessary updates
ADMS-63229	The capacity factor data, using the torque converter example file (mdi_0001.tcf), does not allow the torque converter to develop enough torque to keep the engine spinning with the transmission when the vehicle is descending the hill with the throttle off.
ADMS-59022	When using a powertrain subsystem based on the _engine_transmission template from the acar_concept database, a static set-up of type 'settle' may converge to a wrong equilibrium, and apply a huge driving torque to the driveline. A 'straight' set-up (if po
ADMS-50937	The caster output of the dynamic suspension analysis produce slightly different results when compared with static analysis. This could be happening due to slight difference in the compliance matrix computation as constraints are different betwee two analy
ADMS-42918	The exported request file from Adams Car doesn't have IDs and names in it for few components.
ADMS-39939	Parasolid file path not retained in the template file after saving the template as ASCII

Adams Controls

FMU Encryption for Flex Bodies

Functional Mockup Units (FMUs) exported from Adams Controls now allow for encryption of flexible bodies. In past versions the Adams model and associated files could be encrypted, but the MNF flexible bodies could not be encrypted. In this version of Adams, the .mtx files representing the flexible body information will be encrypted within the FMU. When encryption is active, the MNF file is not included in the FMU file as the encrypted mtx files contain the needed information.



Issues Resolved

ADMS-112717	FMU export does not work when using ATV with Adams VIEW
ADMS-112610	FMU Passes FMU Checker Test externally but fails the test inside Adams View
ADMS-112185	Variables with comments in Car FMU plant export can create issues in modelDescription.xml
ADMS-86473	Added checks for the type of integrators set in the model. Enhanced parallelism is available only for real time simulations using fixed step integrators.

Known Issues

ADMS-115703	Assembly binary file model_name.asy added to unparameterized FMU

Adams Co-simulation Interface

Supported Versions of Software for Marc Co-simulation

An updated table of the Adams co-simulation Interface supported versions of Marc is shown below:

Marc version	ACSI supported version
Marc 2013.0	ACSI 2014.0, 2014.0.1
Marc 2013.1	ACSI 2014.0, 2014.0.1
Marc 2014.0	No support for ACSI
Marc 2014.1	No support for ACSI
Marc 2014.2*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2015*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2016 and later	ACSI 2015 and later

* The ACSI 2016 and later versions require a workaround for the case of Adams models co-simulating with Marc versions 2014.2 and 2015. Marc 2016 does not require this workaround. For details see the "Special requirements to run Marc" section of the Adams product documentation (Online Help) under "Adams Co-simulation Interface."

Adams Driveline

Known Issues

ADMS-108774	During a bench test analysis in Adams Driveline, we observed incorrect engine RPM behavior when the brakes are engaged while the vehicle remains at a stand-still.

Adams Durability

Issues Resolved

ADMS-113344	FEMDATA output does not work as expected when multiple subsystems are created from same template which contains (one or more) flexible bodies in Adams Car
ADMS-112942	Adams crashes when .mat file output is not writeable
ADMS-112295	Femdata output (load and modal files) is not working as expected for multiple flexible bodies

Adams Explore

Issues Resolved

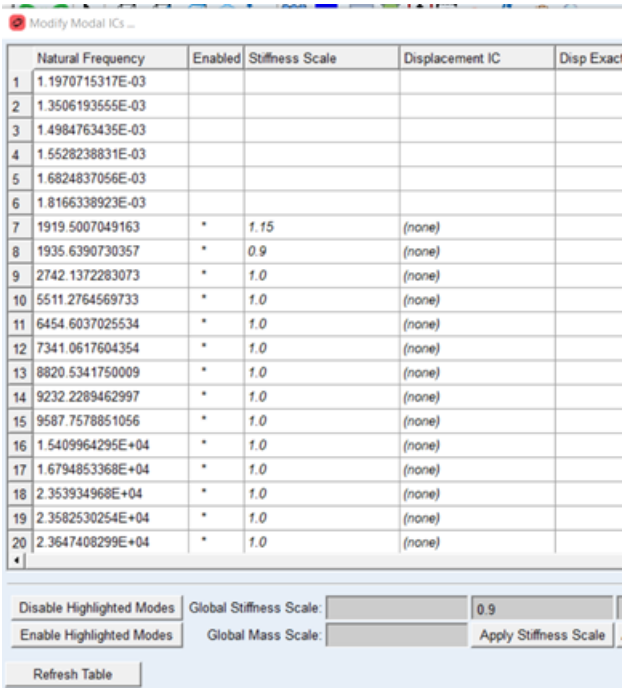
ADMS-95167	In Adams Explore the domain retrieved for the default computer name is the user domain instead of the computer domain.

Adams Flex

Global and Modal Stiffness and Mass Scaling of Flexible Bodies

Adams flexible bodies now permit users to alter their natural frequencies via simple scaling factors. In previous releases one would have to have re-generated the modal neutral file (MNF) with different conditions. A scaling factor applied to all modes' stiffness and a scaling factor applied to all modes' mass are now available. Also, scaling of individual modes' stiffnesses is now supported.

These factors are set in fields in the Modal ICs table accessible for the Flexible Body Modify dialog where they can be parameterized with design variables in addition to simply entering values. Refreshing the table will display the altered natural frequencies. Altered natural frequencies are also displayed in the Adams Solver message file (.msg). Adams View command language and Adams Python scripting language support these new features too. Adams Car users can access this functionality in the same ways and also can set these factors in Adams Car subsystem files.

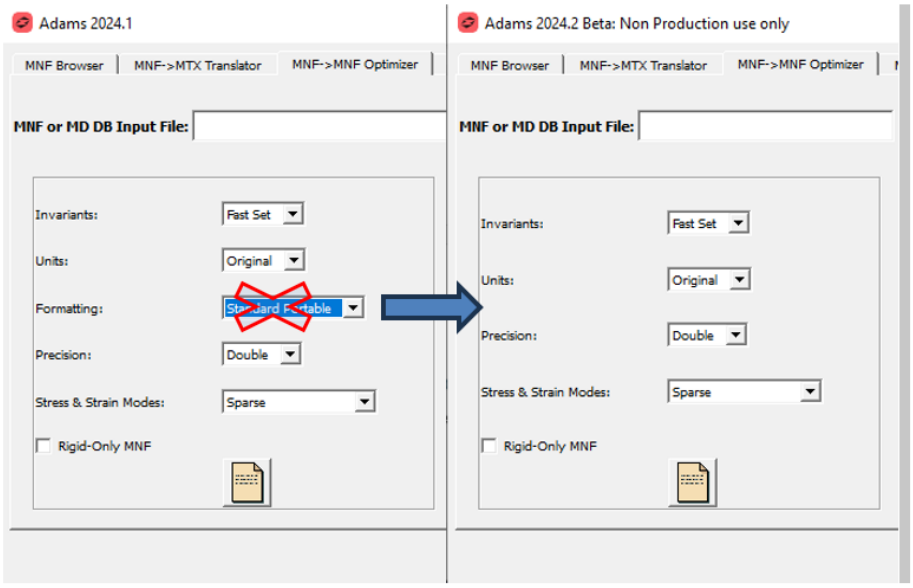


MNF Generation Default Yields Faster Animations

Animations containing flexible bodies load faster when the MNF files have been produced using the 'MNF Optimizer' found in the Adams Flex toolkit and the 'Platform Specific' Formatting option. In past versions of

Adams, the Flex toolkit would use 'Standard Portable' as the default for Formatting. This option has been removed from the Flex toolkit dialog box (it is still available on the command line of the Flex toolkit, if needed) and MNF files are now optimized using the setting 'Platform Specific', which loads faster in animations and works on all platforms.

MNF files generated by MSC Nastran, starting in 2024.2 Beta, will use, by default, this same "platform specific" setting.



Issues Resolved

ADMS-107922	Adams ViewFlex fails to create an MNF on poorly configured Internet Protocol (IP) addresses.
ADMS-85129	ViewFlex feature does not work without any internet connection in Adams View

Known Issues

ADMS-100735	Model import or open not functioning as expected with FE Part.
ADMS-97103	Saving flexible body inertia modeling as "rigid" at the subsystem level can result in error messages when opening the files in Adams version 2022.3 and beyond.
ADMS-87450	Simulations with rotating FE-part results in peaks, numerical singularities.

Adams Insight

Issues Resolved

ADMS-114173	Factor values defined in workspace (xml experiment file) get rounded to one digit when writing out multi event regulator "mer" file and subsequent *.adm files
ADMS-109972	Adams Insight Factor negative nominal value's 'Low/upper limit' and 'Range' values are displayed as N/A when 'Delta Type' is set as "Relative Percent".
ADMS-107388	Insight fitting fails with missing results when "Exclude" runs option is selected

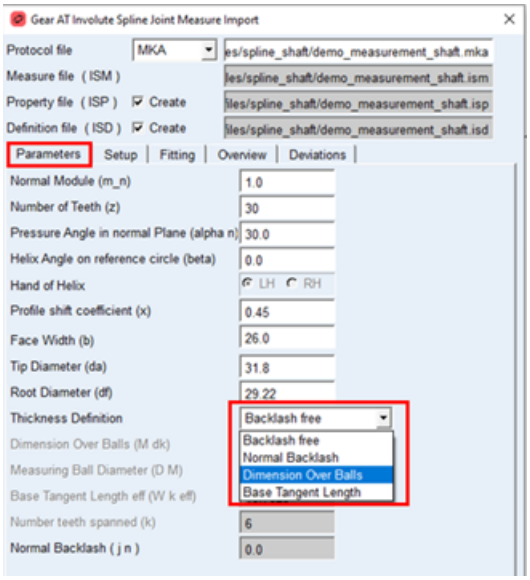
Known Issues

ADMS-106678	DOE of model with Parasolid geometry may stop without error when the number of trial runs exceeds 1000.

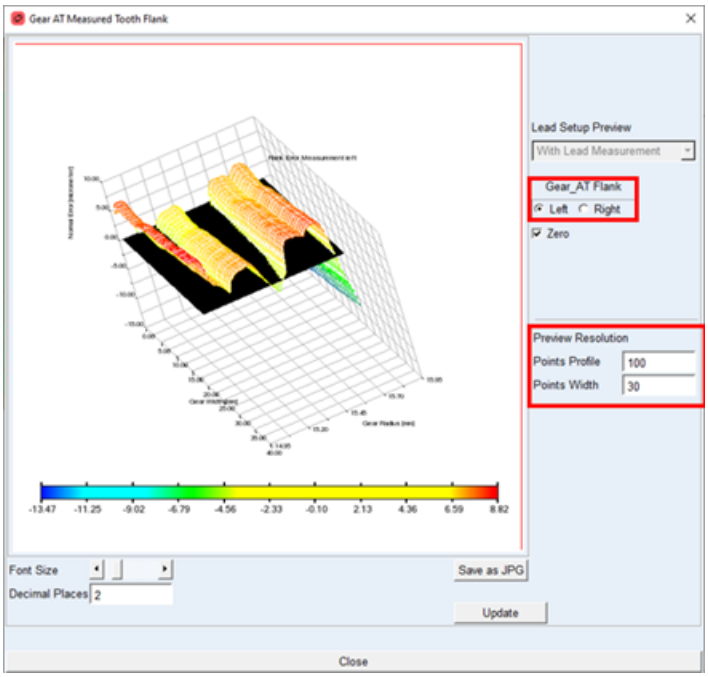
Adams Machinery

Gear AT Spline Joint – Microgeometry & Imported Measurements

For spline joints in Gear AT it is now possible to import measured profiles and microgeometry. This allows for very high-fidelity models of spline joints:

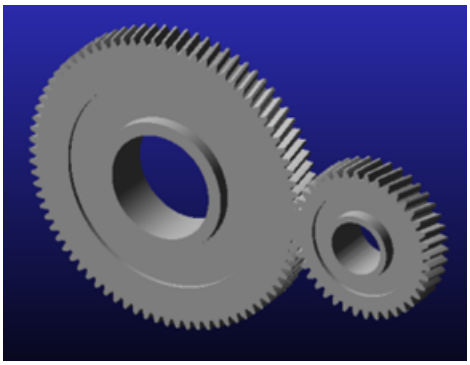


Visualization tools provide rich previews:



Romax to Adams Support for Cutout Gear Blanks

In previous releases, cylindrical gears (spur and helical) modeled via Adams Machinery only supported a pure cylindrical disk geometry for the gear blank. With this release of Adams, such gears' blanks can be modeled with so-called bosses and cutouts. As such, the import of Romax models with such geometry features in the blanks is now better supported with these features being represented in the resulting Adams model.



Romax Non-Linear Stiffness Connection Now Maps to General Bushing

In previous releases, the Romax six degree-of-freedom non-linear stiffness component was mapped to an Adams FIELD object upon import of a Romax model into Adams View. With this release of Adams, it is now mapped to the general bushing object. The general bushing is easier to work with and more closely aligns with the usage intent of the Romax non-linear stiffness component compared to the FIELD object.

Issues Resolved

ADMS-113816	GearAT: Tooth number 1 was occasionally set to the wrong random deviation value, so the load distribution between teeth could be incorrect for full flex spline contact.
ADMS-113614	Full flex gear contact missed the wear calculation, hence the request were not set properly.
ADMS-112302	Each undo-begin block should be completed by undo-end block

Known Issues

ADMS-100003	Gear AT Leadscrew solver crash if Leadscrew nut is too wide
ADMS-91552	The planetary gear built up in template builder does not keep the information in subsystem level
ADMS-85137	Wrong curvature calculation used in Hertz pressure in Hypoid gears for Gear AT
ADMS-76078	Changing the Adams unit system after creation of a belt system can cause the simulation to fail under some conditions and can cause issues with wizard file (.wzd) import.
ADMS-73283	Tooth shape appears incorrect under some conditions for trapezoidal pulley and belt when using certain DIN ISO standards.
ADMS-72681	Under some conditions for some specific inputs, the trapezoidal belt's pulley exhibits unexpected geometry.
ADMS-71381	In Adams Car, when a part is defined as symmetric then a mirror image of the part is created w.r.t center of the car. The direction of rotation (CW-CCW) is defined w.r.t to axis of revolution. In mirror image, both axis of revolution is opposite in direct
ADMS-54852	Roller chain sprocket can be defined using geometry 'parameters'. Alternatively, it can be defined using 'outline' or 'ISO606' options. In case of 'outline' configuration, the force definition is incorrect, causing unreasonable time to balance the forces
ADMS-54600	The involute gear profile can be specified using module, number of teeth, and profile modification coefficient. In the case of advanced3D gear method the sun gear geometry is not created properly when defined with very few teeth (nine) and considerable ad
ADMS-53853	The brushless DC motor does not run correctly as per the maximum angular velocity specified
ADMS-47208	Brushless DC motor exceeds the maximum torque specified by the user while designing the motor. This might be due to incorrect analytical formulation of the motor
ADMS-47207	Documentation needs to be improved regarding the analytical formulation of the

	motor. It should also provide details if torque ripple and stator force is considered in the calculation .
ADMS-40348	The shape of links of silent chain can be specified in terms of curve coordinates. However, with certain set of inputs the curve is not generated correctly. The problem could be with plotting of the curve
ADMS-40177	3D spatial cable wrapping: for distantly placed pulleys (in the range of tens of meters) and very small misalignments angles, the cable wrapping algorithm fails
ADMS-38792	When a tensioner is placed in wrapping order of pulleys, the belt should be wrapped around the tensioner and simulation should exhibit the tension caused by the tensioner pulley. This does not happen in the case of smooth belt configuration.
ADMS-38594	Machinery elements like gear, pulley, cam, etc. can be constrained with other parts in the model in the form of revolute, fixed joints, etc. However, if these elements are to be constained with flexible parts like flexible_body or fe_part then the attache
ADMS-31960	Unable to chage direction of motor in runtime with curve based method for motor.
ADMS-30608	If users run the motor with the exact rated condition of voltage and fluency and the external load (load on motor) is within the motor torque limit, then the AC motor is showing abnormal behavior since current is remaining constant but torque is changing
ADMS-22387	A broken translational joint on the tensioner in a belt systems is observed when reading bin file created on 2013.1 in later versions. Use .cmd as workaround

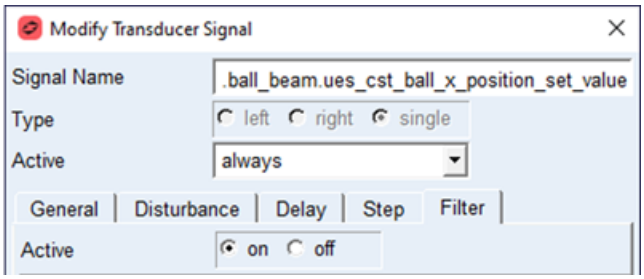
Mechatronics

New Step and Filter Options for Signals

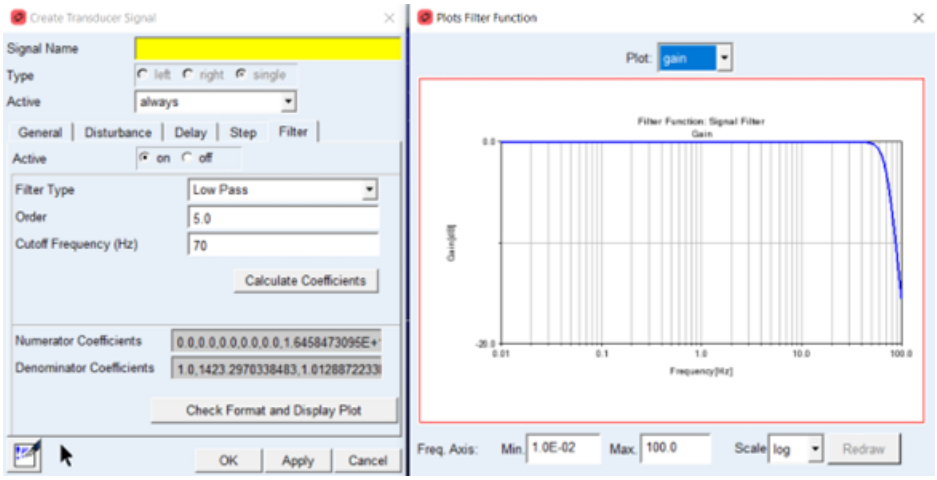
Mechatronics Signals (Actuators, Transducers, Inputs & Outputs) have two new options:

Step – to turn the signal on/off at any point in time,

Filter – to apply a simple Butterworth filter (ie: a lowpass filter) to a signal.



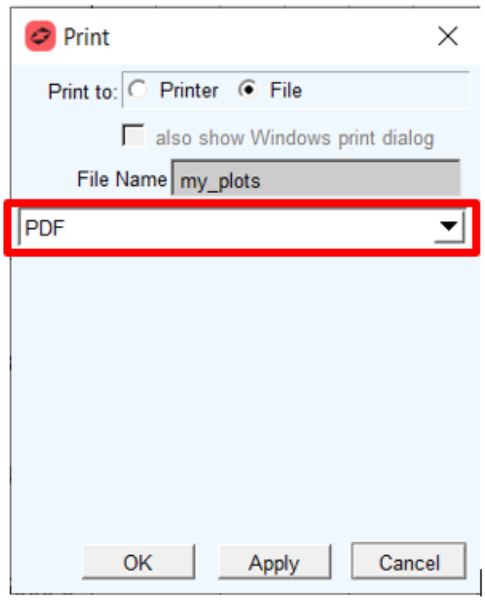
The Filter option lets the user create a low pass, high pass, band pass or band stop filter on the Mechatronics Signal. The Check Format and Display Plot button lets the user check the behavior of the filter in the frequency domain:



Adams PostProcessor

Print to PDF

Adams PostProcessor can now print pages directly to the PDF file format:



Issues Resolved

ADMS-114641	Can't switch back/forth between Adams View/PPT session without error messages
ADMS-114158	Updated new sim companion URL

Known Issues

ADMS-113660	Deformation legend not available for FE-part
ADMS-112747	Export to table option does not properly export data when multiple results are being exported
ADMS-106662	Clearance study overwritten with successive computations
ADMS-104580	Plotting multiple vibration analysis frequency responses at once

ADMS-102513	Light setting not retained with saved database model.
ADMS-97124	AVI file exported through PostProcessor not viewable with Windows Media Player. Workaround is to use other video players (ex: VLC Media Player).
ADMS-92766	Car- Using the "File > Import" menu, tire force graphics are not displayed in PostProcessor
ADMS-91799	flex body plot deformation scale not matching plot values
ADMS-90601	Request (.req) file exported from Postprocessor has incomplete data
ADMS-88182	Adams PPT performance plotting issue (taking more time for operation) in Adams car 2022.2 compared with 2017.2
ADMS-87455	HTML file output from PostProcessor is not displaying in browser.
ADMS-81584	Under some conditions, values displayed in force graphic animation do not match the values for the same object as plotted in an XY plot.
ADMS-81355	Under some conditions, there is no X expression for the gain in the phase curve of a Bode plot in Adams PostProcessor
ADMS-73207	Under some conditions, model display is misaligned in Adams PostProcessor animation when the model is saved as an Adams View database (.bin) file.
ADMS-72385	Plot page background turning black and sluggishness in plotting the curve (with large data points) is observed while using the Linux machine remotely through remote access tool such as DCV NICE from Windows machine.
ADMS-69667	the "force" component of bumpstops request is not provided in the same location in the Adams postprocessor dashboard.
ADMS-61940	The user runs any standard simulation on a full vehicle truck model, the powertrain subsystem stays behind and the rest of the vehicle is moving in forward direction in animation. However, this issue is not observed if the user switches to a binary result
ADMS-61808	Adams fails to show units(NO UNITS) for unitless curve on postprocessor plot when plotting unit less entity and unit entity on same axis.
ADMS-60600	Adams fails to print top boarder line of postprocessor plot, on printing the postprocessor results in a pdf format.
ADMS-58625	Multiple cross plotting curves in Adams postprocessor can lead to missing plot curves. On clicking the refresh button or plot/page resizing, all curves appear correctly.
ADMS-54854	The result file storage differs based on the "type" of request definition. This is confusing when plotting quantities from a results file.
ADMS-54340	Runtime clearance study results in incorrect clearance values for revolution geometry
ADMS-51786	In the Adams postprocessor for the FFT-3D plot, there is a mismatch/difference between the color of the contour plot and the legend.
ADMS-40443	Adams Postprocessor on plotting Aligning Torque - Steer and Camber Compliance

	curves shows incorrect units. Instead of showing deg-sec**2/kg-m**2, it shows deg-sec**2/kg.
ADMS-40080	Problem choosing curves when Legend and curve overlap on a plot
ADMS-39459	Contact graphics is not displayed when animation is run after importing results of external solver
ADMS-23790	View-Reset GUI Dimensions only resets the graphics window (plot/animation) size but not the others (treeview and dashboard)
ADMS-21716	Adams Car bushing geometry disappears during animation when animating a second time after first running the animation successfully and then clicking the reset button
ADMS-5552	No warning that velocity plots of CM in object measures when displacements are disabled in .res are actually Part Xform results

Adams Real Time

Adams Real Time now supports the forthcoming version of CDTire/Realtime. This forthcoming version of CDTire is expected to be released early in the year 2025.

Issues Resolved

ADMS-105338	With MSC_ADAMS_TIRE_AFFINITY set, and after running a real time simulation for a longer time using a vehicle model equipped with STI based tires, oscillations occur and eventually the simulation fails. This has been resolved.
ADMS-69601	An FMU with open loop force based steering fails whereas the offline simulation runs fine using a customized event. Using rotation based steering works fine though for both FMU and offline simulations for this customized event.

Adams SmartDriver

Known Issues

ADMS-103654	SENSOR "testrig.event_monitor_sensor" triggers unmotivated immediately at mini maneuver start

Adams Solver

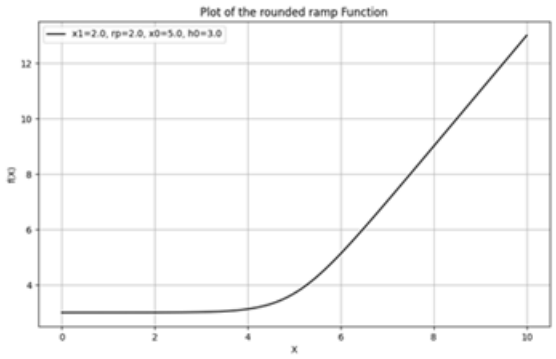
New RAMP Function

A RAMP function is now available in Adams Solver function expressions:

```
RAMP (x, x0, h0, m, rp)
```

Arguments

x	Solver expression for independent value (ex: TIME)
x0	The corner point at which the RAMP function begins.
h_0	The value before the RAMP
m	The slope of the RAMP
rp	Rounding parameter



Issues Resolved

ADMS-115653	Updated Documentation for C++ Solver subroutines related to IFLAG=1 or 3 handling
ADMS-113975	Statics has trouble converging when there is Contact geometry on massless parts.
ADMS-113787	SAVE/RELOAD may fail on models that use SAVE/STATES and contain FRICTION elements.
ADMS-113588	Added a check for the number of threads before starting the enhanced parallelism

	algorithm. Enhanced parallelism is not possible if the number of threads is one.
ADMS-113407	Adams Solver does not recognize change in Contact "Max Stiction Deform" parameter. Solver always uses the default value of 0.01.
ADMS-112151	The minimum distance point in Clearance between two boxes was randomly jumping between points with equal clearance when box edges were parallel.
ADMS-110388	New EP starting algorithm takes into account the possibility of an Euler singularity during the very first step.
ADMS-107707	LINEAR/EIGENSOL - ORIGINAL argument changed the damping option to use damping ratio in Eigen frequencies calculation
ADMS-68778	The Solver command OUTPUT/SEPARATOR is not working as expected. Although SEPARATOR is the default, .gra and .req files do not include the separator. Writing .gra and .req files always behaves as if NOSEPARATOR is specified.
ADMS-42391	function evals and steps number are incorrect
ADMS-12290	Initializing string when calling utility function GTSTRG from a C/C++ user subroutine is required but instructions are missing from online documentation on how to do this.

