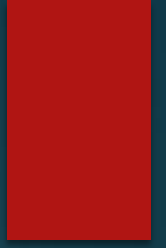
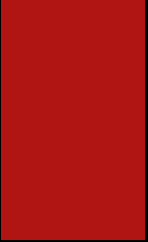


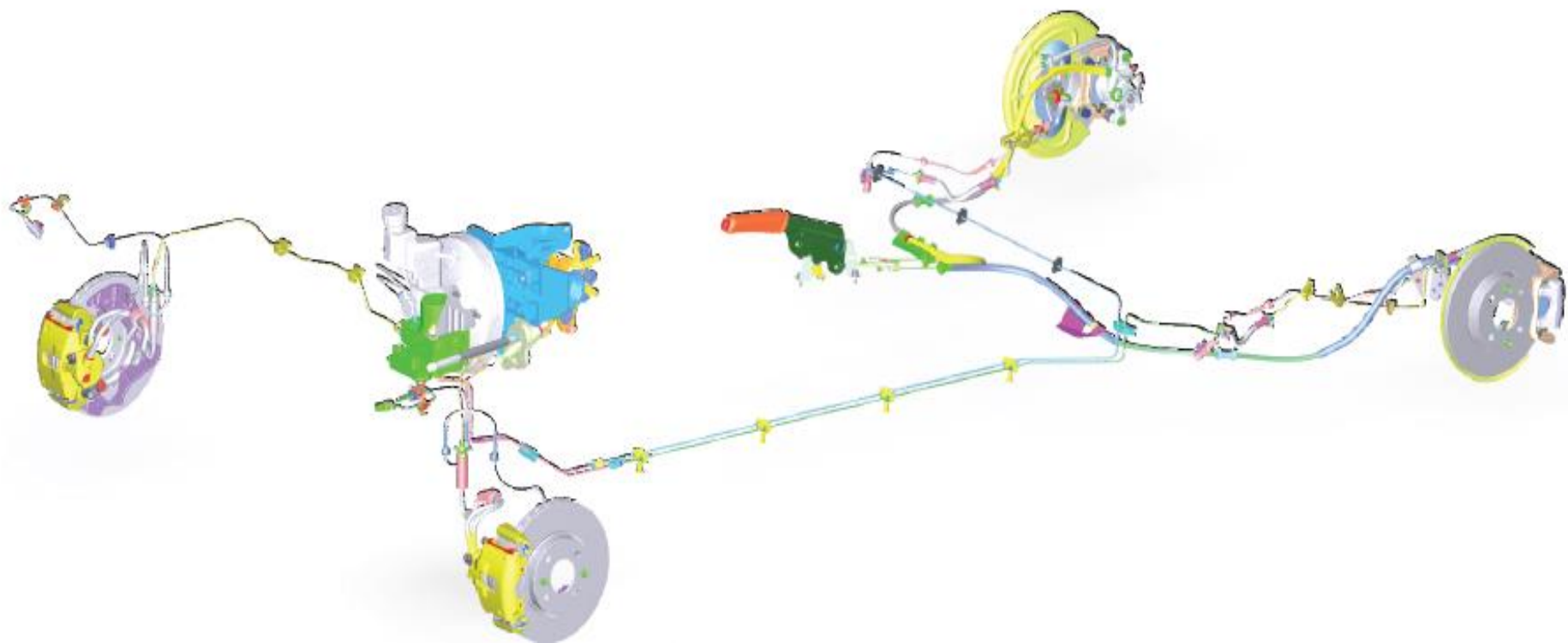
GSA  
Brakes, Steering,  
Suspension, Tires  
and Alignment



# Brakes

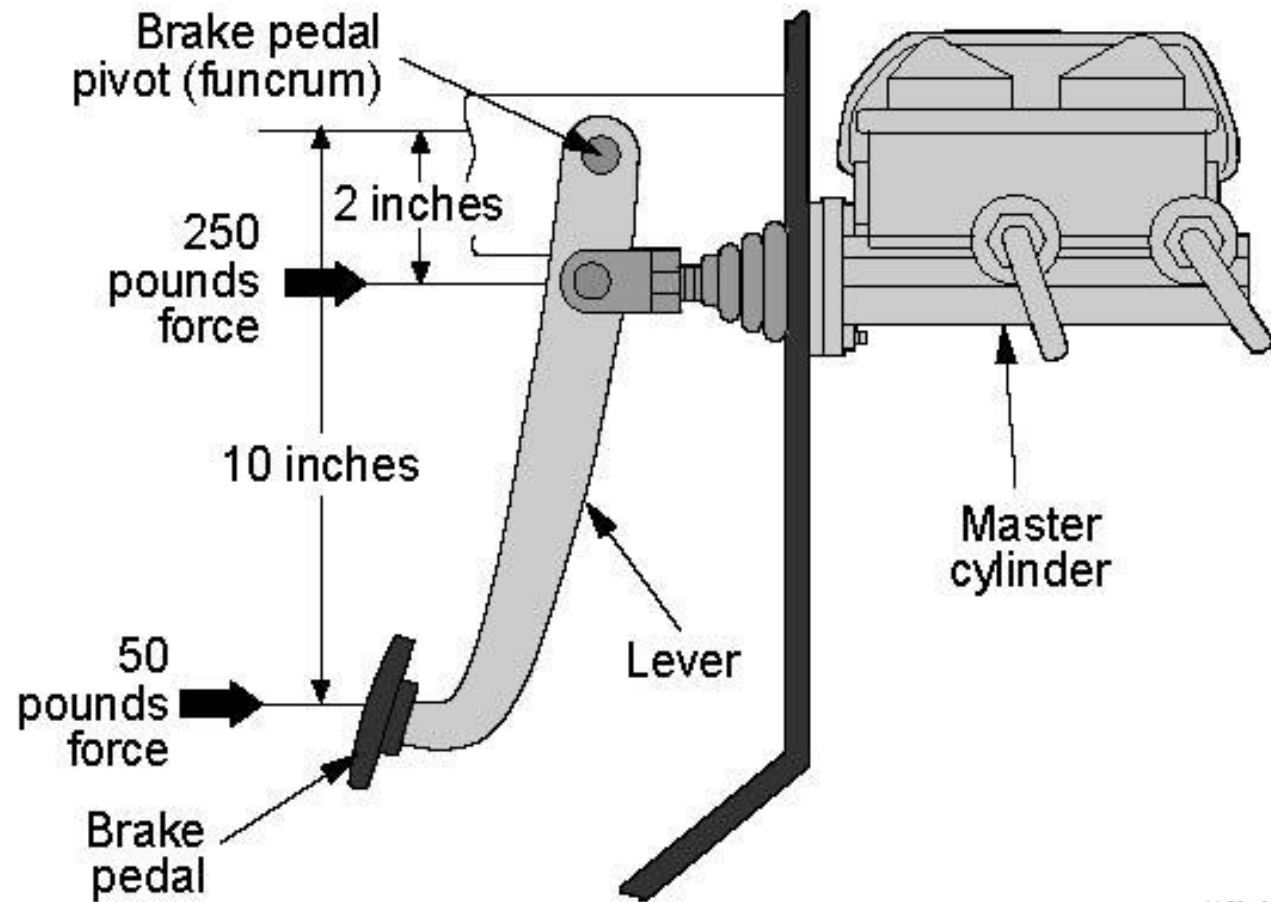






# Categories of brake system

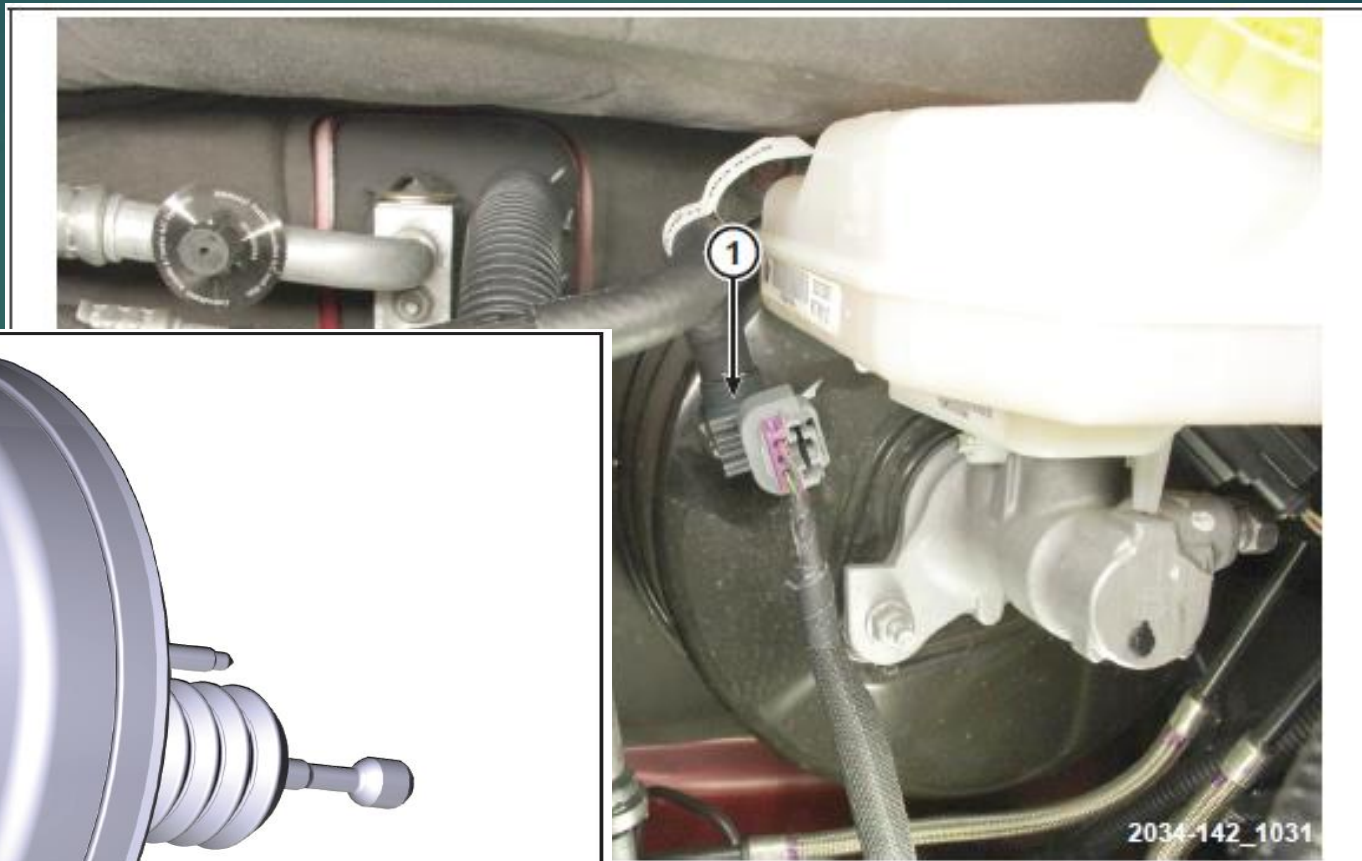
- ▶ Apply system
- ▶ Boost system
- ▶ Hydraulic system
- ▶ Wheel brakes
- ▶ Brake balance control system
- ▶ Brake warning lights
- ▶ Parking brake

