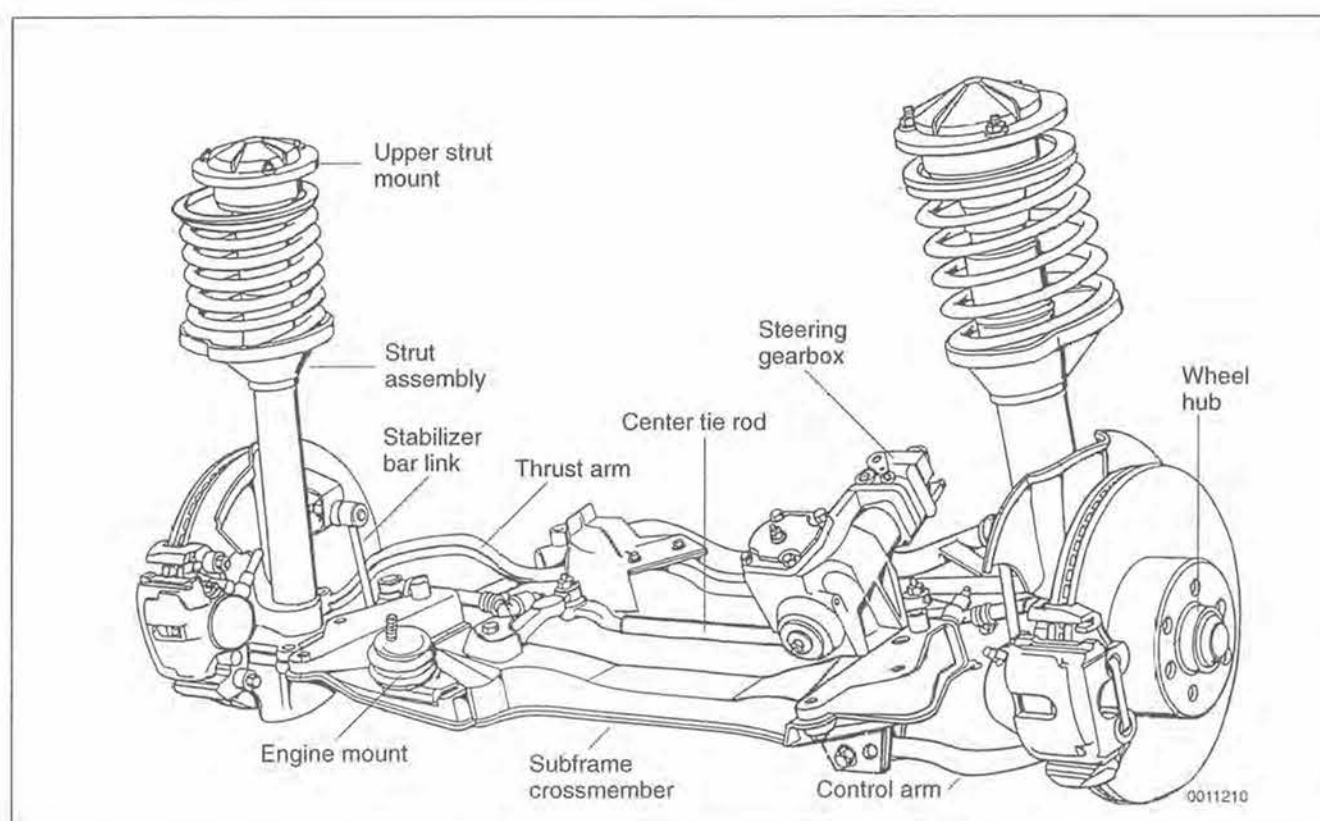


300 Suspension, Steering and Brakes-General

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GENERAL

The **Suspension, Steering and Brakes** repair groups cover front and rear suspension, braking systems and steering system, including wheel alignment. Also covered here are the integrated suspension systems including traction control (ASC/ASC+T), electronic damping control (EDC III), and self levelling suspension (LAD).