Known Issues

ADMS-109152	Differences in results between analyses run with binary file and the exported cmd file.
ADMS-104772	Missing angle unit conversion when exporting .adm file
ADMS-100365	Inaccurate reporting of CPU Time in the Solver msg file at the end of the simulation on Windows11 22H2 systems. This issue is a regression that was introduced starting in Windows 11 22H2. No workaround or solution exists from Microsoft. Reporting of Elapsed Times are not affected.
ADMS-97136	Cannot run the analysis by double clicking on the acf file.
ADMS-82810	The disabled element is recognized by the solver as enabled for the Contacts that refer to poly-lines
ADMS-75552	If switching to write the results file in ASCII or binary format all the requests that were present when using the default XML format are missing
ADMS-42738	If a marker (triad) is created on a curve to mark a specific location on curve, it is expected to retain the position while the curve-part is moving. However, the marker does not retain its position on a curve.
ADMS-16221	OUTPUT variables referencing deactivated BUSHING forces cause analysis failure. Workaround is to comment out or otherwise deactivate the OUTPUT variables.

Adams Tire

Issues Resolved

ADMS-113748	Running a second simulation with FTire (and possibly other tire models) in Adams View fails using the internal Adams Solver. As a result performing a Design Study with the internal Solver may crash Adams View. This has been resolved.

Known Issues

ADMS-114794	Custom RDF (rounded triangle) used for the bottoming test in Tire Testrig does not affect results (same as flat road)
ADMS-114152	Problem generating the Flexible rim from the Tetra mesh FE model
ADMS-112621	Suspicious rear tire sinkage for multi-pass on soft soil
ADMS-107729	FTire - remote option won't work when done through UI, in batch mode this works but have to configure passwordless ssh to work seamlessly.
ADMS-107721	Adams and VTD co-simulation - strange/wrong results when driving over a road with a slope

Adams Vibration

Issues Resolved

ADMS-105501	Simulation Script Name field in Perform Vibration Analysis dialog box disappears
ADMS-114786	'Vibration Animation' tab is not displayed when loaded Ride Vibration Animation for 'Displacement' as 'Actuation type' in PPT

Known Issues

ADMS-109965	Actuator Plot for PSD based Input Channel is in incorrect due to unit inconsistency
ADMS-105504	Adams Car with Vibration - Input Channel Part not allowing flex selection

Adams View

CAD Interoperability Version Support

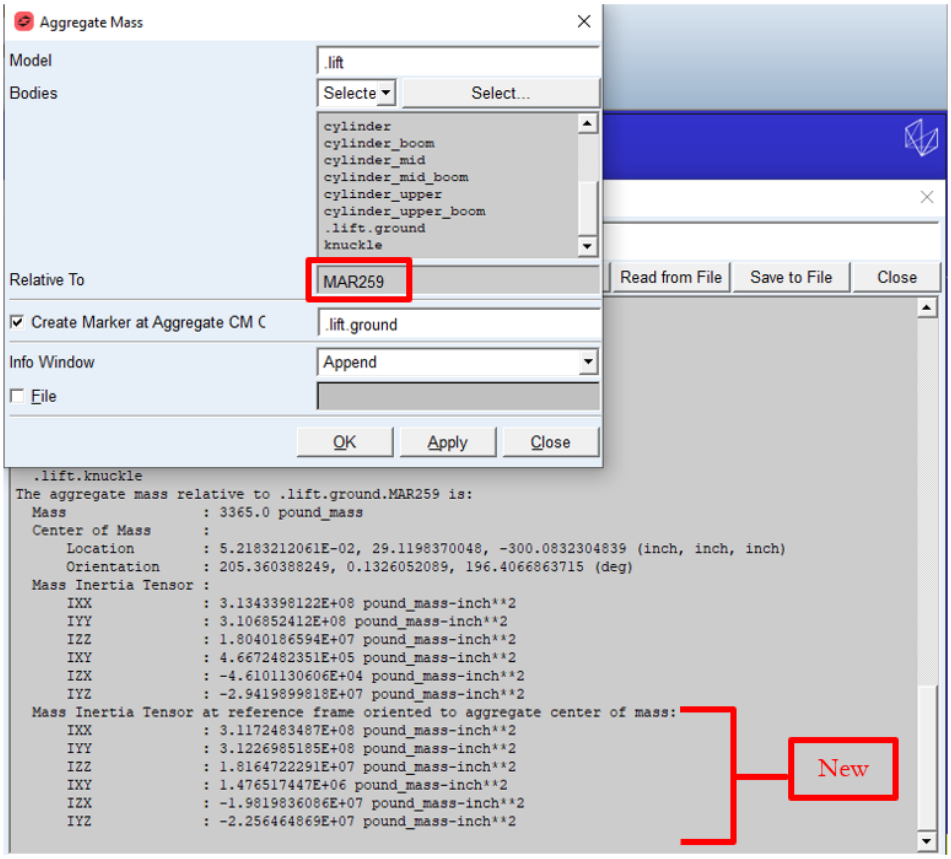
The following table lists the versions of the supported CAD formats that can be imported and exported in Adams 2024.2 .

Format	Import Version	Export Version
IGES (.igs)	5.2 & 5.3	5.3
STEP (.stp)	203/214/242 P	214
ACIS (.sat)	All → R27	Not Supported
CATIA V4 (.model, .dlv, .exp, session)	All 4.XX	Not Supported
CATIA V5 (.CATPart, .CATProduct)	R10 → R33	Not Supported
CATIA V6 (.3dxml)	2014X → 2022X	Not Supported
Pro/Engineer part files (.prt, .asm)	13 → Creo 9	Not Supported
Inventor (.ipt, .iam)	All → 2023	Not Supported
Solidworks (.sldprt, .sldasm)	99 → 2023	Not Supported
Unigraphics (.prt)	11.1 → NX CR 1953, 1957 and 1969, 2212	Not Supported
JT : JtOpen (.jt)	7.0 → 10.5	Not Supported

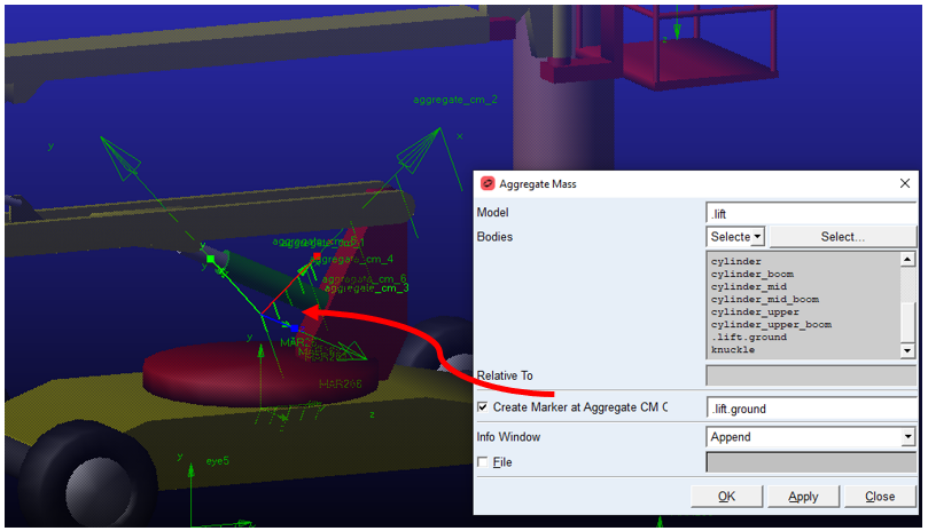
Aggregate Mass Improvements

The Aggregate Mass tool in Adams View (and Adams Car) has been enhanced to provide additional tensor output when a Relative To marker is specified. In addition, it is now possible to create a marker at the computed aggregate CM location.

When specifying a Relative To marker, the following additional inertia tensor information is reported:

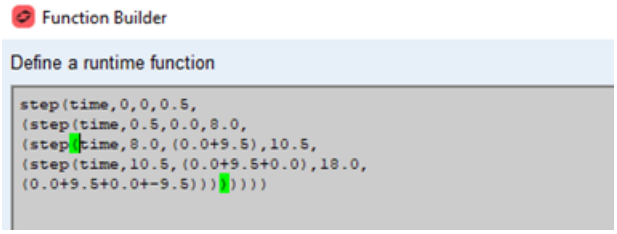


When specifying the Create Marker at Aggregate CM choice and picking a part, a marker is automatically created at the aggregate cm location, having the principal axes aligned with the aggregate inertia:



Function Builder – Bracket Highlights

Detecting matching bracket pairs in function expressions is easier now with dynamic bracket highlighting, shown in Function Builder:

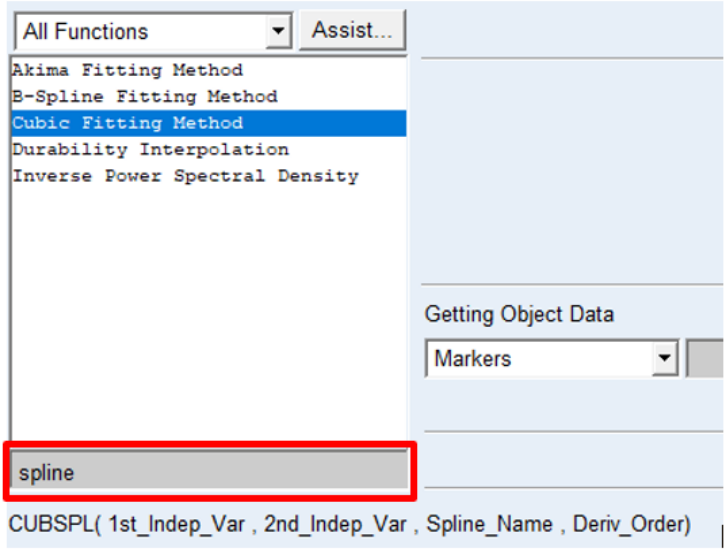


Highlights are shown for the following three types of closing brackets:

- (..expression..)
- [..expression..]
- {..expression..}

Function Builder – Built-in Search Field

Locating functions is now easier thanks to the new search field in Function Builder. The list of functions is now filtered by both the Search field and the Category drown-down selection. Type in a search string, then change the Category from the default of All Functions to something else to locate the function that you need.



Issues Resolved

ADMS-114920	After opening F1 help for any dialog box then the second or later dialog box F1 help does not open on the Linux machine
ADMS-114663	Japanese GUI does not show Appearance Dialog after selecting multiple entities
ADMS-114298	undo/redo after suppress on parametric body.
ADMS-114249	Adams View session is crashing when we do Design study followed by Optimization and vise versa
ADMS-113730	Help link to SimCompanion Updated with new URL
ADMS-113572	Adams simulation don't initiate when the animation is loaded in postprocessor
ADMS-113394	Request dialog has inconsistent setting for Title option
ADMS-113166	Can export aggregate mass from model browser in a Japanese environment when selects multiple parts
ADMS-112701	Updated Japanese translation for "Create a Advanced Bushing"
ADMS-111177	Warnings when creating a createPt2pt measure using Adams Python
ADMS-111175	The design variables are created with incorrect range i.e. units using Adams Python

ADMS-109998	Issue in retrieving Model Base Name
ADMS-109884	The force output for the constraint is correct position and correct sign.
ADMS-109149	Wavefront (obj) export from Adams Car exports files for parts with no active gometries
ADMS-107627	When a part consists of multiple Parasolid geometry, if user defined density is specified by user, Adams View 2023.4.1 gives the following error, "WARNING: Overwriting density of 1000000000000.000000 for the parent part .MODEL_ 1.PART_2 to value in importeimported file, 7750.332824."
ADMS-71391	When 4K monitor is used, Adams may not scale correctly with font size changes
ADMS-61425	Temporary settings files (.tsf) cannot be used to switch objects' properties between Adams Solver function based definitions and Adams Solver user subroutine based definitions. Any such switches fail to revert after the .tsf is applied.
ADMS-57041	View management commands are not working. User may experience trouble while restoring view using command view management restore saved_view_name=

Known Issues

ADMS-114594	Model in Adams view containing GearAT and BearingAT elements crashed
ADMS-114260	Adams python interpreter waits for more input and cannot be stopped
ADMS-113603	Wrong mass moment of inertia calculated for discrete flexible link, using "properties" cross section input
ADMS-113280	Adams Car template builder doesn't allow to close the template after modifying the flexible body connections
ADMS-113172	Parametrization defined with rigid body do not retain when it is converted to flexible body by ViewFlex.
ADMS-110745	Part Extrusion loses Parametrization if the Part's global location is changed
ADMS-110505	Command Server not working on Linux
ADMS-109148	When exporting obj files Adams overwrites geometries that have the same part name in different subsystems
ADMS-108550	When modifying the translational point motion to rotational point motion, or vice-versa, errors occur for initial conditions
ADMS-106688	when spline_read subroutine is used with external solver, simulation fails. AMD needs to allow BLOCK and ROUTINE arguments to coexist in Solver SPLINE statement.
ADMS-106260	Certain 'ANGLES' are used to get Direction Cosine Matrix generated by TMAT. When these Direction coises are used as input for ANGLES() function, it does not return same Euler angles which were used as input
ADMS-106129	Running Four-Post Vibration analysis twice results in a "conflicting IDs" error.
ADMS-104464	FE_PART section based on zy_points generic does not seem to be supported
ADMS-103576	Motion measure characteristic changes to torque unexpectedly.
ADMS-103474	Shell Geometry does not look good for some complex shapes when generating FE Parts using XYZ coordinates
ADMS-103051	Attached Creo 7 geometry file shows holes on surfaces.
ADMS-99994	Incorrect motion information in the log file when run analysis using *.acf file having the DEACTIVATE/MOTION command after SAVE/RELOAD.
ADMS-99003	Corrupted graphics when positioning of FE Part with preload
ADMS-98341	Failure when loading python module matlab.engine in Adams View
ADMS-96894	Cable wrapping for system with many pulleys can fail
ADMS-95010	Model browser does not update after creating new state variable. User needs to close and reopen the Elements folder to see the update.
ADMS-94886	If session unit is set to 'mm' and design variable referenced for X values of spline,

	spline gets created with X values multiplied by 1000 Workaround: do not use design variable in this case.
ADMS-92342	A design variable with the AGGREGATE_MASS() function in it, along with referenced parts having user-defined masses does not properly update when the CM location of one of the parts is altered.
ADMS-91964	There is an orientation issue with extruded geometry when created by following the bspline curve
ADMS-90610	Adams View memory usage growing while creating many files in batch
ADMS-84401	For a specific binary file, when the scripted simulation is ran with "write Files only" option, the Parasolid file is not getting generated. External simulations then fail as the Parasolid file is not found.
ADMS-81674	The I and J markers of bushings connecting two FE Parts with hollow cross-sections will get shifted in location if the model is exported as an Adams View command file (.cmd).
ADMS-76384	Under some conditions FE Parts will improperly reference the underlying graphical curve causing errors upon .cmd import and sometimes causing the Adams View session to become unresponsive.
ADMS-75791	When a State Variable is renamed or altered, the Model Browser scrolls back to the top.
ADMS-75145	SHL file generated by Adams with MMKS units does not import properly into an FE Part as an external geometry
ADMS-75038	Under some conditions the flat part of obstacles in road geometry doe not shade properly. Try precision shading to improve, but not solve, the issue.
ADMS-74664	There could be limitation in loading result files that are larger than 60GB, with contact incidences, in Adams View
ADMS-71387	Slightly different simulation results (less than 1% difference in some outputs) may result when comparing simulation results run inside a View interactive session with results run in a View batch session.
ADMS-64810	The new object creation like state variable does not update in Model Tree in Adams/car automatically, manually refresh is required
ADMS-60930	The time it takes for Adams View to delete results from the Model Browser can be very long when the result size is large
ADMS-54234	The "marker modify" command does not work in the correct reference frame if the values supplied for 'location' are enclosed in parentheses
ADMS-53889	Structure of the Analysis object is different with internal & external solver.
ADMS-53880	When opening an ASCII tire template with external CAD geometry, an error message is issued and the geometry is imported incorrectly. Users may workaround this issue in two ways: 1. Specify the CAD geometry directly in the tire property file. See mdids://

ADMS-53516	In Adams Car if a joint Force is created and is modified with Display Attribute (e.g color/style/size of the line), the modifications in the display attribute will not retain during the animation, or after the animation is played.
ADMS-51334	Adams Online Help cannot be shown for some auto-generated Command Navigator dialog boxes
ADMS-50894	Exporting a .shl geometry file and then importing back into Adams can result in geometry differences for finely tuned rendering parameters on export/import.
ADMS-50747	Variable reference function "user_string" does not handle unit conversion properly in case of "mmks"
ADMS-48293	"Remove Parametric Expressions" option not working properly, incorrectly deletes parent object. This occurs when a force element, for example, references a state VARIABLE using a VARVAL() function; deleting the VARIABLE will incorrectly also delete the referencing object (the force element, in this example) even though "Remove Parametric Expressions" is chosen.
ADMS-47673	Table editor->Motions Table Editor Filter doesn't show "General Motion" option .
ADMS-46136	Adams fails to to translate hollow geometry(Box) having chamfer on its edge.
ADMS-45908	Some tables in Adams View dialogs do not properly display spring damper properties when using the UDE-based spring damper.
ADMS-45471	Some entity classes in adamspy do not support all properties for that entity
ADMS-45350	Incorrect results observed for flex analysis, when saving and opening the bin file multiple times.
ADMS-45099	For some of the imported IGES geometries of curves of degree 5, the shape may not match with the shape of source of the curve.
ADMS-44883	On importing bigger external pararsolid geometries(non-Adams) assembly models, Adams may fail to import some geometries.
ADMS-42441	The ORI_GLOBAL() function in Adams does not work correctly for angles beyond 90 degrees
ADMS-41432	The calculated volume of a cylinder in Adams View is affected in an unexpected way while changing the cylinder side count (especially around the value of 20)
ADMS-40912	Adams datatable widget's performance is affected by number of rows and columns. User will experience slow datatable performance, If dealing with the huge(quite large number of rows and columns) tabular data in data table.
ADMS-40354	Range Measures cannot be referenced by other Measures using runtime expressions. Range measures only update at the end of a simulation.
ADMS-39355	If a User Defined Element (UDE) definition lies in some library. User can create an instance from this definition in a model. However, if this model is saved as binary of command file then only the contents of the model are written in the file (and not th
ADMS-34194	On Windows 10 virtual machines when VMware tools are installed to make a full screen virtual machine, then some of the Adams-View-based product sessions might terminate unexpectedly (Adams View, Adams Car, Adams Driveline).

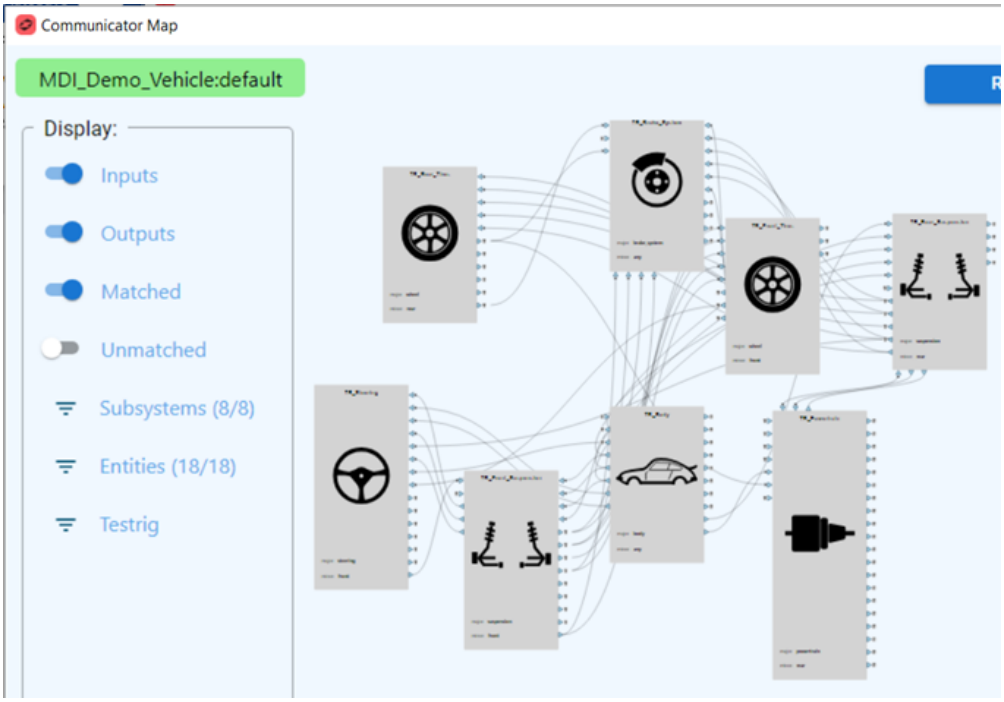
	Uninstalling the Vmware tools alleviates the issue.
ADMS-32067	Bearing disappears when selecting "reset to start" in animation control dialog.
ADMS-31937	When copying a cam system its follower motion will not be copied. Both cam systems will reference the same follower motion object.
ADMS-23976	On machines with multiple graphics hardware options, use of the "CPU integrated" graphics hardware (for example, "Intel HD Graphics") may cause problems with display of flexible bodies and FE parts in wireframe mode. The workaround is to use the other gr
ADMS-22004	Zero volume of cylinders with 1 or 2 segments, with angle extension less than 360 degrees
ADMS-21941	Torsional springs missing when merge two models (each containing one) via "Model assemble" command. Workaround is to use a rotational sforce instead.
ADMS-20196	Force Display ON/OFF option is not working for the FE Load
ADMS-19599	Menu operations from Adams View for view manipulation (front, fit, zoom, etc) act upon the PostProcessor window if it is also open
ADMS-16288	Some options on the View Management Orient command not working correctly. Workaround is to rotate the View via the tools available in the graphics window and toolbar.
ADMS-12740	Error in Mass property calculated for copied part with the original part being a parasolid for some (not all) externally imported parasolid files
ADMS-5419	Want a documented search-order for locations when loading plugins

Adams 2024.1 Release Notes

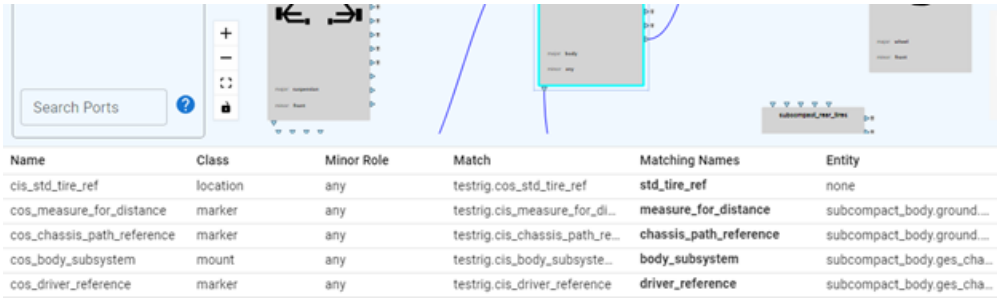
Adams Car

Communicator Map

A graphical representation of Communicator connections between subsystems is now available:

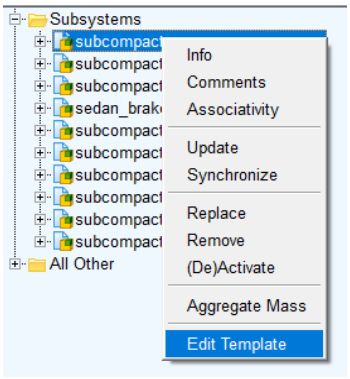


Featuring simple filtering controls, the Communicator Map draws communicator relationships in an easy to follow, graphical format. Subsystem blocks and connection lines show different levels of detail, all the way down to typical communicator connection output:

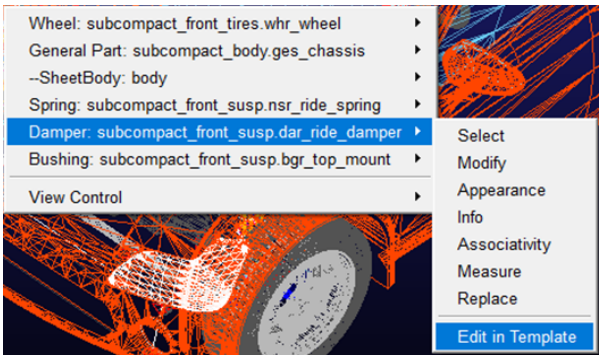


Edit in Template

Making changes to a template is much easier now with the new Edit in Template functionality that is found at the Assembly level of a vehicle model. This new automation functionality lets an expert user easily open a template in an Assembly from the Model Browser:



This is also available by right-clicking elements in the model:

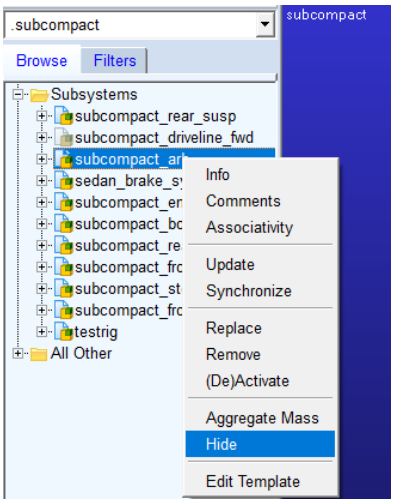


Selecting these actions will automatically locate the template file for a subsystem and load it into Template Builder for immediate modification.

