



Lash Measurement (Driveline System Level)

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 test is to determine the total rotational travel of the driveline forward of the rear axle and the internal rotational lash between the input (pinion) and the output (wheel flanges) of the rear axle, aft of the front axle as previously noted for rear axle or including front half-shafts inboard of the wheels to front axle pinion for the front driveline system.

1.2 Applicability. This test is applicable to all conventional, Two Wheel Drive (2WD), All Wheel Drive (AWD), and Four Wheel Drive (4WD) light trucks with manual transmissions in addition to all front and rear drive axles 19.05 cm to 26.67 cm (7.5 in to 10.5 in). This procedure is for "in-vehicle" or system level measurements.

Note: This procedure details transmission/transfer case to rear axle driveline lash measurement and rear axle lash measurement. The procedure would be similar for transmission/transfer case to front axle driveline lash measurement and front axle lash measurement (AWD/4WD systems). For front axle lash measurements, the front axle has to be engaged, e.g., shift to "4 HI" for 4WD systems.

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

3 Resources

3.1 Facilities. Proving ground or equivalent with suitable vehicle hoist.

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 Inclinator.

3.2.2 Special adapter made by using a small cylindrical magnet and an inclinometer platform.

3.2.3 Pinion flange platform made from welded steel plates to support inclinometer.

3.3 Test Vehicle/Test Piece. Test vehicle with production representative driveline.

3.4 Test Time.

Calendar time: 2 days

Test hours: 8 hours

Coordination hours: 8 hours

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3.5 Test Required Information. All instrumentation is to be calibrated as required. Record instrumentation details and date of calibration on Data Sheet A1 in Appendix A unless the information is otherwise preserved in the testing laboratory records.

3.6 Personnel/Skills. Driveline technician. Some metal fabrication skills may be required, see 3.2.2, 4.1.2.3.2.2 and 4.3.1.2.

4 Procedure

4.1 Preparation.

4.1.1 Rotational Travel of Driveline Forward of Rear Axle.

Note: Also covers method for Rotational Travel Aft of Front Axle on AWD and 4WD vehicles.

4.1.1.1 Position the vehicle for measurement.

4.1.1.1.1 Release parking brake.

4.1.1.1.2 Transfer case to "2 HI" (if applicable).

4.1.1.1.3 Raise vehicle on hoist.

4.1.1.1.4 Mount the special adapter on rear Universal (U) joint companion flange cup or other surface parallel to pinion centerline.

4.1.1.1.5 Mount the digital inclinometer on the adapter to measure pinion angle relative to horizontal (front to rear).

4.1.1.1.6 Adjust front/rear hoist to get pinion approximately horizontal.

4.1.1.2 Shift transmission into gear. Use the direct gear (approximately 1:1 ratio) only to document system lash.

4.1.1.3 Move inclinometer to measure lash by rotating it on the adapter to be perpendicular to vehicle centerline. Inclinometer also can be placed on a flat surface of the pinion flange.

4.1.2 Rotational Travel between Pinion and Wheel Flanges.

Note: Also covers travel between front wheel hubs and front axle pinion on AWD and 4WD vehicles.

4.1.2.1 Raise vehicle on hoist (wheels free).

4.1.2.1.1 Transmission in **Neutral**.

4.1.2.1.2 Parking brake released.

4.1.2.1.3 Pinion horizontal (check using inclinometer).

4.1.2.2 Disconnect propeller (prop) shaft (optional).

Note: Place index marks on prop and pinion flange prior to disassembly for consistent orientation at reassembly. Axle pinion flange may be left engaged at forward end.

4.1.2.3 Set up for applying torque (optional conditions).

Note: Photographs for documentation purposes are optional.

4.1.2.3.1 Prop connected.

4.1.2.3.1.1 Apply torque to small pinion flange bolt.

4.1.2.3.1.2 Use about 10.8 Nm (8 lbf) instead of 13.6 Nm (10 lbf) to compensate for small bolts not being at pinion centerline.

4.1.2.3.1.3 Make sure torque wrench handle centerline intersects pinion centerline to maintain accurate torque readings.

4.1.2.3.2 Prop disconnected.

4.1.2.3.2.1 Torque large pinion nut or,

4.1.2.3.2.2 Fabricate and install a special adapter plate to the four pinion flange bolts. A square hole in center of plate for the torque wrench will allow the torque to be applied without a socket.

4.1.2.4 Mount digital inclinometer:

4.1.2.4.1 On axle pinion flange (magnetic pad preferred).

4.1.2.4.2 Perpendicular to vehicle centerline.

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4.1.2.5 Apply both rear brakes firmly (parking brake).

Note: To apply park brake from inside vehicle, a second person is required, or pull down on parking brake cables from underneath the vehicle by hanging heavy weights on the cables.

4.1.2.6 Rotate axle pinion flange in both directions using 13.6 Nm to 20.3 Nm (10 lbf to 15 lbf) on pinion and observe for any wheel movement. This is to ensure that brakes are holding rear wheels motionless.

4.2 Conditions.

4.2.1 Environmental Conditions. Vehicle must be soaked at room temperature prior to test.

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 Rotational Travel of Driveline Forward of Rear Axle.

4.3.1.1 Measure lash:

4.3.1.2 Zero inclinometer with prop at one extreme (10.8 Nm (8 lbf) torque applied). Use torque wrench on one of the four small flange bolts. Read torque with wrench centerline passing approximately through the prop center of rotation. Make sure that the small flange bolts are tightened to production specifications. Measuring also can be done with prop removed and an adapter installed on the transmission/transfer case output directly. Use 13.6 Nm (10 lbf) of torque.

4.3.1.2.1 Read total rotational travel at opposite extreme with 10.8 Nm (8 lbf) applied. Torque would be normally 13.6 Nm (10 lbf) if applied at centerline of pinion flange.

4.3.1.2.2 Record data on Data Sheet A2 in Appendix A.

4.3.1.2.3 Measure lash in a similar manner for 2ND, 3RD, 4TH, 5TH, etc., gears and record on Data Sheet A2 in Appendix A.

4.3.1.3 Remove inclinometer and adapter.

4.3.1.4 Rotate driveline.

4.3.1.4.1 Leave transmission in highest gear.

4.3.1.4.2 Depress clutch pedal and hold.

4.3.1.4.3 Rotate prop clockwise one-half turn.

4.3.1.4.4 Release clutch pedal.

4.3.1.4.5 Shift to 1st gear (if all gears are being measured).

4.3.1.4.6 Replace adapter and inclinometer.

4.3.1.5 Measure three more times.

4.3.1.5.1 Repeat 4.3.1.1, 4.3.1.2, 4.3.1.3, and 4.3.1.4.

4.3.1.5.2 Take measurements at a total of four driveline locations 180 degrees apart.

4.3.1.5.3 Average data taken in each gear.

4.3.2 Rotational Travel between Pinion and Wheel Flanges.

4.3.2.1 Measure lash:

4.3.2.2 Zero inclinometer with pinion (prop) at one rotational extreme with 13.6 Nm (10 lbf) torque applied to pinion.

4.3.2.3 Read total rotational travel at opposite extreme with 13.6 Nm (10 lbf) torque applied to pinion. Record on Data Sheet A3 in Appendix A.

4.3.3 Remove inclinometer.

4.3.4 Remove adapter

4.3.4.1 Release rear brakes.

4.3.4.2 Hold one wheel stationary.

4.3.4.3 Rotate opposite wheel approximately one-half turn but as required to get inclinometer roughly horizontal when repositioned.

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