



Adjuster Performance

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This test procedure evaluates the global seat system adjuster performance to withstand vibration inputs.

1.2 Applicability. This test shall be applied to all General Motors vehicles with free-standing seat systems mounted on adjusters (includes both power and manual seats).

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- CG190
- HEAD acoustics, Incorporated, Brighton, Michigan, www.head-acoustics.de
- MB Dynamics, Cleveland, Ohio, www.mbdynamics.com

3 Resources

3.1 Facilities. An approved GM certified test lab with an adequate bed plate or equivalent work surface necessary for mounting of the test sample and associated test fixtures.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.1.3 Vibration. Facility vibration levels should not exceed 5% of the test specified input vibration level at any frequency.

3.2 Equipment.

3.2.1 Mounting Blocks. Appropriate model mounting blocks to hold seat subsystem in body position.

3.2.2 Three (3)-Axis Shaker Table. A shaker capable of replicating the vibration spectrum found in Table A1 (Appendix A). Dynamic stroke should be at least 2.5 cm, in order to meet the vibration profile requirements.

3.2.3 Fixture. Ideally, fixtures should be rigid and free of resonances in the 0 Hz to 200 Hz range. Fixture resonances, when excited, can alter the vibration input to the component, and potentially make test control very difficult. To avoid exceeding the dynamic capability of the shaker, the fixture should also be as light as possible. Because of its low mass and high degree of stiffness and damping characteristics, magnesium is the material of choice. Aluminum is often an acceptable substitute. The recommended seat testing fixture is the MB Dynamics Universal Test Fixture.

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Note: For some large fixtures or configurations of a Universal Test Fixture, it may be practical to make the fixture resonant free up to 200 Hz. In these cases, engineering judgment or further analysis may be required. The use of multiple test control accelerometers and wise placement of the control accelerometers can minimize the effects of resonances below 200 Hz.

3.2.4 Random Controller. A digital controller with random and swept sine control capability is required. The controller is required to have a minimum of four (4) control channels (eight (8) channels is recommended). The controller must be capable of controlling the shaker:

3.2.4.1 In the 5 Hz to 400 Hz range with a minimum of 1 Hz frequency resolution.

3.2.4.2 With closed loop control.

3.2.4.3 With selectable N-Sigma clipping units or crest factor.

3.2.5 Accelerometer and Signal Conditioner. An accelerometer and appropriate signal conditioning are required to monitor acceleration input to the test specimen. If a strain gage type accelerometer is used, its nominal acceleration range shall not exceed five (5) times the amplitude of maximum specified input acceleration. The accelerometer must not have a resonant frequency less than twice the highest specified test frequency (normally 200 Hz).

3.2.6 Data Recorder. A portable HEAD acoustics SQuadriga (or equivalent) handheld unit is recommended for data acquisition. Other data acquisition units may be used, providing they have minimum 16-bit resolution.

3.2.7 Software. HEAD acoustics Artemis software (or equivalent) is recommended for analysis of recorded data. Calculation utilizes the Filtered Level vs. Time feature to compile the Root Mean Square (RMS) acceleration Values vs. Time. Set a manual integration rate of 0.100 s, and set bandwidth values 5 Hz to 30 Hz, fourth order Butterworth filters. If software other than Artemis is used, data must be shown that it yields equivalent calculation results.

3.2.8 Seat Test Plate. The seat test plate is approximately 46 cm × 36 cm × 0.3 cm (18 in × 14 in × 1/8 in) thick aluminum (Figures A1 and A2, Appendix A).

3.3 Test Vehicle/Test Piece.

3.3.1 Test Vehicle. No test vehicle is used for the laboratory vibration test in this procedure.

3.3.2 Complete Seat Structural Subsystem. Test requires an appropriate seat structural subsystem consisting of a back frame, bottom frame (pan), adjuster, and recliner as specified by the Design Release Engineer. A fully trimmed seat is required.