GENERAL

300-2 SUSPENSION, STEERING AND BRAKES-GENERAL

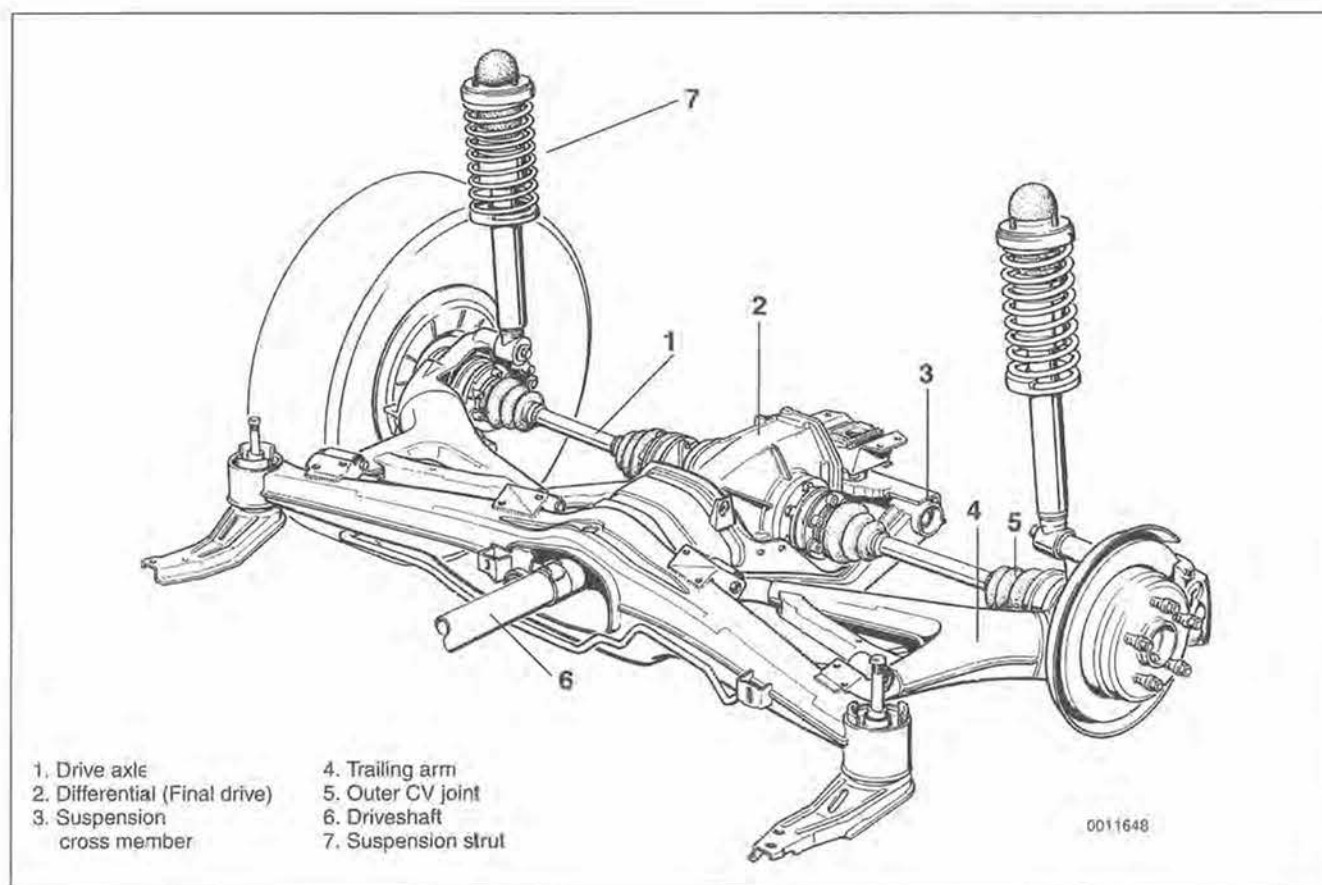
Front Suspension

The double-pivot independent front suspension uses two main structural members as rigid mounting points for the suspension components. The control and thrust arms control front-to-back and side-to-side movement. The arms are connected to the crossmembers through rubber bushings and to the bottom of the suspension struts through ball joints. A stabilizer bar distributes suspension loads during cornering.

Each front suspension strut assembly includes a shock absorber cartridge inside a tubular strut housing and a coil spring. The upper strut mounts allow the struts to turn with the wheels. The lower end of each strut housing includes the stub axle for the front wheel bearings and integral wheel hubs.

Rear Suspension

The rear suspension uses a rear axle subframe as the main mounting point for the differential (also called final drive housing) and the rear suspension components. The differential is mounted through rubber mounts and bushings to help isolate drivetrain noise and vibration.



