



CD/DVD/HD Unit Vibration Test

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.

1.1 Purpose. The purpose of this standard is to subjectively measure the vibration performance of Compact Disc (CD), Digital Video Disc (DVD) players, Hard Drive (HD) mechanisms at the vehicle level. The systems are tested under a full range of conditions typically found on global public roadways.

1.2 Applicability. This test procedure applies to all global vehicles equipped with CD, DVD, HD mechanisms.

1.3 Remarks. Media playback units are tested on select road test courses at various GM Proving Grounds worldwide facilities.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- CG2455 GMW16093 Global CD DVD HD Data Sheet.
- Global Infotainment Specification (GIS) GIS-2A, Global A Optical Disc Playback Mechanism Performance Specification.

3 Resources

3.1 Facilities. This test utilizes specially prepared road surfaces simulating global public roadways available at GM Proving Grounds worldwide. Certain parts of the test also involve specialized test surfaces used to impart repeatable vibration characteristics.

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 Infrared Digital Thermometer. Model: Raytek ST60 or equivalent. Accuracy: $\pm 1\%$ of reading or $\pm 1^\circ\text{C}$, whichever is greater over a temperature range of 23°C to 510°C .

3.2.2 Tire Pressure Gage. Model: Blue Point 0 kPa to 400 kPa (0 psi to 60 psi) and 0 kPa to 700 kPa (0 psi to 100 psi) or equivalent.

3.2.3 Digital Multimeter. Model: Fluke 77 or equivalent. Accuracy: 0.3% Direct Current (DC) voltage.

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3.2.4 Thermocouple Module. Model: Fluke 80TK or equivalent. Accuracy; ± 1 °C, over a temperature range of 0 °C to 100 °C.

3.2.5 Test Media. The following Almedio A-BEX (or equivalent) standardized test media types shall be used to exercise the player mechanism for this test.

- Compact Disc - Read Write CD-RW - Almedio A-BEX TCDW021W or equivalent.
- CD-RW MPEG-1 Audio Layer 3 (MP3) - Almedio A-BEX SCD-5339 or equivalent.
- DVD+RW - Almedio A-BEX TDV-PW521CW or equivalent.
- DVD-RW - Almedio A-BEX TDV-MW521CW or equivalent.
- Blue-ray Disc Read Only Memory Single Layer (BD-ROM SL) - Almedio SBD-8910 or equivalent.
- Blue-ray Disc Read Only Memory Double Layer (BD-ROM DL) - Almedio SBD-8920 or equivalent.

The test media disc life is limited to approximately 120 h of normal use. Normal wear and tear will cause additional performance degradation that may invalidate the test. Replace the disc as soon as possible after 120 h of use has been attained.

3.3 Test Vehicle/Test Piece. The test vehicle is to be production representative with respect to suspension, mechanical player interface, and drive train components. The mechanism(s) under test shall also be production intent versions with respect to hardware and software levels.

3.4 Test Time.

Calendar time: 2 days
Test hours: 8 hours
Coordination hours: 8 hours

3.5 Test Required Information. The following information shall be noted on the test data sheet. The test data sheet is archived in Global Document Management (GDM) as a CG2455 form. See Data Sheet A1 in Appendix A for a sample data sheet.

- Device part number, serial number, and software version.
- Device Regular Production Option (RPO) and manufacturer.
- Tire size and pressure.
- Suspension type.
- Fuel level.
- Player type.
- Number of passengers.
- Test disc type and track number.
- Player temperature prior to start of test.
- Player and disc temperature at end of test.
- Test course environmental conditions.
- Vehicle platform/model.
- Odometer reading.

3.6 Personnel/Skills. The test personnel shall have had the necessary training to be qualified to drive on the test courses at the region where the test is to be performed.

4 Procedure

4.1 Preparation.

4.1.1 Hardware and Software. The test vehicle shall have the correct version of hardware and software installed. The part number and software version shall be recorded on the data sheet with a short description of the device under test. See Data Sheet A1 in Appendix A for a sample data sheet.

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4.1.2 Tire Pressure. Measure the vehicle tire pressures and verify they are set at the nominal operating pressure. Record the tire size and pressure on the test data sheet. Also, record the number of passengers, fuel level, and test disc, and track number used for the test in the appropriate sections of the data sheet.

4.1.3 CD/DVD Player Warm-up. With the vehicle running, insert a warm-up disc into the CD or DVD mechanism (not a test disc). Set the radio at approximately 75% volume, the climate controls at maximum temperature, and headlights on with the instrument panel dimming control set at maximum intensity. Insert the digital temperature probe into the playback unit slot to monitor the temperature. The player shall be warmed up to 49 °C or until the player has reached its maximum operating temperature. Some radios without internal amplifiers and/or incandescent lighting may not reach 49 °C. Once the player is up to temperature, adjust the Heating Ventilation and Air Conditioning (HVAC) temperature controls and volume to a comfortable level. Record the starting test temperature of the playback unit on the data sheet. Begin the test.

4.2 Conditions.

4.2.1 Environmental Conditions. Preferred test conditions are dry road systems without significant precipitation. The test may be delayed at the discretion of test personnel due to inclement weather when road surface conditions are not optimal or safe operation of the test vehicle becomes a factor.

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.

4.2.3 Rating Vibration Performance. The performance of the playback unit is rated for the number and duration of Mute, Skip, Eject, and Video Freeze occurrences for each road condition tested. The following descriptions define the anomaly and its severity in terms of scoring.

4.2.3.1 Minor Mute. Minor mutes are defined as interruptions in audio <1 s in duration with resumption in playback at the same location within the track. The playback unit is given 0.5 points for each occurrence.

4.2.3.2 Major Mute. Major mutes are defined as interruptions in audio >1 s in duration with resumption in playback at the same location within the track. The playback unit is given 1 point for each second of muting.

4.2.3.3 Skip. Skips are defined as interruptions in audio where the playback mutes and returns to a different location on the current track or a different track. The playback unit is given 2 points for each occurrence.

4.2.3.4 Eject/Lock-up. If the playback unit ejects the disc or an auxiliary device locks up, the unit is given 4 points. If a disc eject is experienced, the disc should be reinserted and set to the start of the track under test. Likewise, if an auxiliary device locks up, it shall be unplugged and reinstalled and the test resumed.

4.2.3.5 Video Glitch. Video glitches are defined as interruptions in video defined by momentary frame freezes, scrambled picture, momentary black screen, or jittery picture. Video glitches are given 2 points. An unrecoverable video lock-up is considered a total failure and the player's rating shall default to 1.

4.2.3.6 Rating scores are calculated using a weighted average as shown in Table 1.

Table 1: Weighted Average Subjective Score

Score	Subjective Rating (SR)
0	10
≥ 0 to 1.5	9
≥ 1.5 to 2.5	8
≥ 2.5 to 4.5	7
≥ 4.5 to 7.5	6
≥ 7.5 to 11.5	5
≥ 11.5 to 15.5	4
≥ 15.5 to 20.5	3
≥ 20.5 to 24.5	2
≥24.5	1

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