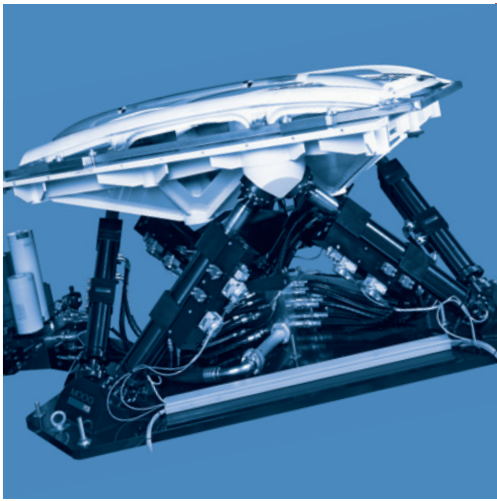# INTEGRATED TEST SUITE

REPLICATION, RUNNER, SINESWEEP AND RANDOM VIBRATION

DEFINE, RUN AND VALIDATE MORE AUTOMOTIVE
TESTS FASTER, MORE EFFICIENTLY AND
ACCURATELY

WHAT MOVES YOUR WORLD

MOOG

INTEGRATED MODULES THAT MAKE THE DIFFERENCE

Wherever test and development engineers are pushing the limits of product design, tests must be conducted faster than ever. In addition, they must be shared on a global scale, take advantage of new techniques and be easily comparable.

The application of the latest testing techniques has become a cornerstone for creating successful new product designs, ensuring shorter time-to-market, managing increased regulatory pressures and maintaining cost efficiencies.

Moog continually develops modules to provide customers with the best tools to run tests faster and more efficiently than ever before while saving development costs.

Listening to our customers and studying their requirements led us to develop the Moog Integrated Test Suite that supports both simple and complex tests through the integration of an array of software modules. The Integrated Test Suite leverages the world-class performance of Moog Actuators, Servo Valves and Test Controllers.

Unsurpassed innovation and technological expertise combined with close customer collaboration make Moog a leader in the design and development of high-performance electric and hydraulic motion platforms.

Our total focus on meeting your unique test requirements means you can rest assured you're using the most flexible, highest performing automotive test software available anywhere.

MOOG INTEGRATED TEST SUITE:
YOUR KEY TO BETTER, FASTER DESIGN AND DEVELOPMENT

The Moog Integrated Test Suite is the result of close and ongoing cooperation with leading automotive OEMs and independent test laboratories, as well as research and development centers.

Our Integrated Test Suite remains the best-in-class option to successfully run both simple and complex solutions for structural and performance tests.

The software architecture helps you to match your investment to your unique test requirements.

It is a suite of PC applications that is used to control and monitor a Moog Test Controller or dedicated real time controller. The Integrated Test Suite consists of four key modules: Replication, Runner, Sinesweep and Random Vibration. Each can be used independently or combined as your requirements change.

