

MB
Dynamics *Innovating and Delivering Solutions*
...Vibration and Shock



*We're proud to serve
the testing needs of . . .*

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No one in the vehicle industry welcomes the customer dissatisfaction, warranty cost, and hassles of annoying interior and exterior noises, including those that show up long after the vehicle is new. That's why MB Dynamics has earned a worldwide reputation for innovative Buzz, Squeak & Rattle (S&R) test solutions. Our technology focuses on helping you detect, diagnose and eliminate these annoying sounds before the vehicle rolls off the assembly line. We'll help you increase customer satisfaction, achieve best-in-class designation and build brand image for your vehicle, module or part. Our capabilities include:

- Full Vehicle S&R Test
- Subsystem or Modular S&R Test
- Component S&R Test
- Stick-Slip/Squeak & Itch/Material Compatibility Test
- S&R Prevention

DSR: the Next Generation of S&R Technology

Merely proving that a vehicle, subsystem or component is Squeak & Rattle-free when new doesn't assure customer satisfaction after 150,000 kilometers. That's why MB Dynamics is innovating next generation S&R testing technology with Durability Squeak & Rattle (DSR) systems built quiet for S&R, powerful for durability and multi-axis for realism.

Our DSR systems enable performing durability and S&R testing on the same equipment. The technology yields quiet testing for S&Rs, then testing at elevated acceleration levels to simulate mileage accumulation. This test cycle can be repeated endlessly—on the same equipment—for significant productivity advantages.

Our systems allow 24/7 S&R testing. By using permanent magnets rather than field coils, heat is minimal. Therefore, we've eliminated the distracting sounds normally associated with cooling the exciters. Our patented flexures and innovative fixture design further reduce test equipment noise. The nearly silent operation allows for easier detection of road-induced annoying noises. Ours are "best-in-class" quiet.

Rely on DSR Technology from MB Dynamics to:

- Verify performance against design specs (DVT)
- Comply with S&R test specs: objective and subjective; internal and customer; industry standards
- Troubleshoot problems during design/development
- Support vehicle launch
- Implement countermeasures that resolve warranty problems and "Things Gone Wrong"
- Audit S&R quality in plants during production
- Audit and benchmark competitor performance
- Enhance quality and build brand image

Features

Realistic reproduction of road noises and excitations; excitation via direct coupling to vehicle body using 2 or 4 independently controlled Energizers

Extremely quiet! Typical background noise, 40dBA; no wheel pan slap, no tire noise, no servo-valve hiss, no rolling road equipment noise

No special foundation or seismic mass required

Forces are small that are needed for road-excited S&Rs

Reproduce road load time histories, sine sweeps, random profiles, periodic inputs, and engine orders

Benefits

Effective at finding S&Rs just like cars tested on roads and hydraulic 4-posters; Realistic road simulation; feels like the road; for example, Belgian Block excitation feels like Belgian Block road

Test equipment noise does not mask S&Rs; effective to identify noises and find their root causes; quiet; suitable for objective measurements; used for OK / Not OK

Easy to move to new location; easy also to reconfigure as Module Detector; versatile

Low equipment and facility cost compared to alternatives

Real-world replication of excitations plus diagnostic tools

Direct Body Excitation



Dynamic Vehicle Twist



S&R Detectors for Modules: Vertical Only

For Cockpits, Seats, Door Modules, Consoles, Sunroofs, HVAC and other Modules

Features

Extremely quiet! Typical background noise , 30-35dBA or <1.5 Sones N10

1 axis of vibration

Performs Durability S&R (DSR) tests on payloads up to 200kg or more

Use inside environmental chamber: -40°C to +50°C

5 – 100 Hz frequency range for S&R and durability, max 250 Hz

Reproduce road load time histories, sine sweeps, random profiles, periodic inputs, and engine orders

Benefits

Test equipment noise does not mask S&Rs, more effective to identify noises and find their root causes; quiet; suitable for objective measurements

Vertical is dominant direction of road inputs

One test system is quiet enough for S&R and powerful enough for durability tests

Find S&Rs not noticed at ambient temperatures; perform combined vibration and environmental DSR; don't need 2 different test systems

