



Real Time Multiaxial Body Mount Assembly Durability

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. The purpose of this test is to evaluate structural durability of the body mounts to the frame/cradle when subjected to test site conditions. It describes test development and durability test execution.

1.2 Applicability. This standard applies to body on frame and body frame integral vehicles.

1.3 Remarks. This test provides triaxial load inputs to the body to frame/cradle mounts.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14048 (ID)	GMW15219	GMW15242	GMW15268
GMW15019 (ID)	GMW15232	GMW15245	GMW15269

(ID) = This standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Lead Engineer for further instructions.

2.3 Additional References.

- Appendix C, Statement of Requirements (SOR)
- CG190 Evaluation Report Template
- Component Technical Specification (CTS)
- MTS Systems Corporation, Eden Prairie, Minnesota (www.mts.com)

3 Resources

3.1 Facilities. A bedplate large enough for securing the test rig (bedplate approximately 2.2 m × 2.2 m) and capable of withstanding the dynamic loading of the test rig/specimen is required. Also required is a hydraulic system capable of supplying oil at a rate consumed by hydraulic cylinders. The test facilities and equipment shall be in good working order and all instrumentation shall have a valid calibration label. The bedplate and hydraulic system must be isolated from outside influences that can affect the data collection portion of the test.

This standard describes the setup for one rig/station capable of evaluating one body mount specimen at a time. (Appendix A, Figures A1 and A2).

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.

3.2 Equipment.

Note: This section includes test rig, fixtures, transducers, instrumentation, and controllers typically used by the General Motors North America Warren Structural Development Laboratory to perform this test. Other equipment

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may be substituted at the discretion of the local testing facility as long as it provides equivalent accuracy as specified herein or by the requester. Any setup must be approved by the Body Mount Bill of Material (BOM) Family Owner (BFO) and Subsystem Validation Engineer.

3.2.1. Hydraulic Actuators. Three (3) hydraulic actuators (vertical, lateral, and fore/aft) with low friction bearings and seals. The actuators must be capable of providing both high and low frequency small displacements. An example of an actuator with these characteristics is the MTS Systems Corporation, Series 242 actuator.

3.2.2. Fixtures. Fixtures necessary to support the body mount at the actuator end simulating the load axes surface of the frame/body rail attachment. The fixtures must simulate the interfacing parts of the body mount. The top of the mount can be attached to a fixed angle stand.

3.2.3. Angle Stands. Angle/tube stands to support the actuator and body mount reaction fixture.

3.2.4. Transducers.

3.2.4.1 Load Cell. The test setup requires three (3) load cells capable of measuring loads in the required range. Preload mount to the in-vehicle load condition.

3.2.4.2 Specimen Transducers. GMW15268 defines the minimum transducer set required for Road Load Data Acquisition (RLDA) and the test development portion of the test procedure. GMW15019 defines the RLDA process in which the transducers are used.

3.2.5 Heat Source. If required, a heat source must be located near the test setup. The durability portion of the test must subject the rubber body mounts to a specified temperature simulating the underhood/body thermal environment experienced in the vehicle.

3.2.6 Torque Wrench. A torque wrench is used to tighten all threaded fasteners to the specified torque.

3.2.7 Instrumentation.

3.2.7.1 Transducer Conditioner. The transducer conditioner is used to condition the inputs from the specimen transducers. It is used during the RLDA as well as for the test development on the test rig. A setup file is created at the start of the RLDA, which defines the gain, full scale, excitation, and sensitivity for each transducer. This information is saved and transferred to the test lab along with the RLDA transducers. This allows use of the same transducers/parameters during test development.

3.2.7.2 Miscellaneous Cabling. Cabling with appropriate end connectors will be required to connect the transducers to the instrumentation and controllers to the hydraulic actuators and instrumentation.

3.2.7.3 Test Site Controller (TSC). The TSC is used to play the specified test profile drive signals out to the test rig during the test. It can also be used to collect responses from the transducers for test monitoring.

3.2.7.4 Servo Hydraulic Controller. The servo hydraulic controller provides a closed loop control to the servo hydraulic loops on the test rig. Test rig drive signals (command) are played into the servo controller from the TSC.

3.2.7.4.1 The servo hydraulic controller also provides shutdown limits that can be tailored by the user for a specific test. These limits can prevent unsafe operation of the test rig when the system control is interrupted.