Further automation is introduced for the return path when a template has been changed. Adams Car will now automatically apply the template changes to a subsystem and then update the assembly with the modified subsystem. This greatly streamlines the process of changing a template and realizing the changes in an assembly:

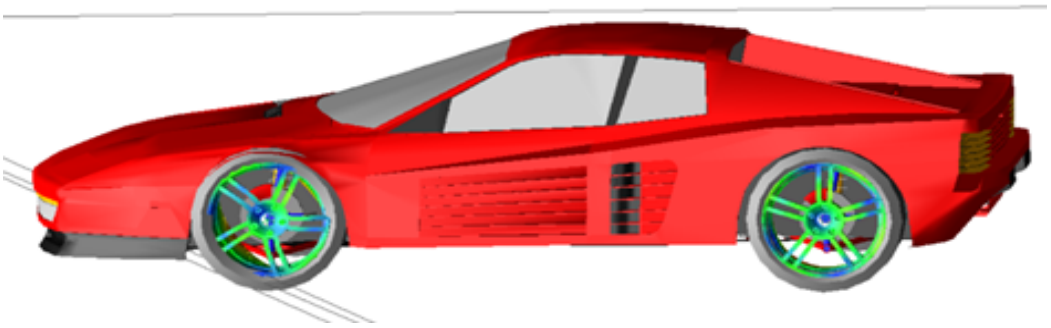
Show & Hide Subsystems

It is now easier to show/hide subsystems when inspecting a vehicle assembly. Right-clicking a subsystem in the Model Browser includes new menu picks for Show and/or Hide, as shown below:

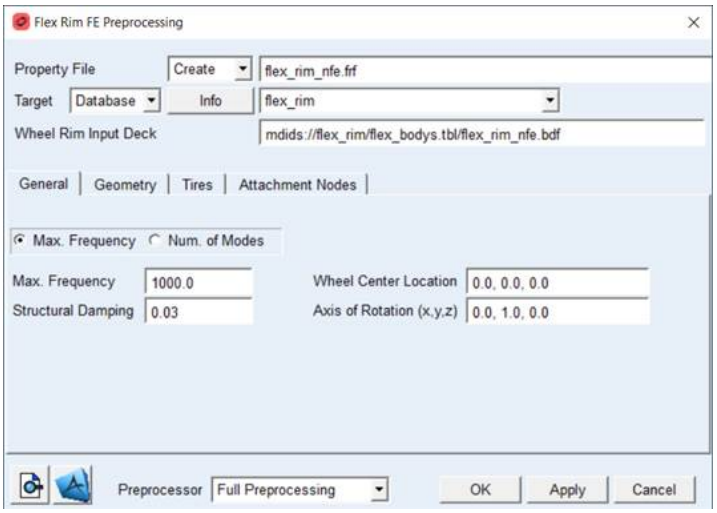


Flexible Rim

It is now possible to incorporate a flexible rim model into Adams Car. This new functionality is available with tire models that use CDTire, from Fraunhofer ITWM (https://www.itwm.fraunhofer.de/en/departments/mf/cdtire.html).



The interface for this new functionality is presented in the Flex Rim FE Preprocessing dialog box, as shown:

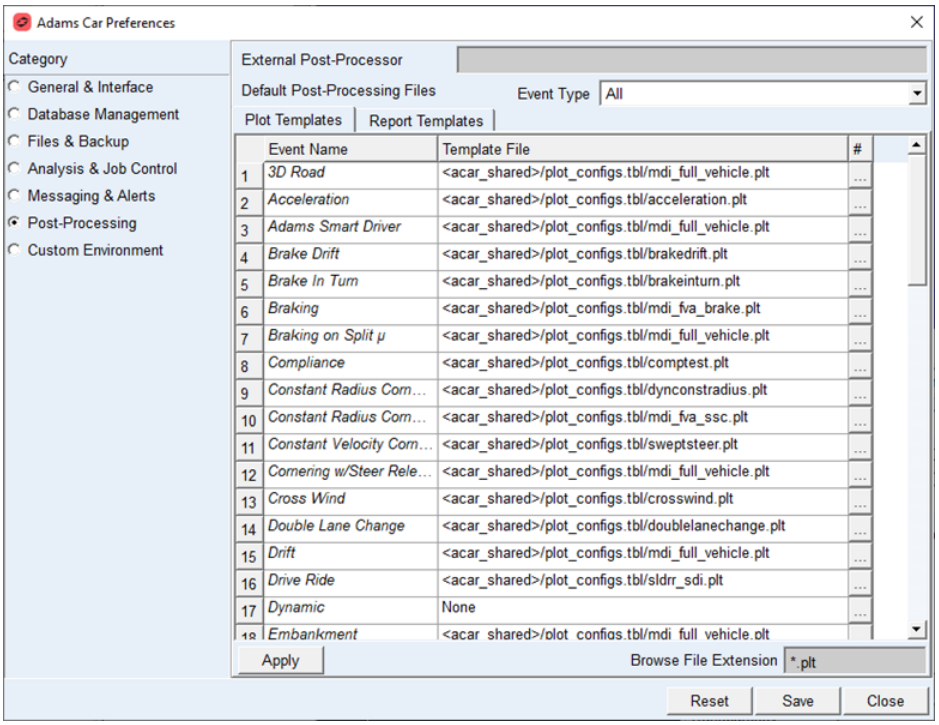


This takes care of the many steps needed to integrate a flexible body into a vehicle assembly.

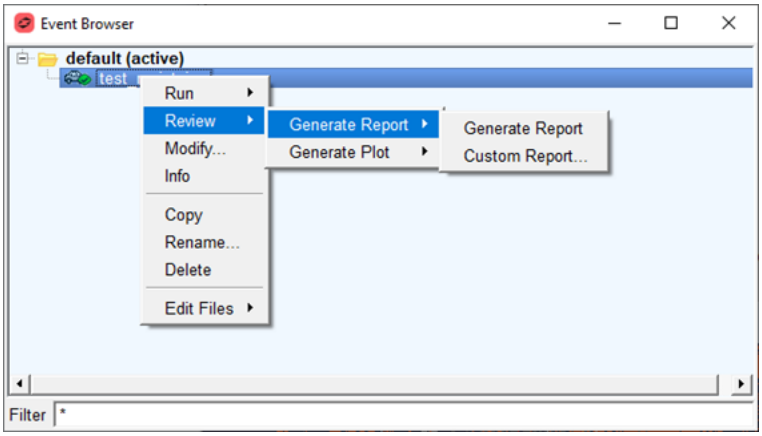
Note:	F1 Context Help is not working for the Flex Rim Preprocessing dialog box. Open the Adams Help documentation from the Adams Help menu and search for 'flex rim' to locate the complete Help documentation. This is found in the Help section: *Adams Car Package → Adams Tire → Contact Methods → Flex Rim*.

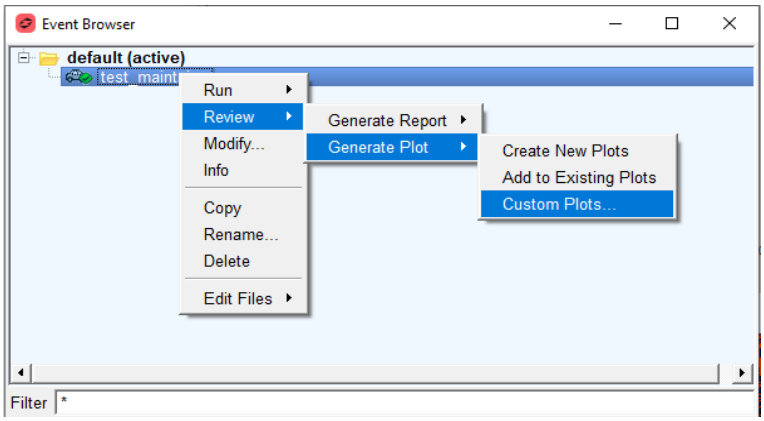
User-Defined Plot and Report Templates

Adams Car uses Plot Template Files (.plt, located in /plot_configs.tbl) and Report Template Files (.rtp, located in /report_templates.tbl) to create standard Plots and Reports for all of the simulation Events. It is now easier to customize these templates via the Post-Processing section of Adams Car Preferences (*Settings → Preferences*):

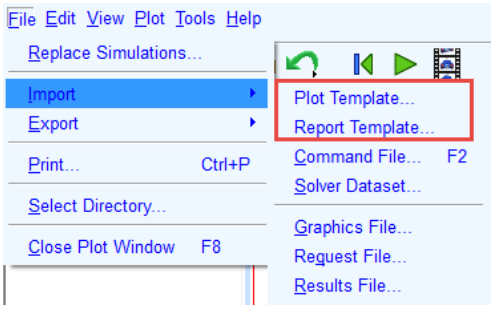


The settings above specify the default template files to be used. To use a different template without setting it as the default, use the new context menu picks in the Event Browser, as shown below:



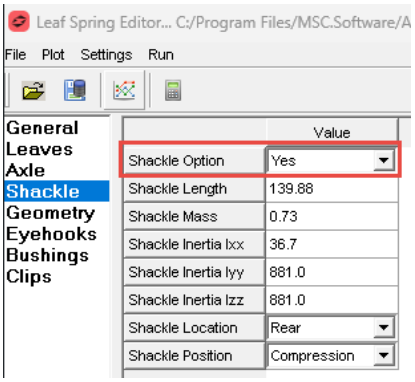


New options also exist in Adams PostProcessor for importing Plot/Report templates:



Tension Leafspring (Without Shackle)

The Leafspring Editor now supports creation of leafsprings with or without a shackle:



The new Shackle Option parameter can be modified in the Editor shown above, or directly using a text editor on the .ltf property file.

Adams Co-simulation Interface

Supported Versions of Software for Marc Co-simulation

An updated table of the Adams co-simulation Interface supported versions of Marc is shown below:

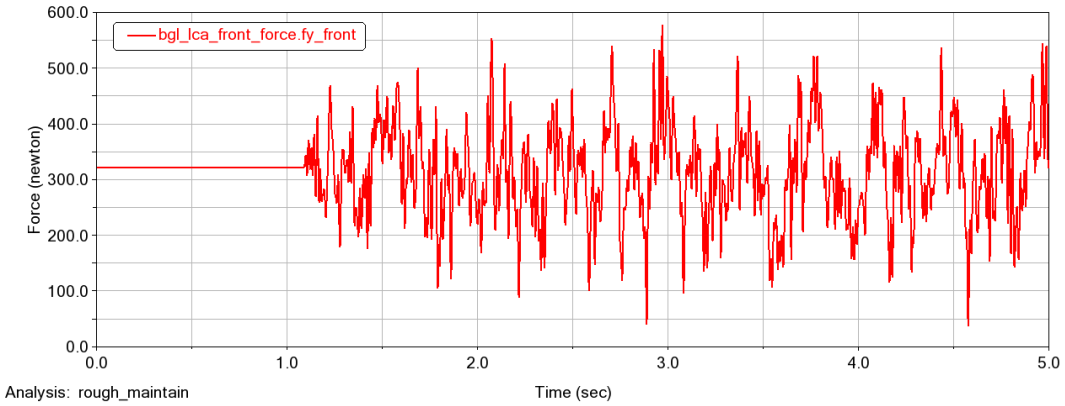
Marc version	ACSI supported version
Marc 2013.0	ACSI 2014.0, 2014.0.1
Marc 2013.1	ACSI 2014.0, 2014.0.1
Marc 2014.0	No support for ACSI
Marc 2014.1	No support for ACSI
Marc 2014.2*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2015*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2016 and later	ACSI 2015 and later

* The ACSI 2016 and later versions require a workaround for the case of Adams models co-simulating with Marc versions 2014.2 and 2015. Marc 2016 does not require this workaround. For details see the "Special requirements to run Marc" section of the Adams product documentation (Online Help) under "Adams Co-simulation Interface."

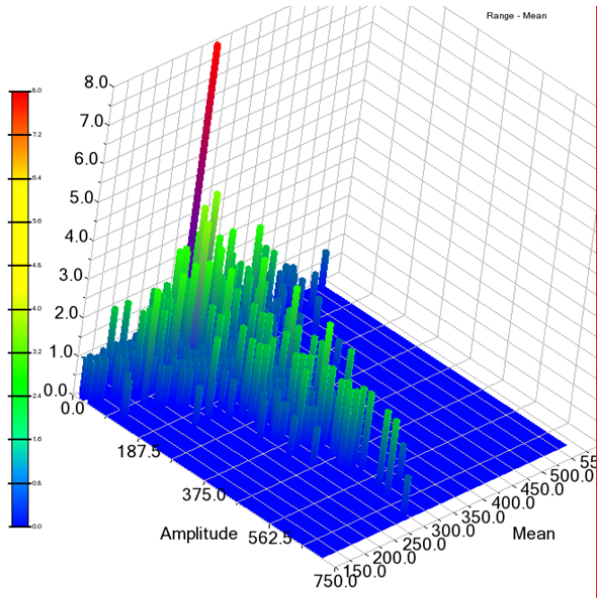
Adams Durability

Rainflow – Fatigue Cycle Counting

The Rainflow counting method computes the magnitude and quantity of different loading cycles found in a complex stress-time history. The number of cycles at different mean values and the corresponding min/max ranges of the cycles can be used to estimate fatigue damage in a component. A typical load-time history from a durability analysis, for example, might appear like so:



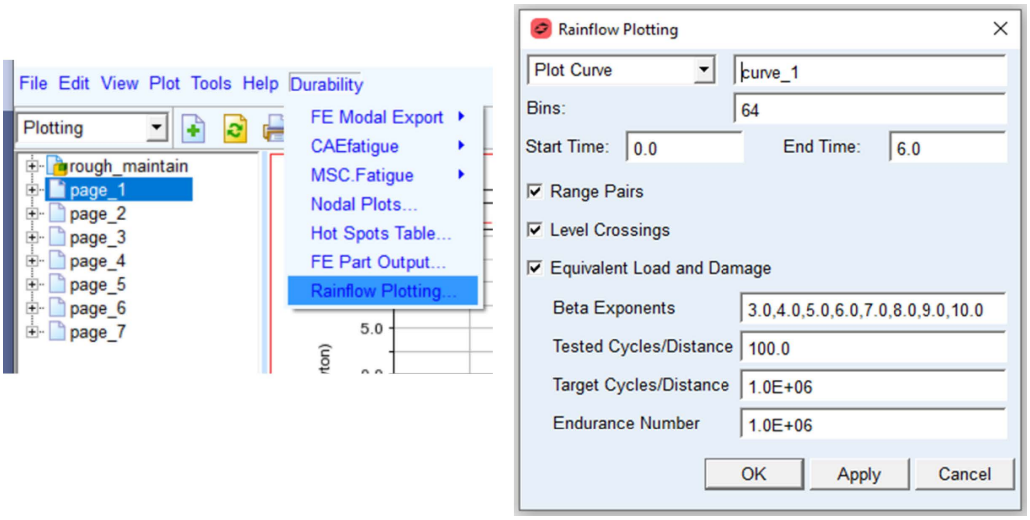
Rainflow cycle counting seeks to describe this signal as a collection of loading cycles, each cycle having a mean and amplitude value, as shown below:



Several plot types are available based on this information:

1. Rainflow Histogram as a function of cycle amplitude and mean value,
2. Rainflow Histogram as a function of cycle start and end values,
3. Range Pairs - the number of cycles as a function of cycle amplitude,
4. Cumulative Range Pairs - a cumulative form of the data above,
5. Level Crossings - range amplitudes as a function of the number of cycles,
6. Equivalent Load & Damage - typically used if the time history represents stress in the material but if the relationship between loads and stress is understood then this may also be applied to load histories.

This new functionality is found in Adams PostProcessor when the Durability plugin (*Tools → Plugin Manager*) is loaded:

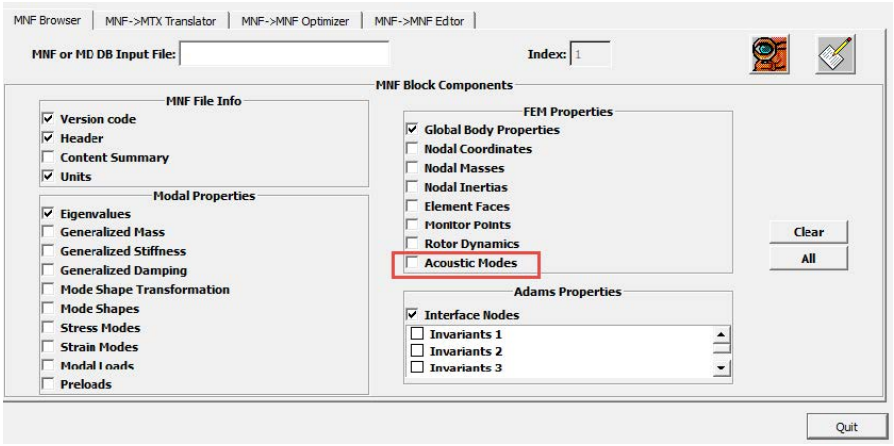


Notes:	These plots are typically overlayed with 2 or more data sources. Currently it is only possible to plot a single result on a single plot. To overlay plots of Range Pairs and Level Crossings for multiple results, do the following: 1. Plot the Range Pairs / Level Crossings of interest for the first result set. 2. Create a second, similar, plot for the 2nd result set of interest. 3. Use Copy / Paste to overlay plots: select the first curve of interest and select *Edit →Copy*. 4. Navigate to the second plot page and use the menus: *Edit →Paste* to add the previously-selected curve to the new page.

Acoustic Pressure Recovery in Flexible Bodies

Acoustic pressure recovery is now possible in Adams, using MNF files that have been generated in MSC Nastran 2024.1.

If a coupled fluid-structure interaction (FSI) is defined in the MSC Nastran model and one creates an MNF, there is an option to include acoustic modes from select fluid grids in the MNF. If this is done, the user can recover acoustic pressure time histories of Adams results using Durability without having to go back to MSC Nastran. This MNF information can be verified using the Adams Flex Toolkit, shown below.

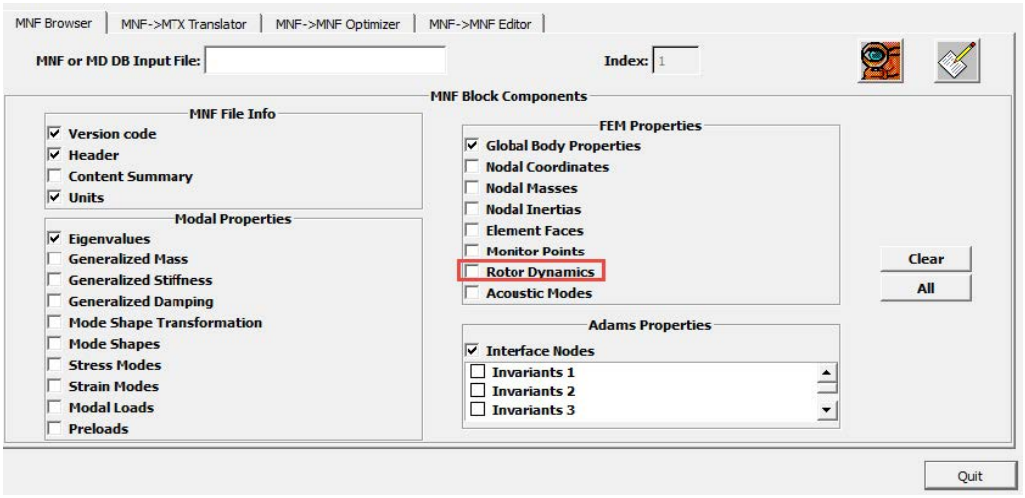


Adams Flex

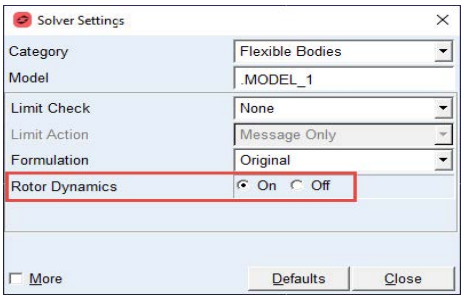
Rotor Dynamics Effects in Flex Bodies

The Modal Neutral File (mnf) file format used for flexible bodies can now include rotor dynamics effects, as computed by a Finite Element package such as Nastran. A new simulation mode exists for running successive dynamic & linear analyses and a new charting option named Rotor Dynamics Campbell Plot is meant for these results.

