

MOTOR AGE
TRAINING

TST

"Steering & Suspension Systems"

Presented by Motor Age & TST

Sponsored by

Duralast®

What To Expect From This Webinar

- **Identify common wear points in steering and suspension systems**
- **Understand the role of control arms, ball joints, and tie rods**
- **Diagnose issues related to rack and pinion systems**
- **Evaluate springs and shocks for performance and safety**
- **Connect system behavior to real world driveability concerns**



- **The Recording Will Be Available at [Motor Age Training Account](#) & [TSTseminars.org](#)**

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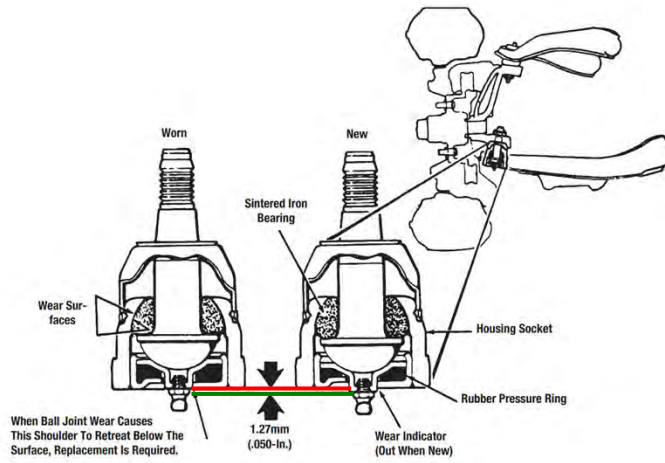
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Front End Components



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Ball Joint



When ball joint wear causes this shoulder to retreat below the surface, replacement is required.

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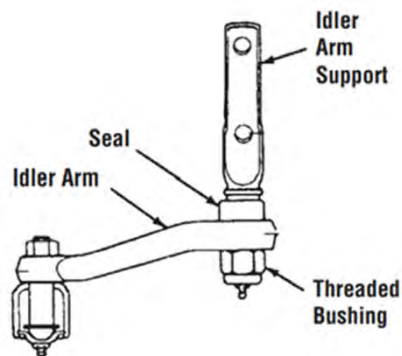
Tie Rod Inner & Outer



A tie-rod is a steering linkage member that connects the steering knuckle with the center link or the steering rack.
It consist of a ball and socket joint that connects the tie rod to the steering knuckle arm and to the center link or steering rack.

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Idler Arm



A worn idler arm can cause front end shimmy and shake.
The idler arm should securely hold the center link parallel to the ground.

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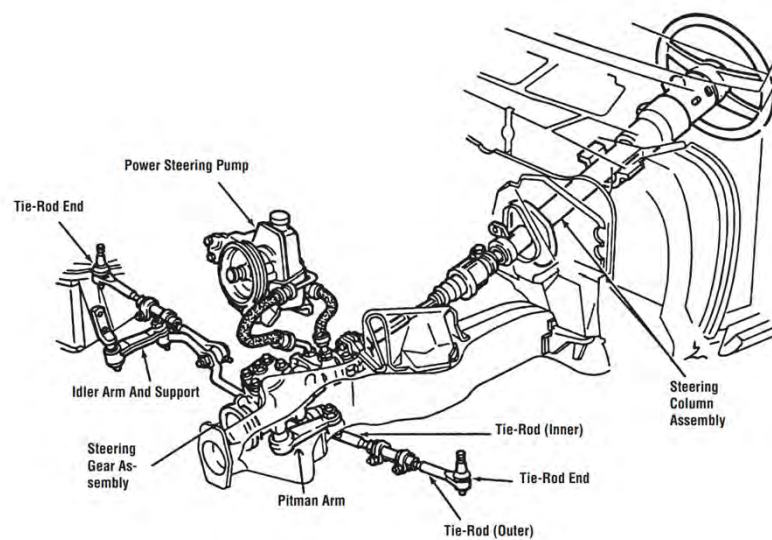
Pitman Arm



Pitman arm is a steering system component mounted on the steering box shaft that transfers the gearbox motion to the steering linkage.