3.2.7.5 Heat Source Temperature Controller. A heat source (typically electric gun blowers), must be controlled to provide the elevated thermal environment required for body mount durability testing. The controller, should be capable of controlling the heat source from the output of a thermocouple.

3.3 Test Vehicle/Test Piece.

3.3.1. Mounts/Brackets/Fasteners. Sample quantity of body mounts assemblies including fasteners as specified by the Requesting Engineer or Component Technical Specification (CTS). All test material should be certified prior to receipt to confirm that it is representative of design intent.

3.3.2 RLDA Hardware. A duplicate set of hardware must be provided by the RLDA requester if: the hardware used in performing the RLDA will not be made available for developing the test in the lab; or any RLDA hardware removed and provided to the lab will have to be replaced on the RLDA vehicle.

3.4. Test Time. This is an estimate of the amount of time (work-hours) needed to perform this procedure.

Calendar time: 30 days

Test hours: 261 hours/life

Coordination hours: 40 hours to 56 hours

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Note: These time estimates are approximate averages. Actual times vary considerably depending on early component failures (and subsequent availability of replacement parts), testing to varying multiples of cycle lives, varying requirements for frequency of environmental test conditions, scheduling problems for test facilities, test equipment malfunctions, scheduling of overtime and/or multiple shifts, actual readiness of test samples upon receipt, unique or additional requests for detailed test information, running multiple samples (times shown are for one system), etc.

The reported times consider preparation and other downtime, actual test, and analysis of data in capturing a total calendar time. They are estimated ranges for a typical durability test and will vary based upon the chosen durability schedule. Report writing, approval, processing, etc., are not part of the reported times.

3.5 Test Required Information. The requesting engineer is responsible for providing the CTS which must include the performance objectives (sample size and failure criteria) for development and/or validation tests.

The following information is required to run this test:

3.5.1 RLDA Report. This should include vehicle/mount information (e.g., identifying numbers, design level, Regular Production Option (RPO) codes, etc.), body mount rates, static offset loads measured at body mounts, photos of transducer locations, and transducer set up information (electronic file preferred). Additionally, if mounts and/or brackets are reworked to accommodate load cells, any resulting out of position mounts must be documented with appropriate dimensions, and provided to the test lab for duplication on the test development setup.

3.5.1.1 RLDA Channel Information.

3.5.2 Time History Data. RLDA data should be provided to the test lab in Remote Parameter Control (RPC) Pro format having 2048 points/group, 2048 points/frame and 409.6 points/s. File names must adhere to the local standard naming convention (reference GMW15219 for the file naming convention). Modifications to the provided data should be documented in the RLDA report.

3.5.3 Durability Part Information. Body mount/bracket/fastener part numbers, design level, Uniform Parts Classification (UPC) codes, Functional Name Address (FNA) codes (e.g., reference 1B1, FNA 0853A, 4D FNA 84XXA, etc.), must be provided for the production intent material to be evaluated during the test. Additionally, fastener torque specifications must be provided along with assembly sequences that may apply to properly assemble the body mount system.

3.5.4 Test Temperature. The desired steady state test temperature that each body mount is to be subjected to during the durability test. Development of the test is performed with all mounts at room temperature.

3.6 Personnel/Skills. Test engineer and technician skills are required to run the test.

4 Procedure

4.1 Preparation.

4.1.1 Test Plan. Create a test plan that details the timeline of events that are to take place in executing this procedure. This may include fixture design/build, data editing, test site/rig preparation, test rig drive file development, durability test execution, etc.

4.1.2 Fixture Design. If the setup will require the use of non-standard fixtures, the fixture design group should be notified as soon as possible. Design and build of the necessary fixtures can commence as soon as the required math data is made available.

4.1.3 Facilities and/or Equipment Preparation. Confirm that the test rig is in proper operating condition. Record all site and instrumentation calibration information per the current lab standard.

4.2 Conditions.

4.2.1 Environmental Conditions.

4.2.1.1 Test Development Environmental Conditions. Unless otherwise specified in this document's text or by the requesting engineer, the typical environmental conditions for developing this test are the temperature, humidity and pressure at the local test facility. Unless otherwise noted, these conditions are typically 22 °C ± 3 °C, relative humidity of 40% ± 20%, and atmospheric pressure equivalent to the local barometric pressure (which is variable during any given day and from day to day).

4.2.1.2. Body Mount Test Temperature.

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