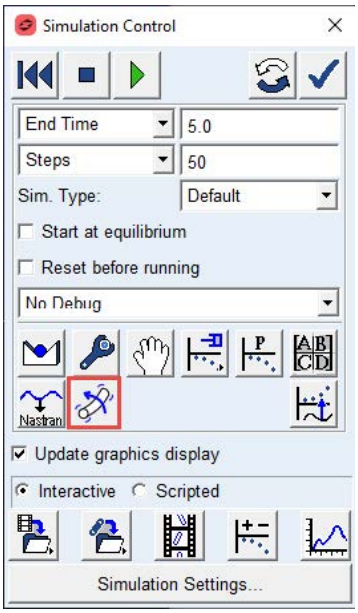
Specifically, Adams Flex now recognizes mnf files containing Rotor Dynamics effects, as shown below. These effects are included in the mnf file using MSC Nastran 2024.1 and SOL107:



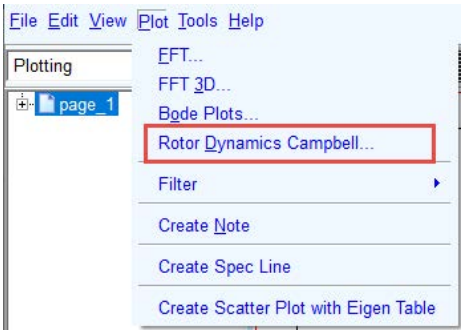
Rotor Dynamics effects for flex bodies must be enabled (Settings *Solver → Flex Bodies...*) as shown:



A new simulation sequence particular to rotor dynamics is included with the simulation controls:



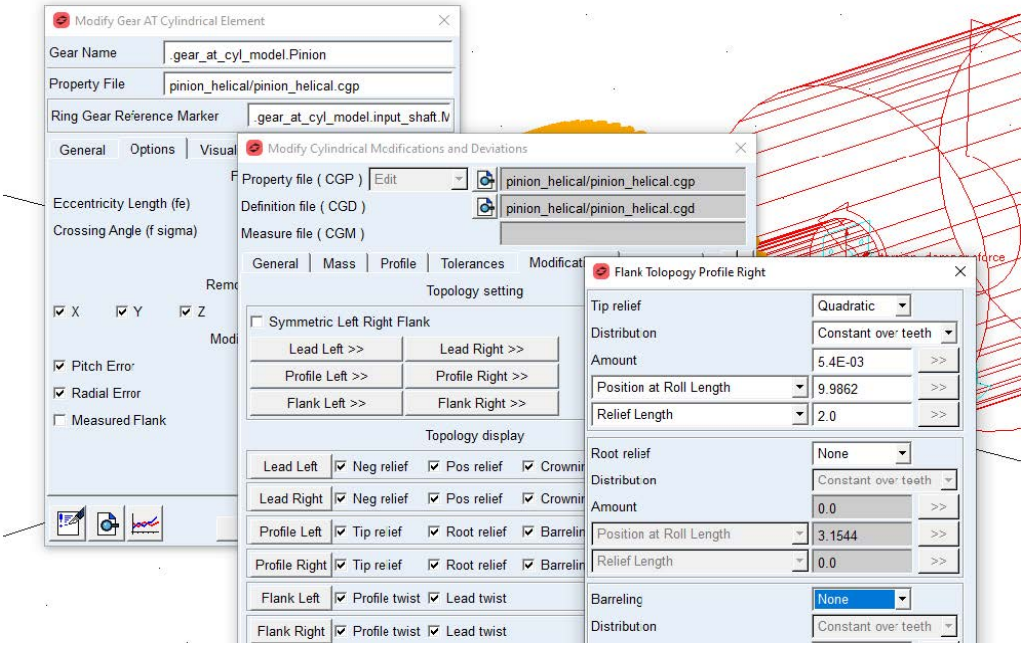
And the new plotting type for Rotor Dynamics is available in PostProcessor:



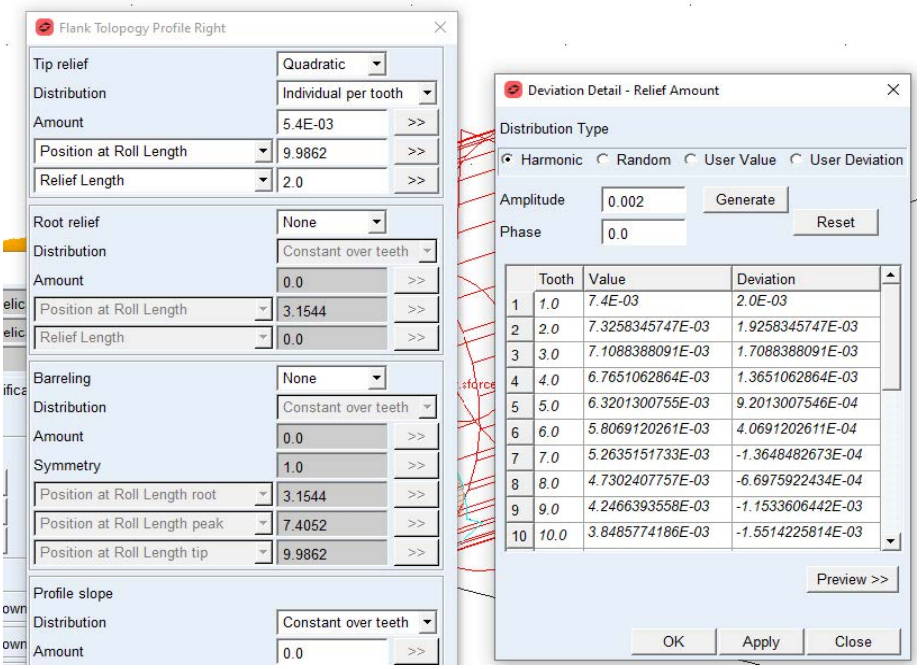
Adams Machinery

GearAT: Gear MicroGeometry Variations

It is now possible to create gears with micro variations in the geometry to simulate manufacturing roughness and similar imperfections:



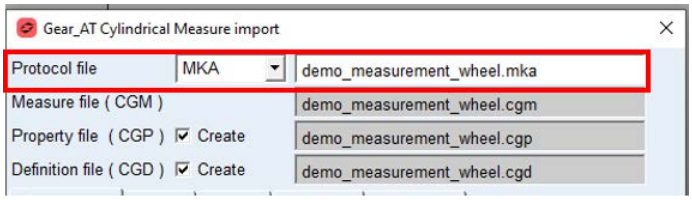
Deviations in geometry are specified with respect to the nominal shape; users can specify different patterns for the deviations as shown:

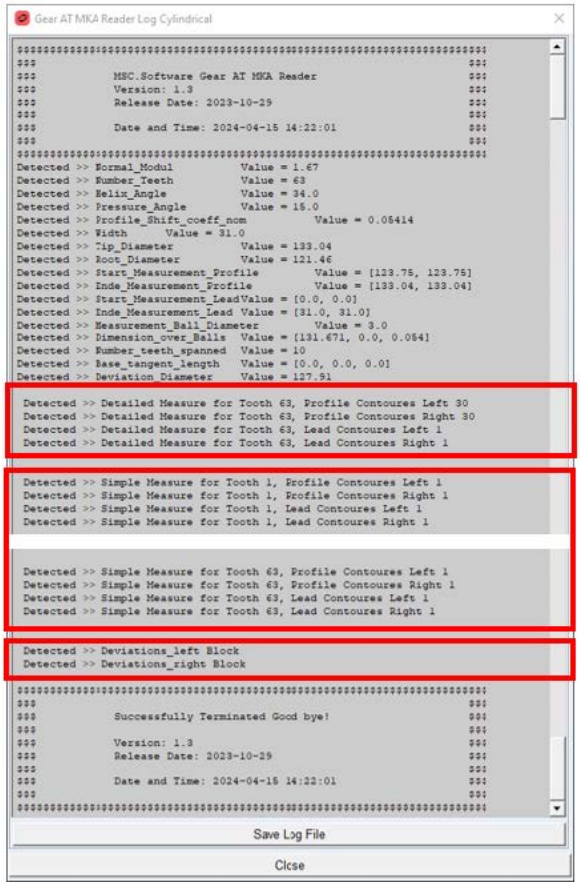


The manufactured gear can be measured on each tooth and flank, the produced measurements can be applied to each tooth so real topology and deviations are used in simulations.

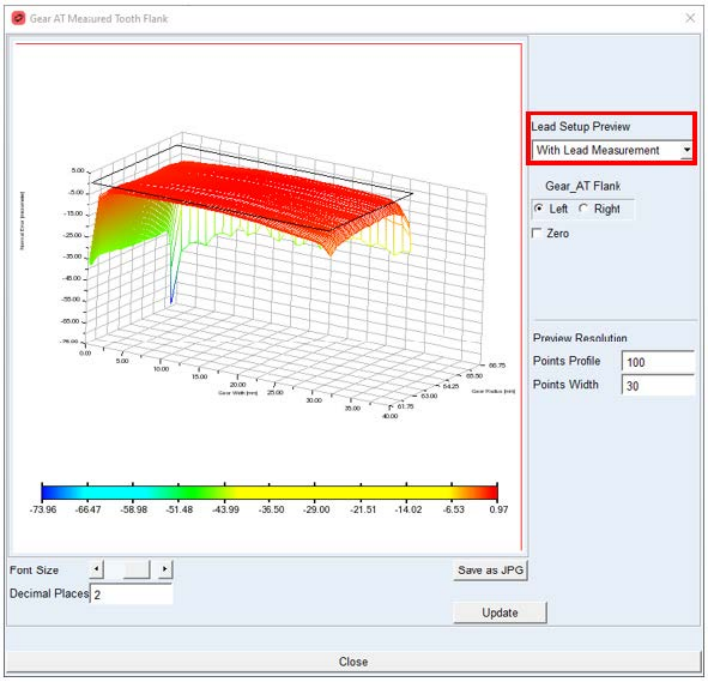
GearAT: Exact Gear Tooth Measurements

The manufactured gear can be measured on each tooth and flank and the produced measurements can be applied to each tooth. This real topology and deviations is used for very detailed simulations.



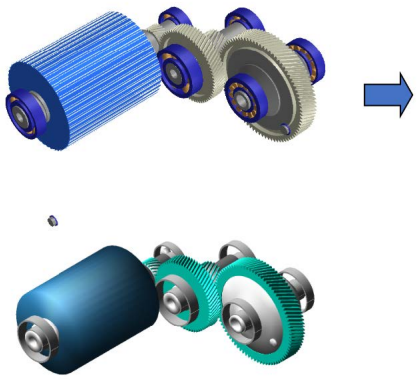


Visualization tools are included to check the imported data:



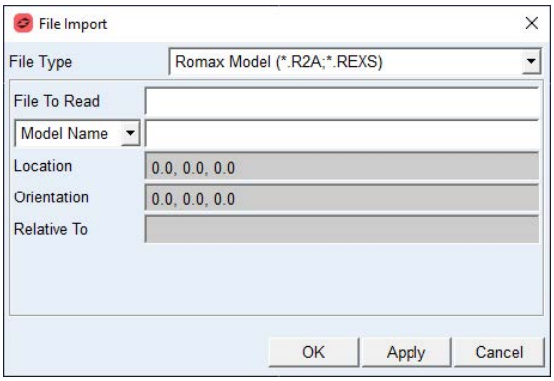
Romax to Adams

A new Getting Started guide is available in the standard Help documentation for Romax-to-Adams. A step by step example shows the process of easily converting a Romax model into an equivalent Adams model.



REXS File Import

It is now possible to import REXS model files into Adams if Romax (version 2023.1 or greater) is installed. The File Import dialog box can now accept this file format:



REXS models are converted, in the background using Romax, to the R2A (Romax to Adams) specification and then loaded in Adams.

Adams Solver

Utility Subroutines for Contact Node Incidents

For users that create contact subroutines (CNFSUB, CFFSUB) for flexible bodies, new utility subroutines exist that are used to identify node incidents and detailed contact data. These are:

N_NODE_INCIDENTS(id, oneflag, index, errflag)

```
Input Arguments:

id - integer specifying CONTACT ID
oneflag - integer specifying whether or not CNNSUB/CFFSUB should
be called once or multiple times:
oneflag = 1 specifies CNFSUB to be called once
oneflag = 2 specifies CFFSUB to be called once

Output
index - integer specifying Contact incident, numbered 1 to N
errflag - an integer specifying success/failure of function call
```

FLEX_CONTACT_DATA(id, comp, data, errflag)

```
Input Arguments

id - integer specifying CONTACT ID
comp - integer specifying node incident data to be returned:
1. loci (available in both CNFSUB/CFFSUB)
2. locj (available in both CNFSUB/CFFSUB)
3. ni (available only in CNFSUB)
4. nj (available only in CNFSUB)
5. gap (available only in CNFSUB)
6. gapdot (available only in CNFSUB)
7. gapdotdot (available only in CNFSUB)
8. slip displacement (available only in CFFSUB)
9. slip velocity (available only in CFFSUB)
10. normal force at node (available only in CFFSUB)

Output Arguments
```

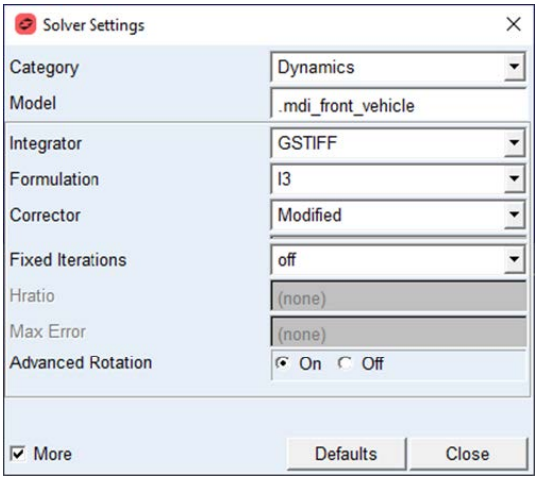
```
data - an double precision array of requested node incident data
errflag - an integer specifying success/failure of function call
```

New Handling of Angles – ADVANCED_ROTATION

Adams Solver has a new method for internally describing angles that is expected to have speed and robustness benefits for certain models. This new method avoids angular singularities during solution, preventing simulation restarts. However, in order to accomplish this, additional equations are added to the equation set so some robust models may run slightly slower. This is activated via the PREFERENCES Statement:

```
PREFERENCES/ADVANCED_ROTATION = {ON, OFF}
```

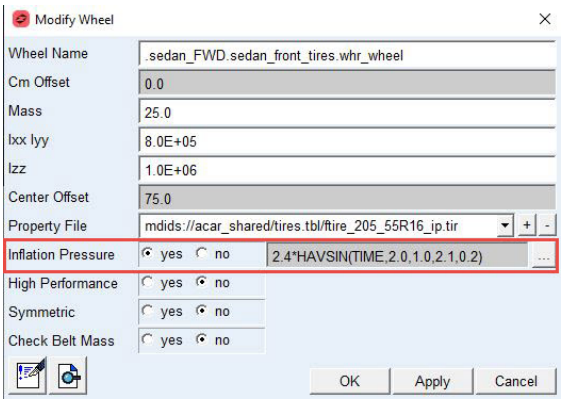
Or within the Adams View interface under Advanced Rotation:



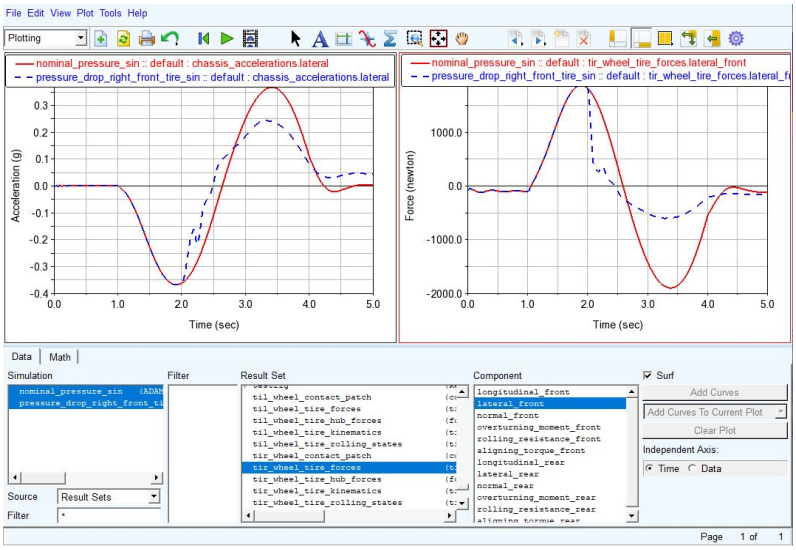
Adams Tire

Runtime Inflation Pressure Changes (FTire)

Simulating the effect of tire pressure changes on vehicle events is now possible when using the Cosin/FTire tire formulation. Tire pressure is specified using a runtime expression, as shown:



The effect of sudden tire pressure changes on a vehicle can easily be studied. The following example shows how the tire lateral force is greatly influenced by a drop in inflation pressure:

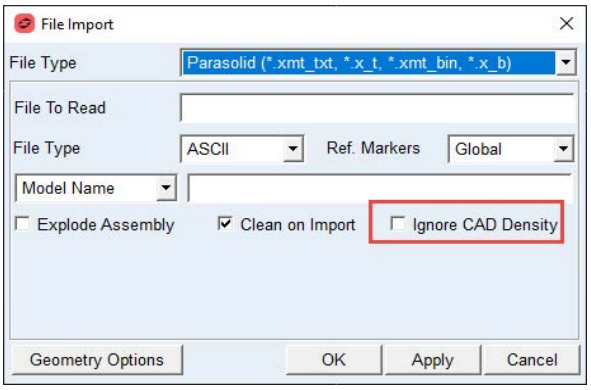


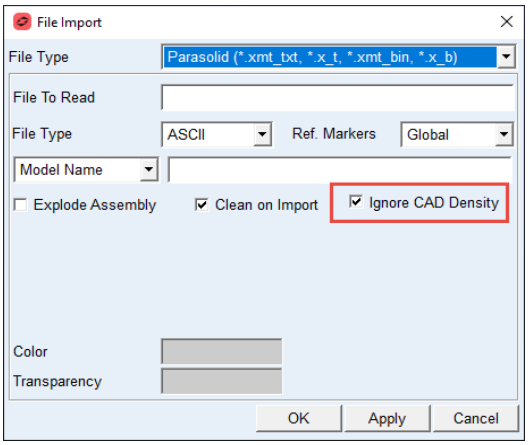
Adams View

Importing CAD with Density – New Defaults

Some CAD geometry types support a density specification. Prior versions would overwrite mass & density information for this operation. A new setting exists on the CAD import dialog box to avoid overwriting density information, as shown below. The default setting for this differs between Adams View and Adams Car as follows:

- Adams View: Ignore CAD Density defaults to Off.
- Adams Car: Ignore CAD Density defaults to On.





CAD Interoperability Version Support

The following table lists the versions of the supported CAD formats that can be imported and exported in Adams 2024.2 .

Format	Import Version	Export Version
IGES (.igs)	5.2 & 5.3	5.3
STEP (.stp)	203/214/242 P	214
ACIS (.sat)	All → R27	Not Supported
CATIA V4 (.model, .dlv, .exp, session)	All 4.XX	Not Supported
CATIA V5 (.CATPart, .CATProduct)	R10 → R33	Not Supported
CATIA V6 (.3dxml)	2014X → 2022X	Not Supported
Pro/Engineer part files (.prt, .asm)	13 → Creo 9	Not Supported
Inventor (.ipt, .iam)	All → 2023	Not Supported

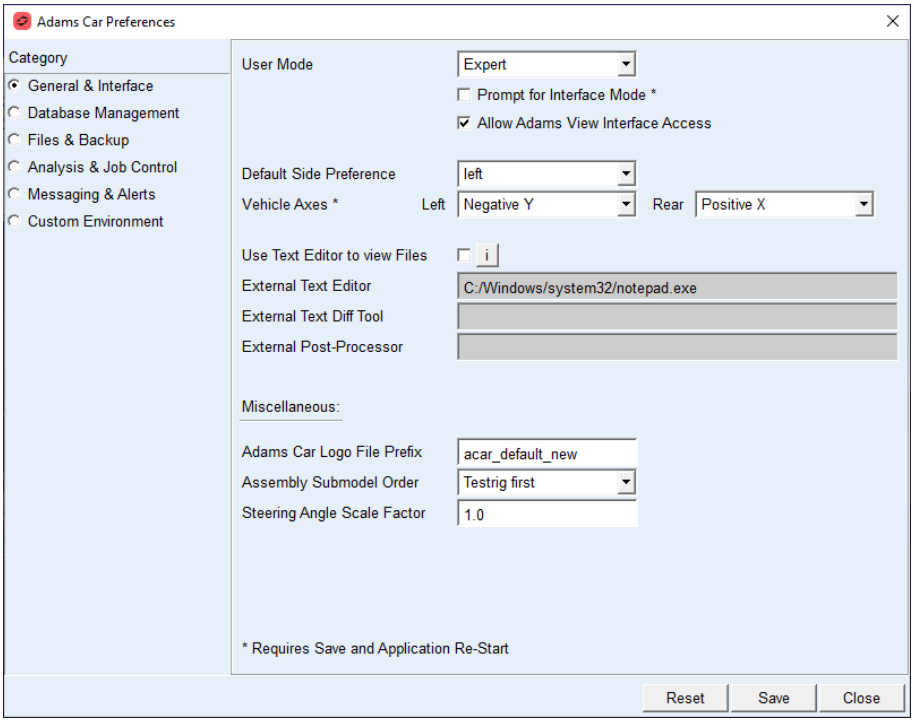
Format	Import Version	Export Version
Solidworks (.sldprt, .sldasm)	99 → 2023	Not Supported
Unigraphics (.prt)	11.1 → NX CR 1953, 1957 and 1969, 2212	Not Supported
JT : JtOpen (.jt)	7.0 → 10.5	Not Supported

Adams 2023.4 Release Notes

Adams Car

New Menu Structure

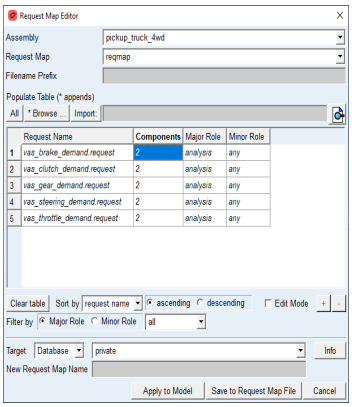
The menu structure has been updated to reflect a logical progression of tasks using the menus. To this end, a new Setup menu contains items that are done before the Simulate menu operations. Additionally, the menus make essential functions more easily discovered. The new '*Setup*' menu now appears between *Adjust* and *Simulate*:



With this approach the *Adjust* menu is mainly used to modify individual items and the *Setup* menu is mainly used to apply subsystem-wide or assembly-related changes, for example:

```
File 'file://c:/     /.acar.cfg' successfully copied to
     'file://c:/     /.acar.cfg.23-06-16.132321'.
save configuration - backup created of previous configuration file c:/     /.acar.cfg
```

Besides this, file operations (such as database (cdb) management) have been moved from the *Tools* menu into the *File* menu:



The following table maps old menu locations to new locations:

Old Menu Location	New Menu Location
File -> Info -> Modified Files	File -> Show -> Model Changes
File -> Info -> Subsystem	Setup -> Model Info -> Subsystem Info
File -> Manage -> Subsystems -> Synchronize	Setup -> Manage Subsystems -> Synchronize
File -> Info -> Assembly	Setup -> Model Info -> Assembly Info
File -> Manage -> Assemblies -> Add Subsystem	Setup -> Manage Assemblies -> Add Subsystem
File -> Manage -> Assemblies -> Add Testrig	Setup -> Manage Assemblies -> Add Testrig
File -> Manage -> Assemblies -> Remove Subsystem	Setup -> Manage Assemblies -> Remove Subsystem
File -> Manage -> Assemblies -> Remove Testrig	Setup -> Manage Assemblies -> Remove Testrig
File -> Manage -> Assemblies -> Replace Subsystem	Setup -> Manage Assemblies -> Replace Subsystem
File -> Manage -> Assemblies -> Replace Testrig	Setup -> Manage Assemblies -> Replace Testrig
File -> Manage -> Assemblies -> Testrig Activity	Setup -> Manage Assemblies -> Toggle Testrig Activity
File -> Manage -> Assemblies -> Toggle Subsystem Activity	Setup -> Manage Assemblies -> Toggle Subsystem Activity
File -> Manage -> Assemblies -> Update Variant	Setup -> Manage Variants -> Update Assembly Variant
File -> Manage -> Subsystems -> Update	Setup -> Manage Subsystems -> Update
File -> Manage -> Subsystems -> Update	Setup -> Manage Subsystems -> Update
File -> Manage -> Assemblies -> Create Variant	Setup -> Manage Variants -> Create Assembly Variant
File -> Manage -> Assemblies/Subsystems -> Delete Variant	Setup -> Manage Variants -> Delete Variant
File -> Manage -> Assemblies/Subsystems -> Rename Variant	Setup -> Manage Variants -> Rename Variant
Adjust -> Adjust Mass	Setup -> Mass Properties -> Design Mass Adjustment
Adjust -> Loading -> Table	Setup -> Mass Properties -> Loading Configuration
Adjust -> Shift	Setup -> Manage Subsystems -> Shift

Adjust -> Sprung Mass Table	Setup -> Mass Properties -> Sprung Mass Table
Adjust -> Actuators ->Table	Setup -> General Actuation -> Actuator Table
Adjust -> Kinematic Toggle	Setup -> Model Simplification -> Kinematic Toggle
Simulate -> Full Vehicle -> Vehicle Setup -> Delete Road Geometry	Setup -> Vehicle Environment -> Delete Road Geometry
Simulate -> Full Vehicle -> Vehicle Setup -> Set Full Vehicle Parameters	Setup -> Full Vehicle Assembly -> Full Vehicle Parameters
Simulate -> General Actuation Analysis -> Actuation Input File -> Open	Setup -> General Actuation -> Actuation Input File -> Open
Simulate -> General Actuation Analysis -> Actuation Input File -> Open	Setup -> General Actuation -> Actuation Input File -> Save
Simulate -> Full-Vehicle Analysis -> Path Optimization	Setup -> Vehicle Environment -> Path Optimization
Simulate -> Full-Vehicle Analysis -> Event Builder	Setup -> Vehicle Environment -> Event Builder
Simulate -> Full-Vehicle Analysis -> Road Builder	Setup -> Vehicle Environment -> Road Builder
Simulate -> Full-Vehicle Analysis -> Vehicle Set-Up -> Set Powertrain Parameters	Setup -> Full Vehicle Assembly -> Powertrain Parameters
Simulate -> Full-Vehicle Analysis -> Vehicle Set-Up -> Set SDI Request Activity	Setup -> Output & Requests -> Driving Machine
Simulate -> Full-Vehicle Analysis -Road Conversion	Setup -> Vehicle Environment -> Road Conversion
Simulate -> Full-Vehicle Analysis -> Set Road for Individual Tires	Setup -> Vehicle Environment -> Set Road for Individual Tires
Simulate -> Full-Vehicle Analysis -> Vehicle Set-Up -> Static Vehicle Set-Up	Setup -> Full Vehicle Assembly -> Static Vehicle Set-Up
Simulate -> Suspension Analysis -> Create Static Loadcase	Setup -> Suspension Assembly -> Create Static Loadcase
Simulate -> Suspension Analysis -> Set Suspension Parameters	Setup -> Suspension Assembly -> Suspension Parameters
Review -> Analysis Management -> Run (acf)	Simulate -> ACF Submit
Tools -> Database Management -> Add	File -> Manage Databases -> Database Management -> Add
Tools -> Database Management -> Create	File -> Manage Databases -> Database Management -> Create
Tools -> Database Management -> Database Migration	Tools -> Database Conversion -> Database Migration
Tools -> Model Diagnostics -> Highlight Connectivity	Setup -> Model Diagnostics -> Highlight Connectivity
Tools -> Model Diagnostics -> Model Auditor	Setup -> Model Diagnostics -> Model Auditor
Tools -> Model Diagnostics -> Spline Check/Repair	Setup -> Model Diagnostics -> Spline Check/Repair
Tools -> Model Diagnostics -> Spline Comparison	Setup -> Model Diagnostics -> Spline Comparison
Tools -> Model Reduction -> Anti-Roll Bars	Setup -> Model Simplification -> Anti-Roll Bars
Tools -> Model Reduction -> Remove Interface Parts	Setup -> Model Simplification -> Remove Interface Parts
Tools -> Model Reduction -> Tires	Setup -> Model Simplification -> Tires
Tools -> Requests -> Request Activity	Setup -> Output & Requests -> Request Activity
Tools -> Requests -> Request Map Activity	Setup -> Output & Requests -> Request Map Activity
Tools -> Requests -> Request Map Editor	Setup -> Output & Requests -> Request Map Editor
Tools -> Database Management -> Database Version	Tools -> Database Conversion -> Database Version

Upgrade	Upgrade
Tools -> Database Management -> Publish Assembly	File -> Publish -> Assembly
Tools -> Database Management -> Publish Subsystem	File -> Publish -> Subsystem
Tools -> Database Management -> Remove from Session	File -> Manage Databases -> Database Management -> Remove
Tools -> Database Management -> Set Default Writable	File -> Manage Databases -> Database Management
Tools -> Model Diagnostics -> Entity Info	Setup -> Model Info -> Entity Info
Tools -> Model Reduction -> Assembly Repositioning	Setup -> Manage Assemblies -> Reposition
Tools -> Model Reduction -> Remove Switch Parts	Setup -> Model Simplification -> Remove Switch Parts
n/a	File -> Save -> Preferences

New API For Optimization & Multi-Run Applications

A new Application Programming Interface (API) for Adams Car has been created to simplify the process of simulating & evaluating Adams Car models. This API, written in Python, simplifies:

- The inspection and simulation of existing Event or Event Set files,
- Opening, creating, saving & modifying Subsystems and Assemblies,
- The retrieval of Objective values and Result Set vectors and much more.