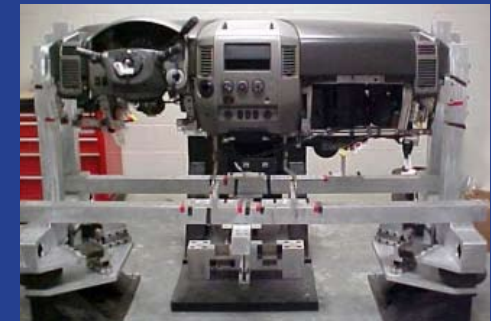
Complies with typical automotive S&R and durability test specs

Real-world replication of excitations plus diagnostic tools

Vertical Only Excitation



Vertical Only Excitation



See Data Sheet for other Features and Explanations

S&R Detectors for Modules: Sequential 3 DOF

For Cockpits, Seats, Door Modules, Consoles, Sunroofs, HVAC and other Modules



Features	Benefits
Extremely quiet! Typical background noise , 30-35dBA or <1.5 Sones N10	Test equipment noise does not mask S&Rs, more effective to identify noises and find their root causes; quiet; suitable for objective measurements
3 sequential axes of vibration	Dominant road excitation directions: vertical, fore-aft, and lateral
3 sequential axes of vibration	Complies with GMW14011 & 7298
Excite in each direction without moving test item, Energizer or fixture	Easy to use; easy and quick to switch excitation directions; easy to find direction-sensitive S&Rs
Performs Durability S&R (DSR) tests on payloads up to 200kg or more	One system is quiet for S&R and powerful for durability tests
Use inside environmental chamber: -40°C to 50°C	Find S&Rs not noticed at ambient temperatures; perform combined vibration and environmental DSR; don't need 2 different test systems
5 – 100 Hz frequency range for S&R and durability, max 250 Hz	Complies with typical automotive S&R and durability test specs
Base mass with air casters allow movement within lab without bolting equipment to floor	Equipment is very versatile: can test full vehicles, modules and components
Reproduce road time histories, sine sweeps, random profiles, periodic inputs, and engine orders	Real-world replication of excitations plus diagnostic tools

Sequential 3 DOF- Fixture Bolted to Floor



Sequential 3 DOF- Fixture Mobile



S&R Detectors for Modules: Simultaneous 1+2

For Cockpits, Seats, Door Modules, Consoles, Sunroofs, HVAC and other Modules

Features	Benefits
Extremely quiet! Typical background noise , 30-35dBA or <1.5 Sones N10	Test equipment noise does not mask S&Rs, more effective to identify noises and find their root causes; quiet; suitable for objective measurements
5 simultaneous axes of vibration in two tests: Vertical is controlled in 1st cycle, pitch and fore-aft are coupled; Lateral is controlled in 2nd cycle, roll is coupled	Excites dominant directions: vertical, fore-aft, lateral, pitch, roll; Complies with Ford DV/PV Outline for Instrument Panels and Seats
Road excitation using MISO -- Multi-Input, Single-Output Controls	Simulates road excitation at favorable price-performance
Performs Durability S&R (DSR) tests on payloads up to 250kg or more	One test system is quiet enough for S&R and powerful enough for durability tests
Use inside environmental chamber: -40°C to 50°C	Find S&Rs not noticed at ambient temperatures; perform combined vibration and environmental DSR; don't need 2 different test systems
Reproduce road time histories, sine sweeps, random profiles, periodic inputs, and engine orders	Real-world replication of excitations plus diagnostic tools

Vertical-Pitch-Roll (VPR)



VPR+MIMO Controller



S&R Detectors for Modules: Simultaneous 2+3

For Cockpits, Seats, Door Modules, Consoles, Sunroofs, HVAC and other Modules



Features

Extremely quiet! Typical background noise , 30-35dBA or <1.5 Sones N10

5 simultaneous axes of vibration in one test: Roll and vertical are controlled using 2 vertical exciters; pitch, fore-aft and lateral are coupled

Road excitation using MIMO -- Multi-Input, Multi-Output Controls

Performs Durability S&R (DSR) tests on payloads up to 250kg or more

Use inside environmental chamber: -40°C to 50°C

Reproduce road time histories, sine sweeps, random profiles, periodic inputs, and engine orders

Benefits

Test equipment noise does not mask S&Rs, more effective to identify noises and find their root causes; quiet; suitable for objective measurements

Quiet and favorable price-performance compared to hydraulic MAST

Productivity of test time; realism of excitation; quiet and favorable price-performance compared to hydraulic MAST

One test system is quiet enough for S&R and powerful enough for durability tests; don't need 2 different test systems

Find S&Rs not noticed at ambient temperatures; perform combined vibration and environmental DSR; don't need 2 different test systems