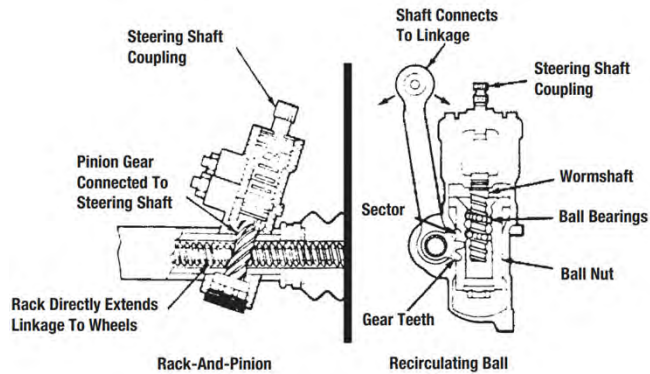
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Steering Components



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Steering Components



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Electronic Steering Rack

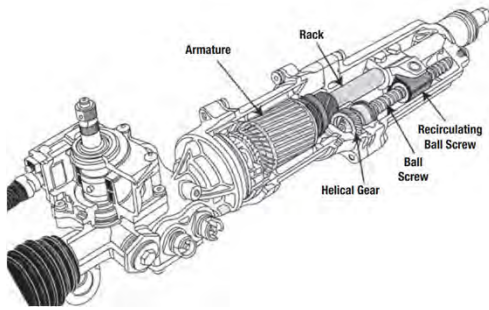
Ram Pickup 1500 2013 to 2018

The electronic power steering (EPS) rack on certain Ram 1500 trucks fails and causes changes in steering effort, vibrations and heaviness in the steering wheel or other issues.



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Electronic Steering Rack



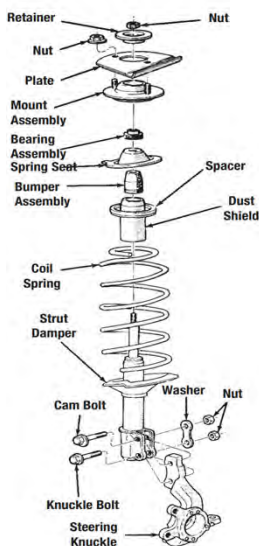
Vehicles with high Rack issues are:
2022-2025 Honda Civic/Acura
2013-2016 Ram
2016 Chevy Colorado
BMW 3 E90/F30 rack clunking issues
Ford Focus 2011-2018
Ford Connect 2011-2018
Many Toyota & Lexus have rack leaks before failure

Cutaway view of the type of electric power steering rack where the armature turns around the rack itself.

(Courtesy: Honda Motor Co., Ltd.)

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Strut Assembly



This is an exploded view of a typical MacPherson Strut used in a front suspension application. In this design, the strut is secured at the upper end to the vehicle's inner fender and at the lower end to the steering knuckle.



Magnetic Ride Struts

This strut uses special fluid that changes stiffness. The change occurs when a magnetic field is on.

No electric signal - SOFT
Electric signal - depending on the rate make the it STIFF.

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Rear End Components



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Rear End Components



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Rear End Strut



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Air Spring Information

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air rear suspension 27

2010 BMW X5 4.8i (E70) V8-4.8L (N62TU)

Shock Absorbers, BMW, E70, 1-Axle Air Spring [TED-TED-TDMUC3132-E70B1S3 - V.1]

Vehicle > Steering and Suspension > Suspension > Suspension Strut / Shock Absorber > Specifications > Mechanical (including Torque) >

Shock Absorbers, BMW, E70, 1-Axle Air Spring [TED-TED-TDMUC3132-E70B1S3 - V.1]

SHOCK ABSORBERS, BMW, E70, 1-AXLE AIR SPRING [TED-TED-TDMUC3132-E70B1S3 - V.1]

Technical data

Shock Absorbers, BMW, E70, 1-axle air spring

TED-TED-TDMUC3132-E70B1S3 - V.1

31 32 Shock Absorbers E70 1-axle air spring

Note:		Currently no details! Reason: Avoidance of incorrect assessments on account of different measuring procedures
Front Axle	mm	--
Rear Axle	mm	--

