



Transmission Engine Dynamometer Durability (TEDD) Test Vendor Version

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 durability characteristics of the transmission. The primary intention is to accelerate gear and bearing durability life.

1.2 Applicability. The Transmission Engine Dynamometer Durability (TEDD) Test is applicable to all transmission configurations including rear drive, front drive, gear boxes, etc.

1.3 Remarks. The TEDD Test consists of both part throttle and wide open throttle (WOT) conditions. The throttle openings at which part throttle upshifts occur are model dependent and could require adjustment.

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.

- Powertrain Oil Start of Test (SOT) Procedure
- Transmission and Engine Calibration Sheets

3 Resources

3.1 Facilities. Facilities include, but not limited to, Global Powertrain Dynamometer and Emissions Laboratory located in Pontiac, Michigan.

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 Dynamometer. Both Direct Current (DC)/Alternating Current (AC) options are available.

3.2.2 Instrumentation. Pressure, temperature, and data acquisition recording devices, (software for electronic control unit development and test (INCA)/open test system automation (PUMA)) external controllers.

3.2.3 Software. INCA/PUMA.

3.3 Test Vehicle/Test Piece. Powertrain assembly.

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3.4 Test Time.

Calendar time: 12 weeks (assume three shift operation)

Test hours: 400 hours

Coordination hours: 20 hours

3.5 Test Required Information. Prior to start of test, obtain a Transmission and Engine Calibration Sheet with shift patterns and line pressure schedule for the particular product to be run.

3.6 Personnel/Skills. Test Development/Validation Engineer and Test Technician trained in transmission/Powertrain testing. Personnel to have completed required safety training and be equipped with appropriate Personal Protective Equipment (PPE).

4 Procedure

4.1 Preparation. Powertrain Oil SOT Procedure, calibration verification, engine break-in cycle, data review of initial cycle.

4.2 Conditions. The test schedule will consist of a combination of twelve (12) Main Forward Cycles (4.3.1), one (1) Supplemental Forward Cycle (4.3.2) and one (1) Reverse Cycle (4.3.3); run to 19 500 forward cycles.

4.2.1 Environmental Conditions. Transmission temperature cooler to 90 °C, air inlet temperature to 20 °C.

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 Main Forward Cycle.

4.3.1.1 Verify that the rotating gear is in a **safe** condition to start a cycle, or set to a **safe** condition, then shift to drive. An example of an **unsafe** condition is running at 2000 rpm in reverse.

4.3.1.2 Shift to drive and idle for 5 s.

4.3.1.3 Accelerate WOT, to the highest gear attainable at WOT or 161 km/h (100 mph), whichever occurs first. The acceleration should be against inertia, or simulated inertia, plus sufficient dynamometer load to duplicate vehicle acceleration rates.

4.3.1.4 If the end condition to 4.3.1.3 was the last WOT upshift, continue to accelerate WOT in that gear for 2 s to 3 s. Otherwise proceed immediately to 4.3.1.5.

4.3.1.5 Reduce the throttle to the maximum that will allow upshifts (typically 40% to 50%) for a **power on** upshift into any remaining overdrive gears and apply of the converter clutch. Throttle opening may need to be reduced after the **power on** upshifts to allow the apply of the converter clutch. Reference the transmission calibration shift pattern (Figure A1, Appendix A). Apply a light load with the dynamometer to maintain approximately constant speed during this step. Continue running for enough time for the engine to be at part throttle for a minimum of 10 s.

Note: The 10 s at part throttle operation is sufficient to reset the stoichiometric air/fuel ratio timer in the Powertrain Control Module (PCM).

4.3.1.6 Accelerate WOT, to reverse the shifts which occurred in 4.3.1.5, for 5 s to 7 s. Maintain the same load as in 4.3.1.5 to allow a slight acceleration.

4.3.1.7 Reduce the throttle to 20% to 30% for a **back off** upshift into any remaining overdrive gears and apply of the converter clutch. Apply a light load with the dynamometer to maintain approximately a constant speed during this step and continue running for enough time to allow all upshifts to occur, plus a 3 s stabilization.

4.3.1.8 Close the throttle and apply a dynamometer load for a **moderate brake** 1.8 m/s² to 3.6 m/s² (6.0 ft/s² to 12.0 ft/s²), down to 5 km/h to 8 km/h (3 mph to 5 mph) below a speed where a downshift to 2nd gear at WOT will occur.

Note: Sections 4.3.1.7 and 4.3.1.8 must be performed such that the engine is at part throttle for a minimum total of 10 s. The 10 s at part throttle operation is sufficient to reset the stoichiometric air/fuel ratio timer in the PCM.