Real-world replication of excitations plus diagnostic tools

VPR+MIMO Controller



VPR+MIMO Controller



S&R Detectors for Modules: Simultaneous 3+2

For Cockpits, Seats, Door Modules, Consoles, Sunroofs, HVAC and other Modules

Features

Extremely quiet! Typical background noise , <40 dBA

5 simultaneous axes of vibration in one test: vertical, fore-aft, and lateral are controlled independently using 3 exciters; pitch and roll are coupled

Road excitation using MIMO -- Multi-Input, Multi-Output Controls

Performs Durability S&R (DSR) tests on payloads up to 325kg or more

Use inside environmental chamber: -40°C to 50°C

Reproduce road time histories, sine sweeps, random profiles, periodic inputs, and engine orders

Benefits

Very quiet, compared to hydraulic MAST; test equipment noise does not mask S&Rs

Quiet and favorable price-performance compared to hydraulic MAST

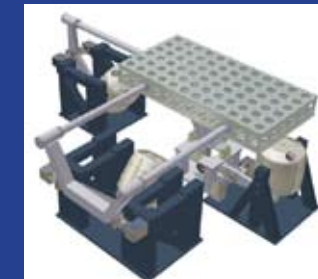
Productivity of test time; realism of excitation; quiet and favorable price-performance compared to hydraulic MAST

One test system is quiet enough for S&R and powerful enough for durability tests; don't need 2 different test systems

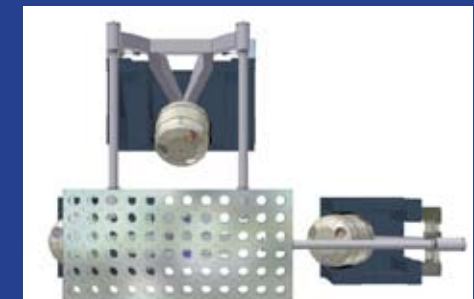
Find S&Rs not noticed at ambient temperatures; perform combined vibration and environmental DSR; don't need 2 different test systems

Real-world replication of excitations plus diagnostic tools

Simultaneous 3 DOF+2



Top View-Uses 3 Energizers



Electrodynamic Simultaneous 4 DOF and 4 + 1 DOF System

For Cockpits, Seats, Door Modules, Consoles, Sunroofs, HVAC and other Modules



Features

Extremely quiet! Typical background noise , <40 dBA

4 simultaneous axes of vibration are controlled independently using 4 exciters: vertical, roll, fore-aft and lateral

4 + 1 delivers 5 simultaneous axes of vibration in one test cycle: roll, vertical, fore-aft, & lateral controlled using 4 exciters; pitch coupled with fore-aft

Performs Durability S&R (DSR) tests on payloads up to 325kg or more

Use inside environmental chamber: -40°C to 50°C

Reproduce road time histories, sine sweeps, random profiles, periodic inputs, and engine orders

Benefits

Very quiet, compared to hydraulic MAST; test equipment noise does not mask S&Rs

Outstanding reproduction of most important DOFs for S&R

Quiet and favorable price-performance compared to hydraulic MAST; Test one axis at a time (X, Y or Z)

One test system is quiet enough for S&R and powerful enough for durability tests; don't need 2 different test systems

Find S&Rs not noticed at ambient temperatures; perform combined vibration and environmental DSR; don't need 2 different test systems

Real-world replication of excitations plus diagnostic tools

Simultaneous 4 DOF



Simultaneous 4 DOF+Pitch



Electrodynamic 6 DOF System

For Cockpits, Seats, Door Modules, Consoles, Sunroofs, HVAC and other Modules

Features

Extremely quiet! Typical background noise , <40 dBA

6 simultaneous axes of vibration are controlled independently using 6 exciters

Performs Durability S&R (DSR) tests on payloads up to 325kg or more

Use inside environmental chamber: -40°C to 50°C

Reproduce road time histories, sine sweeps, random profiles, periodic inputs, and engine orders

Benefits

Very quiet, compared to hydraulic MAST; test equipment noise does not mask S&Rs

Best reproduction of real world DOFs

One test system is quiet enough for S&R and powerful enough for durability tests; don't need 2 different test systems

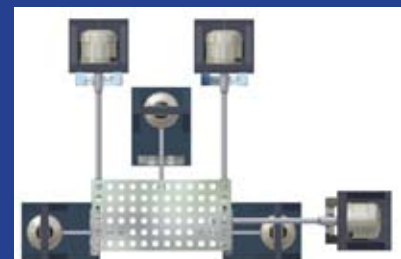
Find S&Rs not noticed at ambient temperatures; perform combined vibration and environmental DSR; don't need 2 different test systems