RELATED INFORMATION

- Description and Operation Components
- Parts and Labor Suspension Strut / Shock Absorber
- Service and Repair Procedures Removal and Replacement
- Specifications Mechanical (including Torque)
- Technical Service Bulletins All Technical Service Bulletins General Information Bulletins

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Air Spring Information

2010 BMW X5 4.8i (E70) V8-4.8L (N62TU)

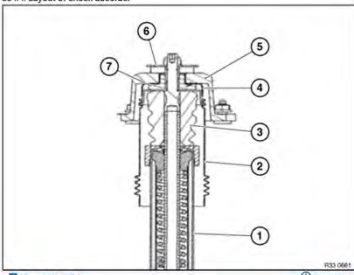
LAYOUT OF SHOCK ABSORBER (REP-UEB-RAE7033-33X2 - V1)

Repair instruction

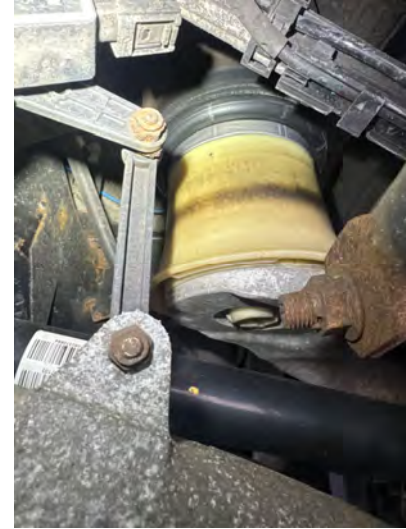

Layout of shock absorber

REP-UEB-RAE7033-33X2 - V1

33 ... Layout of shock absorber



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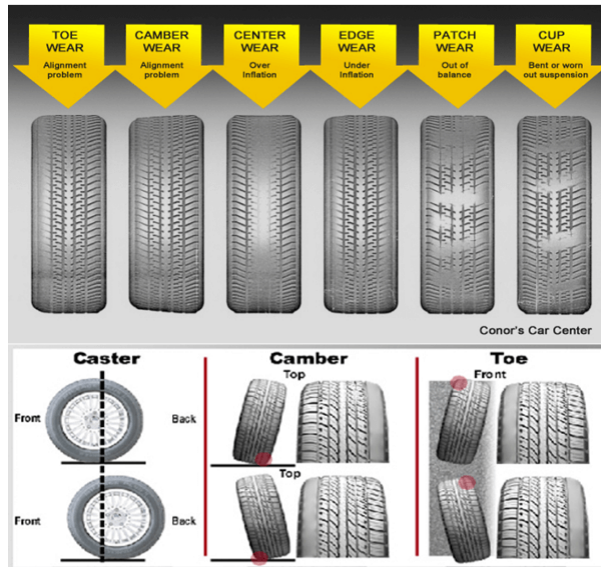
Hyundai & Kia Steering Issue



Hyundai / Kia makes a clicking noise due to steering coupler

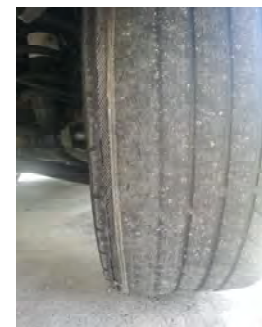
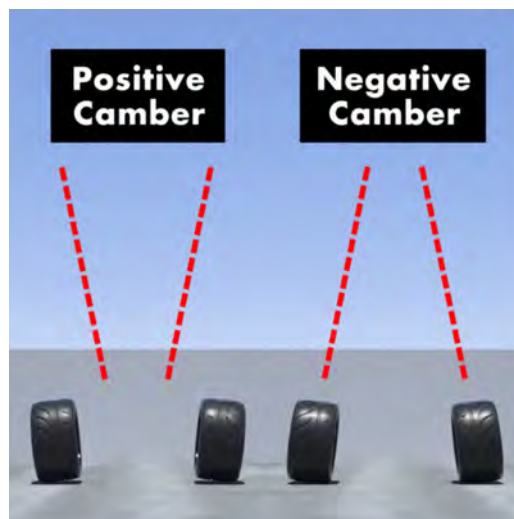
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Tire Wear Patterns



