GM	WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW17342

Electric Power Steering Gear Zipper Noise Test Stand Wear-In Operating 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. This procedure is designed to wear a gear to 50% of the expected life for an Electric Power Steering (EPS) gear.

1.2 Applicability. This test procedure is applicable to any electrically assisted rack and pinion steering system.

1.3 Remarks. This document describes the general operating procedure for conducting a wear test on the Zipper Noise Test Stand. It is not a user's guide to the test machine or its control software.

2 References

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

2.1 External Standards/Specifications.

ISO 9001

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- MB Dynamics Technology, Cleveland, Ohio, www.mbdynamics.com
- Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities.

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 MB Dynamics Technology Zipper Noise Test Stand composed of a steering gear stand, two Road Load Simulator (RLS) force boxes, and a Driver Simulator (DS) and steering column tower.

3.2.2 MB Dynamics Technology pneumatic Controller.

3.2.3 Personal Computer (PC) with MB Dynamics pneumatic control and application software installed.

3.2.4 Integrated or stand-alone capability to transmit the necessary Controller Area Network (CAN) messages to an EPS system for it to fully function.

3.2.5 Power supply capable of providing 150 A at 14 V.

3.2.6 Proper wire harness.

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3.3 Test Vehicle/Test Piece. Parts required to test an EPS system are:

a. Dual pinion or belt drive steering gear complete with inner and outer tie-rods.
b. Intermediate (I) Shaft.
c. Steering column.
d. Gear mounting bolts.
e. Fixtures or brackets for gear mounting.

3.4 Test Time. Time shown is typical per test and per test specimen.

Calendar time:	5 days
Test hours:	40 hours
Coordination hours:	2 hours

Note: If special test fixtures are required for testing, fabrication time would be additional to the testing time listed.

3.5 Test Required Information. The X, Y and Z coordinates are required for all I-Shaft joints. Torque values for gear mounting bolts and I-Shaft bolts are also required.

3.6 Personnel/Skills. Operator must be qualified and documented as capable to run this test as required by ISO 9001.

4 Procedure

4.1 Preparation.

4.1.1 Steering Gear Setup. See Figure 1 for the overall wear test setup.

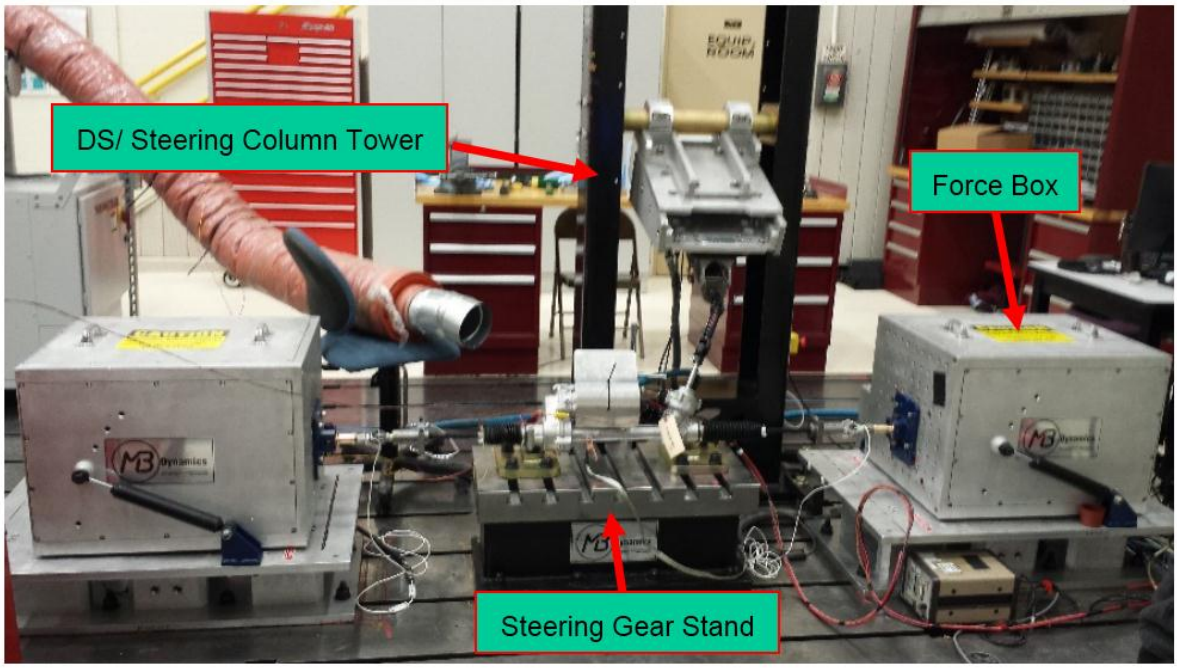

Figure 1: Steering Gear Wear Test Setup

4.1.1.1 Powering Up the Test Bench. Turn on the main power to the controller, flip the black DS switch on the cabinet to the **On** position, and open the main air valve. Press the power button on the computer and log in. The cabinet is shown in Figure 2.

