



Door System - Alignment to Body

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 adjust, as necessary, the door assembly alignment relative to the surrounding surfaces of the vehicle's body, thus achieving a desired door to body alignment.

1.2 Foreword. Not applicable.

1.3 Applicability. This procedure applies to all passenger cars, and light duty trucks and medium duty trucks having passenger or cargo access door systems, excluding door systems with hinges welded to both the door and body side surfaces. This includes but is not limited to side doors, rear doors, and sliding side doors.

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.

- 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.
- **Subsystem Technical Specifications (SSTS)**
- **Vehicle Technical Specifications (VTS)** Pertinent paragraphs include: 3.2.2.1 (Dimensions and capacities) of 55.02, the Rear End Doors SSTS; 3.2.2.1.1 (Fits), of 55.01, the Front and Rear Side Doors 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.

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.

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3.2.1.1 Door lock striker magnetic positioning fixture.

Note: Use of the door lock striker magnetic positioning fixture is optional (Figure A1) and should be used only after the door is already aligned properly.

3.2.1.2 Mechanical/hydraulic lift or jack (optional) for holding door(s) in desired positions during adjustment.**3.2.2 Instrumentation.****3.2.2.1** Scriber and/or marker for marking hinge locations on the body or door hinge pillar.**3.2.2.2** Torque wrench(s) with a range of approximately 1.5 times the torque value(s) specified by the requesting engineer (Section 3.5).**3.2.2.3** Torque wrench adapters.**3.2.2.4** Vernier calipers.

3.3 Test Vehicle/Test Piece. Four fully assembled door(s) for sedan body styles and two fully assembled doors for coupe body styles, (preferably without trim), with hinge-to-body fasteners included. It is recommended that the body and door be painted and heat cured per the production paint process to cure any adhesive(s) the door(s) should be mounted to a body that has no striker(s), or weather seal(s) these items should be supplied but will be installed after the door(s) is aligned to the body. Shims and fasteners, as applicable, may be required. Discuss with the requesting engineer if additional items may be required. It is recommended that the test parts/assembly be dimensionally certified before testing is started.

Note: A convertible body style's door(s) may require a convertible top in order to align the door to the body; the same holds true for any other removable roof panel design.

Note: Additional information on test required material and its assembly can be found in the Release Documentation (see 2.3).

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 (times shown are for one system), etc.

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 this time.

Conventional Side Door

Technician resource: 2 hours

Engineer resource: 6 hours

Total calendar duration: 1 day

Sliding Side Door

Technician resource: 3 hours

Engineer resource: 1 hours

Total calendar duration: 1 day

3.5 Test Required Information. The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested (refer to VTS/SSTS paragraph numbers if applicable).

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.

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3.5.1 The dimensions for seal margins, door flushness, and door gaps: to the roof panel, rocker panel, front fender, quarter glass, and to the rear quarter outer panel and adjacent door, when applicable.

Note: When providing seal margin dimensions for the header section, consider any overbend conditions.

3.5.2 All fastener torques.

3.5.3 Clarification, when aligning a door, on whether flushness or seal margins take precedence.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests and experience in the use of the referenced test equipment is 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 3.3 is of correct design level and assembled properly.

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

Note: If the door hinges will need adjustment, any structural adhesive or sealant on the hinge face(s) may be removed to allow the hinge and its relative mating surfaces freedom of movement when the fasteners are loosened. However, the potential for unwanted door movement (i.e., slippage) relative to the body increases when the structural adhesive is separated or removed from the mating surfaces.

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

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in this document's text or by the requesting engineer, the typical environmental conditions for this test are the temperature, humidity and pressure at the major test facility (3.1). Unless otherwise noted, these conditions are typically 22 °C + 3 °C, relative humidity of 40% + 20%, and atmospheric pressure equivalent to the local barometric pressure (which is variable during any given day and from day to day).

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.

4.3.1 Set Up Instructions. Perform any functional/operational tests/evaluations as requested or as may be referenced in Section 2. Specially, open and close the door(s) at least five times. As applicable, note any irregular sounds or erratic operation indicating a potential problem with design, manufacture, or assembly and verify observations with the requesting engineer.

4.3.1.1 As applicable remove any door lock strikers from the body for the door(s) to be tested. This will allow the door to be positioned and hung onto the body freely with no influence by the striker.

4.3.1.2 If adjusting the door using the seal margin dimensions, then it will be necessary to remove any remaining weather seal from the body flange in order to measure the seal margin. If using flushness measurements, it may not be necessary to remove this seal from the body.

