GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW14211

Powertrain Mounting Interface Attachments - Bosses - 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 on the powertrain mounting attachment interfaces (bosses). These measurements are used to compare powertrain mounting attachment interfaces (bosses) drive point dynamic stiffness/mobility to the specifications.

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

1.3 Remarks. The drive point dynamic stiffness/mobility level of the powertrain mounting interface attachments (bosses) is a factor in powertrain mount isolation 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/s^2), weight less than 0.006 kg.

3.2.3 Small or medium impact hammer with tip capable of providing uniform force input out 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. The dressed powertrain, (engine, transmission and transfer case components) but no accessory brackets or accessories associated with said brackets (example, alternator, power steering pump, or compressor). Eliminate rattles associated with springs, clips, or other loose articles.

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3.4 Test Time.

Calendar time:	0.75 days
Test time:	4 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. Attach test block or fabricated interface hardware at appropriate interface attachments, taking care to minimize added mass and structural dynamics associated with interface hardware. 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.

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 a powertrain mounting attachment with an accelerometer. Using an impact hammer, apply a force at the powertrain mounting attachment in the same direction. Continue measuring driving point FRFs in three (3) orthogonal directions at all of powertrain mounting attachment points. See 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 autopower spectrum.

5 Data

Data may be presented in four (4) ways:

- One-third (⅓) octave drive point dynamic stiffness spectrum
- One-third (⅓) octave mobility spectrum
- Narrow band mobility spectrum or
- Narrow band drive point dynamic stiffness spectrum

5.1 Calculations.

5.1.1 One-third (⅓) Octave Drive Point Dynamic Stiffness Spectrum.

- Integrate the narrow band accelerance to obtain mobility
- Calculate ⅓ octave mobility spectrum according to GMW14181, Appendix C
- Integrate the ⅓ octave mobility to obtain ⅓ octave compliance
- Invert the ⅓ octave compliance to obtain ⅓ octave dynamic stiffness
- Recalculate the units from newtons per millimeter [N/m] to kilonewtons per millimeter [kN/mm]
- Display:
  X-axis: 200 Hz to 3600 Hz (⅓ octave scale)
  Y-axis: kilonewtons per millimeter [kN/mm], log scale

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