



Drive Quality Procedure Rollback

1 Scope

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. Provides a standardized measurement procedure to measure drive quality rollback parameters on gas, electric, or gas/electric vehicles both conventional style, as well as Continuously Variable Transmission (CVT) type transmissions. Vehicle acceleration, accelerator pedal force, engine speed, and vehicle speed/distance are measured and recorded using this procedure.

1.2 Foreword. This measurement procedure includes several measurable parameters to validate passenger drive quality rollback requirements.

1.3 Applicability.

- Passenger cars
- Multi-purpose passenger vehicles
- Light-duty trucks
- Medium-duty trucks

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15008

2.3 Additional References.

Math Works at <http://www.mathworks.com/products/matlab/index.html>.

3 Resources

3.1 Facilities. Road tests shall be conducted on the following recommended road surface.

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.

3.1.3 The road surface shall be 7.2 grade, 11.6 grade, or 16 grade. If this grade is not available, refer to Appendix A.

3.1.4 Track must be of sufficient length to perform test.

3.1.5 The road must be dry, clean, smooth, and free from undulations. The road surface shall be concrete or rolled asphalt.

3.2 Equipment. The following is a recommended list of all equipment used in various tests. See each test for actual equipment used.

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3.2.1 Vehicle Distance Measurement Device. A calibrated velocity encoder sensor or some other device for measuring distance shall be securely mounted to the vehicle. Distance measurement accuracy must be ± 3.0 mm.

3.2.2 Accelerometer Assembly. An accelerometer with a range of $\pm 2.0G$, an accuracy of $\pm 1.0\%$, and a resolution of $0.005G$ is required. The accelerometer must be able to be adjusted in line with the longitudinal axis of the vehicle. A leveling bubble may be used as a visual indication for leveling the plate in the horizontal plane.

3.2.3 Tachometer. An engine tachometer with an accuracy of $\pm 0.15\%$ and a resolution of 10 rpm is required.

3.2.4 Data Acquisition System (DAC). A data acquisition system capable of recording all the "test parameters" within a time base accuracy of $\pm 0.1\%$ of the total sample time interval is required. The DAC must be capable of storing all the "test parameters" at a minimum rate of 100 samples/s for 2 minutes with a resolution of 1/2048.

3.2.5 Accelerator Pedal Sensor. A method to record output from a pedal position sensor is required.

3.2.6 Brake Pedal Force Transducer. A GM approved brake pedal force transducer.

3.2.7 Vehicle Scales. Scales capable of measuring vehicle weight to an accuracy of ± 3 kg (5 lb). A copy of the scale print report should be obtained for reference.

3.2.8 Tire Pressure Gage. Tire pressure gage to measure tire pressure with an accuracy of ± 5 kPa (1 psi).

3.2.9 Safety Equipment. Check with test facility for safety equipment requirements.

Note: All instrumentation shall be calibrated as required. Record instrumentation details and date of calibration on data sheet, unless information is otherwise preserved in the testing facility records.

3.3 Test Vehicle/Test Piece. Refer to GMW15008.

3.4 Test Time.

Calendar time:	2 days
Test hours:	4 hours
Coordination hours:	1 hour

Note: Test time may vary at different test locations. Check with local test coordinator for detail timing.

3.5 Test Required Information.

3.5.1 Test Weight. The requesting engineer must determine the tested weight. See 3.3 for instructions.

3.5.2 Tire Pressure. The requesting engineer must determine the tire pressure for each test if different from the default of **manufacturer's** recommended cold inflation pressure.

3.6 Personnel/Skills. None specified.

4 Procedure

4.1 Preparation.

Note: The following may not apply to all tests.

4.1.1 Road Tests. Inflate vehicle tires to the manufacturer's recommended cold inflation pressure or that which has been requested by the test engineer. Record the inflation pressure.

4.1.2 Set vehicle per 4.2.2 Test Conditions.

4.1.3 Weigh the vehicle as tested with the driver, any passengers and instrumentation. Record weight.

4.1.4 Install the following equipment.

- Vehicle speed measurement device securely mounted to the vehicle.
- Accelerometer assembly. The accelerometer assembly shall be placed on the floor, in the passenger compartment behind the driver's seat, during testing. The right front passenger side floor may be used as an alternate location.
- Engine tachometer
- Data acquisition computer, DAC
- Brake pedal force transducer
- Accelerator Pedal Sensor (APS) interface to the DAC

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- Fire extinguisher.

The equipment must not hinder the vehicle's operation or the vehicle's operating characteristics. Any safety and/or communication equipment that is locally required should be installed at this time.

4.1.5 Do the following:

4.1.5.1 Connect a Digital Multimeter (DMM) to the APS output. To ensure proper APS function, check that the voltage output changes from closed to full throttle. Use the voltmeter to monitor the output voltage during the remainder of the test.

4.1.5.2 Read the DMM and record the APS output voltage with the throttle pedal in an un-depressed state for zero.

4.1.5.3 Press the accelerator pedal down to its maximum displacement, and record the output voltage. Ensure that there are no obstructions (i.e., out of position floor mats, etc.)

Note: Extreme pedal force should not be applied to achieve full throttle opening. Limit pedal force to 90 N (20 lb).

4.1.6 Calibrate the speed channel per manufacturer's procedure.

4.1.7 Calibrate the accelerometer channel. Zero the longitudinal accelerometer. Use the manufacturer's recommended calibration procedure.

4.1.8 Calibrate any remaining channels.

4.2 Conditions.

4.2.1 Environmental Conditions.

4.2.1.1 All road tests must be conducted at ambient temperatures between 0 °C (32 °F) and 30 °C (86 °F).

4.2.1.2 Road tests may not be conducted when wind speeds average more than 15 km/h with gusts no greater than 22 km/h.

4.2.1.3 Road tests should not be conducted during foggy conditions.

4.2.1.4 Ambient temperature, barometric pressure, and relative humidity are to be recorded.

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 The test road surface must be dry and clean. Abnormal or slippery road conditions must be avoided.

4.2.2.2 Air conditioning shall be turned off during testing, and the compressor rendered inoperative, if necessary, unless specified otherwise.

4.2.2.3 All vehicle windows must be closed during the road tests.

4.2.2.4 All high draw current accessories, seat heaters and electric defoggers, must be off during test. The heating, ventilating, air conditioning (HVAC) blower system shall be set at the minimum speed.

4.2.2.5 The vehicle is normally tested with a full tank of fuel. However, fuel level may be adjusted to meet weight requirements or other engineering requirements as long as the targeted vehicle weight is achieved. The specific amount and location, if multiple tanks, shall be recorded.

4.2.2.6 The engine must be in **closed-loop** mode at normal operating temperature during all engine operating tests.

4.2.2.7 If the vehicle is equipped with engine and/or transmission with regular and sport modes, tests should be conducted under all modes for road tests.

4.2.2.8 Electronic control systems which may affect vehicle performance shall be operated in their normal **key-on** mode, unless otherwise requested for road tests including:

- Vehicle stability systems
- Traction control system
- Others as appropriate

4.3 Instructions.

4.3.1 Rollback on Grade Test.

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