



Closure Panel System - Inner Panel/Trim Flutter Structural Test

1 Scope

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 door inner panel's and/or trim pad's maximum inboard and outboard displacement and the decay time period of oscillation when subjecting a door to specified closing energies/velocities. These characteristics are commonly referred to as "flutter".

1.2 Foreword. This test is often run in conjunction with test procedure GMW15092 Door System-Inner Panel Breathing Structural Test.

1.2.1 Throughout this standard, the descriptions and methods of testing inner panel/trim flutter are based on the use of non-contact displacement transducers such as an ultrasonic displacement sensor or a laser displacement sensor.

1.3 Applicability. This standard applies to all passenger cars and light duty trucks having conventional swing open side doors, sliding side doors, rear cargo doors, liftgates, midgates and tailgates.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14269

GMW15092

2.3 Additional References.

- CG190
- Release Documentation. This includes Master Process Documents (MPD), Local Process Plans (LPP), etc., which show any product assembly, orientation, fit, assembly specifications, etc., for the system being evaluated.
- Vehicle Technical Specifications (VTS) and Subsystem Technical Specifications (SSTS). Paragraphs include: 3.2.1.7.9 Inner Panel Breathing, and 3.2.1.7.10 Inner Panel and Trim Panel Flutter of the 55.01 – Side Closures SSTS.

3 Resources

3.1 Facilities. The facility should have all of the equipment listed in Section 3.2 and be capable of providing the conditions required in Section 4.2.

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.

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Note: The following list(s) include fixturing and instrumentation typically used to perform this test. Other equipment may be substituted at the discretion of the testing facility as long as it provides the same data and/or data record with equivalent accuracy as specified herein or by the requestor.

3.2.1 Fixturing.

3.2.1.1 Fixturing for mounting a displacement sensor inside the body structure. The fixture should be custom built for each body style. All of the fixturing must be rigidly mounted inside the body, to the body structure (typically to the floor pan). See Figure A1.

3.2.1.2 Velocity sensor flag (if applicable).

3.2.2 Instrumentation.

3.2.2.1 Non-contact displacement transducer, such as an ultrasonic displacement sensor and sensor controller, or a laser displacement sensor and sensor controller.

3.2.2.2 Connecting cables for the plotter or data acquisition unit, velocity sensor, displacement sensor, and power window regulator cables (optional).

3.2.2.3 A two axis plotter or data acquisition unit.

Note: Door inner panels typically vibrate in the 30 Hz range. Verify that the plotter or data acquisition unit's sample rate and the transducer response are sufficient (for the particular door on test) to prevent aliasing.

3.2.2.4 Door closing fixture, such as a **slam cannon** (if applicable).

3.2.2.5 Velocity sensor (if applicable).

3.2.2.6 Regulated power supply (20 V, 40 A) for power windows.

3.3 Test Vehicle/Test Piece. Additional information on test required material and its assembly can be found in the Release Documentation (see 2.3).

3.3.1 A fully trimmed vehicle is preferred.

Note: Test results for systems tested on side frame body trucks/bucks do not correlate with the same data found on a fully trimmed vehicle. This is due to the lack of suspension, air bind, weatherstripping, etc., characteristic of a full vehicle.

3.3.2 If testing for trim panel flutter, a fully trimmed and assembled door is required. If testing for inner panel flutter, a fully assembled door without a trim pad is required.

Note: If multiple doors are provided for comparison evaluation, each door must go through some or all of the production paint process. This will assure all adhesives and sealants have been properly cured or heat set. Several iterations of trimmed and untrimmed doors can be performed to determine the relative contribution of each condition. All door seals and weather-strips should also be in place before testing. Other considerations for the door assembly are components such as power or manual window regulators, speakers, switches, and lock modules. In addition, map pockets (weighted to simulate customer usage) and different trim levels may also affect the flutter of the door's trim panel and/or inner panel. It is also recommended that the door assembly be dimensionally certified before testing is started.