GENERAL

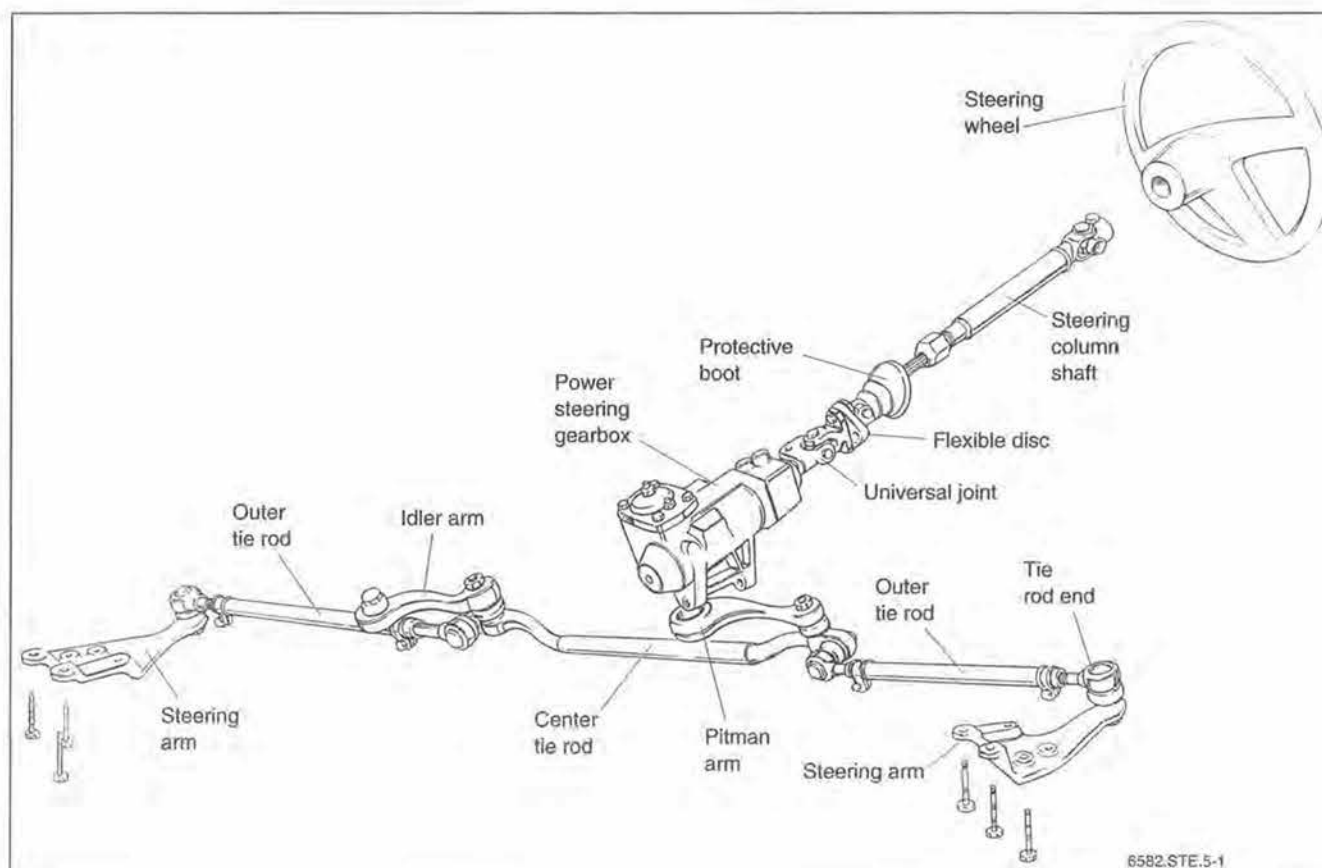
Trailing arms locate the rear wheels and anchor the spring struts and the stabilizer bar. Drive axles with constant-velocity (CV) joints at both ends transfer power from the differential to the road wheels.

Steering

The BMW Servotronic power steering system consists of an engine-driven hydraulic pump, a ball-and-nut type electro-hydraulic steering gearbox, and connecting linkage to the road wheels.

The Servotronic system varies assist electronically according to road speed. An electronic/hydraulic valve on the steering gearbox controls power assist via the Servotronic electronic control module.