Runner

Replication

Random Vibration

Sinesweep

Moog Sidebar

All Moog test applications use the Moog Sidebar. The Sidebar is a powerful tool that allows you to connect to a controller, then monitor and control it. With the Sidebar you can easily create, edit, and run controller scripts or manage your aliases. From the Sidebar all controller properties can be accessed, changed and monitored. The monitoring can be done in a graphical, oscilloscope-based way, or via text-based, with statistical information. You can also make your own monitor sets for even easier and quicker ways to monitor the properties you want.
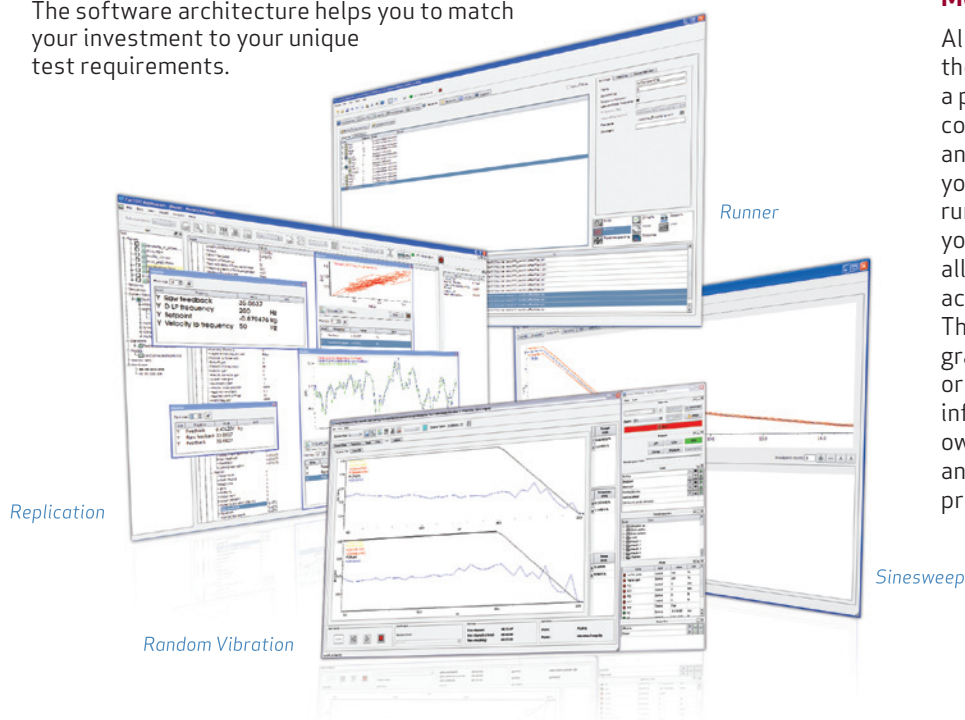
KEY FEATURES THAT BRING YOU REAL BENEFITS

Key features	User benefits
Native Windows applications, familiar interfaces	User-friendly and intuitive
Applications for structural, durability and fatigue tests	One learning curve for working with different tests
Buy individual modules as needed	Investment matches test needs
Modular architecture	Expand the capability required
Modules are interoperable	Work faster
Advanced settings and scripting	Many functions easily accessible
Easy workflow	Basic users create standard tests faster
State-of-the-art algorithms, pseudo channels	Advanced users can perform challenging new tests
Powerful algorithm, batch iteration	Faster time waveform replication
Sidebar	Common interface for all applications

MOOG REPLICATION

Moog Replication module uses state-of-the-art algorithms to replicate time history files in an easy yet powerful way. The time waveform replication process uses system identification and iteration to provide high accuracy and extreme speed.

Whether you run standard or specialized test procedures, the Moog Replication module enhances your creativity and enables your most ambitious test methods every time.

MAP YOUR NETWORK TO OPERATE AND MONITOR TESTS

Operate

Operate any Moog Test Controller on the network using Moog Replication Software.

The software supports the use of multiple network cards which allows the PC to be connected to the office network and to a separate controller network at the same time.

You can remotely operate the controller through a hardware console dialogue box, view the complete hardware model three, edit parameters and create pseudo channels or aliases on the controller.

