

EDS

Engineering,
GM DAEWOO Auto & Technology.
Standards

VEHICLE SUSPENSION PARAMETER MEASURING TEST

EDS-T-2009

ISSUED DATE: 1998. 05. 31

REVISED DATE: 2006. 02. 21

VERSION: 3



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1. PURPOSE

The purpose of this test is to measure parameters of vehicle suspension system on a test vehicle in terms of driving stability and riding comfort.

2. APPLICATION SCOPE

This test standard applies to passenger vehicles only.

3. TEST EQUIPMENT

SPMD (Suspension Parameter Measuring Device).

(Refer to Appendix 2. Test Equipment Schematic.)

3.1. Fixation Unit

3.1.1. Vehicle body fastening device

A hydraulic clamp holds side sills of a vehicle while electric magnet is used to fasten vehicle to test bed. Air bearings are used to move vehicle.

3.1.2. Brake cylinder

Brake cylinder is used to handle and fix foot brake.

3.2. Driving Unit

3.2.1. Multiple Degree of Freedom (5-axial) Tire Input Device

It is a device for applying load through tire onto the vehicle fastened to test bed. Vertical movement, longitudinal movement, lateral movement and inclination/rotation movement (changes in steering angle) can be transmitted to tire.

Each movement is actuated by a Servo-Actuator and tire contact surfaces are controlled in an integrated manner so that a vehicle behaves as on a level ground.

3.2.2. Tread input Device

This device allows adjustment of tread in the range of 1100mm - 1800mm.

3.2.3. Wheel Base Input Device

This device allows adjustment of Wheelbase in the range of 2000mm - 3500mm.

3.2.4. Lifter

Lifter is situated on the opposite side of the wheelbase for measuring (FRT/RR) to hold vehicle attitude for fastening.

3.3. Control Unit

Each servo-actuator of tire input device is independently controlled by a full digital controller consisting of high precision Direct Digital Controller (DDC).

ISSUED DATE: 1998. 05. 31

REVISED DATE: 2006. 02. 21

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3.4. Measurement Unit

3.4.1. Optical Wheel Alignment Measuring Device

This device measures 3-dimensional movements using optical sensor in a non-contact manner. It consists of CCD camera, laser sensors and an inclinor.

This device, in particular, measures wheel alignment (Toe, Camber and Caster) for each directional tire input and the wheelbase displacement (in X, Y and Z direction).

3.4.2. 6-axis Load Cells

Load cells are installed under each tire input device and generate tire loads in the following six modes.

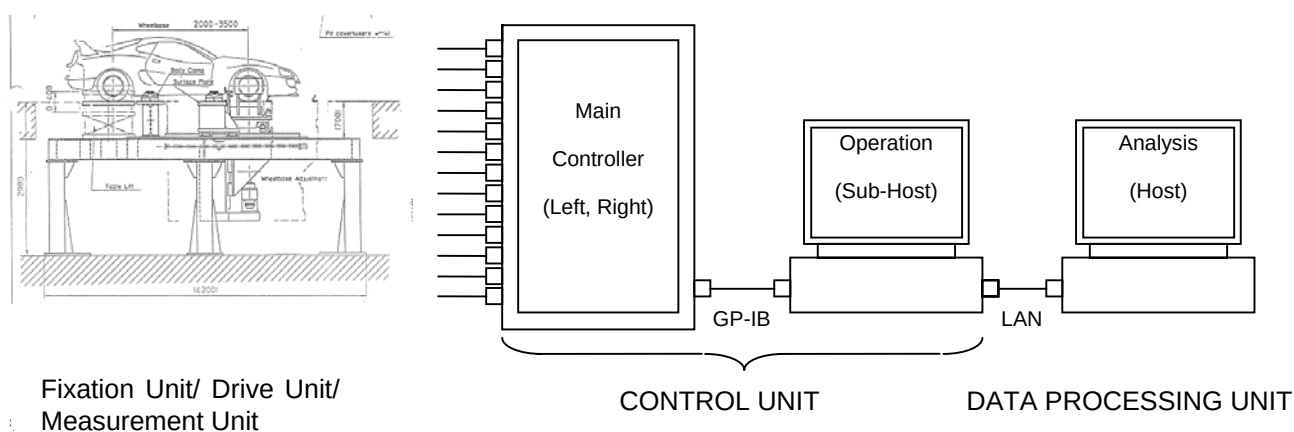
- F_x ----- Longitudinal direction load
- F_y ----- Lateral direction load
- F_z ----- Vertical direction load
- M_x ----- X-axis Rotation Moment
- M_y ----- Y-axis Rotation Moment
- M_z ----- Z-axis Rotation Moment

3.4.3. Body Displacement Correction Device

This device consists of 3 laser sensors and a sensor block fixed onto vehicle body. This device corrects vehicle body movement with respect to tire input load to enable pure displacement of SPMD.

3.5. Data Processing Unit

This device processes sensor signals using analysis software.



Note) Prior to testing, measure test vehicle's dimensions (wheelbase, wheel treads (FW/RW), load distribution of wheels (FRT-RH/LH, RR-RH/LH Weight), Trim Height, tire pressure, tire radii and center of gravity) and enter the data to the Host PC (Analysis PC).

4. TEST PREPARATION

4.1. Check operating status of SPMD.

4.2. Check wheel alignment of all wheels of test vehicle.

Unless specified otherwise, set up vehicle to Design Vehicle Weight (DVW) condition. Here, for GMDAT prototypes, set vehicle to Trim Height (DVW standard) for testing.

4.3. Set tire pressure to specified level.

4.4. Vehicle fixation

4.4.1. Adjust tread and wheelbase of equipment so that the test vehicle's front wheels are at center of Rotation Table (multi-axial tire input device).

4.4.2. Adjust the Lifter and the Tire Input Device vertically to set vehicle at level condition.

4.4.3. Fix the test vehicle using fixation devices and use the brake cylinder to hold Foot Brake.

4.4.4. Fix the steering wheel.

4.5. Attach Sensors

4.5.1. Attach wheel alignment sensors to left and right sides of each test vehicle wheel.

4.5.2. Attach Body Displacement Correction Devices in a vertical direction to wheel alignment sensors as much as possible.

4.6. Standard Load Setup

4.6.1. Each left/right wheel has independent standard load and each suspension has own hysteresis between load and stroke. This characteristic is the Hysteresis Range. Therefore, each test mode starts at this standard load position. To set turn table at a standard load position (top plate of multi-axial tire input device), suspension friction value obtained from vertical mode test is used.

4.6.2. How to set standard load position

First, move down to 1/2 of designated standard load from the current position of left/right wheel. (In case the current position is below the standard load, move up.) Next, increase load to standard load plus suspension friction position, then reduce load again to standard load and stop at the standard load position. Through this operation, always place tire input device at center of the Hysteresis Range. Henceforth, all tests are done upon setting the standard load position.

This operation is automatically performed by sub-host PC based on control parameters. Speed shall be set at lifter input speed at vertical mode test.

5. TEST PREPARATION

Divide tests to FW and RW. For control and measurement data processing at each test mode, refer to Appendix 1. Table.

5.1. Vertical Test