



Propeller Shaft Center Bearing Mounting Modal Frequency Evaluation Procedure

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. Define the process of determining the center bearing mounting natural frequency on vehicle. The product of this procedure will be a vertical and lateral frequency value in Hertz (Hz).

1.2 Applicability. This test procedure is appropriate for use with all passenger cars and light trucks utilizing multi-piece propeller shaft (propshaft) systems with center bearing attachments. This applies to rear wheel drive, rear wheel drive-based all wheel drive, and front wheel drive-based all wheel drive vehicle architectures.

1.3 Remarks. The center bearing mounting frequency is specifically tuned to produce acceptable transmissibility of 1st order driveline imbalance forces, joint-generated forces and powertrain forces into the body/chassis.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14181 GMW16178

2.3 Additional References.

Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities. A test room and/or drive-on hoist to allow vehicles wheels to be carrying the full weight of the vehicle by design. Alternatively, a driveline dynamometer facility may be used.

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 Data acquisition system (DAS)

3.2.2 Accelerometer

3.2.3 Medium impact hammer with tip capable of providing uniform force input up to 100 Hz

3.2.4 Transducer cabling

3.2.5 Signal conditioning

3.3 Test Vehicle/Test Piece. Validation shall be performed on a full vehicle or on a complete driveline system in a driveline dynamometer facility.

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3.4 Test Time.

Calendar time: 0.5 day

Test time: 2 hours

Coordination time: 2 hours

3.5 Test Required Information. Exhaust heat shields/exhaust systems may need to be removed to access center bearing attachment.

3.6 Personnel/Skills. One (1) qualified engineer or technician trained in impact testing, the use of data acquisition equipment and having basic knowledge of acoustic and vibration signal processing.

4 Procedure

4.1 Preparation. Place test piece into test room. Boundary conditions are in-situ. Reference GMW14181.

4.2 Conditions. Reference GMW14181.

4.2.1 Environmental Conditions. Test piece must be at room ambient temperatures. Reference GMW14181. If low temperature performance verification is required for SSTS validation, the test piece shall be stabilized at the temperature specified in the SSTS before data acquisition.

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.

Further detail contained in GMW14181 (non-operating, see 4.3.1) and GMW16178 (operating, see 4.3.2).

4.3 Instructions.

4.3.1 Non-operating Test. Mount accelerometer on the bottom of the propshaft nearest to the bearing support on the centerline of the propshaft with hot glue or other appropriate material. Orientation will be in the plane of the center bearing mount closest to the vertical direction.

If the high temperature test is required, use a temperature appropriate adhesive (e.g., 2-part epoxy).

4.3.1.1 Set up DAS to acquire data up to 100 Hz minimum with a frequency resolution of 0.25 Hz or smaller.

4.3.1.2 Acquire, verify and store a driving-point Frequency Response Function (FRF) in the vertical direction. Impact adjacent to the accelerometer as mounted per section 4.3.1. Refer to Figure 1.

4.3.1.3 Move the accelerometer to the side of the propshaft close to the center bearing.

4.3.1.4 Acquire, verify and store a driving-point FRF in the lateral direction. Impact adjacent to the accelerometer as mounted per section 4.3.1. See Figure 1.

Figure 1: Drive Point Impact Location



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