Complete examples are found in the Adams Car installation folder under the *acar**examples**python_api*\ folder. Documentation of the various classes & methods is found in Help, entitled '*Adams Car API Help*'.

Here is an abbreviated example for how to run an Event found in an Event Set file and extract a key metric from the simulation results:

```
from msc.ADAMS.acar.event import EventSetManager
esm = EventSetManager()
esm.import_event_sets("example1.esf")
my_event = esm['default']['api_example1_01_sdi']
my_event.execute('interactive')
my_event.generate_report()
print(my_event.report_metrics.keys())
print(my_event.report_metric_value('rear_axle_load'))
```

Some of the objects that can be called from this Python API include:

- Assembly, Subsystem, Testrig
- Database
- Event, Event Set, EventSetManager
- ExportFMU
- Utils

Improvements to Low-Speed Reverse Parking Events

Robustness improvements have been made to the Driving Machine that is used in machine-controlled parking events (closed loop steering events following a prescribed path), specifically for driving in reverse. This particularly applies to the case where uneven road profiles and realistic tires (that exhibit a delay in the build-up of lateral forces) would previously result in undesired steering response.

The Connecting Contour parameter, found in the Event Builder for Trajectory Planning, has also been enhanced with an 'auto' option. This new 'auto' option can select between the (default) cubic method and

the circular method, depending on driving conditions. The circular method typically works best for reverse driving, low-speed events.

If users select 'auto' for the Connecting Contour, the Driving Machine will use a "circular" connecting contour for reverse driving (when gear<0). This switches back to the default "cubic" connecting contour for forward driving if gear>0. This allows for using the same event settings for both forward and backwards driving.

In addition, assuming that the gyro is mounted at the location of the rear axle, the minimum preview distance (by default set to 5 meters) is reduced by the wheelbase if gear < 0. It should also be noted that a correction of the throttle/brake controller was made and now properly takes the gravitation force into account in the feedforward longitudinal controller while driving in reverse on a slope.

Adams Co-simulation Interface

Supported Versions of Software for Marc Co-simulation

An updated table of the Adams co-simulation Interface supported versions of Marc is shown below:

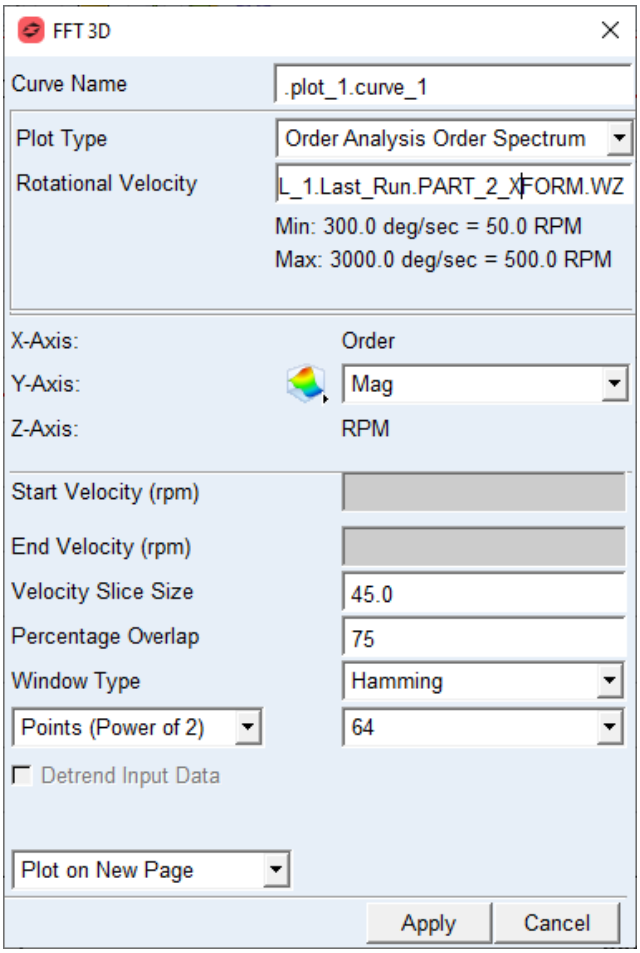
Marc version	ACSI supported version
Marc 2013.0	ACSI 2014.0, 2014.0.1
Marc 2013.1	ACSI 2014.0, 2014.0.1
Marc 2014.0	No support for ACSI
Marc 2014.1	No support for ACSI
Marc 2014.2*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2015*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2016 and later	ACSI 2015 and later

* The ACSI 2016 and later versions require a workaround for the case of Adams models co-simulating with Marc versions 2014.2 and 2015. Marc 2016 does not require this workaround. For details see the "Special requirements to run Marc" section of the Adams product documentation (Online Help) under "Adams Co-simulation Interface."

Adams PostProcessor

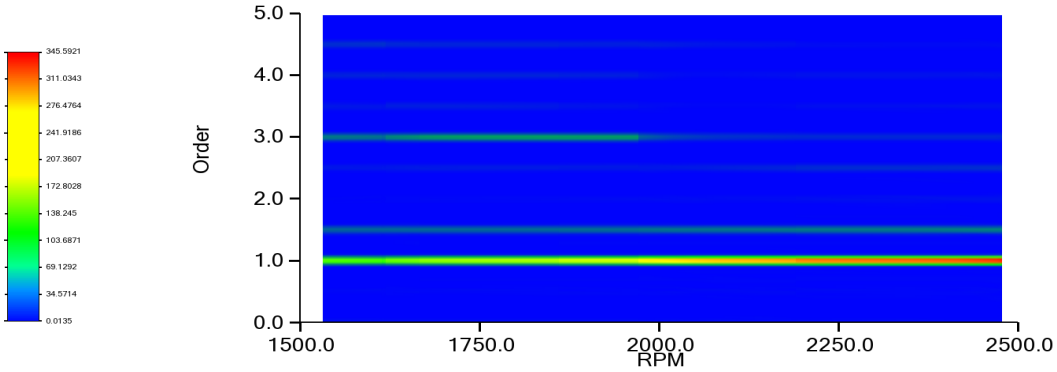
New 2D Order Plots from 3D FFT Plots

New Order Analysis plots are available when working with 3D FFT Order Analysis Spectrum plots (the General 3D FFT plot is not supported). This new functionality allows a user to create a 2D Curve Slice from an existing 3D FFT plot, as shown below:



Order plots can be created for:

- Amplitude vs RPM at Orders (example above),
- Amplitude vs Order at an RPM (example below).



Adams Real Time

Separate Cores for Tires

Real Time simulations running on SIMulation Worbench (SimWB) can realize frame rate improvements by assigning specific computer cores to the tire models in the vehicle.

By default, a tire model will run within the cores specified by MSC_ADAMS_THREAD_AFFINITY_SET0. Adams Solver will call the tire models and wait for the tire models to finish the force calculations.

For the tires that use the Standard Tire Interface (STI), thus the Adams Tire models and third-party tire models using the STI plugin, one can specify that the tire models should use separate cores for their force calculation by setting the environment variable MSC_ADAMS_TIRE_AFFINITY. In this way, the vehicle model frame rate will not suffer from all tire force calculations. For each tire a dedicated core needs to be specified and should not interfere with the cores specified by MSC_ADAMS_THREAD_AFFINITY_SET0. When having 4 tires, using 6 threads for the vehicle model, the specification could look like:

```
MDI_ADAMS_FORCE_NTHREAD=6
MSC_ADAMS_THREAD_AFFINITY_SET0=2-7
MSC_ADAMS_TIRE_AFFINITY=8,9,10,11
```

Real Time Animation on Linux Discontinued after 2023.4

The Real Time animation capability currently offered on Linux will be discontinued after the 2023.4 release. Hexagon is planning an improved real time animation capability for a future release.

Adams Solver

New Contact Measurement Functions

Additional information about CONTACT elements can now be accessed using the new runtime function:

```
CONTACT_DATA(id, comp, flag)
```

This function provides, based on the 'comp' input setting, runtime measurement of the following CONTACT parameters:

1. Penetration Depth
2. Penetration Velocity
3. Penetration Boring Velocity
4. Slip Deformation Magnitude
5. Slip Velocity Magnitude (Speed)

The '*flag*' input setting determines if the Maximum (0) or Minimum (1) of all incidents for this CONTACT, at this time, is returned.

Additionally, the *CONTACT()* runtime function has been expanded to include *Normal Magnitude* and *Friction Magnitude*. The complete list of outputs available with the CONTACT() runtime function is now:

1. Fm
2. Fx
3. Fy

4. Fz
5. Tm
6. Tx
7. Ty
8. Tz
9. Normal Mag
10. Friction Mag

For users creating CNFSUB() and CFFSUB() subroutines, new utility subroutines are available like so:

- N_CONTACT_INCIDENTS() – return the number of contact incidents associated with this contact element for this iteration.
- CONTACT_INCIDENT_INDEX() – return the current contact incident. Assumed to be called from a CNFSUB() or a CFFSUB() when the subroutine author needs to keep track of multiple contact incident locations for a single contact element.

Contact Performance Improvement

Performance improvements of up to 3X in wall time can be realized in simulations involving rigid body contact when using the HHT integrator. This speed-up will depend on model size, contact parameters and the number of Euler singularities that Solver encounters during the simulation.

Adams View

CAD Interoperability Version Support

The following table lists the versions of the supported CAD formats that can be imported and exported in Adams 2023.4.

Format	Import Version	Export Version
IGES (.igs)	5.2 & 5.3	5.3
STEP (.stp)	203/214/242 P	214
ACIS (.sat)	All → R27	Not Supported
CATIA V4 (.model, .dlv, .exp, session)	All 4.XX	Not Supported
CATIA V5 (.CATPart, .CATProduct)	R10 → R33	Not Supported
CATIA V6 (.3dxml)	2014X → 2022X	Not Supported
Pro/Engineer part files (.prt, .asm)	13 → Creo 9	Not Supported
Inventor (.ipt, .iam)	All → 2023	Not Supported
Solidworks (.sldprt, .sldasm)	99 → 2023	Not Supported

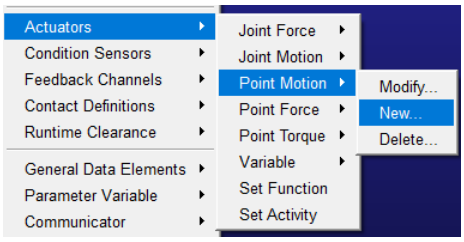
Format	Import Version	Export Version
Unigraphics (.prt)	11.1 → NX CR 1953, 1957 and 1969, 2212	Not Supported
JT : JtOpen (.jt)	7.0 → 10.5	Not Supported

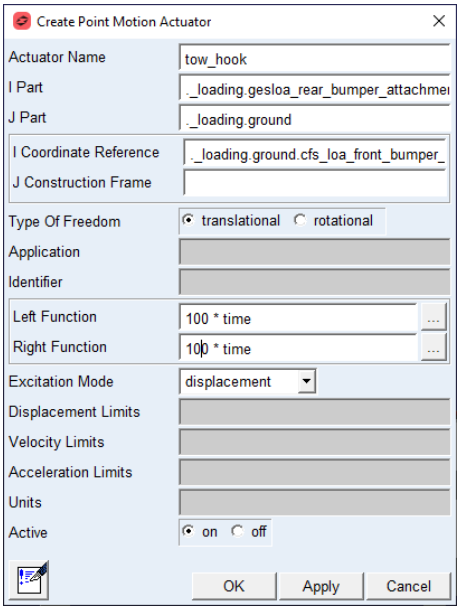
Adams 2023.3 Release Notes

Adams Car

Point Motion Actuators

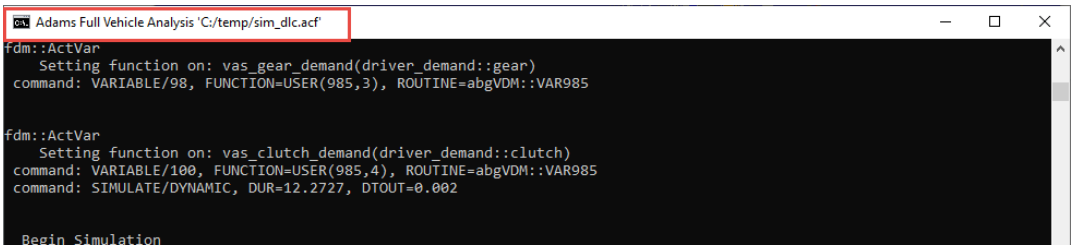
Adams Car traditionally has supported Actuator types of joint force, joint motion, point force & point torque. With this release it is now possible to create an Actuator of type 'point motion':





Background Simulation Shell Shows ACF Filename

Background simulations launched from Adams Car now show both the name and location of the currently-running ACF file in the title-bar of the simulation window. This is helpful when multiple simulations are being executed concurrently in different windows. Finding a specific simulation is now possible by inspecting the title-bar for the desired ACF file.



Improvements to Events

The following improvements have been made to the standard Events available in Adams Car:

- A new 'Disengage clutch' option is available for the Braking and Braking-in-turn events.
- The Frequency Response event is now more flexible when Input Type = Swept Sine, allowing for specification of the initial & maximum frequencies, the frequency rate and the event start time.
- A 'Steering Release' option is new for the Step Steer event. Allows user to specify a time when the steering wheel is to be released.

Car True Batch Mode

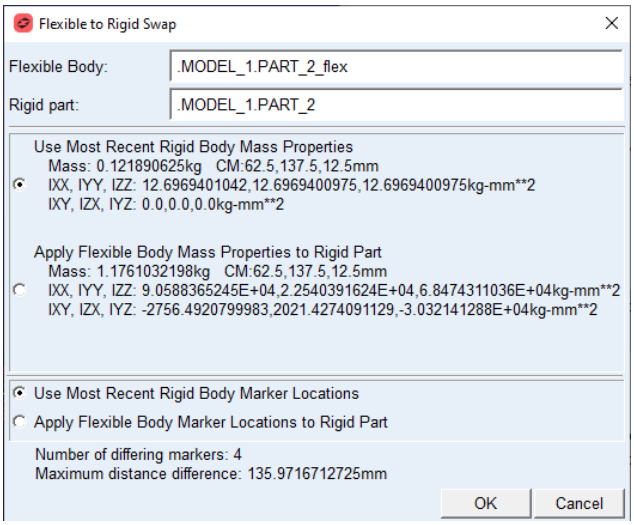
Past versions of Adams Car could be simulated in 'batch' mode, but a requirement existed that the computer must have a valid graphics card & graphics environment. In this release of Adams Car the batch mode scripting can operate on machines that do not contain graphics cards (as found on 'compute servers').

The majority of Adams Car functionality will work in this new environment, but some of the utility applications such as the Road Builder or Leaf Spring Editor may not yet function properly. To use the old behavior for graphics, set the environment variable: HMI_ACAR_LEGACY_BATCH_MODE=1

Improved Flex-to-Rigid Swap

It is now possible to 'undo' a rigid-to-flex (MNF Import) operation, replacing a flexible body with a rigid part. Previously, a flexible body could have its inertia invariants set to rigid to approximate a rigid part but that method required the retention of the (possibly large) mnf file and it also required an Adams Flex license. With this new swap behavior, a smaller Adams Solver model can be realized and the Adams Flex license is not required.

Users can simply right-click on a flexible body to find the two options of "Make Rigid (Retain Mesh)" and "Make Rigid (Original Geometry)". The "Retain Mesh" method simply keeps the flexible body in the model and sets the inertia invariants of the flex body to approximate a rigid body. Choosing the "Original Geometry" method attempts to replace an existing flexible body with the original rigid geometry if it is present in the model. The user is prompted for action when mass & inertias don't match between the rigid & flexible bodies, like so:



Note:	Existing *.acar.cfg files from older Adams versions (prior to *v2023.2)* undergo a one-time conversion process to a new format. This new format is not understood by previous (v2023.1 and prior) Adams versions, so launching older Adams versions will not reflect changes made in the newer format. For users who regularly switch between older and newer versions, it is recommended to save an old-style acar.cfg to a different name (acar_legacy.cfg) and use the 'ACar Preferences' section of the Registry Editor to reference this old-style file. Then, simply maintain the default Preference setting in newer versions. Refer the article Adams Car preferences, private configuration file changes and incompatibilityfor further details.

Adams Controls

New FMU File-Saving Options

Functional Mockup Units (FMUs) exported from Adams now contain two new parameters that control which output files are retained when an FMU is run as a 'child' from within another process. The new options named save_messages and save_results are of type Boolean and will appear as fixed parameters for an FMU exported from Adams. Both parameters default to FALSE, but can be set to TRUE in a host application to turn on output of the Adams Solver Message (.msg) and Results (.res) files, respectively.

These new parameters are an easier way to enable saving of these file types. Previously users would have to set the MSC_ADAMS_REAL_TIME string parameter to specific keywords; these Boolean parameters should be more intuitive. Note that writing of the .res and .msg files requires some computing resources so the fastest performance will be when these parameters are set to the default of FALSE. Turn on the .msg and .res files when debugging or verification is required.

Encrypted FMUs for dSPACE SCALEXIO

Adams FMUs exported to the dSPACE SCALEXIO platform now support the 'Encrypted' option. These FMUs are intended for co-simulation with dSPACE SCALEXIO; in past releases the Adams model within the FMU could be inspected. This new functionality encrypts the Adams (.adm) model, providing a level of security when sharing models that potentially contain proprietary information.

Adams Co-simulation Interface

Supported Versions of Software for Marc Co-simulation

An updated table of the Adams co-simulation Interface supported versions of Marc is shown below:

Marc version	ACSI supported version
Marc 2013.0	ACSI 2014.0, 2014.0.1
Marc 2013.1	ACSI 2014.0, 2014.0.1
Marc 2014.0	No support for ACSI
Marc 2014.1	No support for ACSI
Marc 2014.2*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2015*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2016 and later	ACSI 2015 and later

* The ACSI 2016 and later versions require a workaround for the case of Adams models co-simulating with Marc versions 2014.2 and 2015. Marc 2016 does not require this workaround. For details see the "Special requirements to run Marc" section of the Adams product documentation (Online Help) under "Adams Co-simulation Interface."

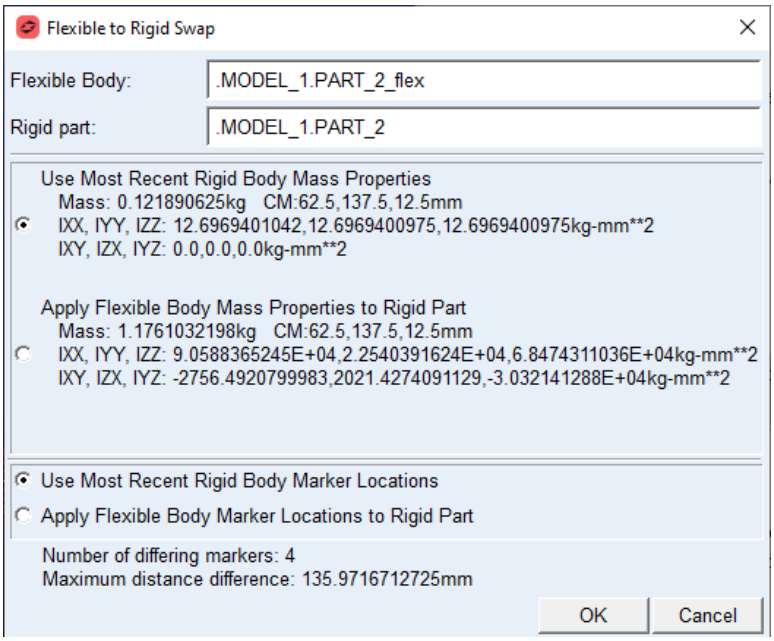
Adams Flex

Improved Flex-to-Rigid Swap

It is now possible, in both Adams View and Adams Car, to 'undo' a rigid-to-flex (MNF Import) operation, replacing a flexible body with a rigid part. Previously, a flexible body could have its inertia invariants set to rigid to approximate a rigid part but that method required the retention of the (possibly large) mnf file and it also required an Adams Flex license. With this new swap behavior, a smaller Adams Solver model can be realized and the Adams Flex license is not required.

Users can simply right-click on a flexible body to find the two options of "Make Rigid (Retain Mesh)" and "Make Rigid (Original Geometry)". The "Retain Mesh" method simply keeps the flexible body in the model and sets the inertia invariants of the flex body to approximate a rigid body. Choosing the "Original

Geometry" method attempts to replace an existing flexible body with the original rigid geometry if it is present in the model. The user is prompted for action when mass & inertias don't match between the rigid & flexible bodies, like so:



Adams Machinery

BearingAT: Cylindrical Roller Bearings Without Inner Ring

It is now possible to create cylindrical roller bearings without an inner ring. This applies to bearings created directly in Adams as well as those created from a REXS file import.

Adams PostProcessor

Performance Improvements with Large Flexible Bodies

Models containing large flexible bodies may exhibit performance improvements in the following areas:

- Loading existing animations can be up to 4X faster for some models.
- Preparing animations for the first time ("memory pre-caching") can be up to 40% faster.

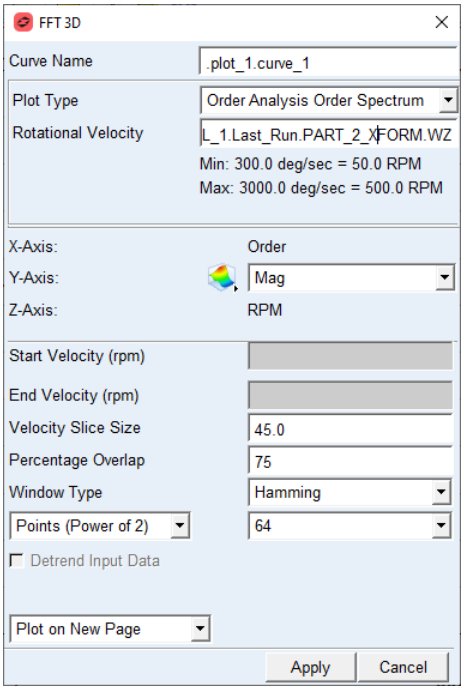
Preparing animations need only happen once due to the following improvements made to flexible body caching:

- Memory pre-caching will be saved to disk when you switch result set or animation type so that the time to prepare the animation is avoided when you return to it.
- Flex body cache files (.fcf) persist from session to session. This means that the work to prepare the flex body for animation is saved when you leave a session and reused when you return to the model

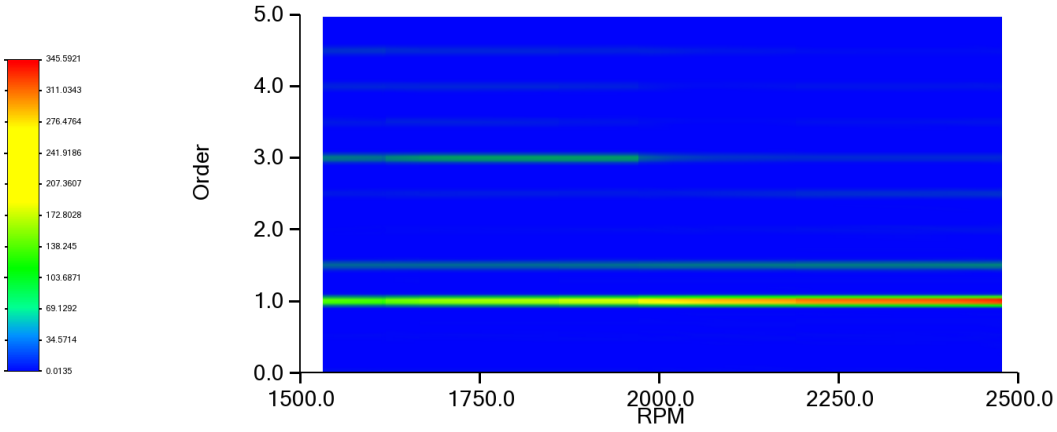
in a new session as long as the .fcf can be found. This avoids the time to prepare animations in subsequent sessions.