4.3.1.9 Accelerate WOT making a power on downshift into 2nd gear and accelerating to the highest gear attainable at WOT or 161 km/h (100 mph), whichever occurs first. Use the same load as in 4.3.1.3.

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Note: Sample the engine parameters during the last 2 s of 3rd gear operation in 4.3.1.9 or 4.3.1.10 approximately once per hour.

4.3.1.10 If the end condition to 4.3.1.9 was the last WOT upshift, continue to accelerate WOT in that gear for 2 s to 3 s. Otherwise proceed immediately to 4.3.1.11.

4.3.1.11 Reduce the throttle to 20% to 30% for a back off upshift into any remaining overdrive gears and apply of the converter clutch. Apply a light load with the dynamometer to maintain approximately a constant speed during this step and continue running for enough time to allow all upshifts to occur, plus a 3 s stabilization.

4.3.1.12 Close the throttle and apply a dynamometer load for a moderate brake down to 5 km/h to 8 km/h (3 mph to 5 mph) below a speed where a downshift to 2nd gear at WOT will occur.

4.3.1.13 Manually shift to low gear and coast to 8 km/h to 11 km/h (5 mph to 7 mph) using the same dynamometer load as in 4.3.1.12.

4.3.2 Supplemental Forward Cycle.

4.3.2.1 Verify that the rotating gear is in a **safe** condition to start a cycle, or set to a **safe** condition.

4.3.2.2 Shift to drive and idle for 5 s.

4.3.2.3 Accelerate WOT to the highest gear attainable at WOT. Continue to accelerate in that gear for 2 s to 3 s. The acceleration should be against inertia, or simulated inertia, plus sufficient dynamometer load to duplicate vehicle acceleration rates. Do **not** exceed safe output speeds.

4.3.2.4 If the highest gear has been reached proceed to 4.3.2.6. Otherwise, reduce the throttle to the maximum that will allow a **power on** upshift (typically 40% to 50%) into any remaining overdrive gears and apply of the converter clutch. Throttle opening may need to be reduced after the **power on** upshifts to allow the apply of the converter clutch. Reference the transmission calibration shift pattern (Figure A2, Appendix A). Apply a light load with the dynamometer to maintain approximately constant speed during this step. Continue running for enough time for the engine to be at part throttle for a minimum of 10 s.

4.3.2.5 Accelerate WOT, to reverse the shifts which occurred in 4.3.2.4, for 5 s to 7 s. Maintain the same load as in 4.3.2.4 to allow a slight acceleration.

4.3.2.6 Reduce the throttle to 20% to 30% for a **back off** upshift into any remaining overdrive gears and apply of the converter clutch. Apply a light load with the dynamometer to maintain approximately a constant speed during this step and continue running for enough time to allow all upshifts to occur, plus a 3 s stabilization.

4.3.2.7 Close the throttle and apply a dynamometer load for a **moderate brake** down to 5 km/h to 8 km/h (3 mph to 5 mph) below a speed where a downshift to 1st gear at WOT will occur.

Note: Paragraphs 4.3.2.6 and 4.3.2.7 must be performed such that the engine is at part throttle for a minimum total of 10 s. The 10 s at part throttle operation is sufficient to reset the stoichiometric air/fuel ratio timer in the PCM.

4.3.2.8 Accelerate WOT making a power on downshift into 1st gear and accelerating to the highest gear attainable at WOT or 161 km/h (100 mph), whichever occurs first. Use the same load as in 4.3.2.3.

4.3.2.9 Reduce the throttle to 20% to 30% for a **back off** upshift into any remaining overdrive gears and apply of the converter clutch. Apply a light load with the dynamometer to maintain approximately a constant speed during this step and continue running for enough time to allow all upshifts to occur, plus a 3 s stabilization.

4.3.2.10 Close the throttle and apply a dynamometer load for a **moderate brake** down to 5 km/h to 8 km/h (3 mph to 5 mph) below a speed where a downshift to 2nd gear at WOT will occur.

4.3.2.11 Manually shift to low gear and coast to 8 km/h to 11 km/h (5 mph to 7 mph) using the same dynamometer load as in 4.3.2.9.

4.3.3 Reverse Cycle.

4.3.3.1 Stop the output in neutral.

4.3.3.2 If the output will not stop in neutral, flag that neutral failed and wait, otherwise continue.

4.3.3.3 Shift to reverse and wait for full engagement and stabilization (approximately 5 s). Apply maximum load with an eddy current dynamometer. Reference the transmission calibration shift pattern (Figure A3, Appendix A).

Note: DC/AC dynamometers require special operation during this portion of the test to maintain zero output speed without a **runaway**.

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