Real-world replication of excitations plus diagnostic tools

Simultaneous 6 DOF



Top View-Uses 3 Energizers



S&R Detector: Steering Assemblies

Features

Extremely quiet! Typical background noise , 30-35dBA or <1.5 Sones N10

Same equipment helps diagnose rack rattle and column noises

Performs Durability S&R (DSR) tests and rack rattle tests

3 sequential axes of vibration

Excite in each direction without moving test item, Energizer or fixture

Reproduce road time histories, sine sweeps, random profiles, periodic inputs, and engine orders

Benefits

Test equipment noise does not mask S&Rs, more effective to identify noises and find their root causes; quiet; suitable for objective measurements

One test system fulfills multiple test functions and objectives

One test system is quiet enough for S&R and powerful enough for durability tests; don't need 2 different test systems

Dominant road excitation directions: vertical, fore-aft, lateral

Easy to use; easy and quick to switch excitation directions; easy to find direction-sensitive S&Rs

Real-world replication of excitations plus diagnostic tools

See Data Sheet for other Features and Explanations

Steering Rack Rattle Test



Steering Column Test



S&R Detector: Components

Features

Extremely quiet! Typical background noise , 30-35dBA or <1.5 Sones N10

1 axis of excitation, or 3 sequential axes

Performs Durability S&R (DSR) tests and rack rattle tests

Reproduce road time histories, sine sweeps, random profiles, periodic inputs, and engine orders

Benefits

Test equipment noise does not mask S&Rs, more effective to identify noises and find their root causes; quiet; suitable for objective measurements

Dominant road excitation directions: vertical, fore-aft, lateral

One test system is quiet enough for S&R and powerful enough for durability tests; don't need 2

Real-world replication of excitations plus diagnostic tools

See Data Sheet for other Features and Explanations

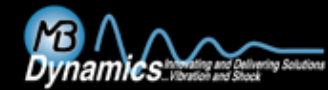
Seat Belt Retractor-Horizontal



Audio on Horizontal Moving Table



Squeak & Itch Test System



Features

Measure stick-slip characteristics of material pairs under different environments (-30 to +80 degC), normal forces (5 to 80N) and speeds (1 to 10mm/s)

Measure stick and slip friction, including effects with salt, dirt, moisture

Induce motions including measured time histories, road load random, sine, and single-excursions

Measure loudness, SPL and acoustic performance of material pairs

Tests leather, hard & soft plastics, elastomers, trim, metal, glass, foams, fabrics and geometries

Measure material adhesion, abrasion, wear and aging

Benefits

Predict squeak and squeal performance; select compatible materials and grains and coatings to minimize risk of squeaks

Develop materials database with in-vehicle test properties and material compatibility statistics

Characterize material pair performance under simulated road conditions

Meet OEM noise specs; use acoustics as another qualifying parameter

Test & evaluate virtually all materials in contact in the vehicle interior for risk of squeaks

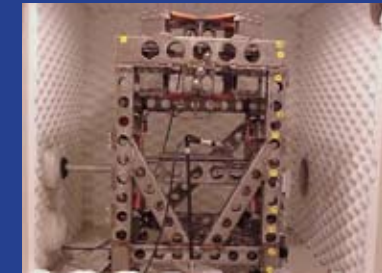
Understand the effects of aging on squeak performance

See Data Sheet for other Features and Explanations

Squeak and Itch System



Material Pair Instrument in Quiet Chamber



SSP-ELP Stick-Slip Test Rig

Features

Measure stick-slip characteristics of material pairs under different environments (-30 to +80 degC), normal forces (5 to 80N) and speeds (1 to 10mm/s)

Measure stick and slip friction, including effects with salt, dirt, moisture

Tests leather, hard & soft plastics, elastomers, trim, metal, glass, foams, fabrics and geometries

Measure material adhesion, abrasion, wear and aging

Benefits

Predict squeak and squeal performance; select compatible materials and grains and coatings to minimize risk of squeaks

Develop materials database with in-vehicle test properties and material compatibility statistics

Test & evaluate virtually all materials in contact in the vehicle interior for risk of squeaks

Understand the effects of aging on squeak performance

See Data Sheet for other Features and Explanations

Stick-Slip and Tribology Machine