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Figure 2: Zipper Bench Control Cabinet

4.1.1.2 Steering Gear Mounting.

4.1.1.2.1 Steering Gear to Stand Mounting. The gear is to be mounted to the steering gear stand using the appropriate fixtures. See Figure 3. Remove the production driver side and passenger side outer tie rod end and jam nuts, if attached. Screw the appropriate tie rod adapter plug onto the inner tie rod such that the outer end of the tie rod is flush with the outer end of the adapter plug.

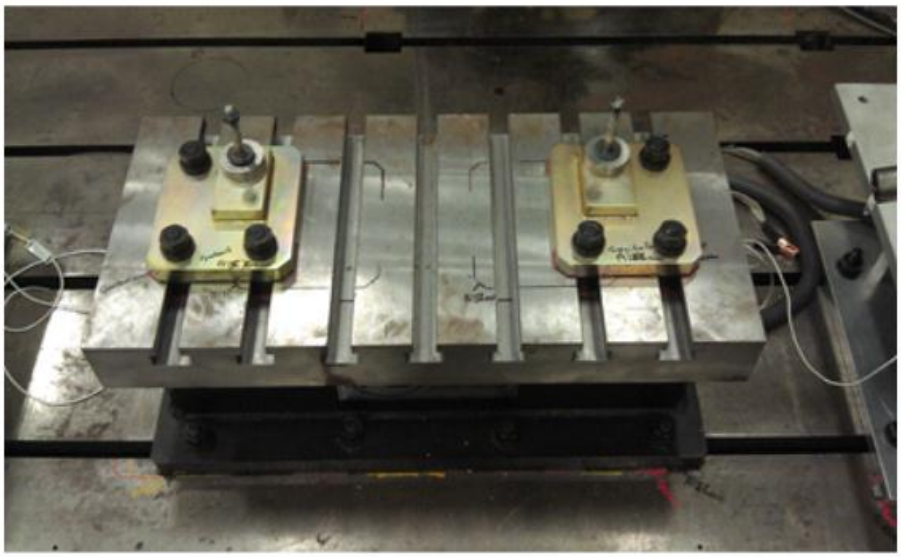

Figure 3: Steering Gear Mounting Plates on Steering Gear Stand

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4.1.1.2.2 Steering Gear Electrical Harness. Connect the proper wiring harness and ground clamp to the gear. If desired, power and CAN communication can be provided to the gear to provide EPS assistance the remaining setup steps if desired.

4.1.1.2.3 Steering Gear to Left Force Box. Center the left side force box and lock the force box into position. Figure 4 shows the hardware used to attach the force box to the steering gear. Using the pinion, slide the adapter plug into the petal clamp and secure as shown in Figure 5. Adjust the gear mounts and petal clamp assembly such that the tie rods are approximately collinear with the rack centerline. The tie rods should also be perpendicular to the force box mounting plate from the top and front views. Loosen the bolts locking the steering gear stand to the bedplate. With the force box still locked in place, slide the steering gear stand (by turning the pinion) so that the steering rack is centered between the stops. Remove the lock pins from the force box once the steering gear stand is tightened in place.

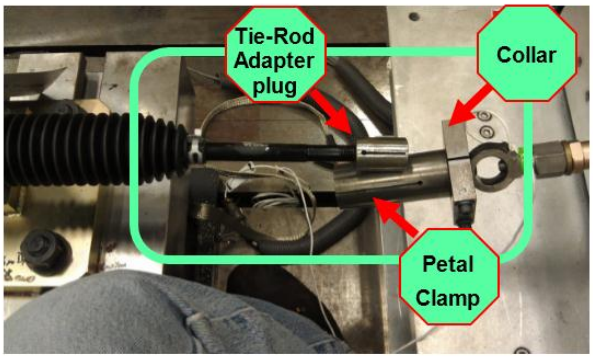

Figure 4: Tie-Rod Clamp Assembly

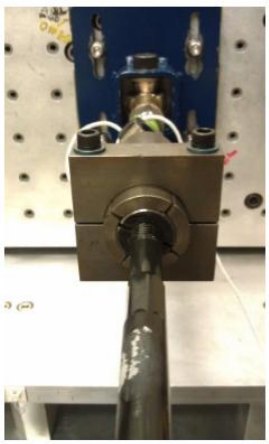

Figure 5: Adapter Plug Clamped into Petal Clamp

4.1.1.2.4 Steering Gear to Right Force Box. The steps to connect the right force box are nearly identical to the steps in 4.1.1.2.3. The only difference is that the force box base will be moved when turning the pinion instead of the steering gear base. The end result will be having the steering rack and both force boxes centered at the same time.

4.1.1.2.5 Cooling Setup. During the wear cycle, the EPS power pack can overheat. To alleviate this condition, air fins should be placed around the periphery of the motor housing. Use a thermal paste on the backs of the air fins and hold them in place using a tie-strap. Vent air onto the fins to maintain an appropriate temperature for the duration of the test. Air fins can also be fitted with thermocouples to actively monitor temperature. See Figure 6.

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