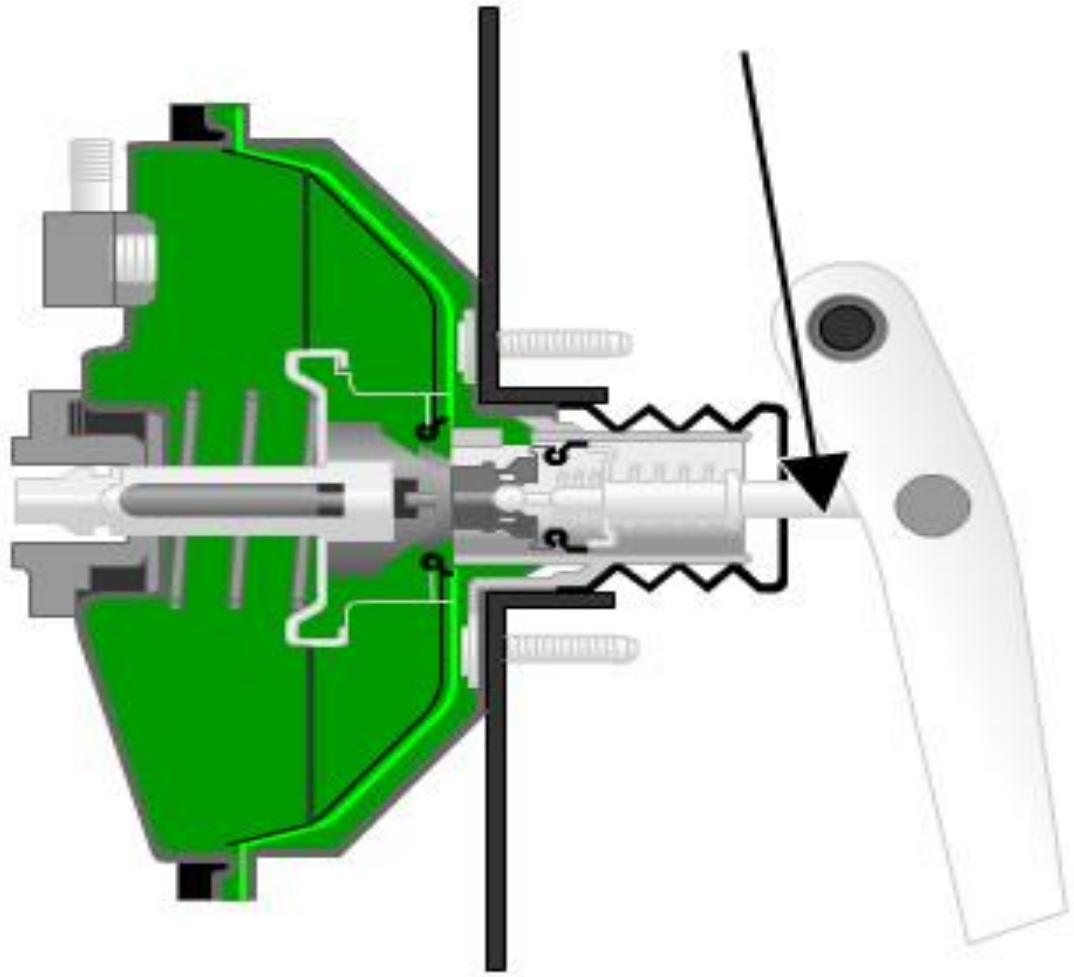


LL03\_01\_0400

# Apply System

# Boost System



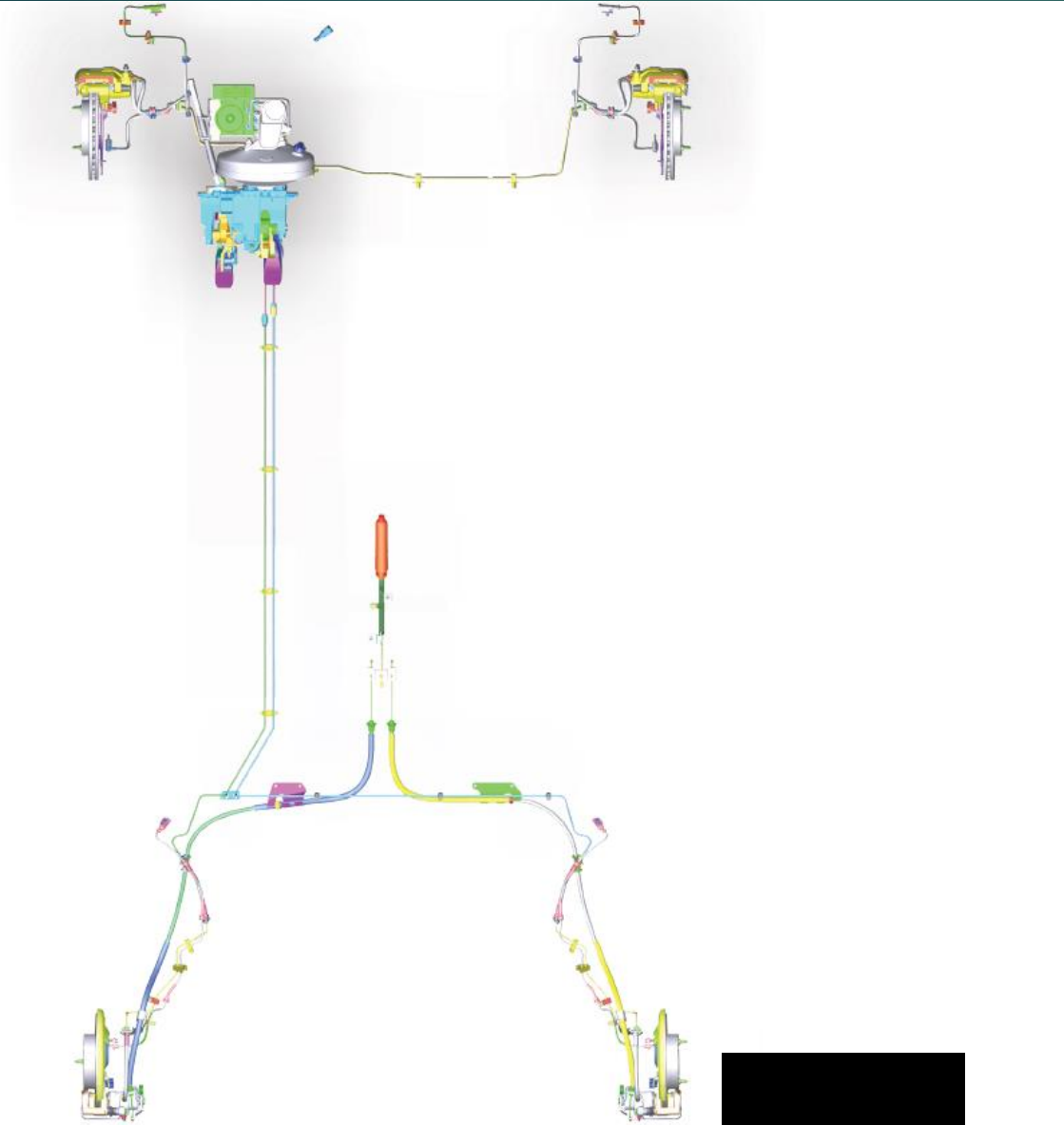




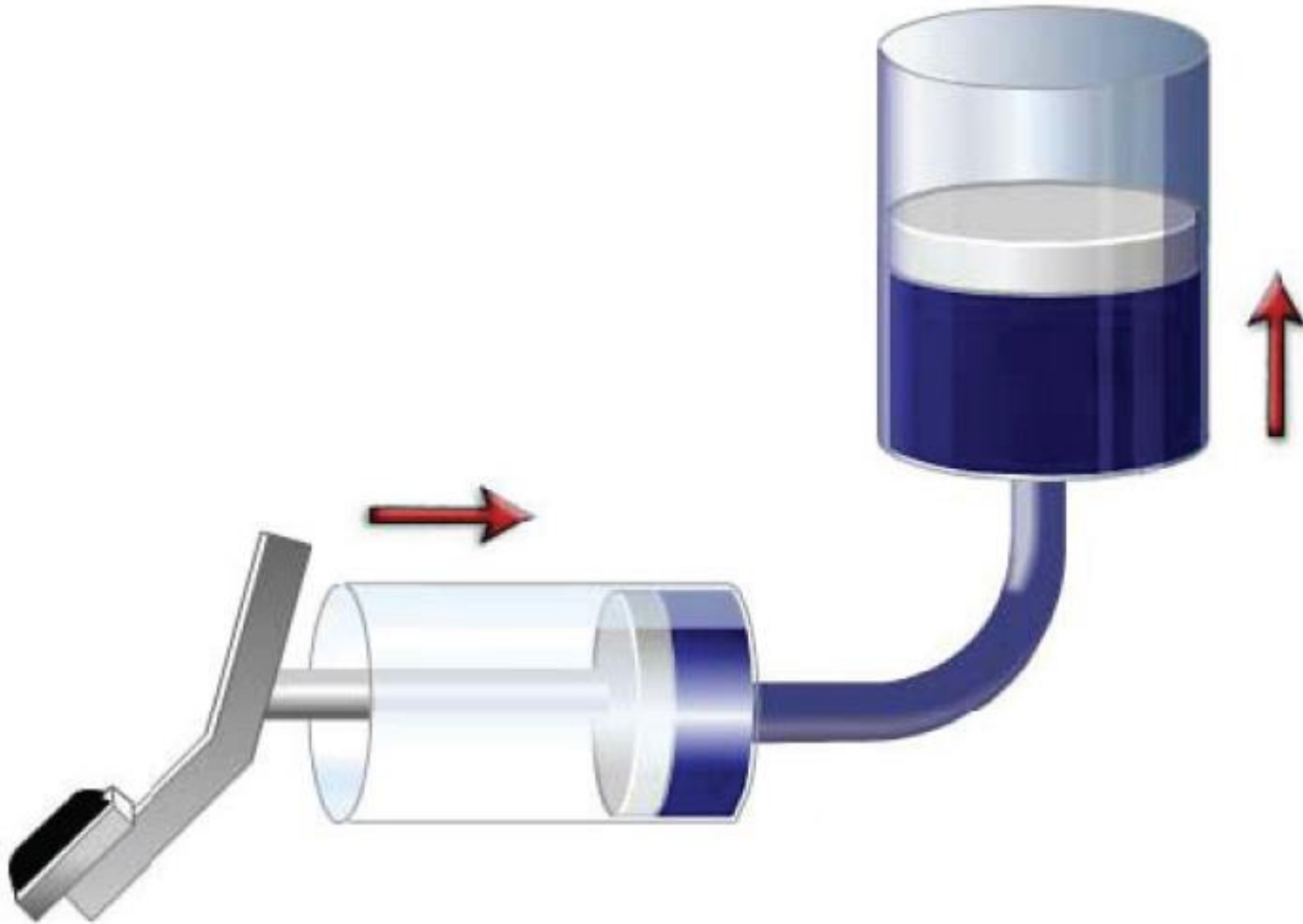
# Hydroboost

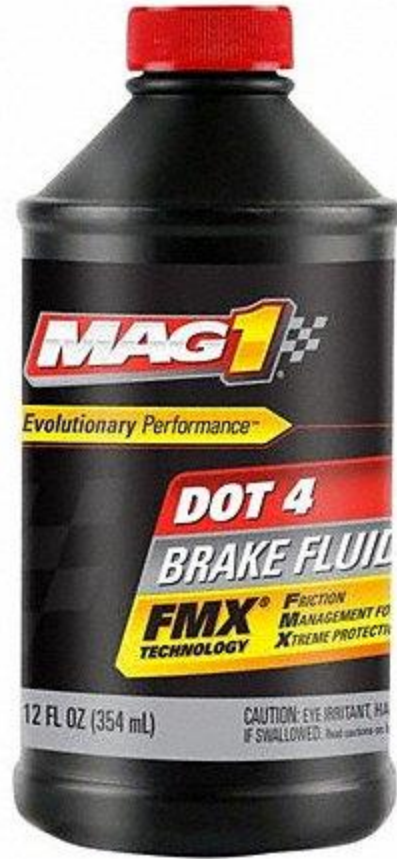


# Hydraulic system



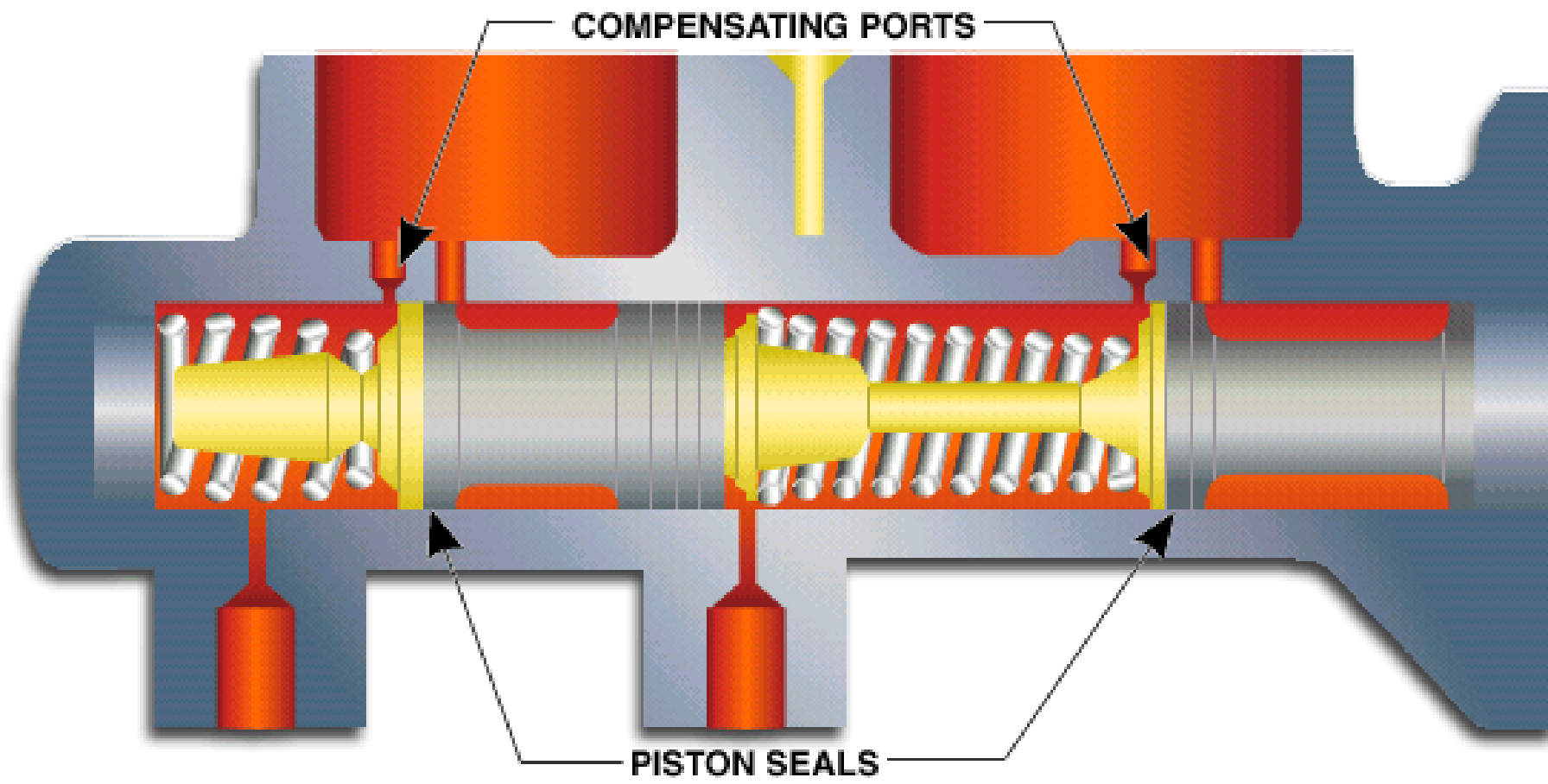
Closed system, multiplication of force







2034-142\_1031

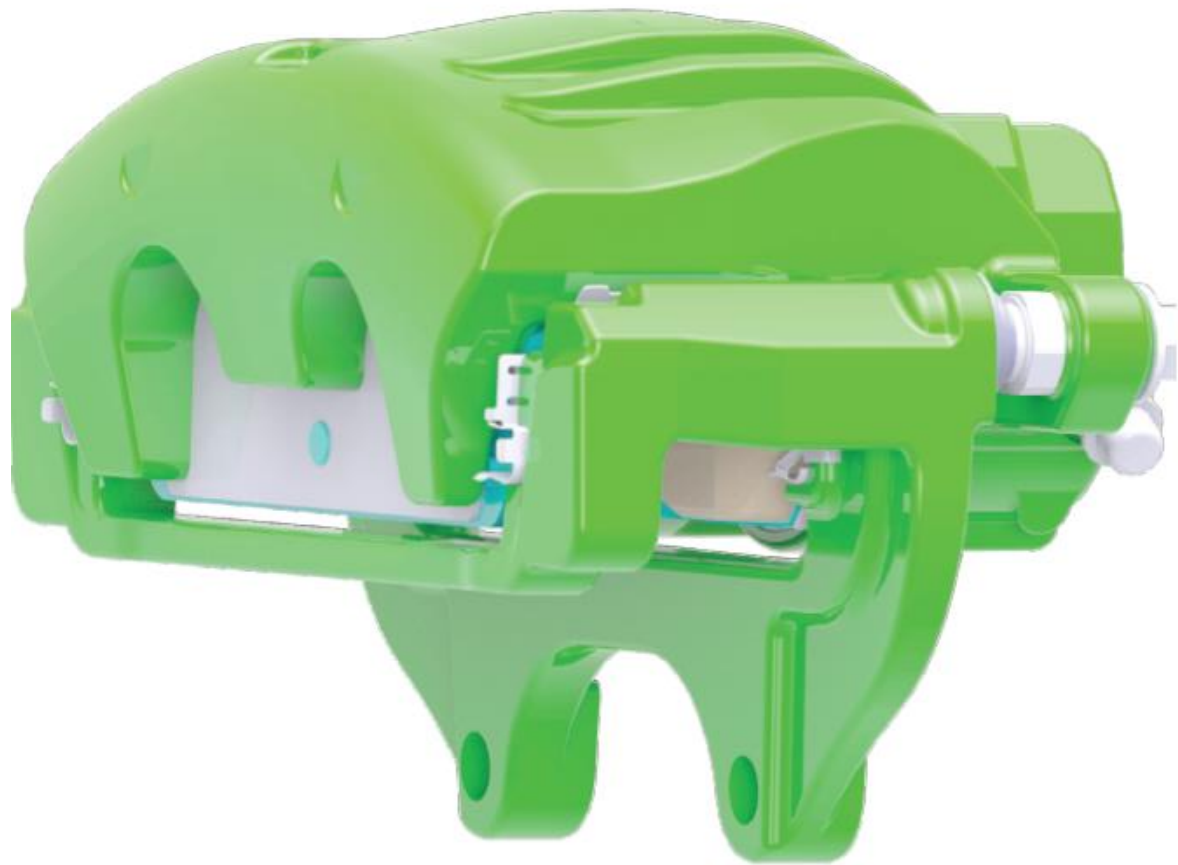




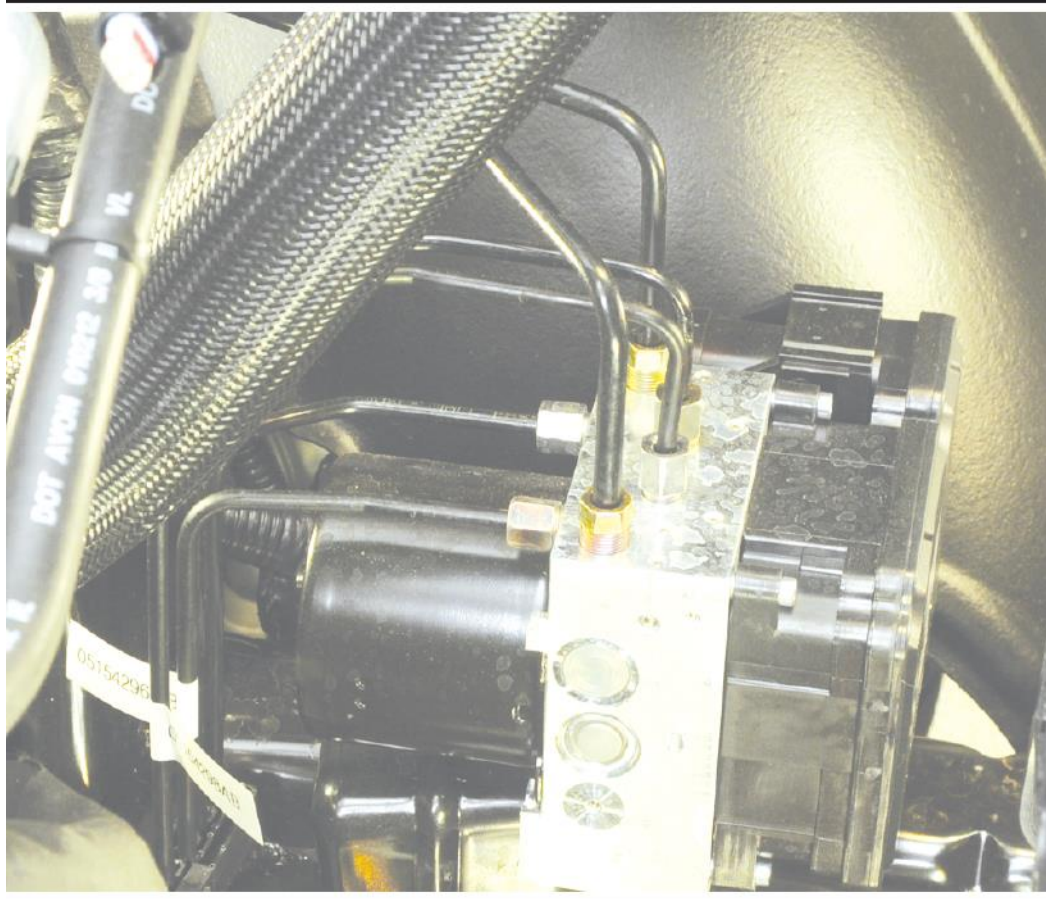
# Wheel Brakes











# Brake Balance Control

# Brake Warning Lights



1 Brake Indicator Lamp

# Parking Brake



🌐 When poll is active, respond at [pollev.com/seanboyle925](https://pollev.com/seanboyle925)

📱 Text **SEANBOYLE925** to **37607** once to join

# Have you personally physically changed your brakes?

Yes

No, but I'd like to try

No, I'll gladly pay someone!

Powered by  **Poll Everywhere**

Start the presentation to see live content. For screen share software, share the entire screen. Get help at [pollev.com/app](https://pollev.com/app)

## Common Services:

- Pad/rotor service
- Drum Brakes
- Bleeding/flushing
- Hoses and lines
- ABS
  - o Wheel speed sensors
  - o HCU

# Brake Service Demonstration

The slide features a white background with a decorative graphic on the right side. This graphic consists of several overlapping, semi-transparent green shapes in various shades, including light lime green, medium forest green, and dark forest green. These shapes are primarily triangular and polygonal, creating a dynamic, abstract composition that tapers towards the top right corner.