The steering linkage connects to the steering gearbox through a pitman arm to the wheels. An idler arm maintains correct toe angle and the tie rod allow the wheels to pivot and react to suspension travel.



300-4 SUSPENSION, STEERING AND BRAKES-GENERAL

Brakes

The E32 7 Series is equipped with power disc brakes with an integral Antilock Brake System (ABS or ABS/ASC). The parking brake is a dual-drum system integrated with the rear brake discs.

Two types of brake assist systems are used depending on model and model year.

Early 735i/iL (up to 3/1988 build date) and all 750iL models are equipped with a hydraulic brake booster unit. This system is hydraulically boosted using the fluid from the power steering pump.

Most 735i/iL (from 3/1988 build date) and all 740i/iL models provide brake assist by a vacuum booster. The vacuum booster uses engine vacuum to help actuate the master cylinder and reduce pedal effort when the engine is running. A heavy duty dual booster is used in 740i/iL models.

The dual-chamber master cylinder pressurizes two separate hydraulic circuits. The front circuit actuates the left front and right rear brakes. The rear circuit actuates the right front and left rear brakes. If one circuit fails, the remaining circuit can still provide a portion of the braking force.

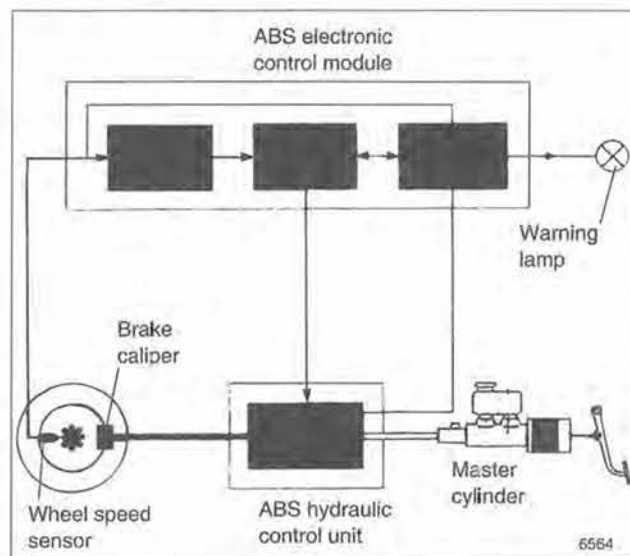
Each disc brake uses a caliper with a single hydraulic cylinder. Front and rear rotors are mounted to the wheel hubs. Disc brakes automatically adjust for brake pad and rotor wear. Brake pads in the left front and right rear brakes contain wear sensors. When the pads need replacement, the sensors illuminate a light on the dashboard. See **340 Brakes** for repair information.

INTEGRATED SYSTEMS

BMW E32 cars include several advanced systems that integrate with other systems to enhance driveability, safety and performance. Anti-lock braking (ABS) is standard on all E32 cars. Other integrated systems include traction control (ASC or ASC+T), self levelling suspension (LAD) and electronic damping control (EDC III). These systems were not installed on all cars. Some systems were standard on some models and installed as optional equipment on others. See **370 Integrated Suspension Systems** for repair information.

Antilock Brake System (ABS)

The electronically-controlled ABS maintains vehicle stability and control during emergency braking by preventing wheel lock-up. ABS provides optimum deceleration and stability during emergency braking. It automatically adjusts the hydraulic pressure at each wheel to prevent wheel lock.



The main ABS system components are the wheel speed (pulse) sensors, the ABS control module, and the hydraulic control unit. The wheel speed sensors continuously send wheel speed signals to the ABS electronic control module. The control module compares these signals to determine, in fractions of a second, whether any of the wheels are about to lock. If any wheel is nearing a lock-up condition, the control module signals the hydraulic unit to maintain or reduce hydraulic pressure at the appropriate wheel(s). Pressure is modulated by electrically-operated solenoid valves in the hydraulic control unit.

