



Mirror Vibration Evaluation Procedure

1 Introduction

The Operating Data Master Test Procedure, GMW14227, 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. To determine the first resonant frequency and the dynamic rotation of all mirror assemblies as mounted to ground.

1.2 Applicability. This procedure is valid for use with all Outside Rear View Mirror (OSRVM) and Inside Rear View Mirror (ISRVM) assemblies.

1.3 Remarks. The first natural frequency of a component or subsystem characterizes the capability of that component or subsystem to couple to vehicle structural natural frequencies and operating inputs. First resonant frequency is a criterion for mirror vibration performance.

Dynamic rotation is a criterion for dynamic mirror image stability (Mirror Blur, see Appendix A).

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

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2.3 Additional References.

- PCB Piezotronics, Inc., 3425 Walden Avenue, Depew, NY 14043-2495 USA.
- Siemens PLM Software - Global Headquarters, 5800 Granite Parkway, Suite 600, Plano, TX 75024.

3 Resources

3.1 Facilities. Shaker table capable of supply the inputs specified in 4.3.2.

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) with four (4) channel measurement capability, e.g., LMS SCADAS Front End and LMS Test.Lab software, available from Siemens PLM Software, Siemens Industry, Inc.

3.2.2 Four (4) low mass ($\leq 2g$) uniaxial accelerometers, e.g., PCB-352A24/NC with ICP, available from PCB Piezotronics, Inc.

3.2.3 Rigid fixturing to prove a to-ground boundary condition. Fixture should be designed to orient the mirror to be positioned as installed on vehicle. See Appendix B for an example of setup.

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3.3 Test Vehicle/Test Piece. All OSRVM and ISRVM assemblies.

3.4 Test Time.

Calendar time:	1 day
Test time:	4 hours
Test Summary	1 hour
Coordination time:	1 hour

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Engineer and/or technician skilled in vibration data acquisition and analysis, and operation of the equipment.

4 Procedure

4.1 Preparation.

4.2 Conditions. Rigid boundary condition. Fixture should be mounted (hard bolted) to the shaker table. Fixture should be designed to have primarily vertical input, and should be oriented to match door patch angle.

4.2.1 Environmental Conditions. Not applicable.

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. Mount rigid fixture to shaker table. Mount mirror assembly to rigid fixture. Mount three (3) accelerometers to mirror lens (perpendicular to lens surface) and connect to DAS. Mount remaining accelerometer to the base of the rigid fixture in the direction of excitation.

4.3.1 Note Pertinent Information. Note the accelerometer location to acquisition channel relationship in data log (see Appendix G). Note the distance between the three (3) lens accelerations in data log.

4.3.2 Set Up Shaker. Prepare shaker to produce the 90th percentile input spectrum profile. Amplitude should be set to overall Root Mean Square (RMS) level of the measured response signal. OSRVM vertical RMS level is 3.55 m/s² RMS and ISRVM vertical RMS is 2.91 m/s² RMS (see Appendix E, Figures E1 and E2 for example input spectrum profiles).

4.3.3 Test Setup. Set up DAS for recording of time data:

- Sampling Frequency: 1024 Hz.
- Duration: 60 s.

4.3.4 Check Data Quality. Collect and observe one (1) set of time domain data. Verify data quality and troubleshoot equipment, if necessary.

4.3.5 Acquire and store at least 60 s of time domain data. Examples of time data are shown for the fixture accelerometer (Appendix D, Figure D1) and the three (3) mirror lens accelerometers (Appendix D, Figure D2).

5 Data

5.1 Calculations. Use the following setup for the post processing of the recorded time data:

- Acquisition Bandwidth: 0 Hz to 128 Hz (minimum).
- Frequency Resolution: 0.25 Hz.
- Hanning window with 75% overlap.
- Averages: 57 (minimum)

5.1.1 First Resonant Frequency. Compute and store the transmissibility Frequency Response Function (FRF) between each lens accelerometer and the fixture accelerometer (three (3) total). Determine the frequency (Hz) of the first peak observed in all three (3) FRFs (see Appendix F, Figure F2). Note frequency in test data log. If peak is difficult to identify, try looking at the imaginary portion of the FRFs.