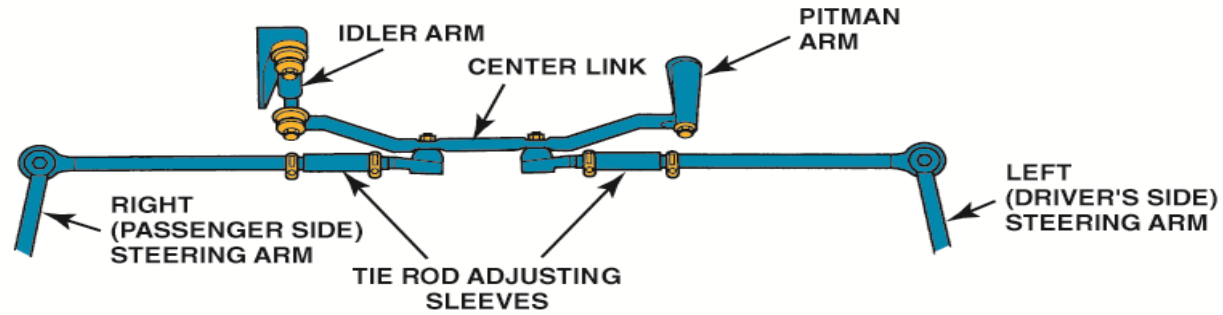


# Steering

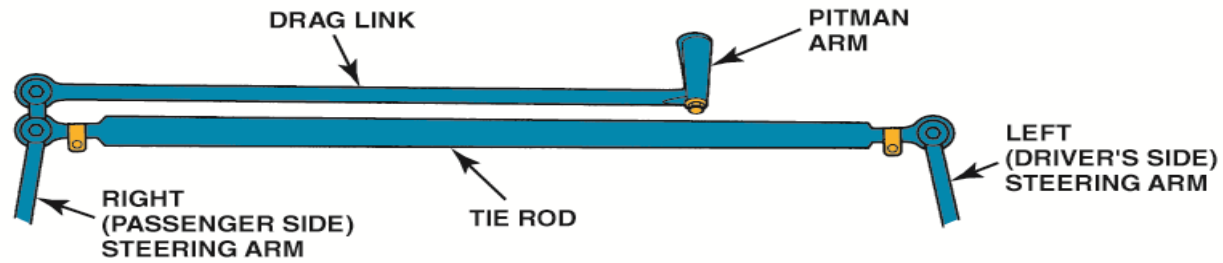


# Steering

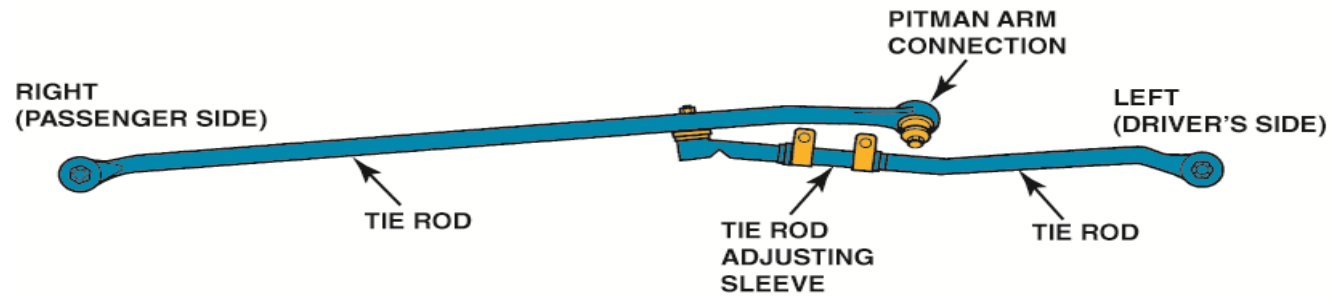
## PARALLELOGRAM STEERING LINKAGE

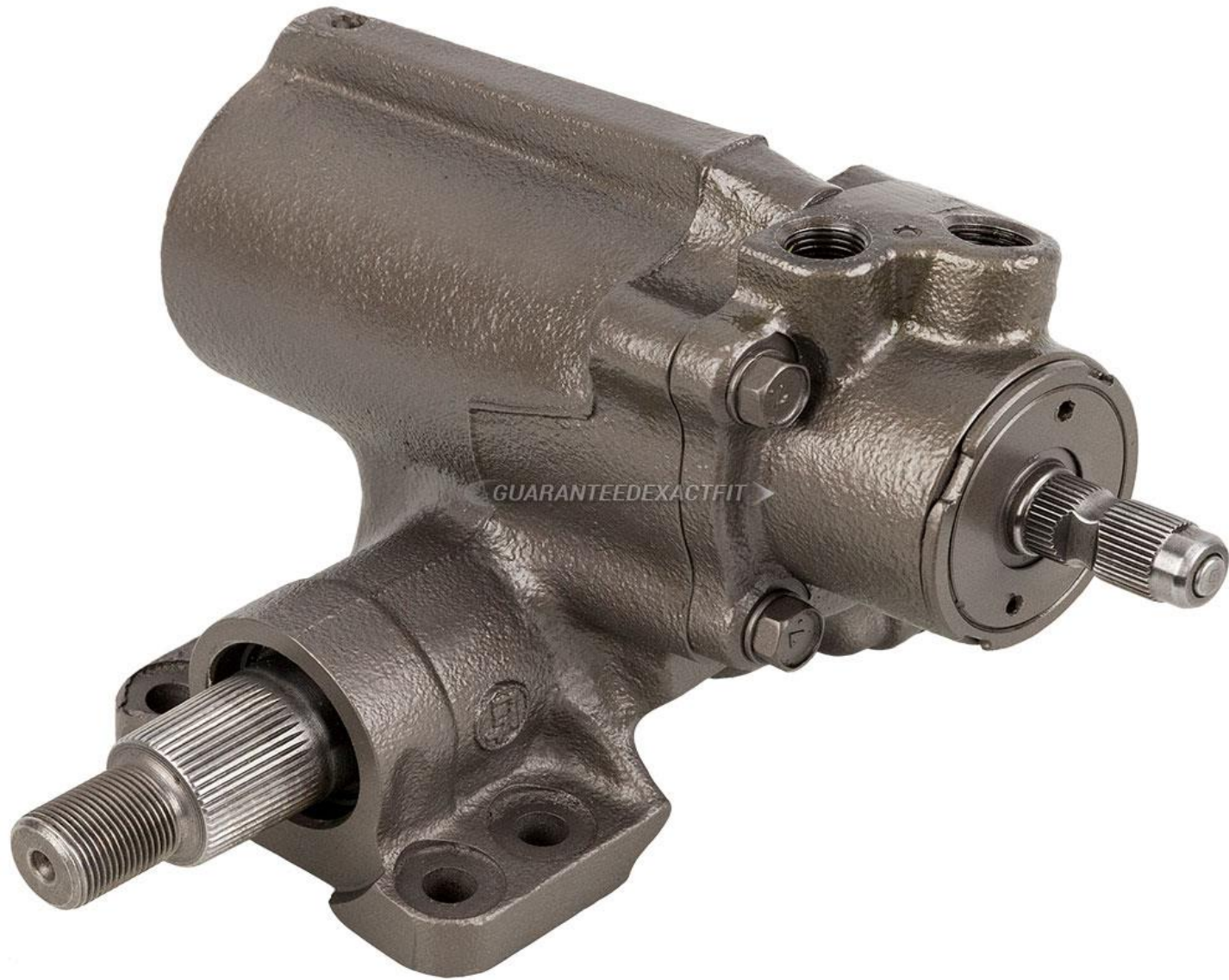


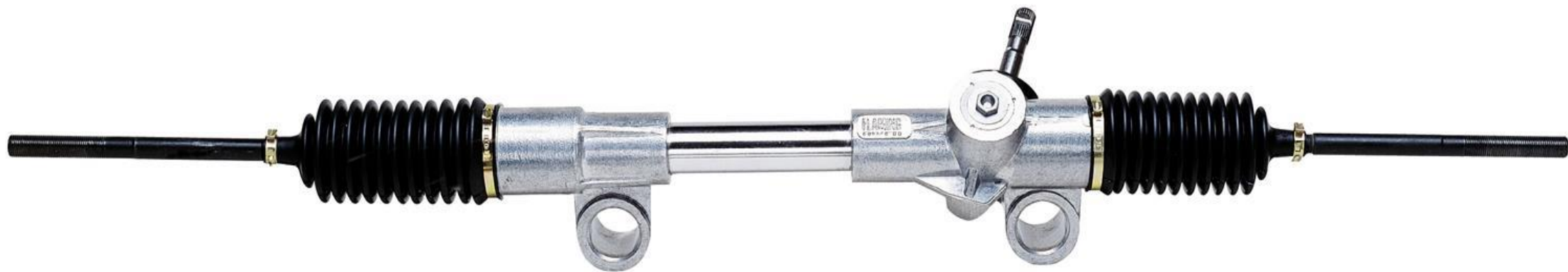
## CROSS-STEER LINKAGE

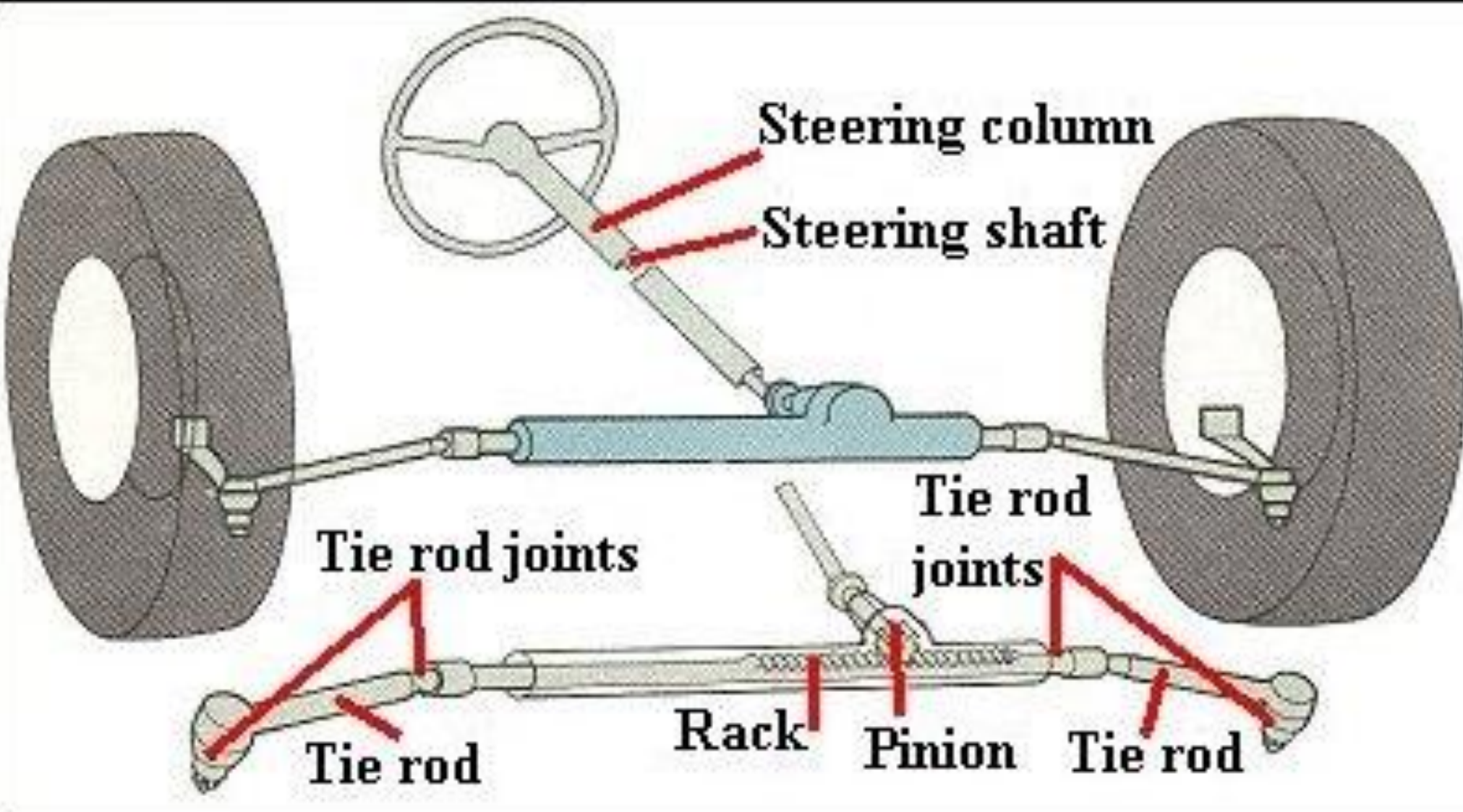


## HALTENBERGER LINKAGE









**Steering column**

**Steering shaft**

**Tie rod joints**

**Tie rod joints**

**Tie rod**

**Rack**

**Pinion**

**Tie rod**











# Suspension



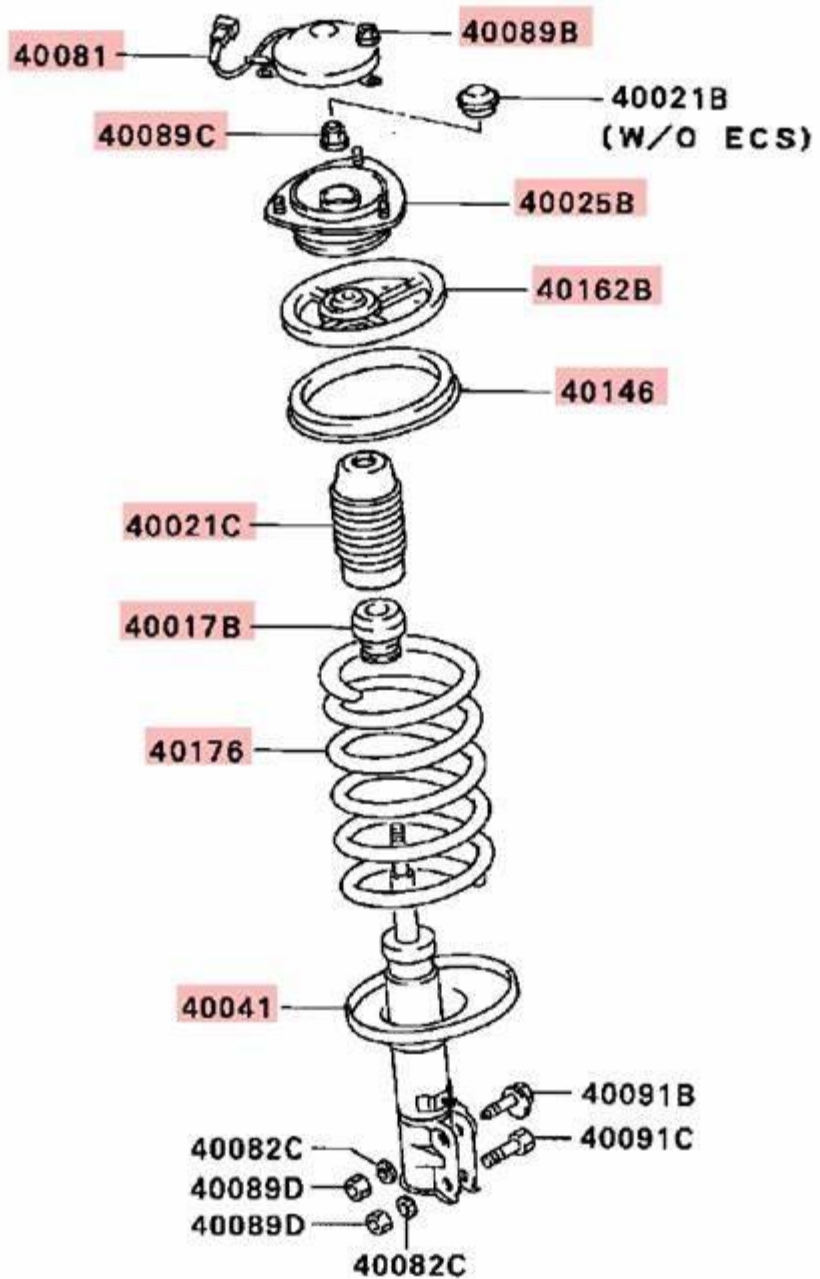