Automatic Stability Control (ASC/ASC+T)

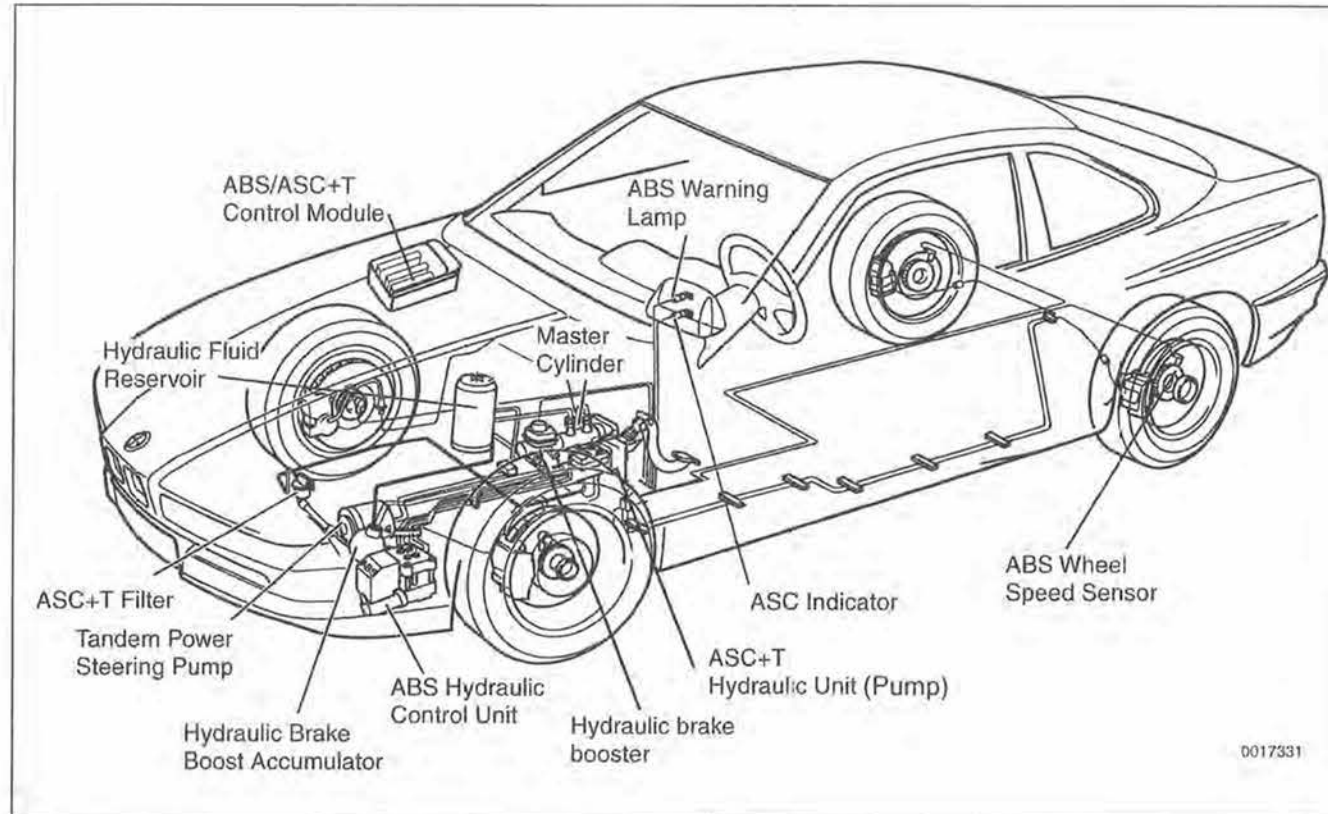
The traction control system, known by different names depending on model and model year, works in conjunction with the ABS and the DME engine management system to enhance vehicle control. In addition to the normal ABS function, the traction control system also controls engine throttle and engine timing to reduce engine torque to help maintain vehicle stability. On later cars with ASC+T, (T=traction), the application of the rear brakes are controlled by the system.

NOTE —

ASC+T is a further development of the earlier ASC system. The ASC+T system integrates an additional hydraulic pump to actuate/apply the rear brakes when the rear drive wheels are spinning at a faster rate than the front wheels.

300-6 SUSPENSION, STEERING AND BRAKES-GENERAL

Repair and troubleshooting of the ASC and ASC+T systems requires special test equipment and knowledge and should be performed only by an authorized BMW dealer.



Self levelling Rear Suspension (LAD)

The self levelling rear suspension system, called LAD (Load Absorption Damping), uses mechanical and hydraulic components to monitor and adjust the rear suspension ride height based on load and driving conditions. The LAD system uses hydraulic pressure (supplied by an additional pump integrated with the power steering pump, sometimes known as the "tandem" pump) to adjust the height of the rear shock absorbers under varying load and driving conditions.

