



Center Floor Console – Drive Point Dynamic Stiffness Evaluation Procedure

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.

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

1.1 Purpose. Define the process for obtaining the drive point dynamic stiffness/drive point mobility level on the center floor console. These measurements are used to compare center floor console mobility to the specifications.

1.2 Applicability. This test procedure is appropriate for use with all car and truck body platforms.

1.3 Remarks. The drive point dynamic stiffness/mobility level of the center floor console is an assessment of the lateral dynamic stiffness 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.

GMW8702

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 Test Equipment.

- Data acquisition system with FRF analysis capability.
- Modally tuned impulse hammer (e.g., PCB-086D05 with PCB-084A51 Adaptor and hammer tips range from 084A50 to 086C05, the super soft tip (Grey 15.101, 1 in 10SS) is recommended and available from PCB Piezotronics, Inc.)
- Six (6) triaxial acceleration transducers (e.g., PCB-356A15, Mass < 0.011 Kg) with Integrated Circuit Piezoelectric (ICP) signal amplifiers (available from PCB Piezotronics, Inc.).

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- Hot glue or light weight mounting clamps are used for positioning the accelerometer transducers on the center floor console. It shall be ensured that no relative motion between the accelerometer and rim is possible.
- Multi-channel spectrum analyzer front end with Analog/Digital (A/D) converter, computer and software for measurement and analysis (e.g., LMS SCADAS Front End and LMS Test Lab software, available from Siemens PLM Software, Siemens Industry, Inc.). A multi-channel Data Acquisition System (DAS) is required to receive all signals simultaneously.

Note: See GMW14181, Appendix A, Transducer Examples for transducer key characteristics.

3.2.2 Test Fixtures. See GMW14181 for test fixture specifications and examples.

3.3 Test Vehicle/Test Piece. The full vehicle level, complete trimmed body or trimmed structure vehicle shall be in the appropriate state as defined in GMW8702.

3.4 Test Time.

Calendar time:	1 day
Test hours:	4 hours
Test summary:	1 hour
Coordination hours:	2 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. As described in GMW14181.

4 Procedure

4.1 Preparation. Lateral drive point accelerometer should be selected to ensure sufficient exterior console trim attachment to underlying console structure. The attachment surface should be prepared to provide a clean mounting surface.

4.2 Conditions.

4.2.1 Environmental Conditions. As described in 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.

Test conditions are described in GMW14181.

4.3 Instructions.

4.3.1 Setup for Measurement System. Set up a data acquisition system to acquire accelerance FRF in the units of meters per second squared per Newton ($\text{m/s}^2/\text{N}$).

- Frequency range: 0 Hz to 128 Hz
- Resolution: 0.25 Hz minimum
- Trigger mode: Hammer Input channel
- Time windows: Uniform window. If event cannot be completely observed, use Force/Exponential Windows
- Trigger level: 10% to 50% slope channel. Sign of the slope may vary depending on transducer type and data acquisition system.
- 1% (of time block) trigger delay (per-trigger) for all channels
- AC Coupled (1 Hz high pass filter) Enable overload detection
- Measuring function: FRF with force as reference
- Number of average: Five (5) minimum
- Force level input: Select hammer tip to achieve an approximate 12 dB roll off 5 Hz to 100 Hz. Typical time domain input 40 N peak (approximately 1 N to 1.2 N Root Mean Square (RMS) from 5 Hz to 100Hz).

4.3.2 Instrumentation. Instrument center floor console with lateral drive point accelerometers at appropriate console interface locations. Accelerometers should be mounted and aligned in the global vehicle coordinate system. Additional lateral acceleration response locations can be placed in line of action of the drive point

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measurement on the opposing vertical console face to provide a comparison between the local and global lateral dynamic stiffness. See Appendix A, Figures A1 and A2.

4.3.3 Measurement. Using an impact hammer or hand held shaker, apply a force at the same center floor console interface attachment in the same direction. Measure driving point FRFs in the lateral direction at all of the center floor console interfaces specified in the Subsystem Technical Specification (SSTS). Reference GMW14181 for GM standard vehicle coordinate directions and appropriate accelerometer mounting adhesives.

4.3.4 Saving the Data. For each measurement, measure accelerance, check coherence and verify levels. Upon measurement completion, save accelerance FRF, coherence and force auto-power spectrum.

5 Data

5.1 Calculations. This section describes methods to calculate the data for target validation.

5.1.1 Data Calculations for Target Validation.

5.1.1.1 Narrow Band Drive Point Dynamic Stiffness Spectrum.

5.1.1.1.1 Integrate the narrow band accelerance (Appendix B, Figure B1) to obtain mobility (Appendix B, Figure B2).

5.1.1.1.2 Integrate the narrow band mobility (Appendix B, Figure B2) to obtain compliance (Appendix B, Figure B3).

5.1.1.1.3 Invert the compliance to obtain dynamic stiffness (Appendix B, Figure B4).

5.1.1.1.4 Display:

- X-axis: 0 Hz to 50 Hz, linear scale
- Y-axis: Linear full scale, based on data peak amplitude.

5.1.1.1.5 Record the lateral dynamic stiffness as specified in the SSTS in units of N/mm.

5.2 Interpretation of Results. Verify whether SSTS requirements are achieved using display formats according to 5.1.1.

5.3 Test Documentation. As described in GMW14181.

6 Safety

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

7 Notes

7.1 Glossary. Reference GMW8702

7.2 Acronyms, Abbreviations, and Symbols.

A/D	Analog/Digital
FRF	Frequency Response Function
ICP	Integrated Circuit Piezoelectric
RMS	Root Mean Square

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW17279

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