3.4 Test Time.

Calendar time: 1 day

Test hours: 24 hours

Coordination hours: 4 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. The required personnel to perform this test procedure are:

3.6.1 General Motors Design Release Engineer.

3.6.2 General Motors Validation Engineer.

3.6.3 Testing organization's Test Engineer.

3.6.4 Testing organization's Test Technician.

4 Procedure

4.1 Preparation.

4.1.1 Mounting. Mount the seat subsystem on the appropriate model mounting blocks in vehicle position. Include mounting spaces if specified for installation.

4.1.2 Attach Seat Subsystem. Mount the seat subsystem and its mounting blocks to the three (3)-axis shaker table. The shaker should be attached at the center of gravity of the fixtured part so that no rotational motion or side loading occurs to the seat subsystem while on the shaker.

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4.1.3 Positioning. Recline seat to the design seat back angle position. The seat shall be in the highest adjuster position.

Note: The seat subsystem must be tested in five (5) locations along the horizontal movement of the adjuster. The first location shall be 10 mm from the full rearward adjuster position. The second location shall be 20 mm from the first location. This test procedure will continue this movement for a total of five (5) locations.

Note: The locations for testing can vary depending upon the architecture of the seat adjuster. These positions need to be agreed upon by the GM Design Release Engineer and Validation Engineer prior to testing.

4.1.4. Weights for Seat Load. Weights (100 kg) must be available for seat load (4.3.2.2).

4.1.5 Random Controller. The random controller shall be set up with the random profile specified in Table A1 (Appendix A) and the appropriate meter/second squared RMS vibration level. N-Sigma clipping should be set for three (3) unless otherwise stated in Table A1 (Appendix A).

4.2 Conditions.

4.2.1 Environmental Conditions. Conduct test in a room temperature environment of +22 °C.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Pretest Measurements.

4.3.1.1 Attach the accelerometer directly to the seat test plate (Figure A1, Appendix A). Cycle the seat to its full forward position, to full rearward position, then full forward position again.

4.3.1.2 Pretest Data Acquisition.

4.3.1.2.1 With seat in full forward position, begin recording data on the HEAD acoustics SQuadriga handheld data acquisition (or equivalent).

4.3.1.2.2 Move the adjuster to the full rear position.

4.3.1.2.3 Stop recording.

4.3.1.2.4 Restart the data acquisition device.

4.3.1.2.5 Move the adjuster to the full forward position.

4.3.1.2.6 Stop recording.

4.3.2 Test Steps.

Note: Duration of the test for all five (5) seat positions is 20 h.

4.3.2.1 Seat Position 1. Move the seat adjuster to the full rear position. Move the adjuster 10 mm forward of the full rear position (Position 1).

4.3.2.2 Load Seat. Load the seat subsystem with 100 kg of weight.

4.3.2.3 Random Controller. Start the random controller to actuate the shaker table. The random controller should be allowed to ramp up and stabilize to the profile specified in Table A1 (Appendix A).

4.3.2.4 Test Duration. Run the seat through the profile provided in Table A1 (Appendix A) continuously for 5 h. When complete, stop the shaker table.

4.3.2.5 Seat Position 2. Move the seat adjuster to 20 mm forward of the full rear position (Position 2). Repeat 4.3.2.2 thru 4.3.2.4 for Seat Position 2.

4.3.2.6 Seat Position 3. Move the seat adjuster to 30 mm forward of the full rear position (Position 3). Repeat 4.3.2.2 thru 4.3.2.4 for Seat Position 3.

4.3.2.7 Seat Position 4. Move the seat adjuster to 40 mm forward of the full rear position (Position 4). Repeat 4.3.2.2 thru 4.3.2.4 for Seat Position 4.

4.3.2.8 Seat Position 5. Move the seat adjuster to 50 mm forward of the full rear position (Position 5). Repeat 4.3.2.2 thru 4.3.2.4 for Seat Position 5.

4.3.3 Posttest Measurements.

4.3.3.1 Verify the accelerometer is still secured to the seat test plate.

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