



Electrically Powered Component – Drive Point Dynamic Stiffness and Mobility Level Evaluation Procedure

1 Scope

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.

Note: The Hand Held Force Input Frequency Response Function Acquisition Master Test Procedure, GMW14181 and the Transducer Calibration Verification Master Test Procedure, GMW14172, shall be referenced for more detailed information corresponding to the following procedure.

1.1 Purpose. Define the process for obtaining the component/bracket assembly drive point dynamic stiffness/mobility levels at the vehicle attachment locations for electrically powered components.

1.2 Foreword. The attachment drive point dynamic stiffness/mobility of an isolated component is one of the factors affecting structure-borne noise. The quantity, with others, can be used to calculate forces into the body or to predict noise levels in the vehicle passenger compartment.

1.3 Applicability. The test procedure is appropriate to use for electrically powered system actuated and customer actuated components that can be tested free-free. Free-free means without additional mounting fixtures, complex line routing, complex electronic controls or complex fluid controls. Example components include, but are not limited to, the following:

1.3.1 Secondary Air Injection (SAI) pumps.

1.3.2 Air suspension system compressors used for electronic leveling and/or air suspension control.

1.3.3 Brake system electric vacuum pumps.

1.3.4 Fuel system electric vacuum pumps used in Evaporative Leak Check Modules (ELCM).

1.3.5 Low temperature coolant pumps used for:

- Heater core cooling
- Electric Rear Differential Module (RDM) cooling.
- High voltage battery cooling.
- Powertrain electric control module cooling such as; the Transmission Power Inverter Module (TPIM), the electric Motor/Generator Unit (MGU), the Starter Generator Control Module (SGCM) or the Powertrain Electronics Box (PEB).

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14172 GMW14181

2.3 Additional References.

- Component Technical Specifications (CTS)
- Subsystem Technical Specifications (SSTS)

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3 Resources

3.1 Facilities. A test room or an area that is free of extraneous vibration is required. Reference GMW14181.

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. Data acquisition system, small accelerometer (with a weight of less than 6 g), small impact hammer with a tip capable of providing uniform force input out to 800 Hz, transducer cabling and signal conditioning. Reference GMW14181, Appendix A, Table A2 for transducer key characteristics.

3.3 Test Vehicle/Test Piece. The complete component and bracket assembly with mounting isolators are required.

3.4 Test Time.

Calendar time: 1 day

Test hours: 6 hours

Coordination hours: 2 hours

3.5 Test Required Information. Not applicable

3.6 Personnel/Skills. Reference GMW14181.

4 Procedure

4.1 Preparation. Place component with bracket assembly (including attachment isolators) on 7 cm to 10 cm of acoustic foam or support on elastomeric cords at the mount locations to approximate a free-free boundary condition. Manipulate the elastic compliance to achieve a rigid body bounce frequency less than 1 Hz.

4.2 Conditions.

4.2.1 Environmental Conditions. Reference GMW14181.

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 Calibration Verification. Check equipment for valid calibration date. Replace out-of-date equipment. Perform equipment calibration verification. Reference GMW14172.

4.3.2 Data Acquisition. Set up a data acquisition system to acquire accelerance Frequency Response Functions (FRF) in the units of meters per second squared per Newton [(m/s²)/N] from 0 Hz to 1024 Hz with at least 1 Hz resolution.

4.3.2.1 Instrument one of the component's vehicle attachment point locations with an accelerometer. The General Motors standard vehicle coordinate directions shall be followed as included in Appendix A. In the event that the component attachment point does not line up with the vehicle coordinate system, use a local coordinate system relative to the component's attachment point alignment. Document the local coordinate system used and record the angle relative to the global coordinate system.

4.3.2.2 Using an impact hammer, apply a drive-point force at the instrumented component attachment location. (A small piece of aluminum may be glued to the test part, if necessary, to create a striking surface.)

4.3.2.3 For each impact, measure accelerance, check coherence and verify response levels. Upon measurement completion, store the accelerance FRF, coherence and force autopower spectrum.

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