Order Analysis Plotting

This is an extension to Adams Post Processor's 3D FFT capability to allow generation of a 3D plot of an Adams result set component signal's amplitude over RPM slices versus order. The RPM is from a user-chosen reference rotational velocity Adams result set component. This reference rotational velocity must be monotonically increasing or, at least, have an average that monotonically increases. Adams can pick out such averages if, for example, the signal is sinusoidal about an increasing mean as in the case of many motor-driven rotating machinery applications.



Order Analysis plots can be visualized as either 3D surfaces or colormaps, as shown below, that represent magnitude with respect to order and input rotational velocity:

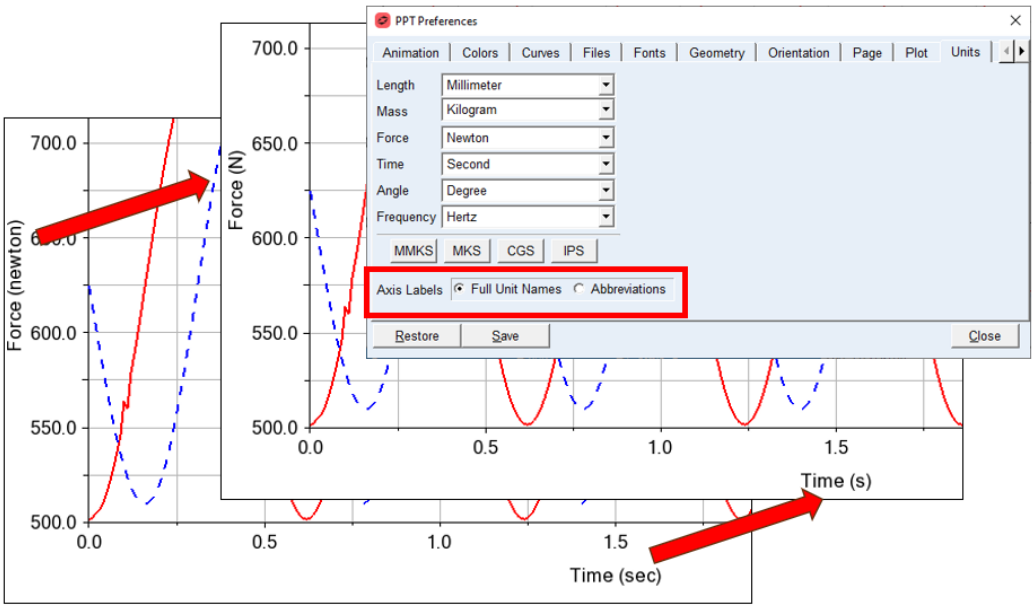


Abbreviation Option for Plot Unit Labels

It is now easy to change unit labels in plots to Abbreviations from Full Names. Examples of abbreviations for units vs full names might be:

```
Force: newton vs N
Time: sec vs s
Torque: newton-mm vs N-mm
```

This setting is found in Adams PostProcessor under *Edit* → *Preferences* as shown below:



Adams Real Time

New Setup Guide for VI-grade Driving Simulator

A new document has been created that illustrates how to use an Adams Real Time model (exported from Adams Car) with VI-DriveSim and the VI-grade DESKTOP Simulator running in SIMulation Workbench (SimWB) on a Concurrent Redhawk Realtime OS. See the Adams Real Time documentation, located under the 'Adams Advanced Package' section of the documentation.

Tire Performance Improvements & New Capabilities

Models using the PAC2002 tire format can run up to *15% faster* in Real Time simulations, as compared to the previous version.

Belt Dynamics and 3D Enveloping Contact in Real Time

Tire models using *belt dynamics* effects can now run in Real Time. Tire property files that specify belt dynamics must be changed to use the new '*INTERNAL*' option to realize the performance benefits. Any simulation in Adams using tires with belt dynamics can be changed from the old settings of:

```
BELT_DYNAMICS = 'YES' OR BELT_DYNAMICS = 'EXTERNAL'
to the new setting of
BELT_DYNAMICS = 'INTERNAL'
```

As well, tires using the *3D enveloping contact* feature now run in Real Time simulations.

Adams View

CAD Interoperability Version Support

The following table lists the versions of the supported CAD formats that can be imported and exported in Adams 2023.3.

Format	Import Version	Export Version
IGES (.igs)	5.2 & 5.3	5.3
STEP (.stp)	203/214/242 P	214
ACIS (.sat)	All → R27	Not Supported
CATIA V4 (.model, .dlv, .exp, session)	All 4.XX	Not Supported
CATIA V5 (.CATPart, .CATProduct)	R10 → R33	Not Supported
CATIA V6 (.3dxml)	2014X → 2022X	Not Supported
Pro/Engineer part files (.prt, .asm)	13 → Creo 9	Not Supported
Inventor (.ipt, .iam)	All → 2023	Not Supported

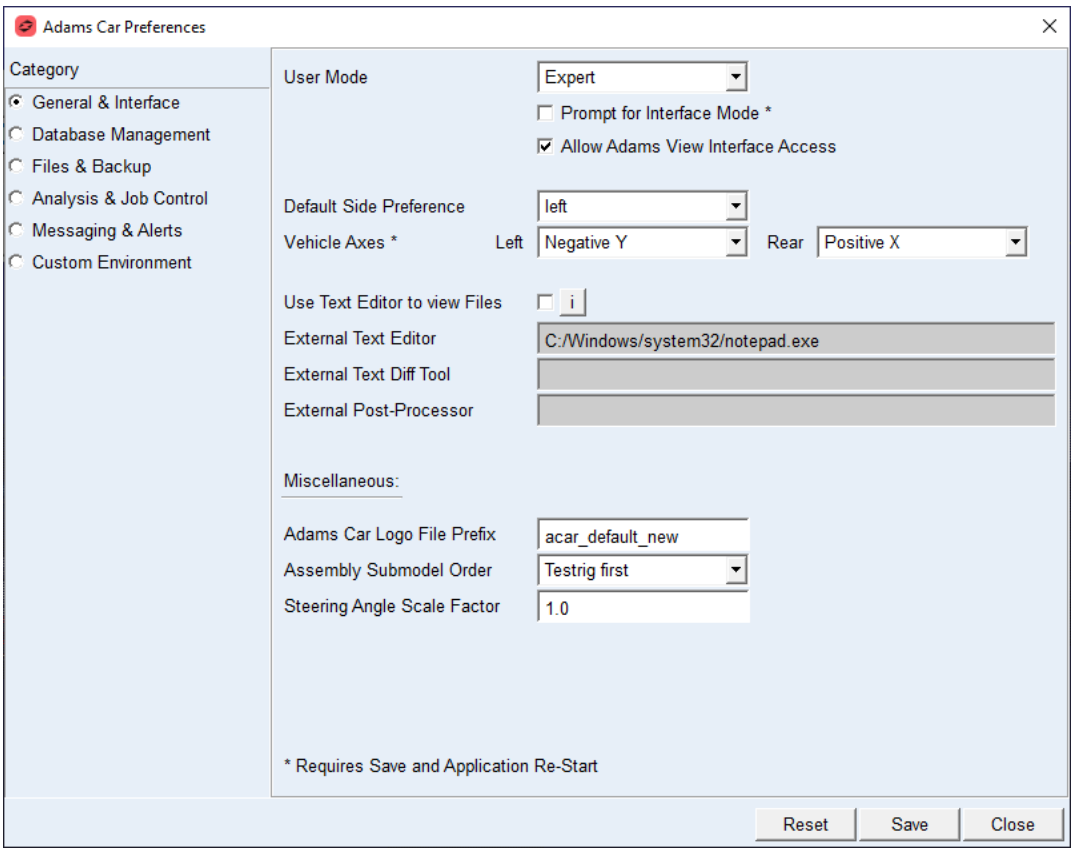
Format	Import Version	Export Version
Solidworks (.sldprt, .sldasm)	99 → 2023	Not Supported
Unigraphics (.prt)	11.1 → NX CR 1953, 1957 and 1969, 2212	Not Supported
JT : JtOpen (.jt)	7.0 → 10.5	Not Supported

Adams 2023.2 Release Notes

Adams Car

Adams Car Preferences

Setting preferences in Adams Car has been simplified with the new Preferences (*Settings* → *Preferences*) panel. Past versions required users to edit the *.acar.cfg file in a text editor to persist settings; now it is much easier in a graphical user interface, like so:

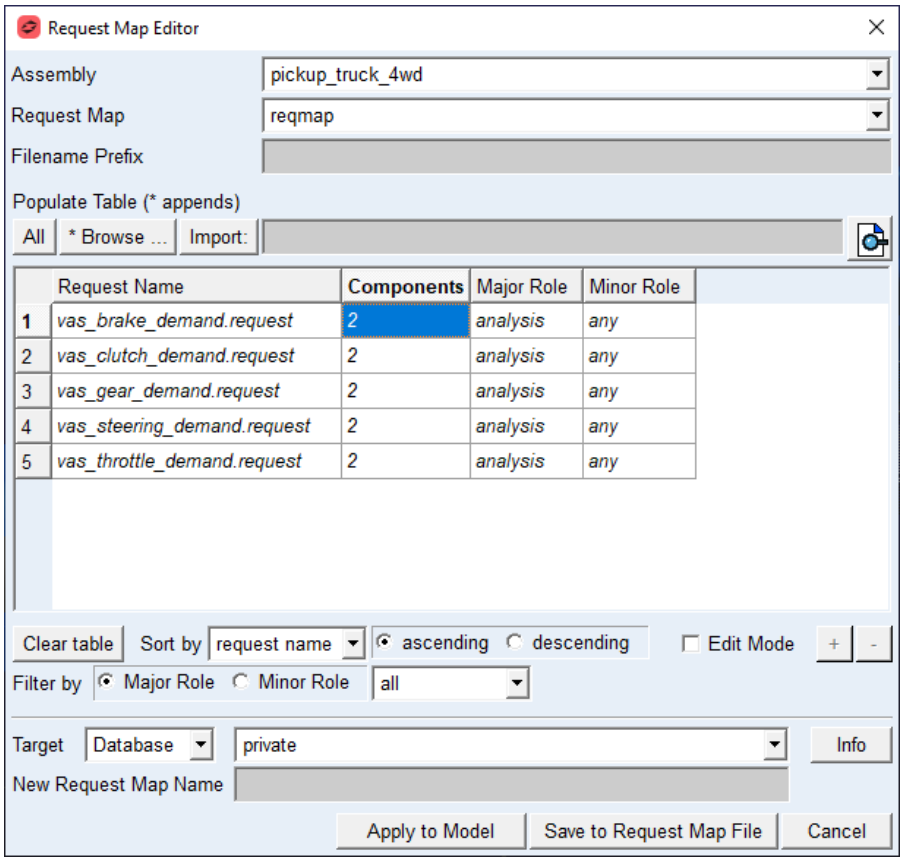


Note:	Changes made in the Preferences panel get written to the private *.acar.cfg file. The location of this file is reported in the Command Window (press F3 to open Command Window):
	
	`File 'file://c:/ /.acar.cfg' successfully copied to 'file://c:/ /.acar.cfg.23-06-16.132321'.`
	`save configuration - backup created of previous configuration file c:/ /.acar.cfg`

Note:	Existing *.acar.cfg files from older Adams versions (prior to *v2023.2)* undergo a one-time conversion process to a new format. This new format is not understood by previous (v2023.1 and prior) Adams versions, so launching older Adams versions will not reflect changes made in the newer format. For users who regularly switch between older and newer versions, it is recommended to save an old-style acar.cfg to a different name (acar_legacy.cfg) and use the 'ACar Preferences' section of the Registry Editor to reference this old-style file. Then, simply maintain the default Preference setting in newer versions. Refer the article Adams Car preferences, private configuration file changes and incompatibilityfor further details.

Request Map Editor Updates

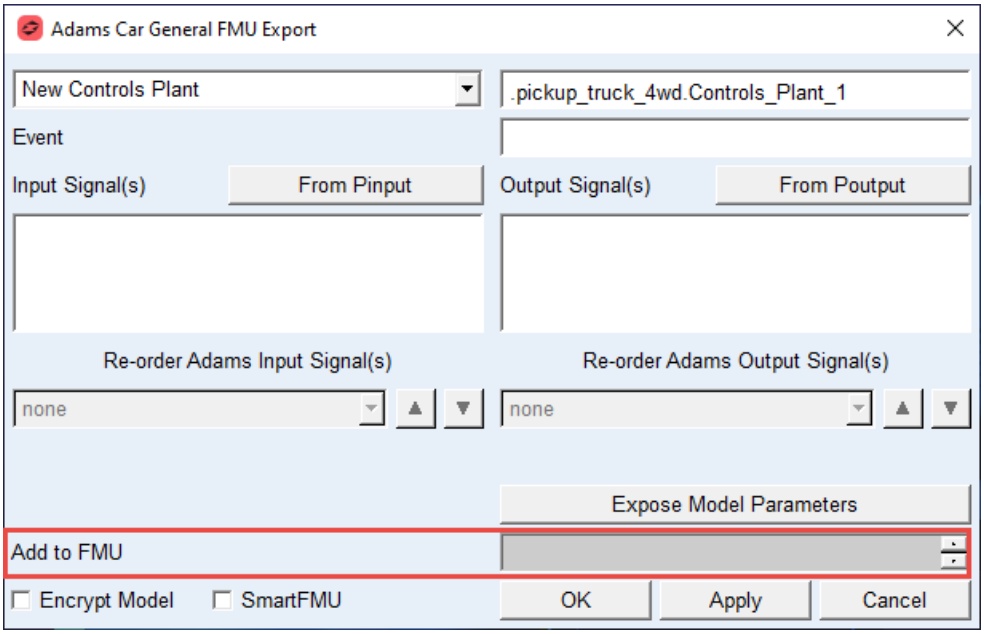
The Request Map Editor functionality is now used for both RPC and MAT file export. As such, the Request Map Editor and Request Map Activity dialog boxes contain minor cosmetic changes to better support both formats:



Adams Controls

Allow Additional Files when Building FMUs

Adams Controls can be used to create Functional Mockup Unit (FMU) files. The export process for FMU creation has been enhanced to let the user include arbitrary files in the fmu. This is useful for cases where the fmu model requires an additional dll or data file, for example, to run properly. There are several ways to create an FMU file in Adams View or Adams Car; the 'Car General FMU Export' dialog box, below, shows the new *Add to FMU* field that allows users to browse for files that will be packaged into the fmu:



Adams Co-simulation Interface

Supported Versions of Software for Marc Co-simulation

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Marc 2014.0	No support for ACSI
Marc 2014.1	No support for ACSI
Marc 2014.2*	ACSI 2015-2015.1, ACSI 2016*-

Marc version	ACSI supported version
	2019.0*
Marc 2015*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2016 and later	ACSI 2015 and later

* The ACSI 2016 and later versions require a workaround for the case of Adams models co-simulating with Marc versions 2014.2 and 2015. Marc 2016 does not require this workaround. For details see the "Special requirements to run Marc" section of the Adams product documentation (Online Help) under "Adams Co-simulation Interface."

Adams Drill

Adams Drill 2022.4 is the Last Release

Beginning with Adams 2023.1, Adams Drill is no longer included in Adams releases. If you have any questions about the transition, please contact your Hexagon Account Manager.

Adams Linear

FE_PARTs Work with Adams Linear & Animation

FE_PART elements now support Adams Linear animations. In the prior release, the FE_PART worked with Adams Linear solutions but animation was not supported. It is now possible to perform Linear simulations in Adams with models containing FE_PARTs and view tables for eigenvalues & vibration results as well as animate the linearized system.

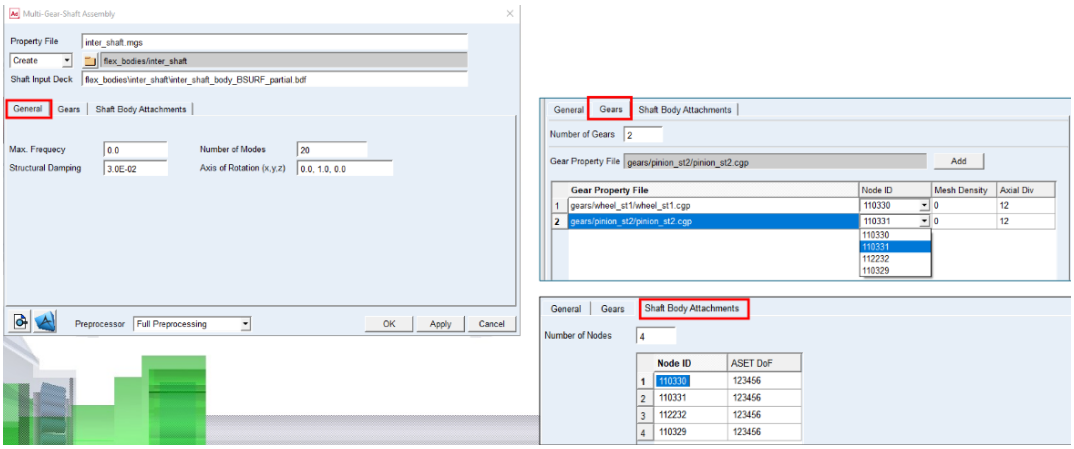
Note:	Only the formulation of "3D Beam" for the FE_PART is supported in Adams Linear for this release. The "2D Beam" methods will not work with Adams Linear for this release.

Adams Machinery

GearAT: Multi-Gear Shafts

Modeling geared systems having multiple gears on a single shaft that are in contact with other gears has has traditionally been a difficult task. GearAT has been enhanced to automatically orient gears in contact so that initial conflicts (penetration of gear teeth) are avoided and complex geared systems begin the simulation in a suitable configuration.

Multiple full-flex gear elements can be mounted to flexible shaft elements and oriented into consistent initial configurations for a gear system. In the past, this process was laborious and error-prone; in this release much of the connection & orientation logic is handled by GearAT.



Adams Real Time

Update Earlier Adams Car FMUs

FMUs generated before Adams 2021.3 and contain Adams Car model .adm files need to be updated in order to be solved in 2021.3 and beyond. Due to the elimination of the Adams Chassis product, there is no "apresolver" library anymore which may be referenced by older .adm files. So, please regenerate such FMUs from this version or later of Adams.

Adams Solver

Direct Export to .mat (HDF5) Format

It is now possible to export simulation results directly to the Matlab .mat format from an Adams Solver simulation. The .mat format is version 7.3, which is an HDF5-based format. The OUTPUT statement for Adams Solver now supports the following new option:

OUTPUT/MATSAVE

This statement can be added to your model in Adams View & Adams Car via the *Settings* → *Solver* → *Output* menu picks, selecting the 'More' checkbox, then selecting the '*Durability Files*' sub-category:

```
File 'file://c:/      /.acar.cfg' successfully copied to
     'file://c:/      /.acar.cfg.23-06-16.132321'.
save configuration - backup created of previous configuration file c:/      /.acar.cfg
```

Enabling this setting will export REQUEST elements in the model to the .mat format. Which REQUESTs are saved differ like so:

1. Adams View models: all REQUEST elements in the model are saved to a .mat file when the simulation completes.

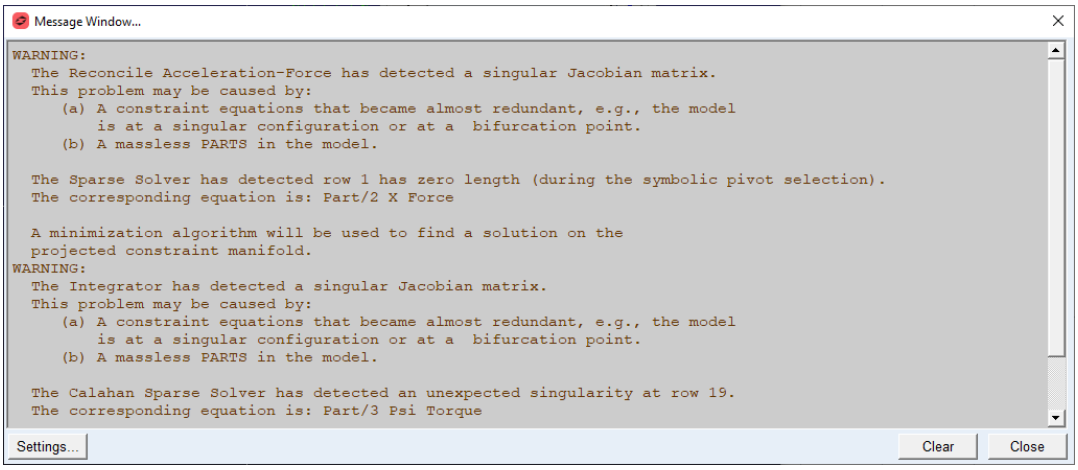
2. Adams Car models: if a Request Map file is used (*Tools → Requests → Request Map Editor)* then only the REQUESTs defined in the Request Map file are exported. If Request Maps are not used then all active REQUESTs are exported to the .mat file.

Note:	This release of Adams Python also includes the **h5py** (https://docs.h5py.org/en/stable/) module for working with HDF5 files via Python scripting, for example:
	
	`import h5py`
	
	`# Print all keys (result names) found in .mat file:`
	
	`with h5py.File('somefile.mat') as f:`
	
	`for res_key in f.keys():`
	
	`print(res_key`

Adams View

Warnings & Errors Now Color-Coded

Warning & Error messages that appear in the Message Window in Adams View & Adams Car are now displayed using different colors. It should now be easier to distinguish between the three levels of Information, Warning & Error Messages:



CAD Interoperability Version Support

The following table lists the versions of the supported CAD formats that can be imported and exported in Adams 2023.2.

Format	Import Version	Export Version
IGES (.igs)	5.2 & 5.3	5.3
STEP (.stp)	203/214/242 P	214
ACIS (.sat)	All → R27	Not Supported
CATIA V4 (.model, .dlv, .exp, session)	All 4.XX	Not Supported
CATIA V5 (.CATPart, .CATProduct)	R10 → R31	Not Supported
CATIA V6 (.3dxml)	2011 → 2013X	Not Supported
Pro/Engineer part files (.prt, .asm)	13 → Creo 8.0	Not Supported
Inventor (.ipt, .iam)	All → 2021	Not Supported
Solidworks (.sldprt, .sldasm)	99 → 2021	Not Supported
Unigraphics (.prt)	11 → NX CR 1953, 1957 and 1969	Not Supported
JT : JtOpen (.jt)	7.0 → 10.5	Not Supported

Adams 2023.1 Release Notes

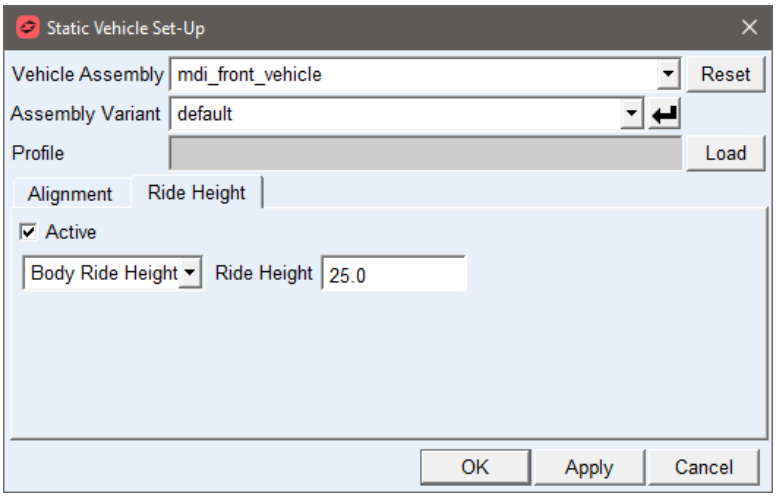
Adams Car

Automatic Ride Height Adjustment in Suspension Analyses

To make it easier to set the ride height prior to subsequent analyses, the suspension testrig (__MDI_SUSPENSION_TESTRIG) now includes a body (chassis) part constrained to ground with an adjustable force. The user sets the target ride height, and the body moves up or down during the initial static equilibrium phase, prior to the desired suspension analysis.

Background: When you enable *Ride Height Adjustment*, you specify the target ride height relative to the design position. The target ride height is achieved during static equilibrium. In subsequent transient or quasi-static, or static analyses of that event, the ride height remains fixed.

The alignment button  , when running a suspension analysis, displays a new option for *Body Ride Height*, as shown below:



Adams Co-simulation Interface

Supported Versions of Software for Marc Co-simulation

An updated table of the Adams co-simulation Interface supported versions of Marc is shown below:

Marc version	ACSI supported version
Marc 2013.0	ACSI 2014.0, 2014.0.1
Marc 2013.1	ACSI 2014.0, 2014.0.1
Marc 2014.0	No support for ACSI

Marc version	ACSI supported version
Marc 2014.1	No support for ACSI
Marc 2014.2*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2015*	ACSI 2015-2015.1, ACSI 2016*-2019.0*
Marc 2016 and later	ACSI 2015 and later

* The ACSI 2016 and later versions require a workaround for the case of Adams models co-simulating with Marc versions 2014.2 and 2015. Marc 2016 does not require this workaround. For details see the "Special requirements to run Marc" section of the Adams product documentation (Online Help) under "Adams Co-simulation Interface."