A camber warning switch is used to monitor suspension loading via the instrument cluster and check control. If the rear axle is loaded beyond the regulating limit of the LAD system (i.e. excessive wheel camber), the check control warning **SUSPN LEVELLING** will be displayed. The camber warning switch is mounted on the rear axle subframe. For additional information on LAD see **370 Integrated Suspension Systems**.

Electronic Damping Control (EDC III)

Some late model E32 7 Series cars are equipped with a fully automatic electronic damping system (EDC III). This system allows the driver the choice of two settings for ride control: Comfort or Sport (K or S on the console mounted switch).

NOTE—

Cars with EDC III can be quickly identified by inspecting the front strut assemblies. Cars with EDC III will have electrical wires coming from a set of switching solenoids at the lower section of each strut.

The EDC III electronic control module uses input from three accelerometers, a steering angle sensor and the speedometer to determine road and driving conditions. The module then controls solenoid valve operation (shock valving) at each shock absorber based on the switch position selected by the driver.

Component testing and replacement information on EDC III can be found in **370 Integrated Suspension Systems**.

SUSPENSION AND STEERING TROUBLESHOOTING

Stable handling and ride comfort both depend on the integrity of the suspension and steering components. Any symptom of instability or imprecise road feel may be caused by worn or damaged suspension components.

In addition to inspecting for worn parts, troubleshooting must also consider the condition of tires, wheels and alignment. Tire wear and incorrect inflation pressures can dramatically affect handling. Subtle irregularities in wheel alignment angles also affect stability. Mixing different types or sizes of tires, particularly on the same end of the car, can affect alignment and may unbalance a car's handling.

300-8 SUSPENSION, STEERING AND BRAKES-GENERAL

Table a. Suspension and Steering Troubleshooting

Symptom	Probable cause	Corrective action
1. Car pulls to one side, wanders	a. Incorrect tire pressure b. Incorrect wheel alignment c. Faulty brakes (pulls only when braking)	a. Check and correct tire pressures. b. Check and adjust wheel alignment. c. Check for sticking/damaged front caliper.
2. Steering heavy, poor return-to-center	a. Worn upper strut bearing(s) b. Incorrect tire pressure c. Power steering system faulty	a. Replace strut bearings. b. Check and correct tire pressures. c. Check power steering fluid level. Test system pressure.
3. Front-end or rear-end vibration or shimmy	a. Worn strut shock absorber cartridges b. Worn suspension bushings (control arm, thrust arm, trailing arm, crossmember) c. Worn front suspension ball joints (control arm, thrust arm, steering tie-rod end) d. Unbalanced or bent wheels/tires e. Loose wheel lug bolts	a. Replace struts. b. Replace worn bushings. c. Replace worn ball joints. d. Balance tires. Check tires for uneven wear patterns. Check wheels for damage. e. Tighten lug bolts to proper torque.
4. Poor stability, repeated bouncing after bumps, suspension bottoms out easily	a. Worn struts	a. Replace struts.
5. Suspension noise (especially over bumps)	a. Worn front upper strut bearings(s) b. Worn suspension bushings (control arm, thrust arm, trailing arm, crossmember) c. Worn stabilizer bar rubber mounts d. Loose front suspension crossmember	a. Replace upper strut bearings. b. Replace worn bushings. c. Replace stabilizer bar rubber mounts. d. Check crossmember for damage. Tighten mounting bolts.
6. Uneven ride height	a. Incorrect coil springs b. Bent or damaged suspension components c. Sagging coil springs d. Faulty Self levelling (LAD) system (where applicable).	a. Measure ride height and replace springs as required. b. Inspect and repair/replace as necessary. c. Check and adjust ride height. Test LAD system. d. Test LAD system. Check and adjust ride height.
7. Wheel noise, continuous growling, may be more noticeable when turning	a. Worn wheel bearing	a. Replace wheel bearing.
8. Steering loose, imprecise	a. Incorrect tire pressure b. Loose steering gearbox mounting bolt(s) c. Worn tie rod end(s) d. Faulty front wheel bearing e. Worn or damaged steering gearbox	a. Check and correct tire pressures. b. Inspect and tighten bolts. c. Replace tie rod(s) and align wheels. d. Replace wheel bearing. e. Adjust or replace steering gearbox.