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Tire Wear Patterns



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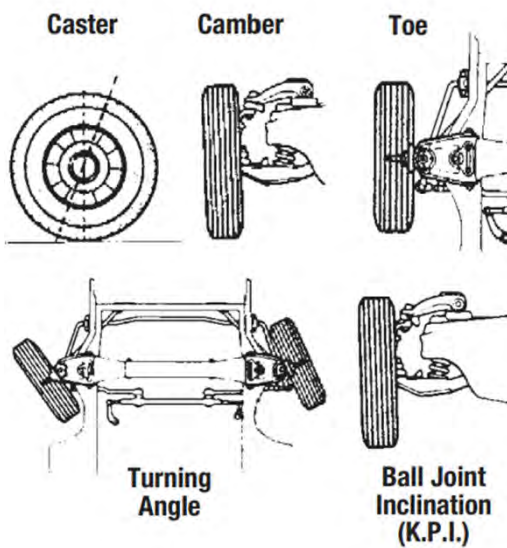
Tire Wear Patterns



**Feather Edging
Excessive Toe In or Out**

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Alignment Angles

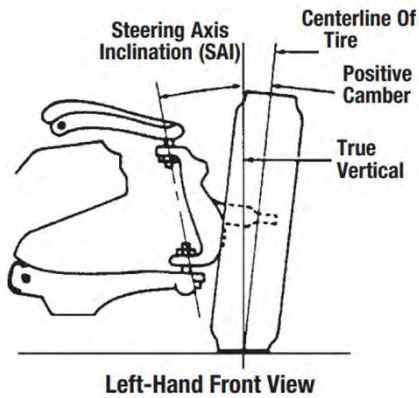


Wheel alignment angles. Ball joint inclination, also known as steering axis inclination, and turning angle, also known as toe-out on turns, are not adjustable during an alignment.

(Courtesy: Ford Motor Co.)

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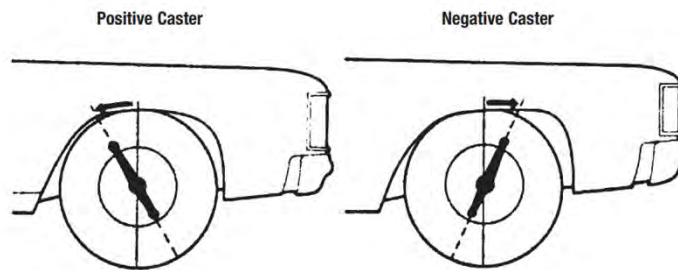
Alignment Angles



Camber is the angle as seen from the front of the vehicle between a wheel's centerline and a true vertical. Positive camber leans out from the vehicle at the top and negative camber leans in at the top. A vehicle will tend to steer or pull towards the side with the most positive camber. A general rule of thumb is that camber should not vary by more than 0.5 degrees from one side to the other.

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Alignment Angles

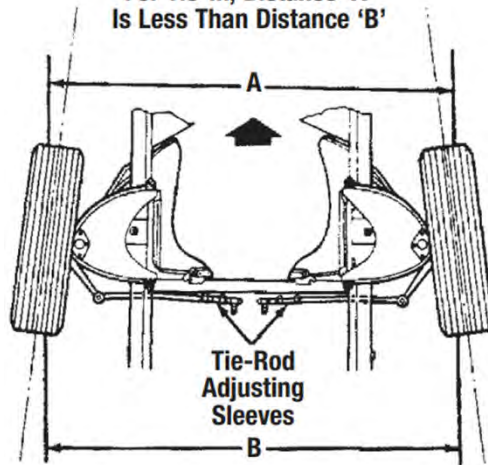


Caster is the forward or rearward tilt of the steering axis in reference to a vertical line. The caster angle is always measured and displayed in degrees. Caster is positive when the top of the steering axis is tilted rearward and it is negative if the top of the steering axis is tilted forward.

