



Reverse Gear Test (Manual Transmission)

1 Scope

Note: Nothing in this standard supersedes 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. Evaluation of manual transmission strength of the total reverse gear system by driving on grade.

1.2 Foreword. This Test Procedure was formerly known as GME R-7B1D-11.

1.3 Applicability. This standard is applicable for testing all FWD, AWD and RWD manual transmission.

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

The test facilities and equipment shall be operable and shall have a valid calibration level.

3.1 Facilities.

3.1.1 Secured track on a level surface to allow accelerations and starts/stops, linked to a grade of 20 % and 30 % having a length of 50 m (total length of mountain road shall be 100 m, including 30 m coasting).

3.2 Equipment.

3.2.1 Engine with highest torque as it shall be used in combination with the engine in production.

3.2.2 Production clutch combination.

3.2.3 Attached tachometer and speedometer.

3.2.4 Sensors for transmission oil temperature and ambient temperature.

3.2.5 Writing materials.

3.3 Test Vehicle/Test Piece.

3.3.1 Transmission, assembled according to specification.

3.3.2 The engine type and the vehicle equipment must correspond to the release.

3.4 Test Time.

Calendar time: 3 days

Technician/ Mechanical/hours 9 hours

Preparation/documentation/hours: 3 hours

3.5 Test Required Information. Possible sources are:

- SOR
- VTS (Vehicle Technical Specifications)
- SSTS (Sub System Technical Specifications)
- ADV Plan
- VCRI
- Application engineer
- Development Groups
- Drawings

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation.

4.1.1 Vehicle weight.

4.1.1.1 If tow capacity < 2800 kg. 2/3 of permissible payload, distributed according to axle weight rating.

4.1.1.2 If tow capacity > 2800 kg. Full load, distributed according to axle weight rating.

4.1.2 Check fuel, engine oil and cooling fluid. Check brake linings.

4.1.3 Tire pressure for maximum load.

4.1.4 Drive until transmission oil temperature reaches +80 °C minimum.

4.2 Conditions.

4.2.1 Environmental Conditions. The test shall be performed on a dry surface.

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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 Test on Grade I.

4.3.1.1 At normal acceleration rate (engine speed not to exceed 3000 min⁻¹), drive the vehicle in reverse gear for 20 m on the level surface, then 15 m uphill (20 % grade) and for the remaining 35 m of the grade at the maximum acceleration rate of up to 5000 min⁻¹ (or at 95 % of red line RPM if not achievable).

4.3.1.2 Check function of reverse gear shiftability.

4.3.1.3 Drive back to the start of the test track in 2nd gear.

4.3.1.4 Repeat paragraphs 4.3.1.1 through 4.3.1.3 for a total of 10 times.

4.3.1.5 Repeat paragraphs 4.3.1.1 through 4.3.1.3 however rev the engine up to 6000 min⁻¹ at maximum acceleration rate (or at 95 % of red line RPM, if not achievable) for a total of 20 times.

4.3.1.6 Cooling. Drive vehicle in 4th gear at about 80 km/h for 10 km to cool vehicle off (circular or endurance test track).

4.3.2 Test on Level Surface.

4.3.5.1 Accelerate the vehicle in reverse gear on track ($\approx$ 1 km, if available, otherwise record track length used) to maximum engine speed and coast until the engine speed reaches 1000 min⁻¹. Remain in reverse gear and run this cycle for a total of 4 times. Take safety precautions at the test track.

4.3.5.2 Check function of reverse gear shiftability after completion of all cycles according to paragraph 4.3.5.1.

4.3.6 Test on Grade II.

4.3.6.1 Drive backwards over the mountain road, leaving the transmission in reverse gear, 20 % grade in drive uphill at 200 min⁻¹ below red line, 30 % grade in coast downhill with engine brake, 30 % grade in uphill driving as fast as possible, 20 % grade in downhill with engine brake. Run this cycle for a total of 4 times. Record the track length of each grade performance.

4.3.6.2 Check function of reverse gear shiftability after each cycle according to paragraph 4.3.6.1.

Note: If driving on grade according to paragraph 4.3.6.1 is not achievable, perform without payload and note accordingly in the test report.

If transmission temperature exceeds +170 °C or excessive/damaging noise, terminate test.

In case, facilities according to paragraph 4.3.6.1 are not available, equivalent facilities upon test engineer's discretion shall apply.

4.4 Evaluate transmission function and noises. Make a visual inspection of the disassembled transmission.

5 Data

5.1 Calculations. Record at least the following data (the test engineer may require additional data; see example data sheet in Appendix A):

1. Oil temperature
2. Ambient temperature
3. Engine type / km reading (mileage).

5.2 Interpretation of Results. The program shall be performed with three (3) transmissions of new condition.

The requirements are considered fulfilled, if:

5.2.1 Shiftability of reverse gear is not impaired.

5.2.2 Vehicle is ready for operation without gear noise not impaired.

5.2.3 No reverse gear jump out occurs while driving.

5.2.4 Visual check and measurement do not reveal more than normal stress marks.

5.3 Test Documentation.

5.3.1 Transmission Data. Record name and number of all parts removed or installed (gear, reduction and overall ratio, type of oil and quantity), cell and transmission numbers, test hours on part and on transmission, together with reason part was removed.

5.3.2 Comment. Report a detailed comment of the transmission performance and of individual components.

5.3.3 Rating. Record test rating of transmission as a whole (for evaluation criteria, see paragraph 5.2).

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