# Springs



# Shocks and Struts



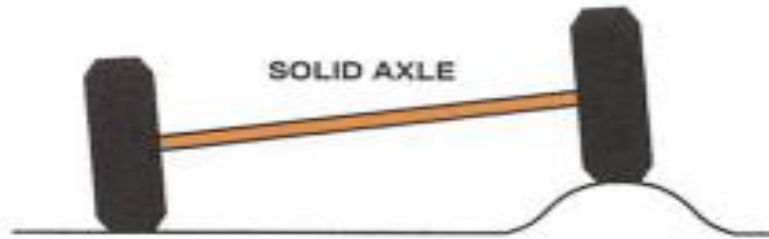




1 Nivomat Shock

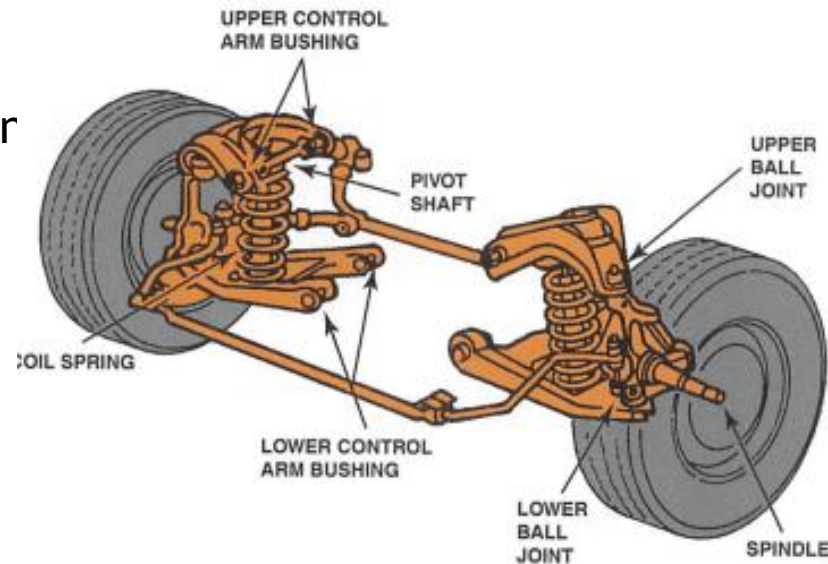
# Basic Types of Suspensions

- Solid axle
  - One wheel affects the other



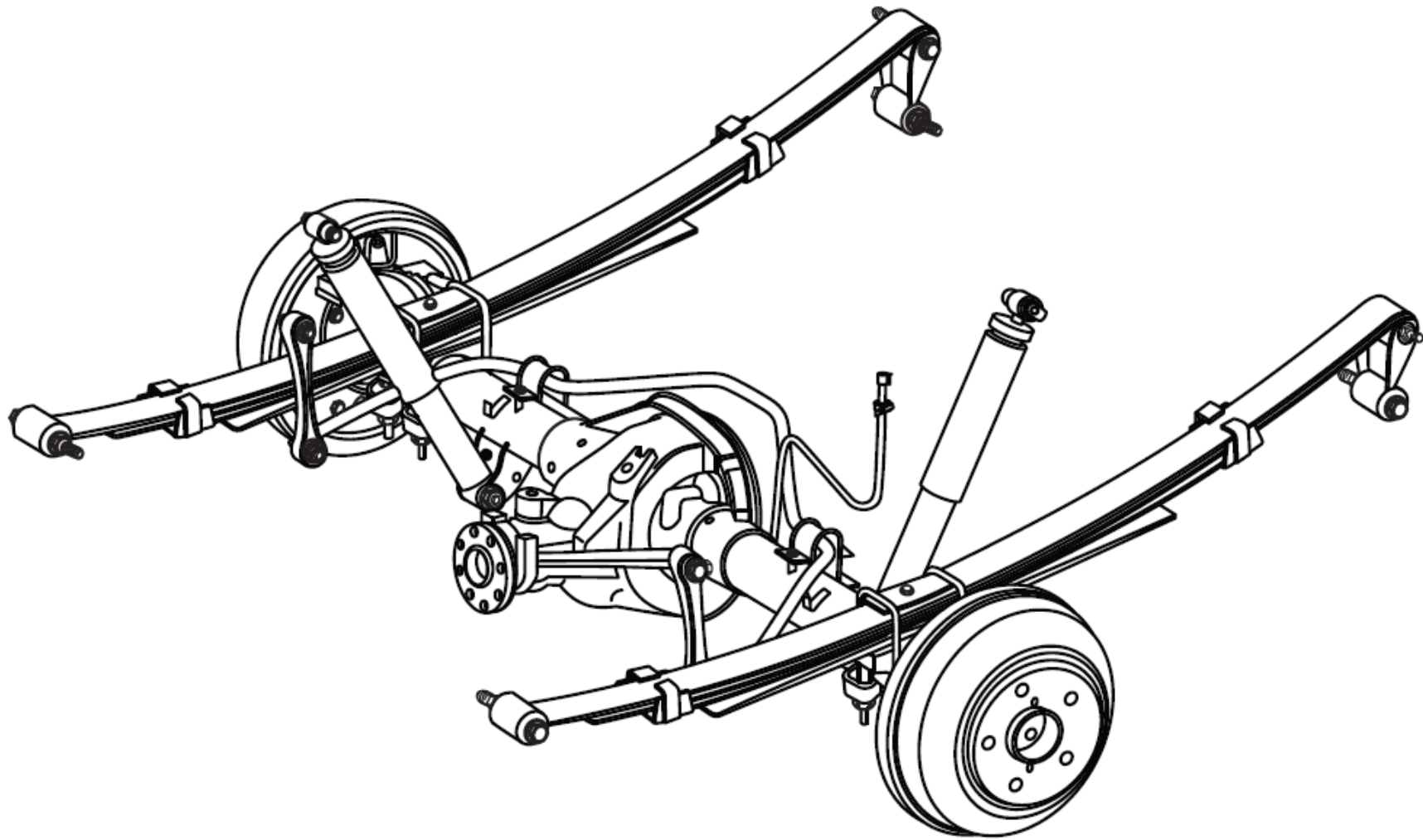
**FIGURE 24-6** When one wheel hits a bump or drops into a hole, both left and right wheels are moved. Because both wheels are affected, the ride is often harsh and feels stiff.