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Alignment Angles

For Tie-In, Distance 'A'
Is Less Than Distance 'B'

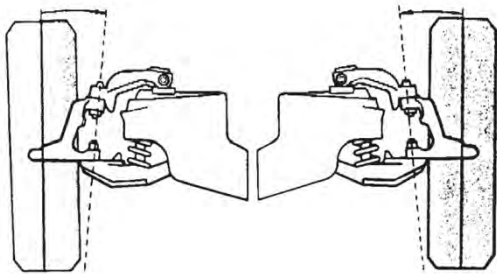


Toe measuring points

(Courtesy: Chrysler Group LLC)

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Alignment Angles



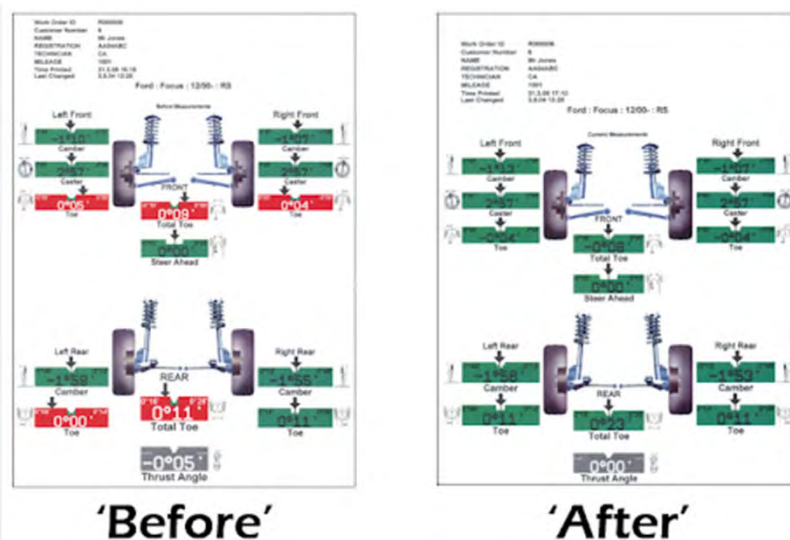
Steering axis inclination (SAI), also known as ball joint or kingpin inclination, is the angle formed by a line drawn through the upper and lower pivot points of the spindle and true vertical as viewed from the front. SAI permits the use of smaller camber angles by helping maintain the vehicle load inboard on the spindle.

Greater load inboard on the spindle enhances road isolation. If SAI is incorrect and camber is within specification, something in the suspension is most likely bent.

(Courtesy: Ford Motor Co.)

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Alignment Angles

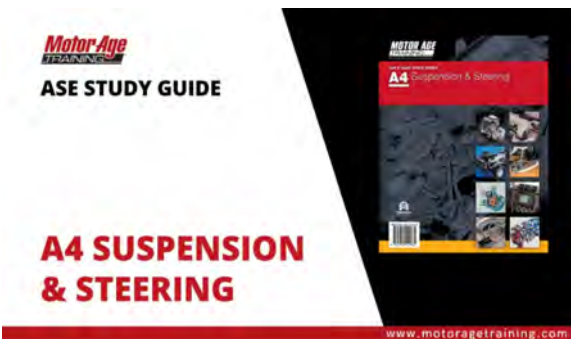
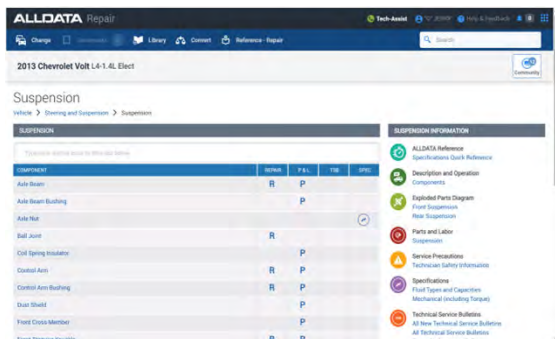


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On To The Vehicle

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"Steering & Suspension Systems"

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