Actran™
Powerful Acoustic Simulation Software

MSC Software®
**Superior Acoustic Performance**

Actran is a premier acoustics software solution for simulating acoustics, vibro-acoustics, and aero-acoustics quickly, easily, and accurately. Under a common technological umbrella provided by the finite and infinite element method, Actran has a rich library of elements, material properties, boundary conditions, solution schemes and solvers. With the high performance solution coupled with easy to use modeling environment, engineers can gain insight into the acoustic behavior of their products and improve designs early in the product development cycle.
Why Choose Actran

Broad Range of Applications
With its broad range of acoustic analysis capabilities, Actran is used by diverse customers like automotive manufacturers and suppliers, civil and military aircraft and aircraft engine manufacturers, and consumer product manufacturers including loudspeakers and audio device producers. With its special elements and analysis capabilities, users can also analyze sound wave propagation in narrow ducts or thin cavities, which can be beneficial in developing products like hearing aids and solar array panels.

Robustness
Actran contains a wide set of acoustic modeling features supported by its robust and reliable acoustic finite and infinite element library. Whether you are analyzing interior or exterior acoustic problems, modeling the transmission through flexible walls or predicting the absorption by a porous medium, you can easily accomplish the task with Actran, which offers both modal and physical approaches and multiple material models. Through its seamless interface with most finite element structural analysis solvers like MSC Nastran, you can also solve sound radiation problems with improved accuracy.

Modular
Actran is packaged to suit your specific analysis requirements. You can get started with the foundation module of Actran Acoustics, which provides a wide set of acoustic analysis capabilities. For specific advanced analysis requirements, you can choose to add from the application specific modules to achieve improved efficiency and productivity.

Superior Performance
By taking advantage of Actran’s superior solvers, and shared and distributed parallel processing capabilities, users can solve bigger problems faster. With the ability to run more design iterations in shorter time, you can improve time to market for your products with increased confidence in your designs.

Outstanding Support
Backed by world-wide support, you can be confident to get answers to your questions at all stages of software usage. Our highly proficient services teams can also help you gain the most out of the software through customized training, consulting services, methodology development and product customization.
Actran Acoustics

Robust Solution for all your Acoustic Analysis Needs

Actran Acoustics is the foundation module of the Actran family and offers a wide set of acoustic analysis capabilities to help you simulate your complex systems.

“We have verified the ability of Actran to solve vibro-acoustic problems with a wide variety of physics, & continue to advance our capability thanks to Actran’s efficient solver capabilities which allow us to analyze larger and more sophisticated models. This has given us a competitive advantage and stronger relationships with our customers.”

Chris Carter,
Frazer-Nash Consultancy

Robust Material Library
- Model acoustic fluid accurately
- Simulate viscothermal fluids to account for damping mechanisms occurring in thin acoustic layer and narrow tubes (or channels)
- Analyze complex absorption occurring in foams or rock wools with rigid porous, lumped porous and Delany-Bazley porous material models

Comprehensive Element Library:
- Model with linear and quadratic elements
- Perform 2D, 3D and axisymmetric analyses
- Choose from standard volume elements and special transverse elements
- Simulate acoustic radiation in free field with conjugate infinite elements

Rich Set of Boundary Conditions, Operating Conditions and Sources
- Choose from various acoustic sources - plane, spherical and cylindrical wave sources
- Apply realistic boundary conditions of pressure, velocity, acceleration and admittance
- Apply excitation of ducts by incident plane waves
- Recover vibration results from MSC Nastran (or other FEA solvers) for radiation analysis

Multiple Solution Strategies
- Extract acoustic modes
- Choose from direct response and modal superposition approaches
- Apply multiple loads to simulate reality
- Avoid unnecessary re-computations with multi-level sequence tree
- Restart your analyses for multi-step problems
- Achieve performance with in-core and out-of-core solvers supporting sequential and parallel (Shared and Distributed) computer architectures
- Analyze fast frequency response synthesis using Krylov solver

Applications
- Sound absorption inside passenger compartments of cars, trains and aircrafts
- Intake and exhaust noise
- Airconditioning units and distribution systems
- Audio devices such as telephones, hearing aids or musical instruments
- Sound radiation by vibrating structures: powertrain, engine components, compressors, electric motors, loud speakers etc.
Actran AeroAcoustics

Predict the Noise Generated by Complex and Turbulent Flows

Multiple Step Approach

- Compute aerodynamic noise sources from flow simulations performed with commercial CFD codes such as Fluent TM, Star-CD TM, or StarCCM+TM.
- Translate results from time to frequency domain and interpolate results from CFD to the acoustics mesh.
- Compute the radiated acoustic field and generate results like acoustic pressure, velocity or intensity maps, frequency response functions of local (pressure) or global (power) quantities.