3.4 Test Time. The following is an estimate of the amount of time (work hours) needed to perform this procedure.

Note: These time estimates are approximate averages. Actual times vary considerably depending on early component failures (and subsequent availability of replacement parts), testing to varying multiples of cycle lives, varying requirements for frequency of environmental test conditions, scheduling problems for test facilities, test equipment malfunctions, scheduling of overtime and/or multiple shifts, scheduling of witnesses for tests, actual readiness of test samples upon receipt, unique or additional requests for detailed test information, running multiple samples, etc. Times shown are for one system.

These times consider preparation and other downtime, actual test, and analysis of data in capturing a total calendar time. Report writing, approval, processing, etc., are not part of these times.

Calendar time:	3 days
Engineer hours:	10 hours
Technician hours:	16 hours

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3.5 Test Required Information. The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested. Reference VTS/SSTS paragraph numbers 3.2.1.7.9 and 3.2.1.7.10 (paragraph 2.3).

3.5.1 Testing worst case scenarios may uncover some potential problems. Discuss with the requesting engineer if testing should include some worst case scenarios. Depending on which test is being performed and which level of parts or systems is being tested, consider if any of the following may apply: tolerance stack-ups, build variations, misalignment, minimum/maximum fastener torque(s), lubrication, environmental extremes, location of customer representative load application, symmetry (left hand vs. right hand), color, mold or die source, etc.

3.5.2 The following specifications or information are required to run this test:

3.5.2.1 Measurement location(s) coordinates.

3.5.2.2 Door closing slam energies and/or velocities.

3.5.2.3 Door hardware and trim level (see 3.3).

3.5.2.4 Maximum allowable displacement of trim/inner panel.

3.5.2.5 Allowable decay time.

3.5.2.6 Flutter direction, if different than in the inboard and outboard directions.

3.5.2.7 Map pocket contents mass, or any other door interior trim (if applicable).

3.5.2.8 Any specific movable glass positions (such as fully opened, fully closed, or mid position).

3.5.2.9 Desired weatherstrip set period.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests and experience in the use of the referenced test equipment are critical to achieving the estimated times shown in 3.4.

4 Procedure

4.1 Preparation.

4.1.1 Sample Inspection. The test and requesting engineers should inspect the test items to insure all material listed in Section 3.3 is the correct design level and assembled properly. A check should also be made to verify that no cracks, broken heat stakes, or loose staples/fastening devices can be found on the trim pad assembly.

4.1.2 Sample Preparation. This test is normally run on the test subject in an as-received condition. If it is requested to be run in a specifically adjusted condition, follow the applicable procedure(s).

4.1.2.1 Determine with the requesting engineer the area on the door inner panel or trim pad at which the flutter is to be measured and mark this location. This location should be the area(s) at which the greatest displacement and/or decay time will occur. A sketch, photograph, or drawing illustrating this location should be made and included with the test data.

4.1.2.2 It is suggested that the weatherstrip undergo a compressive set with the door closed and fully latched before testing begins. The time period for this set depends on variables such as temperature, material, and weatherstrip design, and should be established by the requesting engineer. The usual time period is 24 h.

4.1.3 Facilities and/or Equipment Preparation. Record the instrumentation calibration information on Data Sheet A1 or an equivalent document.

4.1.3.1 Install fixturing in the vehicle and aim the displacement sensor at the marked location while the door is in the fully latched (closed) position. Mount the displacement sensor such that the signal projects normal to the test surface being evaluated as mentioned in 3.5.1. Make sure fixturing, as referenced in 3.2.1.1, is mounted rigidly to the body (i.e., seat attachments) and to the sensor so that vibrations from the door slam do not result in oscillation interference and amplitude distortion in the graph. Refer to Figure A2 for an example of an incorrect sample plot.

Note: The inboard and outboard location of the sensor should be adjustable to compensate for limited displacement sensor range.

Note: The displacement sensor chosen should be able to read a measurement off any type of surface (including carpet). If the sensor is sensitive to the uniformity or glossiness of the panel and is having difficulty in locating the test surface, add a small piece of tape to the marked location to make the surface uniform. Also,

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