

Spring Rate Changes

Modification

Increase front and rear rate
Increase front rate only
Increase rear rate only
Decrease front and rear rate
Decrease front rate only
Decrease rear rate only

Effect on Handling

Ride harshness increases; tires may not follow bumps causing reduced traction. Roll resistance increases.
Front ride rate increases. Front roll resistance increases, increasing understeer or reducing oversteer.
Rear ride rate increases. Rear roll resistance increases, increasing oversteer or reducing understeer.
Ride harshness decreases; tires follow bumps more effectively, possibly improving traction. Roll resistance decreases.
Front ride rate decreases. Front roll resistance decreases, decreasing understeer or increasing oversteer.
Rear ride rate decreases. Rear roll resistance decreases, decreasing oversteer or increasing understeer.

Antiroll Bar Changes

Modification

Increase front rate

Increase rear rate

Decrease front rate

Decrease rear rate

Effect on Handling

Front roll resistance increases, increasing understeer or decreasing oversteer. May also reduce camber change, allowing better tire contact patch compliance with the road surface, reducing understeer.
Rear roll resistance increases, increasing oversteer or decreasing understeer. On independent rear suspensions, may also reduce camber change, allowing better contact patch compliance with road surface, reducing oversteer.
Front roll resistance decreases, decreasing understeer or increasing oversteer. More body roll could reduce tire contact patch area, causing understeer.
Rear roll resistance decreases, decreasing oversteer or increasing understeer. On independent rear suspensions, more body roll could reduce tire contact patch area, causing oversteer.

Shock Absorber Changes

Modification

Increase rebound and bump rates
Increase rebound rates only
Increase bump rates only
Decrease rebound and bump rates
Decrease rebound rates only
Decrease bump rates only

Effect on Handling

Ride harshness increases.
On bumps, tires may leave track surface.
Body roll resisted; outside tire loaded too quickly; car won't stabilize into a turn.
Ride harshness decreases; car may float over bumps.
On bumps, tires follow track surface more effectively; car may continue to oscillate after bumps.
Body rolls quickly; car is slower to respond to turn-in.

Troubleshooting Tire Temperatures

Reading

Front tires too hot
Rear tires too hot
Inside edges too hot
Outside edges too hot
Center of tread too hot
Inside/outside edges of tread too hot
All tires too hot
All tires too cold
Front tires too cold
Rear tires too cold

Handling problem

Understeer
Oversteer
Too much body roll
Too much body roll

Reason

Front tire pressures too low.
Rear tire pressures too low.
Too much negative camber or too much toe-out.
Too little neg. camber, too little toe-out or too much toe-in or wheel width too narrow for tire width.
Tire pressure too high.
Tire pressure too low.
Compound too soft for track and ambient temperature conditions.
Compound too hard for track and ambient temperature conditions or car not being driven to limit.
Inadequate load on front tires.
Inadequate load on rear tires.

Solving Handling Problems

Problem

Steady state understeer

Steady state understeer
Steady state oversteer

Steady state oversteer
Corner entry understeer
Corner exit understeer
Corner entry oversteer

Corner exit oversteer
Straightline instability

Straightline speed too slow
Excessive steering effort
Chassis or suspension bottoms

Manifestation

All turns or low-speed turns only

High-speed turns only
All turns or low-speed turns only

High-speed turns only
All turns

Solutions

If front tire temps are optimum and rears are low, stiffen rear antiroll bar.
If front temps are too hot, soften front (most likely).
If front tire pressures are optimum, decrease rear tire pressure. Increase if chunking occurs. Improper front camber. Too much body roll at front, causing excessive camber change.
If front tire temps are OK, increase front downforce.
If front tire temps are too hot, reduce rear downforce.
If rear tire temps are optimum, with fronts too low, stiffen front antiroll bar.
If rear temps are too hot, soften rear antiroll bar (most likely).
If rear tire pressures are optimum, decrease front tire pressure.
Increase if chunking occurs. Improper rear camber.
If rear tire temps are OK, increase rear downforce.
If rear tire temps are too hot, reduce front downforce.
Front shocks are too soft in bump resistance. Too much front toe-in; use a small amount of front toe-out.
Rear shocks are too soft in bump. Front shocks are too stiff in rebound.
Rear shocks are too soft in rebound. Rear ride height is too high (too much rake) compared to front.
Rear shocks are too soft in rebound. Too much rear toe-in or any rear toe-out.
Tire pressure is too low in one or more tires. Too little positive front caster. Too much front toe-in or any toe-out in rear.
Too much overall downforce. Too much toe-in or toe-out. Ride height is too high.
Too much positive caster. Front tire pressures are too low.
Spring rates are too soft. Shock absorber bump rates are too soft. Inadequate suspension travel. Inadequate ride height.