4.3.1.3 If the door contains a window and a window lift system, then the window system should be in its full up, stall position, or, for latching windows, in a closed/latched position. This will take into consideration any forces exerted on the window-door system which ultimately affects the door header's inboard/outboard alignment.

Note: The adjustment procedure requires an iterative process to obtain the specified adjustment. As applicable, adjust the rear door first, because the quarter outer panel is typically non-adjustable (fixed); this gives the best reference point off of the body. Recognize that the flushness and seal margin specifications may not both be simultaneously achievable due to their dependence on each other and also due to any variations in the body and door systems.

4.3.2 Test Operation Instructions.

4.3.2.1 Swing Open Side and Rear Doors.

4.3.2.1.1 Determine adjustment(s) required to meet the specifications of the door to body alignment (2.3).

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Note: If all measurements meet specification, then the door is aligned and no further adjustment is needed. If adjustments are required, reference the “**Release Documentation**” (2.3) the following steps will assist in performing adjustments.

4.3.2.1.2 The door to body alignment can be adjusted in three directions: up/down, in/out, and fore/aft. If the door is out of alignment in any of these three directions, then refer to 4.3.2.1.3 thru 4.3.2.1.5 to make the necessary adjustments.

4.3.2.1.3 In and out (i.e., inboard and outboard) adjustments are made by loosening the door side hinge bolts/nuts and positioning the door to the correct in/out position based on either the door's flushness with the body, or the seal margin spacing as shown in Figure A2. For certain hinges (Nummi type), a shoulder-less repair fastener is required for in/out adjustment.

Note: If adjusting the door to obtain a specified seal margin, place spacers of the specified seal margin thickness between the door and the body's sealing flange, and hold the door against these spacers as the door side hinge bolts/nuts are tightened.

4.3.2.1.4 Up/down adjustments can be made in two ways. Loosen the body side bolts and move the door up/or down to the limits allowed by the hinge hole clearance to the body side hinge bolts, or if significant up/down adjustments are required, loosen the door side hinge bolts/nuts and the door can be slid up or down relative to the hinge.

4.3.2.1.5 Fore/aft adjustments, as well as door rotation adjustments in the vertical door plane are accomplished by loosening the body side hinge bolts and moving the door to the desired location.

4.3.2.1.6 After the door to body alignment is completed, torque the door hinge fasteners to the required specification(s).

4.3.2.1.7 Now that the door is positioned correctly, the door lock striker can be installed onto the body. Finger-tighten the door lock striker bolts. Although optional, the magnetic striker positioning fixture can be used at this time by inserting it over the lock striker and using it to hold the striker in place.

4.3.2.1.8 Gently close the door to the fully latched position. This process should center the door lock striker relative to the latch mouth.

4.3.2.1.9 Position the rear of the door to obtain the specified seal margin or flushness of the door to the adjacent body panel. (The door striker will shift with the door as the door is moved to the appropriate position.) Next, unlatch and open the door and slightly tighten the door lock striker bolts. Be careful that the door lock striker does not rotate/move as the bolts are tightened. If the desired in/out position is not achieved at the rear of the door, minor adjustments may need to be made to the lock striker. Scribing or marking around the striker will help in the incremental adjustments.

Note: Some door lock striker designs may require shims to be placed under the base of the door lock striker in order to properly position the striker into the door latch.

4.3.2.1.10 Repeat steps in 4.3.2.1.1 and determine if additional adjustment(s) are required to meet the door to body alignment specification (2.3).

4.3.2.1.11 If necessary, repeat 4.3.2.1.2 thru 4.3.2.1.9 until the door meets the required door to body alignment specification (2.3).

4.3.2.1.12 Torque all fasteners to their required specifications and remove the magnetic lock striker positioning fixture, if applicable.

Note: Production plant processes will typically focus more on door flushness, fit, and gaps to the body than on the seal margin, except when water leaks are of main importance. Any dimensional variations from those requested (2.3) should be reported to the requesting engineer before any testing begins.

4.3.2.1.13 As applicable, repeat 4.3.2.1.1 thru 4.3.2.1.12 for any other swing-open side or rear doors on the test body. Upon completion, if no sliding doors are to be adjusted, go to 4.3.3.

4.3.2.2 Sliding Side Doors.

4.3.2.2.1 Determine adjustment(s) required to meet the specifications of the door to body alignment (2.3).

Note: If all measurements meet specification, then the door is aligned and no further adjustment is needed. If adjustments are required, reference the Release Documentation (2.3) the following steps will assist in performing adjustments.

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