Adams Drill

Adams Drill 2022.4 is the Last Release

Beginning with Adams 2023.1, Adams Drill is no longer included in Adams releases. If you have any questions about the transition, please contact your Hexagon Account Manager.

Adams Linear

Linear Support for FE_PARTs

Prior to this release of Adams, models containing FE_PARTs could not be used for an Adams Linear analysis. This release supports models with FE_PARTs but only in tabular output form. Animation of Linear results with models containing FE_PARTs is not yet supported; this will appear in a future release.

Adams Machinery

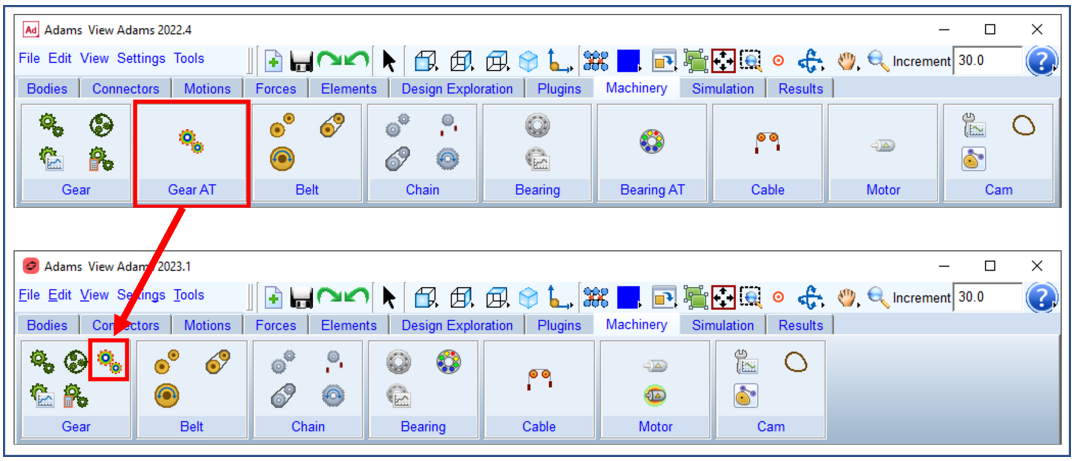
Romax to Adams Translator: Expanded List of Elements

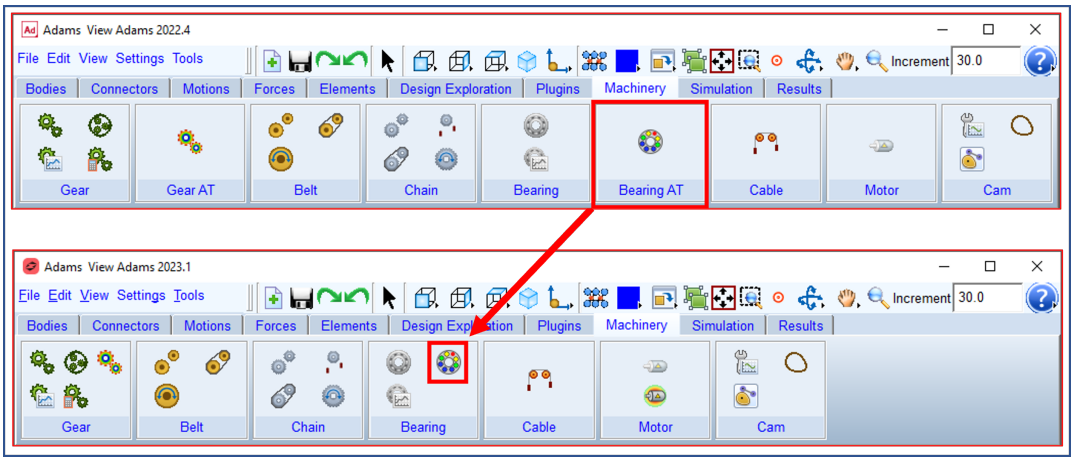
More Romax modelling entities may now be translated into Adams Machinery components, including:

- Straight / Spiral Bevel Gear types: modelled with the Romax Detailed or Romax Concept methodologies
- Hypoid Gear types: modelled with the Romax Detailed or Romax Concept methodologies
- Romax Loading Planetary Gear Set: mapped to equivalent arrangement of Adams PARTs and general constraints
- Improved handling of mass properties related to Shaft & Bore dimensions for Romax Detailed and Romax Concept gears

Gear AT and Bearing AT: Consolidation under Machinery ribbon containers

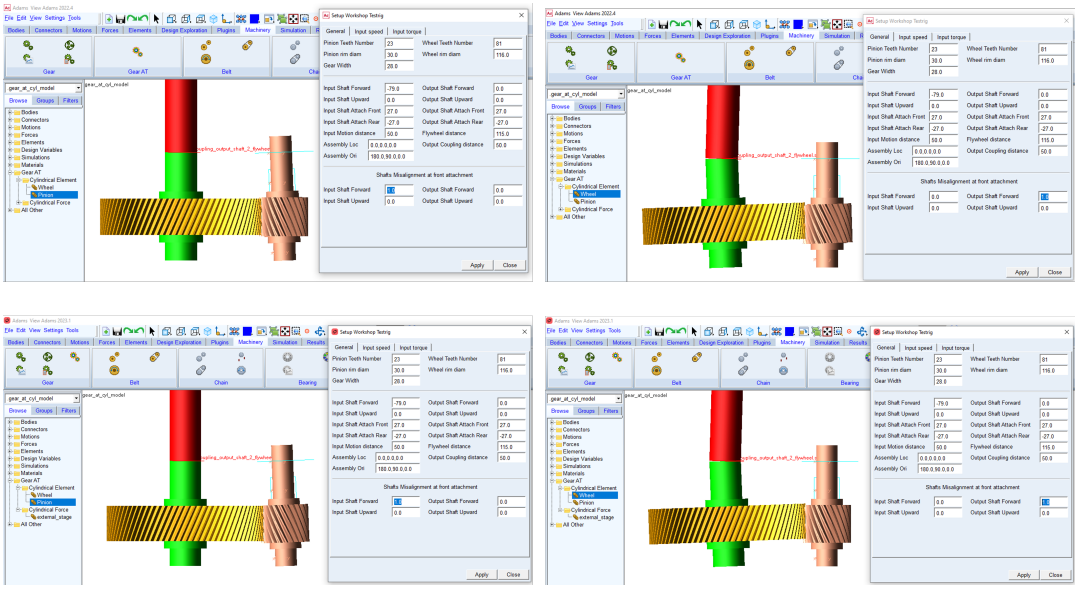
In previous release of Adams, Gear AT and Bearing AT menus were accessible from Machinery ribbon each having its dedicated container. In this release, Gear AT and Bearing AT menu buttons were moved to reside within the Machinery Gear and Bearing containers, respectively.



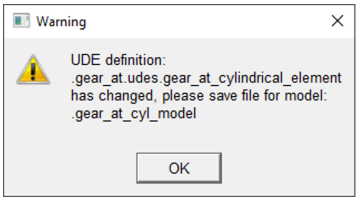


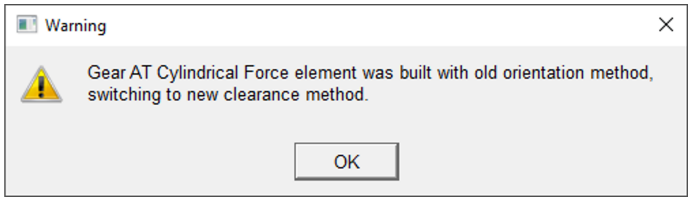
Gear AT: New orientation method for cylindrical gear pair by clearance study

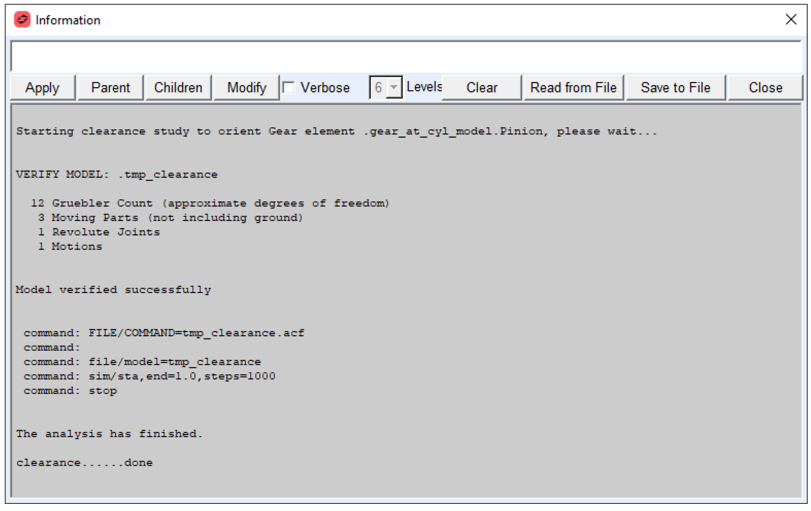
Prior to this release of Adams, Gear AT cylindrical gear elements were parametrized in a gear pair during gear force creation by use of formula, so the gear meshing was properly set up. However, this approach imposed some limitations when complex gear trains had to be set up, such as planetary stage, gear train with idler gear and when a gear shaft misalignment had to be imposed at design position.



In current Adams release those limitations are removed by using new orientation method which is based on clearance study. In background, Adams creates model to run clearance study of a gear pair using gear rim solid geometry to correctly orient the gears. Please note that the process will fail in case there is no clearance possible in current gear pair set up.







Bearing AT: TeimOrbit Support for Cylindrical and Needle Roller Bearings

Property files for Cylindrical & Needle Roller Bearings have been consolidated into a single file using the TeimOrbit file format. This file format is human-readable and logically structured, which simplifies the task of organizing and inspecting property files. Users will now use a single property file of type *.NPF and single contact file of type *.NCF (for the needle roller bearing) where previously four files were needed (*.NPF, *.NIF, *.NOF and *.NCF for contact). Similarly for the cylindrical roller bearing, there will be now a single property file of type *.RPF and single contact file of type *.RCF where previously four files were needed (*.RPF, *.RIF, *.ROF and *.RCF for contact).

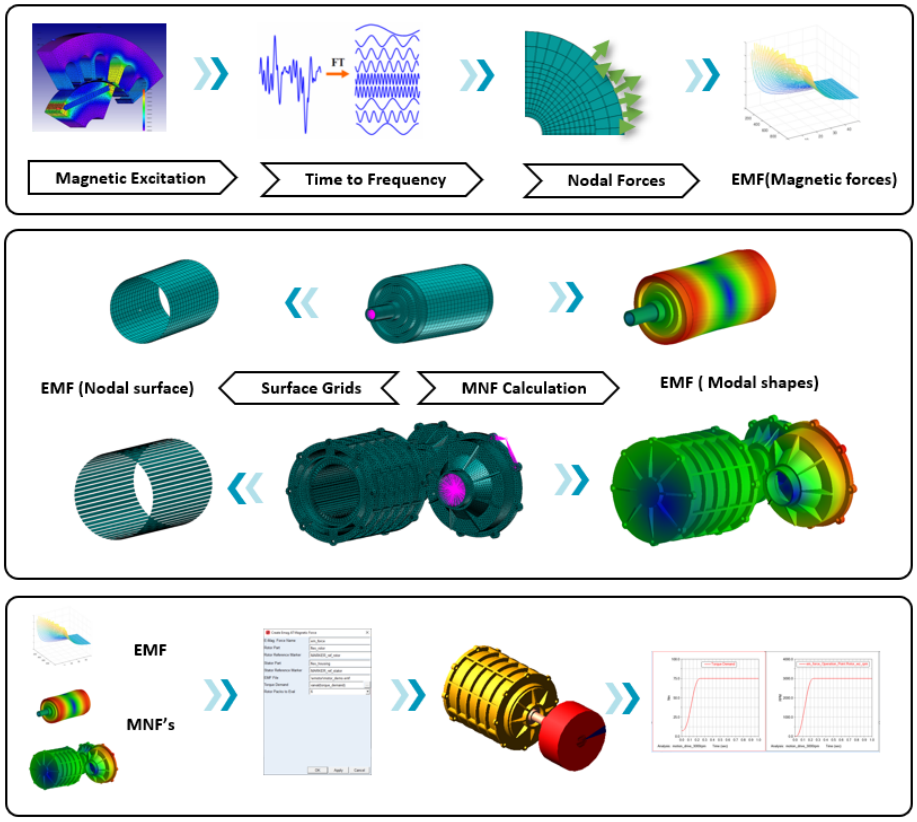
If older-style property files are referenced when creating a bearing, the user is prompted to accept a conversion procedure that produces the new-style property file.

The number of rollers is limited to 150 elements and the number of bearings is capped at 50. It is anticipated that these limits will increase in the next release of Adams

EMag AT: New Detailed Motor Type

It is now possible to define a motor element based on magnetic force density data (*.tab) files, typically produced from a package such as Ansys Maxwell. A high-fidelity EMag AT motor requires the following pieces of information:

1. Common electromotor parameters.
2. Harmonic Force data files .emh (as a collection of Fourier series , created from the original time-domain .tab files) for the 4 drive cycles (drive forward/reverse, brake forward/reverse), or optionally directly the time-domain .tab files.
3. Stator and Rotor FE models as .bdf (nastran bulk data files).



Adams PostProcessor

Animation Performance Improvements

Animation performance has been enhanced for models containing large FE_PARTs. In addition, Clearance computations in PostProcessor have been improved, specifically:

- FE_PART animation: models containing FE_PART elements with larger numbers of nodes (20+ nodes) animate significantly faster; select models show between 3X and 8X speed improvement for animation display.
- Clearance computations in PostProcessor show improvement for models containing large flexible bodies. Up to 4X improvement has been observed for the computation time required to display Clearance results in PostProcessor with select models containing flexible bodies having a large number of nodes & modes.

Adams Real Time

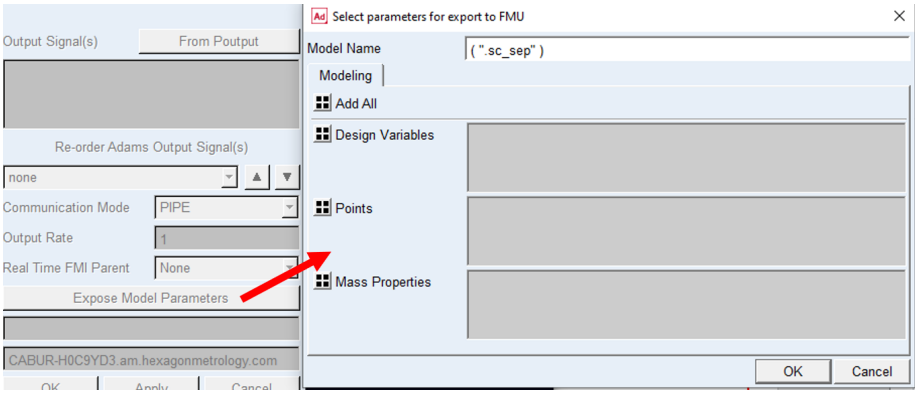
Switching Mini-Maneuvers in Real Time

While running Real Time simulations, the time to switch between mini-maneuvers may result in a large runTime spike. This is largely due to initial conditions computations that are executed immediately after switching mini-maneuvers. You can dramatically reduce the time to switch between mini-maneuvers by setting the environment variable ADAMS_REALTIME_MINI_FAST.

Note:	You need to ensure that function expressions set on the actuators, such as steering, throttle, etc, through the .xml event files are continuous as no initial condition operations are performed, otherwise acceleration spikes may occur.

Parametric Support for dSPACE FMUs

Functional Mockup Units (FMUs) created for the dSPACE platform now support parametrics. With this functionality, it is easy to change an operating parameter of a model before the simulation and investigate different model configurations. When exporting an Adams model as an FMU, users can choose to 'Expose Model Parameters', as shown below.



FMUs exported from Adams View can have Design Variables, Point Locations & Mass Properties as parameters. In Adams Car this list also includes Property Files and User Defined Element (UDE) parameters.

Adams Solver

New INTEGRATOR Setting: ADAPTIVITY

The (default, as opposed to the legacy Fortran Solver) Adams C++ Solver supports a new argument named ADAPTIVITY that is intended to make simulations more robust when the integrator is taking a very small

stepsize. ADAPTIVITY, which is on by default, relaxes the ERROR tolerance when the integrator stepsize is very small and applies to GSTIFF (I3 and SI2 formulations) and HHT. This change has yielded better Solver robustness across a range of problematic models.

Note:	The ADAPTIVITY formulation in the (default) C++ Solver differs from the legacy Fortran Solver. Users familiar with ADAPTIVITY in the Fortran Solver should not assume identical behavior with the C++ Solver

ADAPTIVITY is turned **on by default for this release** (C++ Solver only) and may be deactivated by setting ADAPTIVITY = 0 on the INTEGRATOR command.

Adams Vibration

ODS Animation Performance Improvements

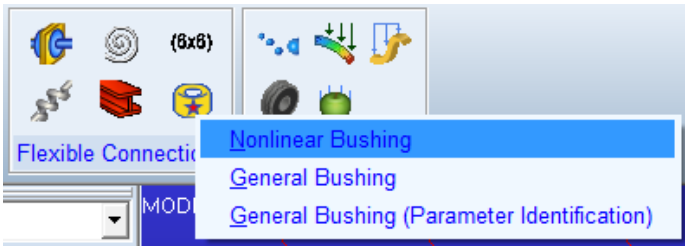
Operating Deflection Shape (ODS) animation performance has been improved, specifically for models containing large flexible bodies. The process of creating an ODS animation object can be nearly 2X faster for some models. Navigating between animation frequencies can be up to 8X faster for other large models.

Adams View

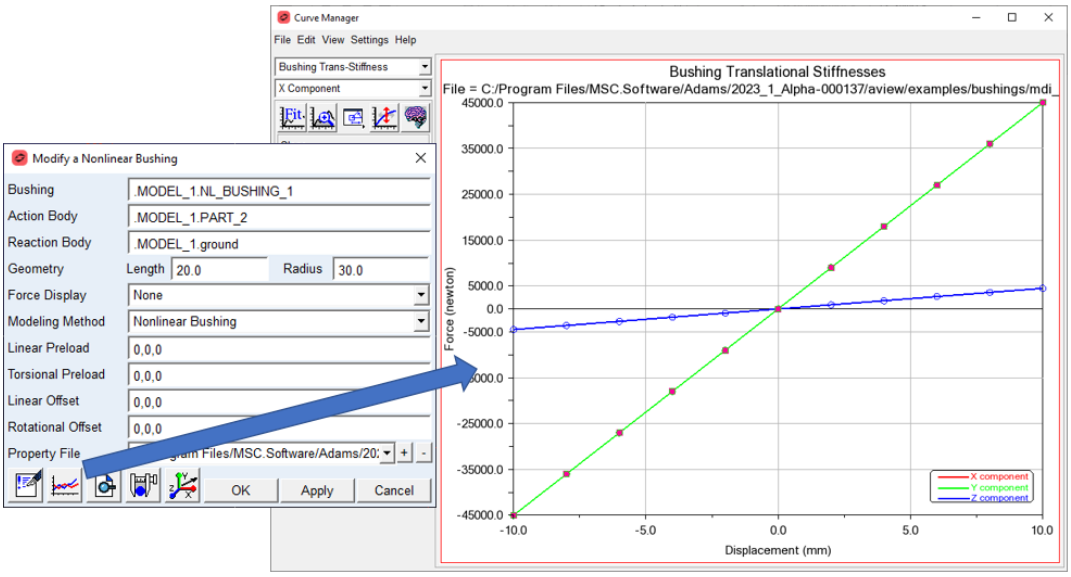
New Nonlinear Bushing Element

Traditional bushing elements in Adams View have linear force-displacement and force-velocity characteristics. It is now possible to create a Nonlinear Bushing in Adams View having nonlinear relationships for the individual force components with respect to displacement and velocity.

This new bushing type can be accessed via the Advanced Bushing element, in the Forces panel:

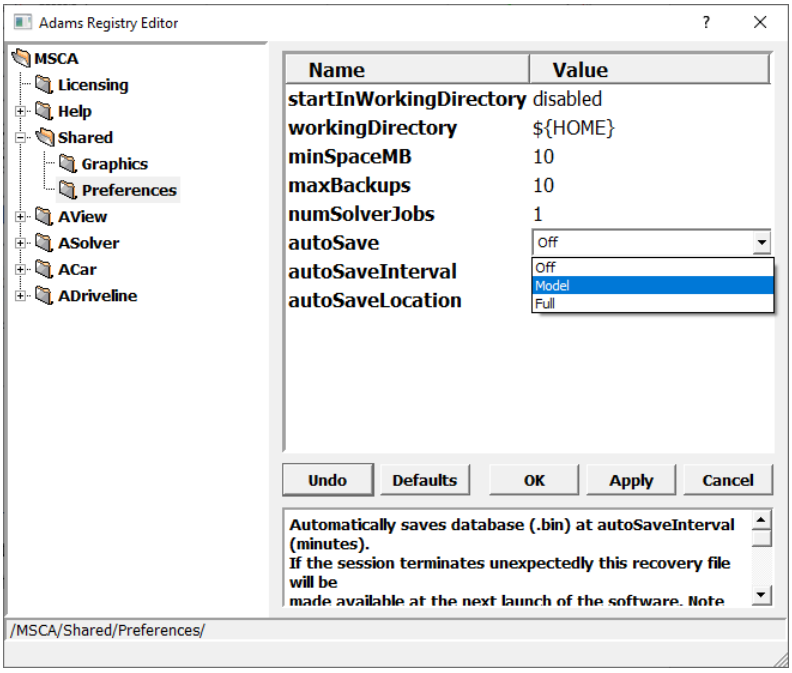


When creating/modifying this bushing a Property File reference is required to define the characteristics. Property File contents can be viewed/edited graphically via the Curve Manager:



AutoSave in Adams View & Adams Car

Adams View and template-based products (such as Adams Car) now provide AutoSave functionality, automatically saving the session as a bin file every X number of minutes. This feature must be enabled via the 'Settings & License' pick from the Adams startup menu and is found under the *Shared → Preferences node*:



CAD Interoperability Version Support

The following table lists the versions of the supported CAD formats that can be imported and exported in Adams 2023.1.

Format	Import Version	Export Version
IGES (.igs)	5.2 & 5.3	5.3
STEP (.stp)	203/214/242 P	214
ACIS (.sat)	All → R27	Not Supported
CATIA V4 (.model, .dlv, .exp, session)	All 4.XX	Not Supported
CATIA V5 (.CATPart, .CATProduct)	R10 → R31	Not Supported
CATIA V6 (.3dxml)	2011 → 2013X	Not Supported
Pro/Engineer part files (.prt, .asm)	13 → Creo 8.0	Not Supported
Inventor (.ipt, .iam)	All → 2021	Not Supported
Solidworks (.sldprt, .sldasm)	99 → 2021	Not Supported
Unigraphics (.prt)	11 → NX CR 1953, 1957 and 1969	Not Supported
JT : JtOpen (.jt)	7.0 → 10.5	Not Supported

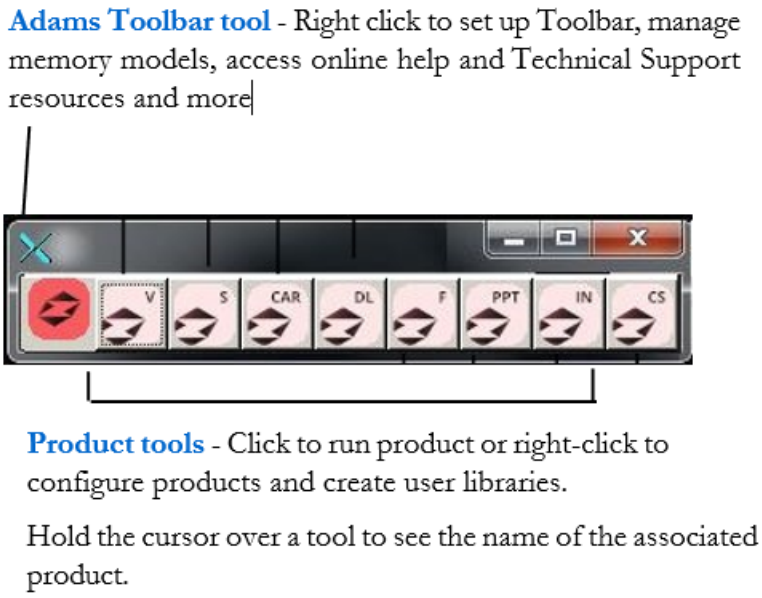
Running Adams Products

Starting Adams Products

This sections described how you can start your Adams products on Linux and on Windows.

Starting Adams Products on Linux

The Adams Toolbar is a starting point to using Adams products on Linux. The toolbar is shown below.