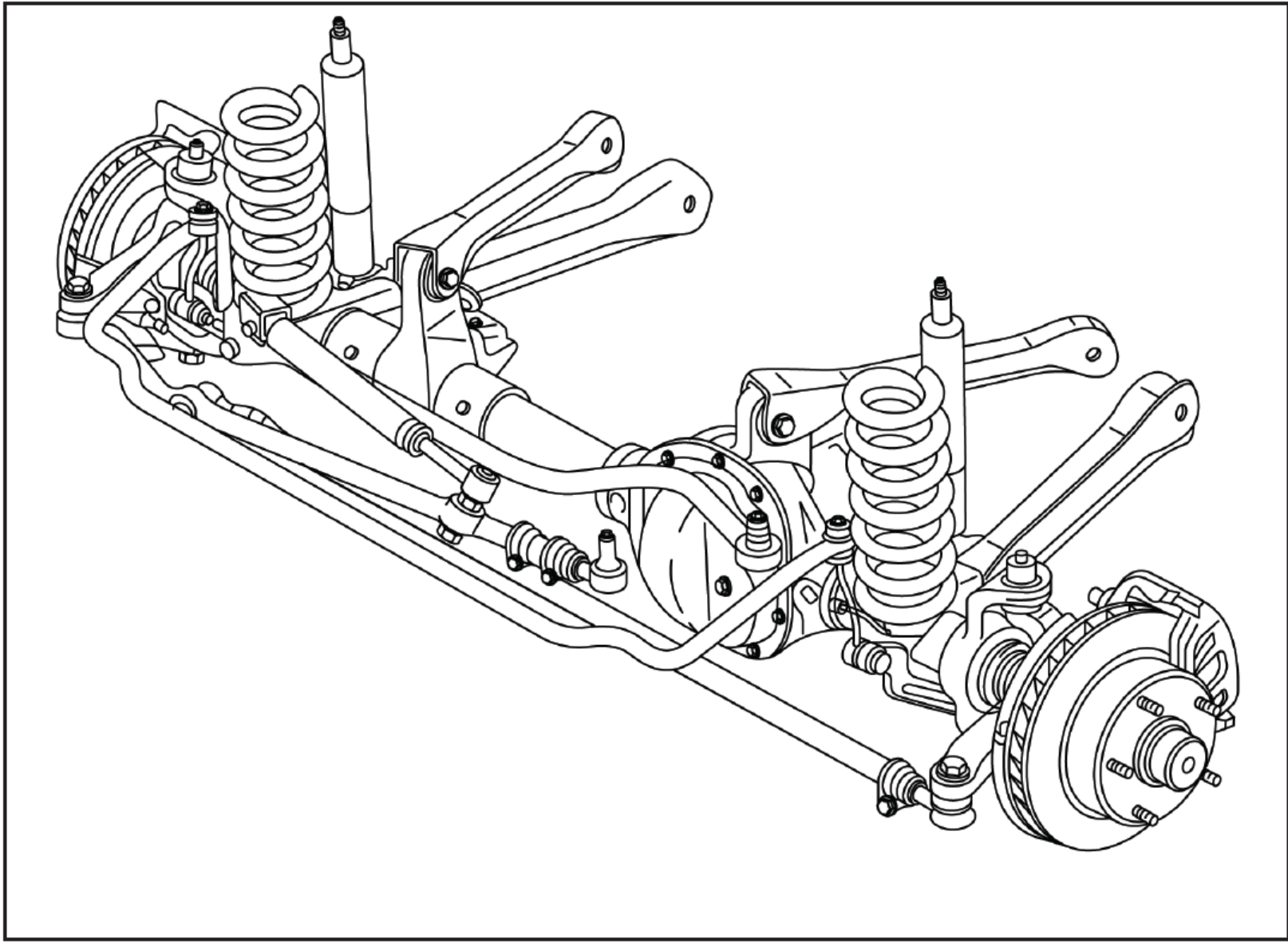
- Independent
  - Separate moving components
    - Control arms
    - Struts

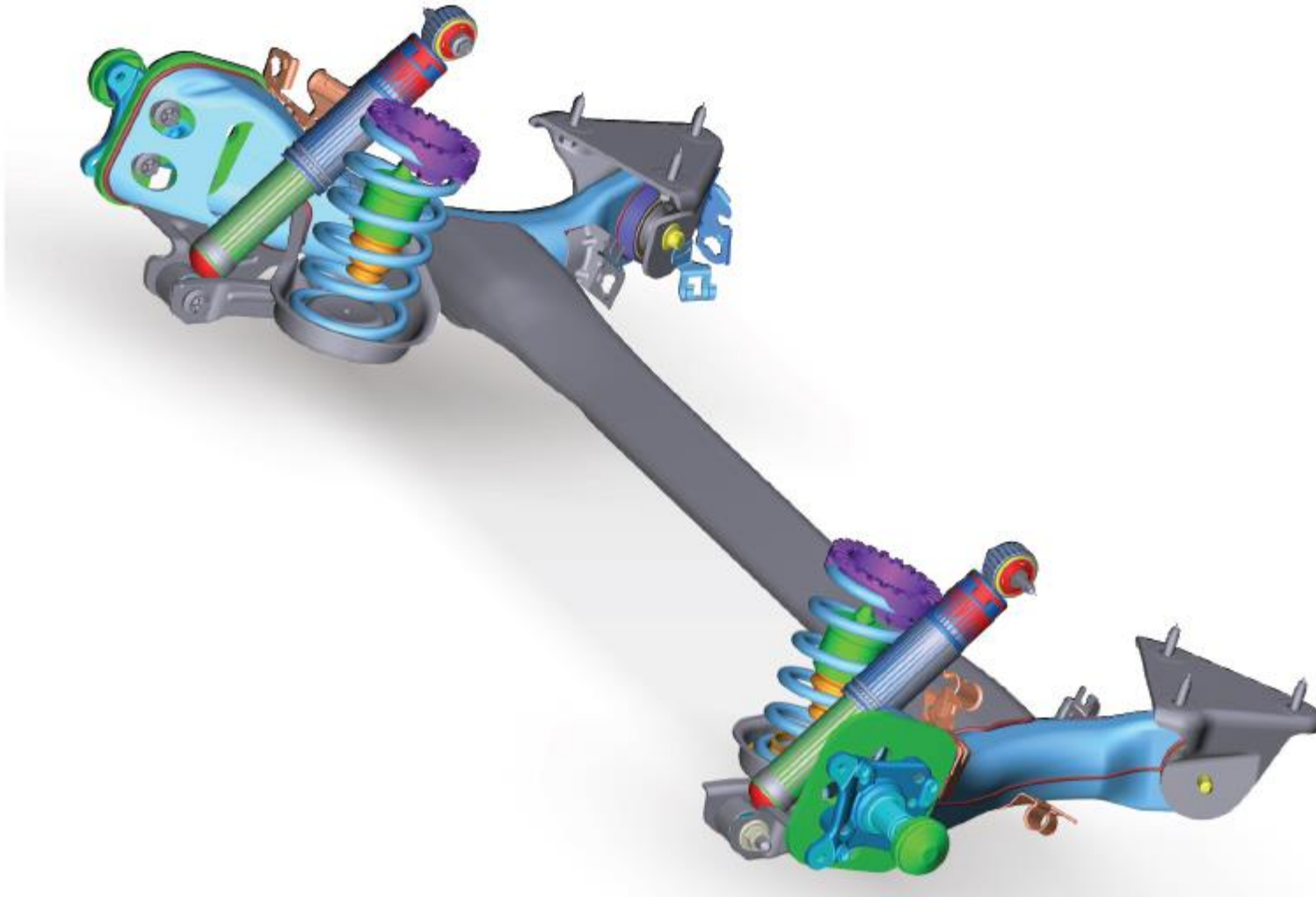


**FIGURE 24-7** A typical independent front suspension used on a rear-wheel-drive vehicle. Each wheel can hit a bump or hole in the road independently without affecting the opposite wheel.