Moog Replication Software enables you to view critical data files in a wide range of formats and plots.
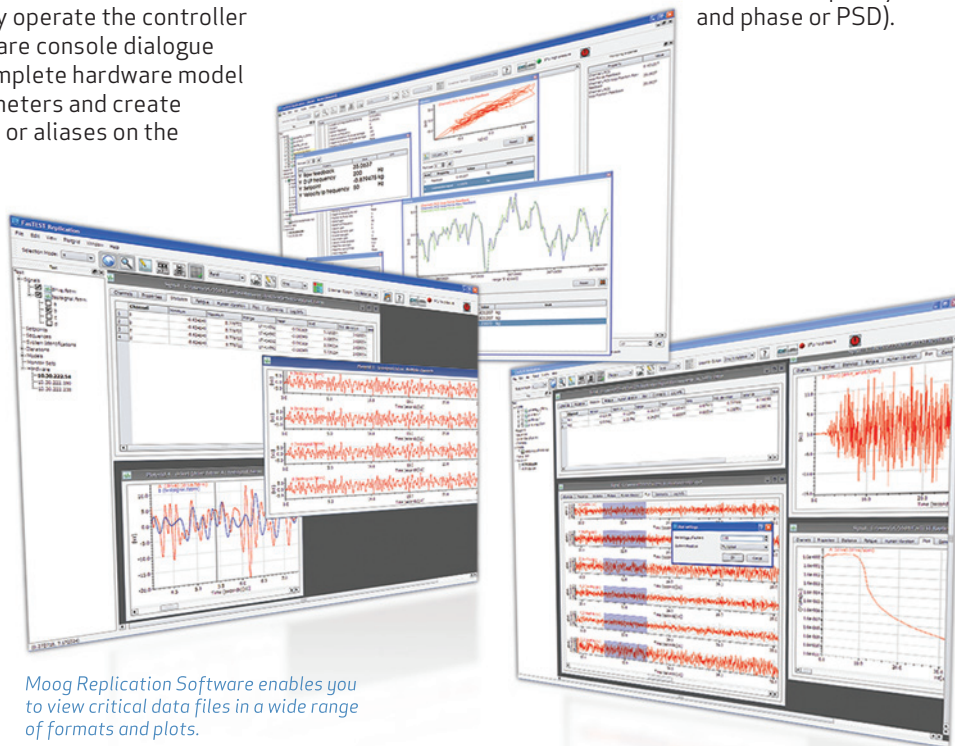
MANAGE TEST DATA: CREATE VIEWS, EDIT DATA AND SPOT ANALYZE

View

View data files in a wide range of formats and plots.

The software can create single plots, multi-plots and offers matrix plots, drag and drop functionality to view data from one or more files in one plot window.

The plotting can be done in time domain or in the frequency domain (magnitude and phase or PSD).

Monitor

Monitor critical data in real-time using graphs or meters.

A number of sets enable you to combine data and create desired screens even faster.

Edit

Edit data from the plot, using cut, copy or paste as well as tools such as re-sampling, spike removal, tapering, filtering, removing offsets and custom-made scripts using a universal scripting language.

Analyze

Analyze data using analysis tools like FFT, PSD, fatigue analysis and more.

STICK TO REALITY USING HIGH SPEED TIME WAVEFORM REPLICATION

System identification

The Moog Replication module offers the necessary tools to analyze the system model (e.g., transfer function, coherence, inverse model).

This process helps develop drive files to match desired target data. The convergence towards the optimal drive file is achieved at incomparable high speed, dramatically reducing your test preparation time. It starts with performing a system identification that can be done with all channels at once (simultaneous), or channel by channel (sequential) for both square and non-square systems.

