



Power Transfer Unit (PTU) Cold Start 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 evaluate the performance of the Power Transfer Unit (PTU) during extreme cold conditions.

1.2 Applicability. This standard is for PTUs used in both car and light trucks.

1.3 Remarks. The procedure was developed to verify the cold sealability of the PTU Intermediate Drive Shaft (IDS) seal, but can also be used for all other seals in the PTU.

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. Cold chamber capable of fitting the entire vehicle and cooling to -30 °C. Parking lot and highway, e.g., Milford Proving Ground (MPG) Oval Track, near the exit to the chambers to perform the necessary maneuvers. See 4.3.

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 Thermocouple and reader.

3.2.2 Vehicle hoist and if using the optional trace dye, lighting and eyewear recommended by the dye manufacturer.

3.2.3 Optional: PTU sump pressure transducer and reader.

3.3 Test Vehicle/Test Piece. The vehicle shall be equipped with specific driveline configuration requested. It may be possible to interchange driveline, chassis controls, tires and wheels, and powertrain hardware and software to accomplish multiple test configurations on the same vehicle. If there is a manual transmission available in the program, that is the preferred transmission to test. The test vehicle shall be production representative, in terms of performance and handling, including:

- Transmission gear ratios
- Rear differential module
- Prop shaft(s)

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- PTU and IDS or other seals of interest.
- PTU lubricant filled to the manufacturer recommended level.
- Engine and transmission calibrations
- Clutch and clutch apply system.

3.4 Test Time. Test times are estimated for validation testing only. Development tests may have a longer or shorter duration depending on the number of tests desired. Calendar time includes overnight temperature soak times.

Calendar time: 10 d

Test time: 10 h

Coordination time: 10 h

3.5 Test Required Information. Not applicable.

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. Prior to the start of the test the engine and transmission calibrations must be updated to the most recent version. If a manual transmission application, the clutch and clutch apply system must be updated for proper snap clutch apply rates.

4.1.1 Install the test PTU in the test vehicle. Record the required description of the test vehicle.

4.1.2 Install a thermocouple to monitor the PTU sump oil temperature. Ensure that the thermocouple remains covered by the PTU sump oil during the test. Optional: Install a sensor or other method to measure PTU internal pressure.

4.1.3 Fill the PTU with the recommended type and quantity of lubricant. Record the quantity of fill. Optional: Add tracer dye in either the transmission or the PTU fluid for ease of leakage detection.

4.1.4 Clean the exterior surface of the PTU. Optional: Mask the vent and paint the exterior area with white paint for ease of leakage detection. Remove masking from vent.

4.2 Conditions.

4.2.1 Environmental Conditions. The test can be run in any environmental conditions that provides normal tire adhesion. See 4.3.

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. Record the ambient conditions, soak temperature and the length of the vehicle soak prior to running the maneuvers and the PTU sump temperatures and pressures (optional) before and after each maneuver. Monitor for and note any odors due to vapor leakage during all testing maneuvers.

4.3.1 Cold Soak. Soak the vehicle in a cold chamber at the test temperature for a minimum of 8 h.

4.3.2 Maneuvers.

4.3.2.1 Manual Transmission Cold Abuse Launch. Apply the clutch pedal, increase the engine speed to approximately 3000 Revolutions per Minute (RPM), Shift to 1st gear and cautiously drive the vehicle out of the cold chamber. Once out of the cold chamber, stop the vehicle and scrape the frost off the windshield and side windows as needed for unobstructed vision. Perform five (5) circles with the steering wheel turned to the stop in the right direction at maximum speed before tire scrub occurs. Once five (5) circles are complete, perform five (5) circles with the steering wheel turned to the stop in the left direction at maximum vehicle speed before tire scrub occurs.

4.3.2.2 Automatic Transmission Cold Abuse Launch. Engage the brake pedal, shift from Park to Neutral, increase the engine speed to approximately 3000 RPM, shift to Drive, and cautiously drive vehicle out of cold

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