Key Features

- Model and analyze accurately with state of the art implementation of Lighthill’s and Mhöring’s acoustic analogies.
- Interface with leading CFD codes using native CFD file formats.
- Achieve high performance with direct and iterative solvers and parallel processing capabilities.
- Model and post-process your problems with Actran VI.
- Inherit all the features from the Actran Acoustics module.
- Address your aero-vibro-acoustic challenges with compatible vibro-acoustic features.

Applications

- Air conditioning modules (HVAC)
- Side mirror noise
- Airframe noise (landing gear, trailing edge)
- Air distribution systems

Actran AeroAcoustics offers high performance solvers and parallel processing features and can be combined with Actran VibroAcoustics to address aero-vibro-acoustic challenges.
Actran VibroAcoustics

Complete and Robust Solution for Vibro-acoustic Analysis

Perform coupled & uncoupled analyses in physical and modal coordinates, in frequency or time domain. Import modal basis from most structural FEA codes to be used as a representation of the structural model.

**Broad Range of Materials**
- Model bulk reacting materials with poro-elastic element library based on the Biot theory
- Analyze viscoelastic structures
- Model active structures with piezoelectric materials
- Simulate complex multilayered structures with composites material models

**Realistic Loading Conditions**
- Combine acoustic, dynamic and kinematic boundary conditions
- Simulate real-life excitations like diffuse sound field, turbulent boundary layer or rain-on-the-roof
- Import aero-dynamic excitations from most CFD solvers
- Couple aero-acoustics features to model aero-vibro-acoustics
- Utilize physical, modal or hybrid modal-physical approaches
- Choose between direct and iterative solvers
- Improve performance with staggered solution scheme
- Unique fast FRF synthesis solver
- Improve productivity with staggered solution scheme and parallel solvers

**Applications**
- Automotive: noise problems from power trains, intakes, exhausts, passenger cabin, trim, seats, hoses, tires, windows and window shields, audio, HVAC.
- Aerospace: sound transmission through cockpit and fuselage, noise propagation in air distribution system, response to TBL excitation, random dynamic response of rocket payload at take-off
- Consumer goods: telephones, headsets, loudspeakers, hearing aid devices, disk drives, washing machines, refrigerators, cameras
- Defense: underwater acoustics, sonars
Actran for Nastran

Combine the strengths of Actran and Nastran to predict the response of a trimmed body vehicle.

Accurate Trim Modeling
- Utilize poro-elastic element library based on the Biot theory to model porous materials
- Utilize visco-elastic element library to model elastic shells or heavy layers
- Define acoustic elements for modeling air-gaps

Efficient Structural-Acoustic Coupling
- Merge Actran models of individual trim components with MSC Nastran body-in-white model to create a fully trimmed body vibro-acoustic model
- Connect Actran model to MSC Nastran model for real-world simulations
- Enrich MSC Nastran model by exporting Actran components using DMIG data blocks
- Import MSC Nastran superelements into Actran

Applications
- Acoustic transmission through components in real-life mounting conditions
- Trimmed body modeling using a combination of Actran detailed models in physical coordinates and a Nastran body-in-white modal model
Actran TM

Powerful Acoustic Solution for Turbomachinery Noise Prediction

Actran TM is used extensively by many leading aerospace companies that rely on its accuracy, ease of use and performance for reaching their strategic acoustic design goals. It can be complemented by Actran DGM to solve problems involving complex shear layers and flow gradients occurring at the engine exhaust.

