



Subjective and Objective Brake Caliper Assembly Squeak and Rattle Vehicle 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 and objectively evaluate brake caliper assemblies for squeak and rattle at the vehicle level. This test includes the detection, evaluation, and root source identification of caliper assembly squeak and rattle during a Dynamic Road Simulation Evaluation (where available) and a Dynamic On-Road Evaluation.

1.2 Applicability. This procedure is applicable to all passenger cars, light trucks, and medium duty trucks.

1.3 Remarks. As noted in GMW8518, this test procedure is primarily focused on guiding an evaluator through vehicle-level squeak and rattle evaluations of caliper assemblies. The subjective performance shall be evaluated according to the GMW14264 subjective rating scale.

2 References

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

2.1 External Standards/Specifications.

FMVSS 135

2.2 GM Standards/Specifications.

GMW7880

GMW14188

GMW14925

GMW15367

GMW8518

GMW14264

GMW15363

3 Resources

3.1 Facilities. Information wholly contained within GMW8518.

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. GMW8518 and GMW7880 list and describe the required equipment for the Dynamic Road Simulation and the Dynamic On-Road Evaluation, except for the additional items and/or modifications noted below.

3.2.1 Deceleration U-tube mounted within view of the driver.

3.2.2 Ambient temperature thermocouple.

3.2.3 Vehicle speed measurement equipment.

3.2.4 Brake pressure monitoring equipment visible to driver and a data acquisition system capable of recording pressure channels and any other requested channels (i.e., vehicle velocity, deceleration, etc.)

3.2.5 The recommended instrumentation includes tri-axial type accelerometers as specified in GMW7880 except for the additional items and/or modifications as noted:

a. Accelerometer mass should be less than 5 g

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- b. Frequency range should be 2 Hz to 10 000 Hz ($\pm 5\%$)
- c. Operating temperature range should be at least $-30\text{ }^{\circ}\text{C}$ to $120\text{ }^{\circ}\text{C}$

3.2.6 Facilities for Dynamic On-Road Evaluation. GMW8518 lists and describes the appropriate road systems for overall vehicle squeak and rattle evaluations. At Milford Proving Ground (MPG), for caliper assembly squeak and rattle evaluations, the middle and high excitation, random input roads are recommended.

3.3 Test Vehicle/Test Piece.

3.3.1 A test vehicle which reflects the design-intent of the development or production status of the appropriate build phase shall be used for the caliper assembly squeak and rattle vehicle-level performance test.

3.3.2 The caliper assembly should be of the latest revision level available and include all applicable hardware (brake hose, pads, abutment clips, springs, etc.)

3.3.3 Caliper assembly samples should include new brake caliper assemblies, with-use caliper assemblies, and durability posttest caliper assemblies that include with-use pads. Refer to 4.2.2.1 for further details about assembly conditioning.

3.4 Test Time.

Calendar time:	1 day to 3 days
Test hours:	1 hour to 8 hours
Coordination hours:	2 hours to 8 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Information wholly contained within GMW8518.

4 Procedure

4.1 Preparation. GMW8518 lists and describes the required preparation except for the additional items and/or modifications noted in 4.1.1 and 4.1.2.

4.1.1 Install the brake hardware. Tighten fasteners to manufacturer's recommended torque requirements.

4.1.2 Complete installation of instrumentation and data acquisition system. Make certain that driver can monitor vehicle speed, brake pressures, and accelerometers as needed.

4.2 Conditions. GMW8518 lists and describes the required conditions except for the additional items and/or modifications noted in 4.2.1 thru 4.2.2.3.

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.

4.2.2.1 Test samples should include new brake caliper assemblies, with-use caliper assemblies, and durability posttest caliper assemblies that include with-use pads.

4.2.2.1.1 New brake caliper assemblies can be tested with green or burnished pads, but pads that were already subjected to a 200 stop Federal Motor Vehicle Safety Standard (FMVSS) 135 brake burnish are recommended.

4.2.2.1.2 With-use calipers and/or pads can be conditioned by machining the pads to a half-thickness plus 1 mm wear condition and completing a GMW14925 test or 200 stop FMVSS 135 brake burnish.

4.2.2.1.3 Durability posttest parts include caliper assemblies that have been subjected to GMW15363 for light-duty trucks, GMW15367 for passenger cars and/or a general purpose vehicle durability test. The durability posttest caliper assemblies can also be generated using GMW14188, but this should be agreed upon with the responsible engineer prior to any testing. The durability posttest parts should also be tested while equipped with with-use pads, if the posttest pads have more than half of the puck thickness remaining.

4.2.2.2 Having an additional subjective observer in the vehicle is highly recommended. For safety and accuracy of execution of the drive schedule, the driver should be freed from having to write down the subjective squeak and rattle rating while driving the schedule. Also, the second observer can be seated in the rear seating area, if so equipped, in order to subjectively rate rear caliper assembly squeak and rattle.

4.2.2.3 Lightly loaded vehicle weight is recommended for all rattle evaluations. However, gross vehicle loading may be added to the test sequence in addition to the lightly loaded condition, if requested. Lightly loaded vehicle

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