Once you are satisfied with the system identification result, the calculated model can be stored. This can be used for simulation purposes or the iteration step.
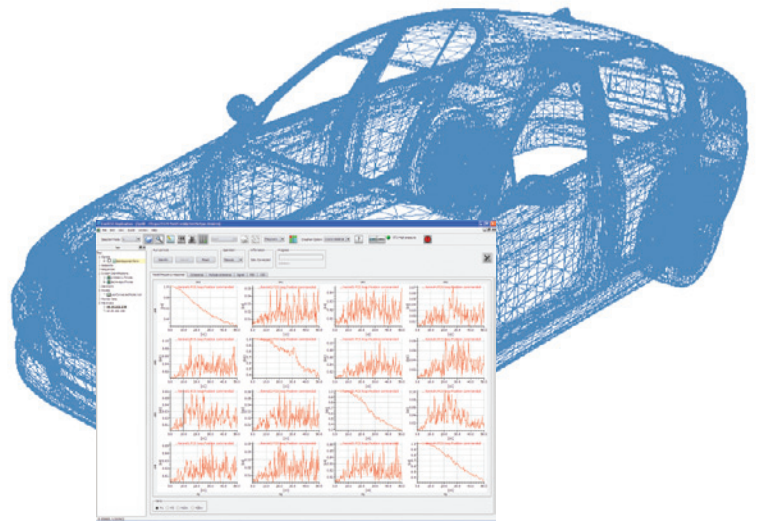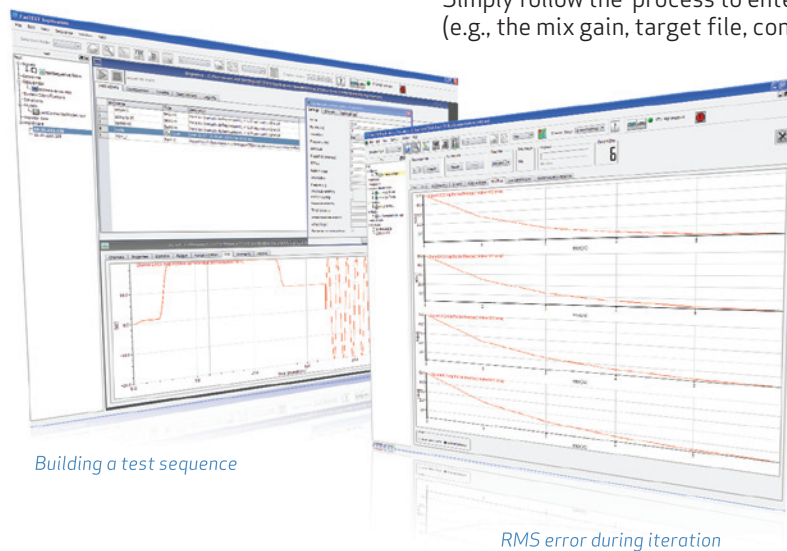
Sequence building

Once the drive files have been iterated, they can be used in a sequence to develop specific tests. Sequence building in Moog Replication can be used to develop a test.

The software also offers different views for sequence building. A table view can be used, but also a very intuitive graphical representation of the sequence is available to quickly put all steps in the desired order.

A timeline view lets you see the sequence per channel in the time domain. You can preview your sequence before sending it to the controller.

Building a test sequence

Iteration

The advanced Moog iteration algorithms result in fewer iteration steps to reduce the fatigue of your test specimen and optimize your preparation time.

Simply follow the process to enter your general parameters (e.g., the mix gain, target file, control channels, controller bandwidth). Then the algorithms of the program will gradually adjust the drive file in such a way that the system response matches the desired target.

During the automated iteration process, the operator can easily view several comparative calculations to judge the iteration quality. Once the required level of accuracy has been reached, the final drive file can be stored for use in subsequent testing.

RMS error during iteration

LET THE AUTO ITERATION WORK FOR YOU

Batch iteration

Replicate a set of target files (or time history reference files) with the same scheme without further intervention and with the necessary monitoring.
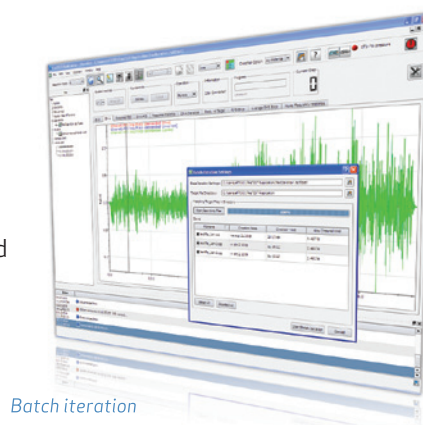
The generated report gives the operator an overview of the iteration results for each of the replicated files.

You can perform other tasks while the auto iteration runs for you.

Batch iteration

MOOG RUNNER

Once you have defined one or multiple drive-files, the Moog Runner module allows you to configure, execute and monitor your durability testing. It is widely used by automotive labs for its simple setup and fast test times.