Comprehensive Solution

- Analyze acoustic propagation and radiation taking into account a non-uniform mean flow
- Model liners accurately including the flow effects (Myers-Eversman formulation)
- Perform harmonic analysis
- Create models with streamlined interface leading CFD tools, including Fluent™, STAR-CD™ and PowerFlow™
- Model turbofan using a decomposition of incident analytical or numerical spinning duct modes
- Complement your analysis by Actran DGM to solve problems involving complex shear layers and flow gradients at the engine exhaust

Choice of Elements

- Utilize infinite elements for unbounded domains
- Perform 2D, axisymmetric and 3D analysis
- Model accurately with a complete finite element library

Applications

- Aircraft engine noise, including nacelle design
- Helicopter turbine noise
- Ducted cooling systems (electronic devices)
Actran DGM
Model Noise Propagation in Complex Flows

With its unstructured mesh method, Actran DGM is not limited by standard constraints of a finite difference mesh. Elements are automatically adapted allowing for a non-homogenous mesh without any performance degradation.

Efficient Solution
• Predict noise propagation in complex physical conditions
• Solve linearized Euler equations using discontinuous elements
• Set up and analyze 2D, axisymmetric and 3D models
• Analyze your models with a time domain solver

Meshing for Performance
• Model using unstructured mesh that overcomes standard constraints of a Finite Difference mesh
• Get accurate results with automatic adaption of the elements, without performance degradation
• Reuse mesh for frequencies of ratio 1 to 4 saving you modeling effort
• Achieve high parallel scalability with discontinuous spatial scheme

Extensive set of features
• Decompose engine excitation in duct modes
• Model non-reflective boundary conditions with absorbing buffer zones
• Model liners using a time-domain translation of the Myers BC

Applications
• Exhaust of turbomachines
• Inlet of large turbomachines
• Acoustic propagation problems with non-homogenous mean flow conditions
• Acoustic radiation of large problems (time domain)
Actran VI
Dedicated pre- and post-processor for Actran

Actran VI supports all the Actran features for creation and editing of acoustic models. The input file reader helps you check and modify input files generated by other tools.

Powerful and Flexible
- Create and edit Actran models
- Import from any of multiple supported files formats including MSC Nastran, Ansys, and Patran Neutral File Format
- Read results in any of widely accepted formats, including OP2, UNV, NFF, RST, HDF and Punch
- Speed up your model creation through analysis templates
- Automate your computational chain through the use of the powerful API to improve your design process

User-friendly Interface
- Visualize all Actran specific features
- Synchronize viewport for results and analyses comparison
- Display and handle of frequency response functions
- Gain insight through multiple results-display options including contour plots, iso-surfaces, and vectors
- Visualize results with cut plane filters
- Animate complex harmonic and transient results
- Export results in video and sound files
MSC Products
Simulating Reality, Delivering Certainty

Integrated Solutions

**Adams**
Multibody Dynamics Simulation

**Actran**
Powerful Acoustic Simulation Software

**Easy5**
Advanced Controls Simulation

**Marc**
Advanced Nonlinear & Multiphysics

**SimXpert**
Multidiscipline Simulation

Solver Solutions

**MSC Nastran**
Structural & Multidiscipline

**Dytran**
Explicit Nonlinear & Fluid Structure Interaction

**MSC Fatigue**
Fatigue Simulation

**Sinda**
Advanced Thermal

Mid-Sized Business Solutions

**FEA, AFEA, TFEA**
Structural, Nonlinear, Thermal Simulation Bundles

**MSC Nastran Desktop**
Multidiscipline Simulation for the Desktop

**SimXpert**
Multidiscipline Simulation Environment

**SimDesigner**
CAD-Embedded Multidiscipline Simulation

Modeling Solutions

**Patran**
FE Modeling and Pre/Post Processing

**SimXpert**
Multidiscipline Simulation Environment

**SimManager**
Simulation Data and Process Management
Actran™
Powerful Acoustic Simulation Software

MSC Software is one of the ten original software companies and the worldwide leader in multidiscipline simulation. As a trusted partner, MSC Software helps companies improve quality, save time and reduce costs associated with design and test of manufactured products. Academic institutions, researchers, and students employ MSC technology to expand individual knowledge as well as expand the horizon of simulation. MSC Software employs professionals in 20 countries.

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