



Transfer Case Mode Shift Abuse

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 test the performance and capability of the transfer case mode shift system, by artificially inducing a driveline torsional binding condition during operation.

1.2 Applicability. This specification is applicable to all transfer cases that have mode change capability.

1.3 Remarks. The primary intent of this test is to provide measurable effects of the transfer case mode shift system when subjected to driveline torsional binding condition. The effects will be the capability of the shift system to perform its functional intent throughout the test procedure and determine physical characteristics through a post procedure teardown of the transfer case. The teardown will measure any wear that occurs on the transfer case mode shift system. This by no means limits the reporting and monitoring of other effects on the propulsion system or driveline that may be incurred via capabilities of the transfer case mode shift system.

The artificial inducement of driveline torsional binding is desired and is accomplished by the use of vehicle driveline components that are operating within their design limits. Objectively, the Revolutions per Kilometer (RPK) combined values of the front wheels versus the rear wheels are diverging. Typically this is achieved by using combinations of new and worn tires, and spare tires that are not the size of the road tires. The worn tires are artificially achieved via shaving new tire tread down to the wear indicators.

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. Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities. A test road with graduated kilometer/mile markers that will allow highway and expressway speeds, e.g., GM Milford Proving Ground Circle Track.

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 Odometer. The test vehicle odometer shall be in working order.

3.2.2 Cruise Control. The test vehicle cruise control is suggested but not required.

3.2.3 Thermocouples. Thermocouples are required to monitor sump temperatures during the test procedure.

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3.2.4 Tires. One (1) set of wheels that represent three (3) new tires and one (1) worn tire or smaller size spare. The worn tire is typically artificially achieved via shaving a new tire down to the wear indicators. See also 4.2.2.1 Temperature Limits.

3.2.5 Transfer Case and Driveline. Fully operational part time Four Wheel Drive (4WD) transfer case or All Wheel Drive (AWD) transfer case and driveline hardware.

3.2.6 Transfer Case Controls. Fully operational transfer case controls for both manual and electric shift transfer cases.

3.3 Test Vehicle/Test Piece. Transfer case with 804 km (500 mi) break-in or equivalent as determined by test requestor.

3.4 Test Time.

Calendar time: 3 d
Test time: 15 h
Coordination time: 4 h

3.5 Test Required Information.

3.5.1 Transfer Case Architecture. Determine transfer case design architecture and any limitations with respect to this procedure.

3.5.2 Shift Control Limits. Identify supplier recommended and design intent speed limit for shifting in and out of Four High (4HI) lock position from a non-lock position in same range. This limit exists for both part time transfer case and AWD transfer case.

3.6 Personnel/Skills. One engineer, technician, and/or driver is required with the appropriate driver license/permit for the given test facility. The engineer, technician, and/or driver should be able to maneuver the vehicle according to the driving sequences listed herein and induce the behavior of the test vehicle for the purposes of evaluating the response. In addition, the engineer, technician, and/or driver shall have the ability to conduct end of test inspection of test parts if required.

4 Procedure

4.1 Preparation.

4.1.1 Thermocouples. Install thermocouples in sumps of front axle, rear axle, transfer case and transmission.

4.1.2 Thermocouple Monitor. Obtain appropriate readout for installed thermocouples to monitor temperature during test procedure.

4.1.3 Tires. Install shaved tire and new tires on vehicle. Three (3) new tires and one (1) shaved tire are required. Initial start of test condition will have the shaved tire on the rear axle on the left side only as an arbitrary starting point. Check and verify tire pressures are at placard recommended settings.

4.1.4 Vehicle Ballast. Curb weight plus driver.

4.2 Conditions.

4.2.1 Environmental Conditions. All weather conditions are acceptable.

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 Temperature Limits. Determine normal and maximum sustained operating temperature of fluid for the thermocoupled components. Accommodate for the measured temperature at sump location. If temperature limit is exceeded, then employ a temporary suspension of test. Two (2) options will be utilized to remedy the condition.

4.2.2.1.1 Option 1. Perform a cool down drive circuit. The use of Option 1 or Option 2 is dependent on the feasibility of the cool down process and the capability of the driveline system to maintain desired temperature limits for the test setup. If the temperature limit of the component in question exhibits a high rate temperature increase and cannot be managed via the cool down drive circuit, then Option 2 will be required.

4.2.2.1.1.1 The test schedule will need to be temporarily interrupted to perform the cool down. The test schedule will need to be restarted where interruption occurred.

4.2.2.1.1.2 The interruption starts by pulling vehicle over to the nearest rest stop.

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