



Powertrain Accessory Interface Attachments - Drive Point Dynamic Stiffness and Mobility Level Evaluation Procedure

1 Introduction

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

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. Define the process for obtaining the drive point dynamic stiffness/mobility level at the powertrain accessory mounting attachment locations. These measurements are used to compare powertrain accessory mounting attachment drive point dynamic stiffness to the specifications.

1.2 Applicability. This test procedure is appropriate to use for all car and truck powertrain accessory mount systems.

1.3 Remarks. The drive point dynamic stiffness/mobility level of the powertrain accessory mounting attachment interfaces is a factor in powertrain noise performance.

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.

Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities. A test room or an area which is free of extraneous vibration per 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.

3.2.1 Data acquisition system (DAS).

3.2.2 Accelerometer: 10 mV/(m/s²), weight less than 0.006 kg.

3.2.3 Small or medium impact hammer with tip capable of providing uniform force input from 0 Hz to 3600 Hz.

3.2.4 Transducer cabling, and signal conditioning. See of GMW14181, Appendix A, Table A2 for transducer key characteristics.

3.3 Test Vehicle/Test Piece. Depending upon the method used to achieve the fixed boundary condition, the hardware requirements are as follows.

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3.3.1 A dressed powertrain, (engine, transmission and transfer case components) with the accessory brackets and all hardware associated with mounting the bracket to the powertrain (i.e., braces, bolts). Do not include accessories associated with said brackets (example: alternator, power steering pump or compressor).

3.3.2 Bedplate, accessory brackets with all hardware associated with mounting the bracket to the powertrain (i.e., braces, bolts), and adapter hardware to affix the accessory brackets to the bedplate.

3.4 Test Time.

Calendar time: 0.5 days

Test time: 2 hours

Coordination time: 2 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. To complete this test, at least one (1) technician and/or one (1) engineer skilled in vibration data acquisition, analysis, equipment use, and test setup is required.

4 Procedure

4.1 Preparation. The boundary conditions for this evaluation are fixed-free with the free boundary condition located at the accessory to bracket interface.

4.1.1 Two (2) methods may be used to achieve the fixed-free boundary condition.

4.1.1.1 The dressed powertrain (engine, transmission and transfer case components) can be used to approximate the fixed boundary condition. Mount the powertrain on elastic cords, or metal springs for free-free mounting boundary condition. Manipulate the elastic compliance to achieve less than a 1 Hz rigid bounce frequency. Mount and test each accessory bracket (with all correct attachment hardware) on the powertrain, one (1) bracket at a time.

4.1.1.2 The second method that can be used for the fixed boundary condition is to attach the bracket of interest to a bedplate. Care must be used to ensure the adapter hardware from bracket to bedplate introduces no unwanted dynamic response (see GMW14181).

Attach test block or fabricated interface hardware at appropriate accessory interface attachments (free boundary condition), taking care to minimize added mass and structural dynamics associated with interface hardware.

Note: This procedure is to use the method outlined in 4.1.1.1 for the purposes of powertrain (and accessory bracket) requirements. The procedure may be modified for the purposes of measuring bracket-only performance, in such a case, use the method outlined in 4.1.1.2.

4.2 Conditions.

4.2.1 Environmental Conditions. See 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 Set up a DAS to acquire accelerance FRF in the units of meters per second squared per Newton $[(m/s^2)/N]$ from 0 Hz to 4096 Hz with 1 Hz resolution.

4.3.2 Instrument an accessory mounting attachment with an accelerometer. Using an impact hammer, apply a force at the accessory mounting attachment in the same direction. Continue measuring driving point FRFs in three (3) orthogonal directions at all accessory mounting attachment points. Reference GMW14181 for GM standard vehicle coordinate directions and appropriate accelerometer mounting adhesives.

4.3.3 For each impact, measure accelerance, check coherence and verify levels. Upon measurement completion store accelerance frequency response function, coherence and force auto-power spectrum.

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