RUN YOUR TEST EFFICIENTLY WHILE PROTECTING THE TEST SPECIMEN

Set Sequences

Create all basic functionalities efficiently using drag-and-drop functions.

Use multiple play modes like sequential and 'rule of three'.

Select data acquisition channels, add monitors, proceed to channel mappings from the drive file and the sequence building.

Use advanced data acquisition options like storing partly data sets, trend monitoring, signal guarding.

Setup statistical and fatigue calculation for monitoring and guarding.

Optimize sequence editing.

Sequence editor
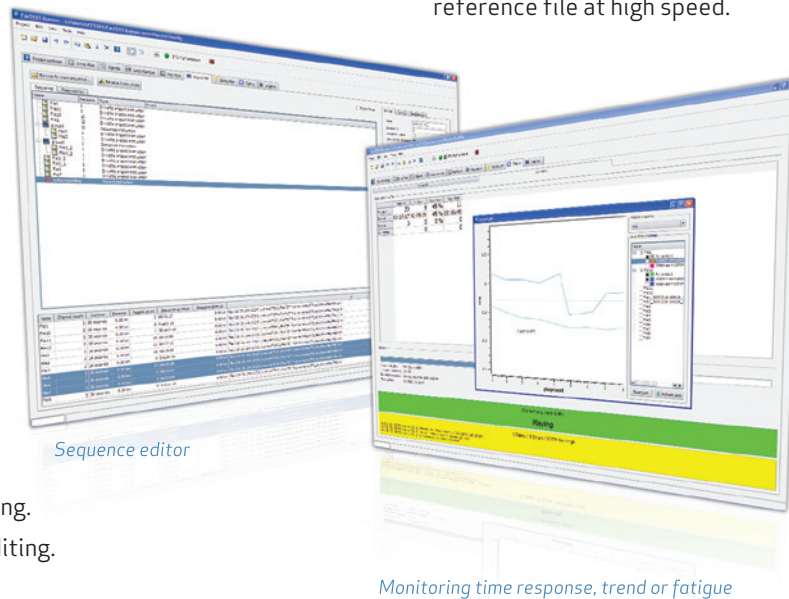
Test Specimen Monitoring

Protect your test specimen with maximum safety by selecting monitoring options to get an alarm or trigger a failsafe.

Time response monitoring is done in real-time on the controller and compares the signals with a pre-recorded reference file at high speed.

Both trend and fatigue monitoring are done by Moog Runner after each executed drive-file.

Trend monitoring checks the change of signals over time. It supports the creation of trend plots, statistical operations like minimum / maximum, mean RMS and standard deviation.

Fatigue (e.g., crest factor, pseudo damage) monitoring checks the fatigue endured by the specimen.

Monitoring time response, trend or fatigue

MOOG SINESWEEP

Moog Sinesweep module is used to investigate the resonance frequencies of a test specimen and to run sinesweep durability tests. The application has an intuitive design that makes it user friendly.

## ANALYZE AND UNDERSTAND THE TEST SPECIMEN IN FOUR STEPS

1. Controller

Select a real time controller or station and make the connection using the sidebar.

2. Set Up

Define which controller channels to use, set frequency and amplitude and choose between the open and closed-loop control modes.

No iteration is needed using closed-loop algorithms.

Next, define the sweep profile and establish the alarm and failsafe limits.
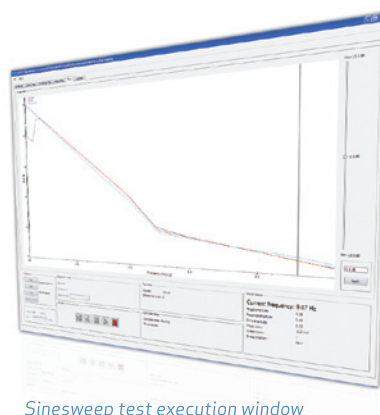
Sinesweep test execution window

3. Recording

Define recording of any controller parameters and store them to your hard-disk. You can then use the test for reporting or further analysis.