5.1.2 Dynamic Rotation. Compute and store the measured rotation of the mirror lens using the lens accelerometers (see Appendix C for more details). Determine the maximum amplitude (degrees) and

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corresponding frequency (Hz) of the mirror lens rotation spectrum (see Appendix F, Figure F1). Note frequency and amplitude in test data log.

5.2 Interpretation of Results.

5.3 Test Documentation. For reporting of the test results, see Appendix G for an example.

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.

Autopower Spectrum: The magnitude squared of the linear spectrum.

Frequency Response Function (FRF): An output/input relationship of a system as a function of frequency.

Transmissibility: A type of FRF where both the output and input are measured responses and differ regarding their location.

7.2 Acronyms, Abbreviations, and Symbols.

DAS	Data Acquisition System
FRF	Frequency Response Function
ISRV	Inside Rear View Mirror
N&V	Noise and Vibration
OSRV	Outside Rear View Mirror
RMS	Root Mean Square
VPO	Vehicle Performance Owner

8 Coding System

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

Test to GMW14201

9 Release and Revisions

This standard was originated in June 2005. It was first approved by the Global Noise and Vibration Structural Vibrations IDSR Harmonization Team in July 2005. It was first published in July 2005.

Issue	Publication Date	Description (Organization)
1	JUL 2005	Initial publication.
2	JUL 2010	5 year refresh, no change to technical content. (Global Noise and Vibration Team)
3	JUL 2015	Revised to current template. (Global N&V VPO Team – Structural Vibration)

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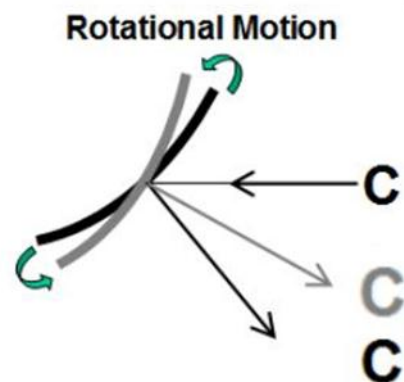
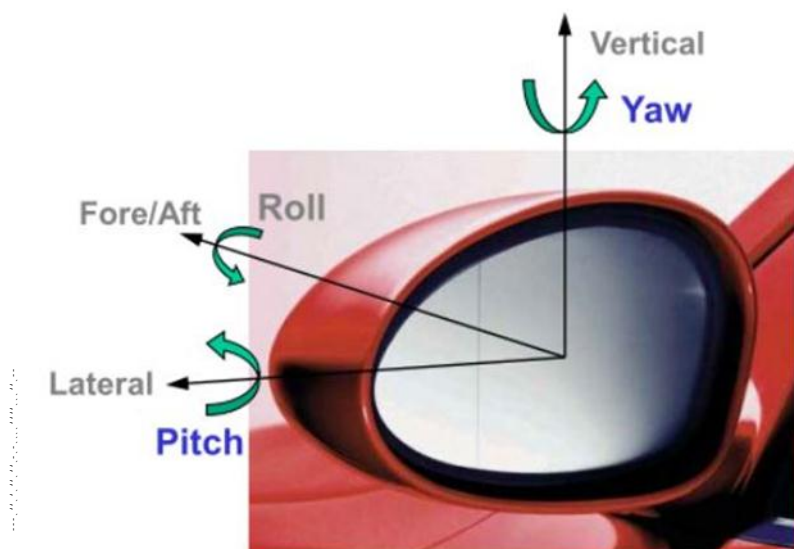
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Appendix A: Dynamic Mirror Image Stability



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