You can also use the Adams Toolbar to:

- Customize, keep track of, and organize multiple libraries of standard Adams products
- Create binaries
- Manage custom memory models and product preferences

For more information on these or other Adams Toolbar operations, see the Running and Configuring online help (from the *Help* menu in any product, select *Adams Help*, on the left pane, select *Configuring Adams*).

To start a product on Linux:

1. To display the Adams Toolbar, at the command prompt, enter the command *adamsx* where ***x*** is the version number, for example *adams2022_1*.
2. Click on the tool representing the product you want to start.

Note:	We recommend that you use the Adams Toolbar to start your Adams products, but if you want to automate certain operations, use the text-based Program Menu. For more information, see the Running and Configuring online help.

Starting Adams Products on Windows

You start any Adams product from the Start menu. You can also use the Start menu to:

- Change your license type
- Generate problem reports
- Set Adams preferences

For more information on these or other operations, see the Running and Configuring online help.

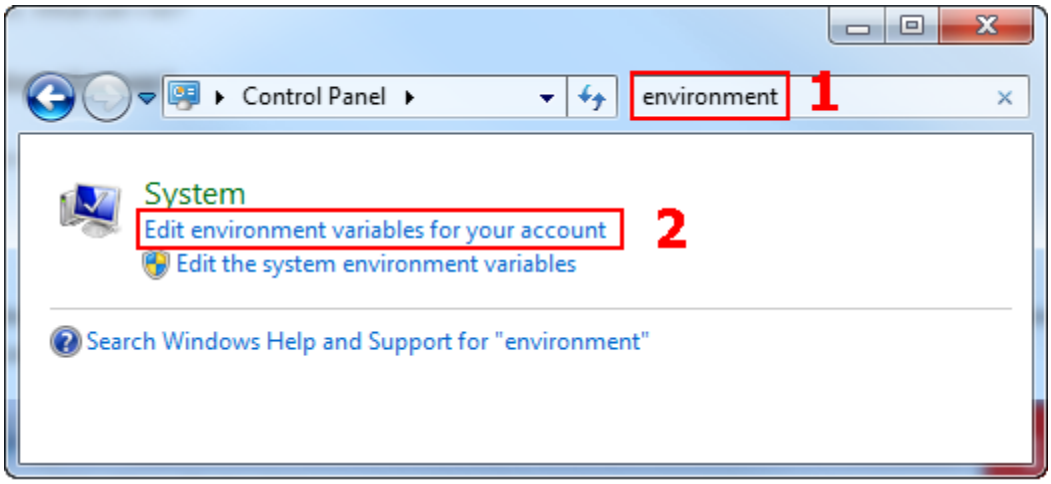
To start a product on Windows:

- From the *Start* menu, point to *Programs*, point to *Adams 2024.2* , point to the name of the product you want to start.

Tip:	Select the corresponding desktop icon for the product, if you installed it on your desktop.

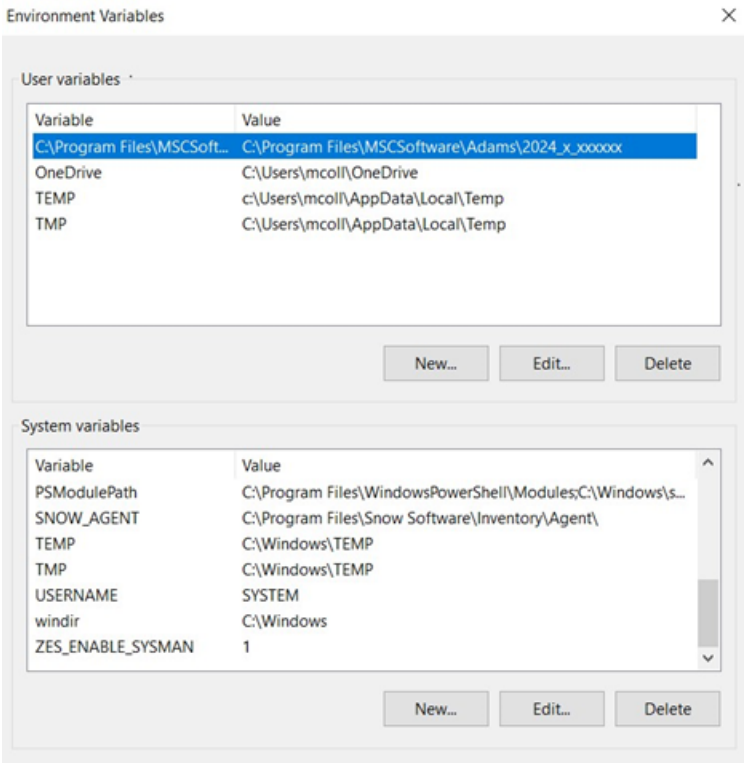
To start a product from DOS shell in Windows:

- *Start → Programs → Adams 2024.2 → Command Prompt.*
- An alternative is to add the */bin* directory under the Adams installation directory to your user PATH environment variable. You can do this via the Control Panel:
  a. Type *environment* in the Control Panel search box.
  b. Select the *Edit environment variables for your account* pick.



- Check to see if you already have a PATH variable defined under "*User variables*". If it exists then edit it, add a semicolon ";" to the end of the existing value, and then add the "bin" directory under the Adams installation directory. Otherwise select *New...*, use PATH for the variable name and add the "bin" directory under the Adams installation directory as the value. The default location of this directory is:

```
Windows Adams:
C:\Program Files\MSC.Software\Adams\2023_1_xxxxxx\bin
where xxxxxx denotes build number.
```



- Once you are done click *OK*.

Note:	Windows appends your User PATH to the System PATH environment variable, so there is no need to copy the existing System PATH variable to your user PATH variable. This behavior is unique to the User PATH variable. For all other environment variables, a User variables definition overrides a System Variables definition.

Setting Preferences

This section describes how you can set preferences, such as your working directory, graphics setting, and memory model size.

Setting Preferences on Linux

You use the Registry Editor from the Adams Toolbar to set a variety of preferences. For information on the preferences you can set, see the Running and Configuring online help.

To display the Registry Editor:

- From the *Adams Toolbar*, right-click any product tool, and then select *Change <Product Name> Settings*.

Setting Preferences on Windows

You use the Settings menu to modify:

- Graphics settings
- Memory model size

To display the Settings dialog box:

- From the *Start* menu, point to *Programs*, point to *Adams 2024.2* , and then select *Settings & License*.

Setting Your Working Directory

During a session in a default or custom product, you can select the directory where you want to place your model and output files.

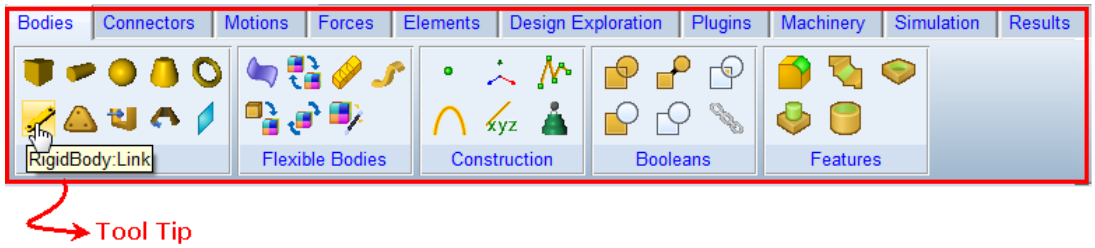
For Adams View, you can set the working directory from the Welcome dialog box.

To set your working directory:

1. From the *File* menu, select *Select Directory*.
2. In the dialog box that appears, select the working directory.

Tool Tips

Tool tips display information about the item the cursor is currently over in an Adams product. The following shows the tool tip that appears when you place the cursor over the link geometry tool.



To display tool tips:

- Move the cursor over the item in the interface on which you'd like information.
  A brief description of the item appears.

Getting Help

Online Help

To help you use the Adams products, Hexagon provides online help (HTML format). To view the online help and tutorials, you can use your default Web browser. An example of online help is shown below.

Versions of Web Browsers

For the Adams Help system, all you need is a Windows, Macintosh, or Linux computer running a fairly new browser with JavaScript enabled. If JavaScript is not enabled, then the Help set will not display in its entirety.

Accessing the Online Help

You can view help for a dialog box, a product, or for all Adams products. The figure below shows the help for all Adams products, called the integrated master site. You can use this site to view any product's help and search across all product help. You can also access release notes for all products, and view the documents in Adobe Reader.

Note:	The PDFs is no longer embedded with the help system from Adams 2024.2 release. The PDFs made available in the Hexagon Product Document Center (https://nexus.hexagon.com/))

To get help on a dialog box:

1. Click in the dialog box for which you need help.
2. Press *F1*.

   Adams launches a browser window that contains information about the dialog box.

To get general help on your product:

- From your product's *Help* menu, select *Product Name Help* (where *Product Name* is the name of your Adams product).

  Adams launches a browser window that contains the starting point for your product's online help.

To open the Adams online help from the Adams Toolbar:

- Right-click the Adams Toolbar tool, and then select *Online Help*.

  Your default browser starts and displays the master site for Adams online help.

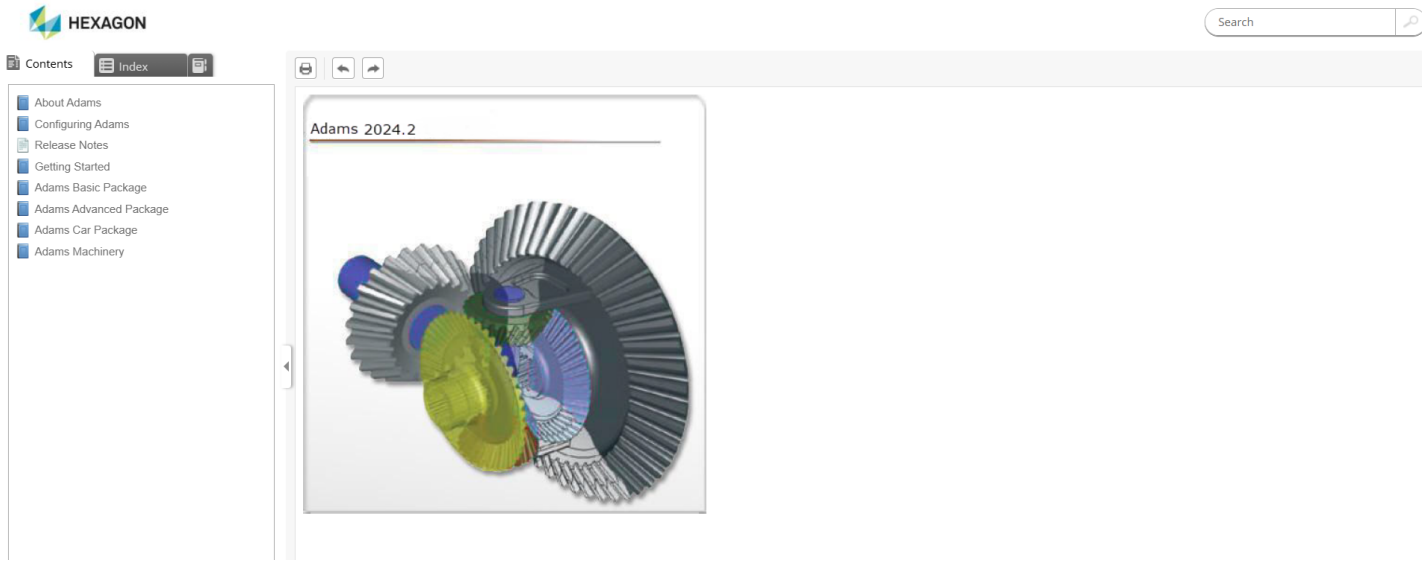
To open the Adams online help from the Start Menu:

- From the *Start* menu, point to *Programs*, point to *Adams 2024.2* , and then select *Online Help*.

  Your default browser starts and displays the master site for Adams online help.

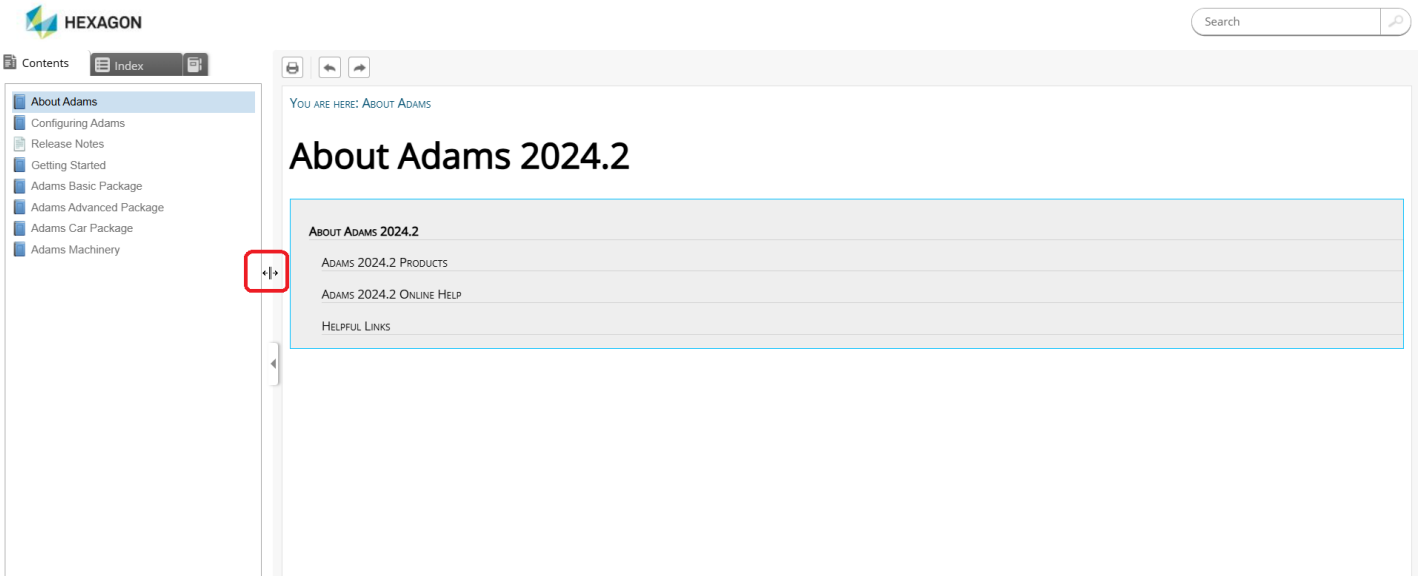
Navigating through the Help

The navigation panel on the left side of the Help window displays the help topics for each Adams product. Click the closed book icon ( ) to expand, or the open book icon ( ) to collapse the entries beneath. Topics with no icon contain no subordinate topics. Use the left ( ) and right ( ) arrows to page forward and backwards through the help topics.



Left Pane Adjustment

To adjust the left pane size, drag the icon in the separator as shown below.

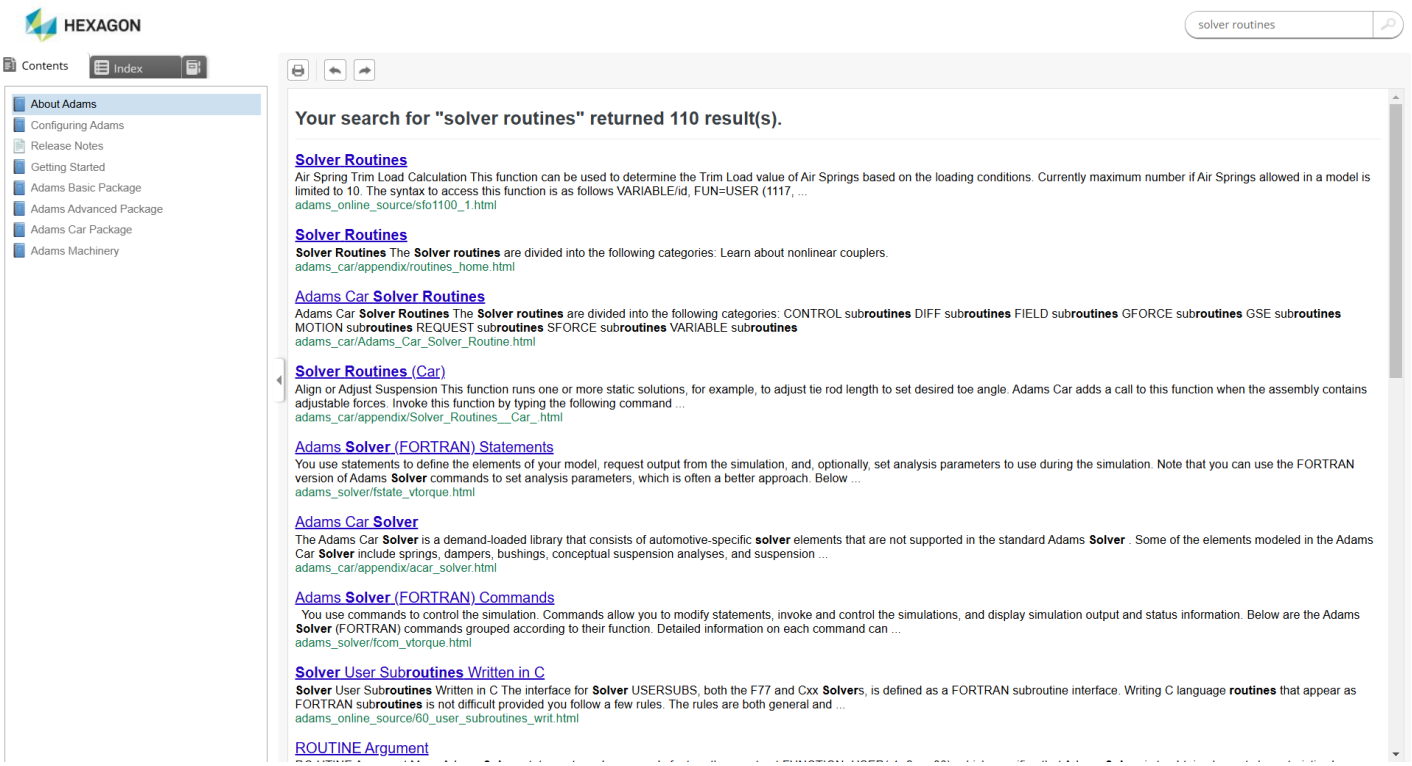


Note:	The adjustment of the Left Pane is not available in Internet Explorer.

Searching

You can search all the help files in HTML format for a particular product or all Adams products.

The results are shown on the same page below.



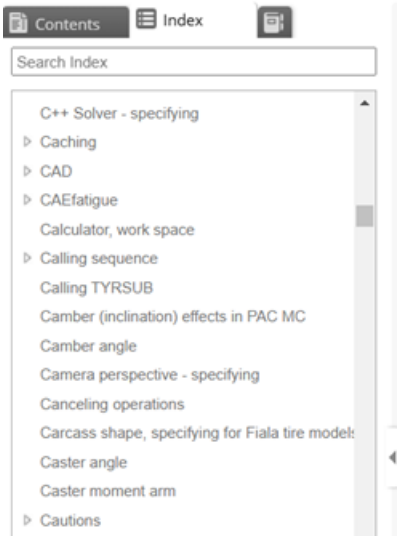
Printing

To print a file:

- In the help system you can select the Print button . to print the topic that you are viewing
- Print the PDF files from Hexagon Product Document Center (https://nexus.hexagon.com/)

Index

The Index tab displays product specific help in alphabetical list of keywords associated with help topics. To view index entries, you can select a letter group to display the entries for that group. When you click on an index entry, the related topic will display in the topic frame.


Contents
Index
Search Index
C++ Solver - specifying
Caching
CAD
CAEfatigue
Calculator, work space
Calling sequence
Calling TYRSUB
Camber (inclination) effects in PAC MC
Camber angle
Camera perspective - specifying
Canceling operations
Carcass shape, specifying for Fiala tire model
Caster angle
Caster moment arm
Cautions

Tutorials and Examples

Adams products have a set of tutorials or getting started guides that step you through examples of using the product's features, as well as introduce the basic concepts of the product. The getting started guides are online. In addition, many of the products have examples of its features that are stored in Knowledge Base Articles.

You will find links to all the tutorials and examples for a product under its Examples tab.

To access the tutorials and examples:

- From the online help, from the left pane, select *Getting Started* and select the product that you are interested in.
- From the online help for a product, from the pane on the left, select *Examples*.

Supported Versions of Integration Products

Support for Easy5 and MATLAB

Easy5

This release of Adams Controls is certified to run with Easy5 2024.1 Easy5 version support is subject to change. For the latest information, see updates to the Release Guide here: http://simcompanion.hexagon.com/.

MATLAB

This release of Adams Controls is certified to run with MATLAB 2022b, 2023a on Linux and Windows. For more information on MATLAB platforms and compatibility, see:

http://www.mathworks.com/support

Note:	If you want to co-simulate with Easy5 or MATLAB and you are running Adams Controls on one of the platforms that Easy5 or MATLAB does not support, you should consider using TCP/IP communication. This allows Adams Controls to communicate with Easy5 or MATLAB even though the codes are running on different platforms.

Important:	In MATLAB 2022b and MATLAB 2023a on the Windows platform - Co-simulation with Adams does not support the DIRECT mode for inter-process communication. Only TCP/IP and PIPE modes of inter-process communication are supported.

Supported Environments for Adams Real Time

Concurrent SIMulation Workbench

Adams Solver supports Concurrent's SIMulation Workbench® (SimWB) real time modeling environment on the RedHawk™ Linux® operating system. In addition to participating in real time co-simulations facilitated by SimWB, standalone Adams can be run on the RedHawk Linux operating system. For this release of Adams, Adams Solver is certified in the following environment:

- iHawk® running RedHawk Linux 9.2 and 8.4 with SIMulation Workbench Control Center 2023.2-0 and 2024.1-0.
- The Adams Red Hat Linux 8.8 installer should be deployed on the RedHawk machine.

dSPACE SCALEXIO

Adams Real Time FMUs will run on dSPACE with the SCALEXIO firmware updated to 2021-A. You must install the dSPACE Hypervisor extension and configure a Linux-based virtual machine (Ubuntu 20.04/22.04). The Adams 2023.4.1 Installation and Operations Guide provides details of the installation procedure.

Supported Versions of Integration Products

Company	Product Name	Product Version	Adams Product	Platform (x64)
The Math Works, Inc.	*MATLAB** (The minimum features of MATLAB required for interfacing with Adams are MATLAB, Simulink, MATLAB Coder and Simulink Coder)	2022b, 2023a	Adams Controls	Red Hat Enterprise Linux 8.8 Suse 15SP4 Redhat 9.2 Ubuntu 20 Ubuntu 22 Windows 10 Windows 11
Hexagon	Easy5**	2024.1	Adams Controls	Red Hat Enterprise Linux 8.8 Suse 15SP4 Redhat 9.2 Ubuntu 20 Ubuntu 22 Windows 10 Windows 11
Functional Mock-up Interface (FMI)#	FMU Export Co-Simulation FMU Import Co-Simulation FMU Import Model Exchange	1.0, 2.0	Adams Controls	Red Hat Enterprise Linux 8.8 Suse 15SP4 Redhat 9.2 Ubuntu 20 Ubuntu 22 Windows 10 Windows 11
MSC Software Corporation	MSC.Nastran	V69.X and above	Adams Durability Adams Flex	All Linux and Windows
MSC Software Corporation	Marc	2005 and above 2003 and above	Adams Durability Adams Flex	All Linux and Windows

Supported Versions of Integration Products

Company	Product Name	Product Version	Adams Product	Platform (x64)
MSC Software Corporation	Fatigue	2001 and above	Adams Durability	All Linux and Windows
nCode	FE-Fatigue	Version 5.2 and above	Adams Durability	All Linux and Windows
ANSYS, Inc.	ANSYS	V6.0 and above V5.4 and above	Adams Durability Adams Flex	All Linux and Windows
Dassault Systemes, SIMULIA division	ABAQUS/ADAMS	Version 6.3 and above Version 6.1-1 and above	Adams Durability Adams Flex	All Linux and Windows
Siemens Digital Manufacturing Solutions division	I-DEAS Mechanism Design	I-DEAS NX 10 and above I-DEAS 8, 9, NX 10 and above	Adams Durability Adams Flex	All Linux and Windows
ANSYS, Inc.	EnSight	10.1.1b (but later than 8.2.1f may likely function	Adams PostProcessor	All Linux and Windows
cosin scientific software AG	FTire	Version 2020-3 22743	Adams Tire	All Linux and Windows

Notes:	With regards to compilers, Adams 2023.4.1 officially supports the Professional Edition of Microsoft Visual Studio 2017, but the Community Edition 2017 has been found to function in the following scenarios (for more details on compiler support see Hardware and Software Specifications section of the Adams Installation and Operations Guide): *Function Evaluation and co-simulation mode for Adams and MATLAB/Simulink; External System Library (ESL) import of MATLAB/Simulink models into Adams. **Function Evaluation and co-simulation mode for Adams and Easy5; External System Library (ESL) import of Easy5 2024.1 models into Adams. #FMI co-simulation and model exchange FMUs generated with Easy5 2024.1