4. Test

Run the test by selecting the manual mode (which is suited for resonance finding with dwell and reverse function) or choose automatic and run durability tests for a predefined number of cycles or timeframe.

MOOG RANDOM VIBRATION

The Moog Random Vibration module was designed for fatigue and structural tests, and can help to generate meaningful test results earlier in the design cycle.

This software will allow you to identify and quantify defects more rapidly, helping to reduce costs related to late design changes and eliminate warranty issues.

Random Vibration module and hardware configurations

Random Vibration can be used for single channels systems, but also supports multi-axis test systems, like the Moog Simulation Table, using MIMO (Multiple Inputs, Multiple Outputs) algorithms.

Set up made fast and easy

First enter a set of basic parameters and define your power spectral density profile (PSD). Step by step the software will increase the energy levels until the target PSD is reached. Once the desired PSD has been reached the test time will start running. The advanced parameter option allows you to fine tune or define additional parameters as needed.

While running, the sidebar will help you monitor and record your data while running the test, so you keep full control of the running test at all times
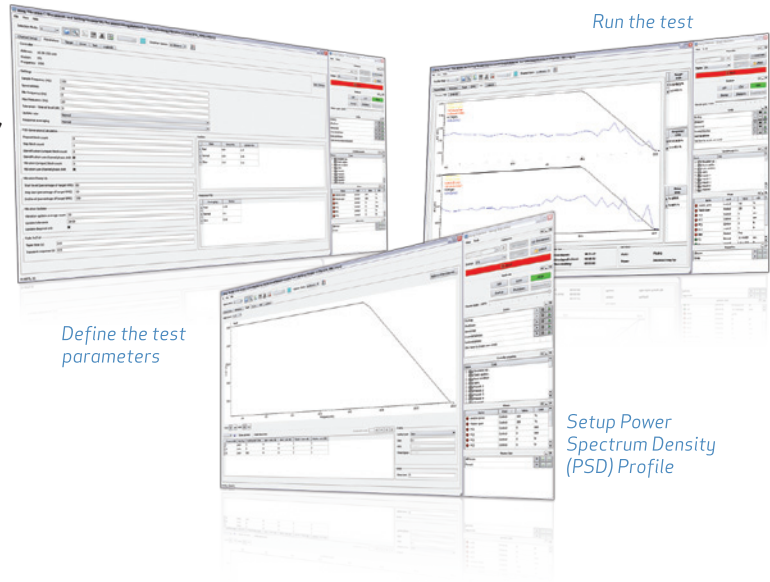
Run the test

Define the test parameters

Setup Power Spectrum Density (PSD) Profile

ONE MOOG SOFTWARE, MANY APPLICATIONS

Test labs have to adapt quickly to changing requirements when running different tests. Moog Automotive Test Software leads you to develop successful tests that match your changing priorities and protect the test specimen.

Our approach to achieving faster and better tests on new models, parts and prototypes using electric and hydraulic technologies, ensures we can meet even the highest requirements for frequency, payloads and stiffness.

Ride and Comfort Test System
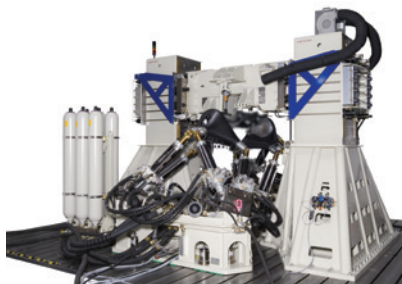
Suspension Test System

Roof Test System

Seat Test System

4-Poster Test System

7-DOF Driving Simulator with Lateral Rail

TAKE A CLOSER LOOK.

Moog designs a range of products that complement the performance of those featured in this catalog. Visit our Web site for more information and the Moog facility nearest you

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