MACPHERSON  
STRUT



DOUBLE WISHBONE



MULTI-LINK



TRAILING-ARM

# Steering and Suspension Inspection

Visual inspection

Dry park

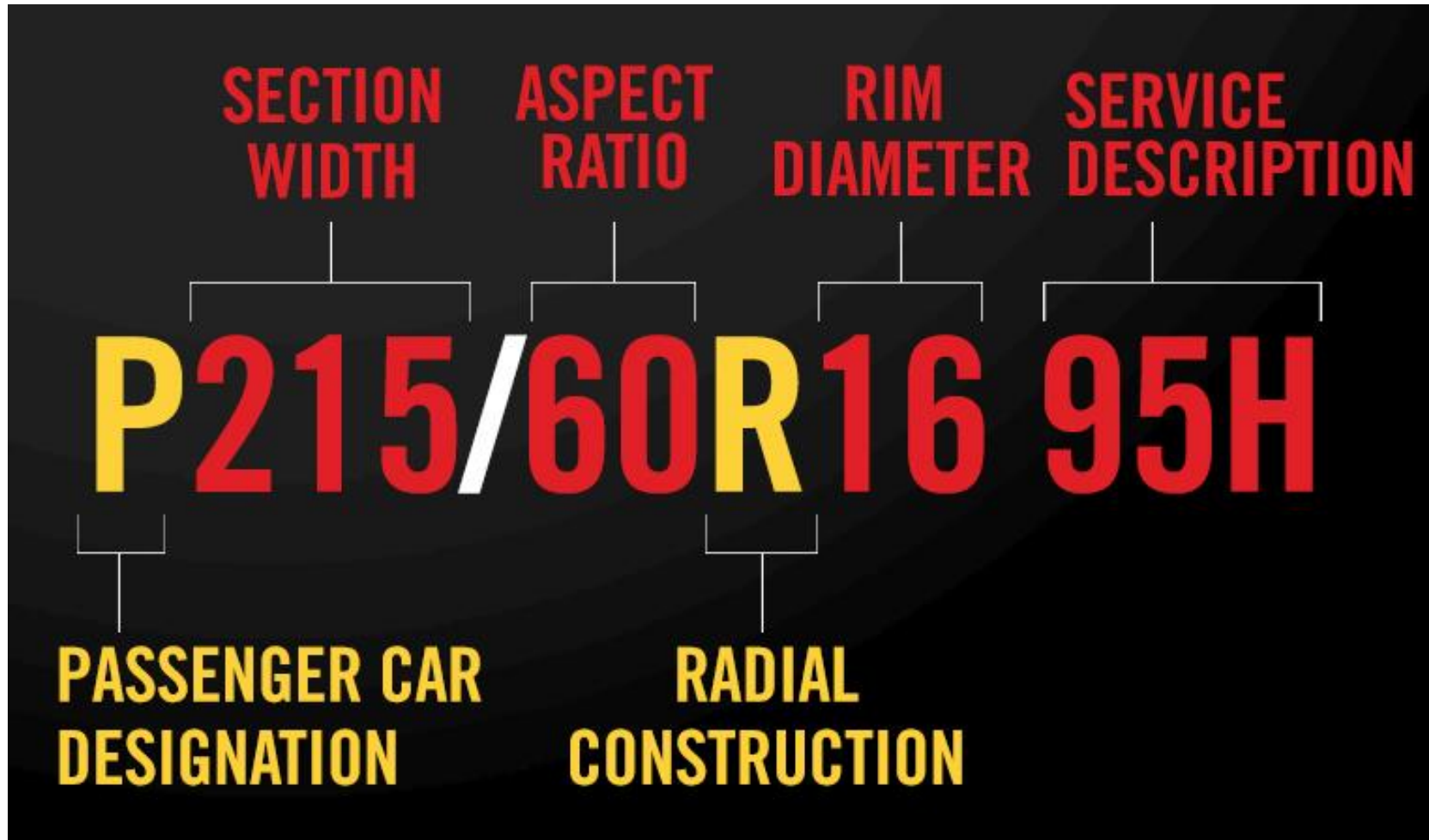
Shake down

Loaded vs Unloaded

# Tires



# Tire sizing



# Service index

## LOAD INDEX

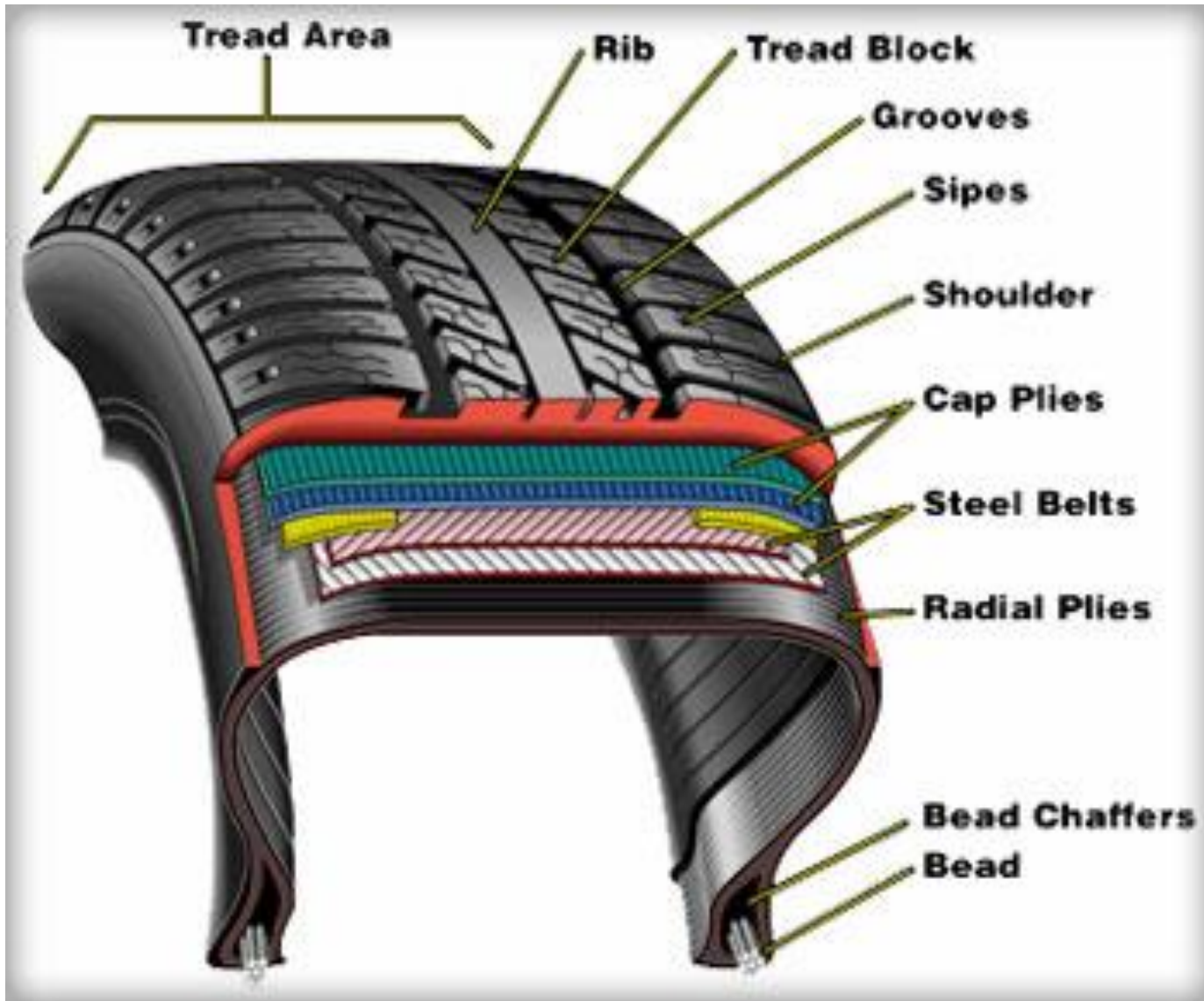
LOAD INDEX	LOAD (lbs)	LOAD INDEX	LOAD (lbs)	LOAD INDEX	LOAD (lbs)
65	639	94	1477	123	3417
66	661	95	1521	124	3527
67	677	96	1565	125	3638
68	694	97	1609	126	3748
69	716	98	1653	127	3858
70	739	99	1709	128	3968
71	761	100	1764	129	4079
72	783	101	1819	130	4189
73	805	102	1874	131	4299
74	827	103	1929	132	4409
75	853	104	1984	133	4541
76	882	105	2039	134	4674
77	908	106	2094	135	4806
78	937	107	2149	136	4938
79	963	108	2205	137	5071
80	992	109	2271	138	5203
81	1019	110	2337	139	5357
82	1047	111	2403	140	5512
83	1074	112	2469	141	5677
84	1102	113	2535	142	5842
85	1135	114	2601	143	6008
86	1168	115	2679	144	6173
87	1201	116	2756	145	6393
88	1235	117	2833	146	6614
89	1279	118	2910	147	6779
90	1323	119	2998	148	6944
91	1356	120	3086	149	7165
92	1389	121	3197	150	7385
93	1433	122	3307		

## SPEED RATING

SPEED SYMBOL	SPEED (mph)
A1	3
A2	6
A3	9
A4	12
A5	16
A6	19
A7	22
A8	25
B	31
C	37
D	40
E	43
F	50
G	56
J	62
K	68
L	75
M	81
N	87
P	93
Q	99
R	106
S	112
T	118
U	124
H	130
V	149
W	168
Y	186
ZR*	(Y) Above 186

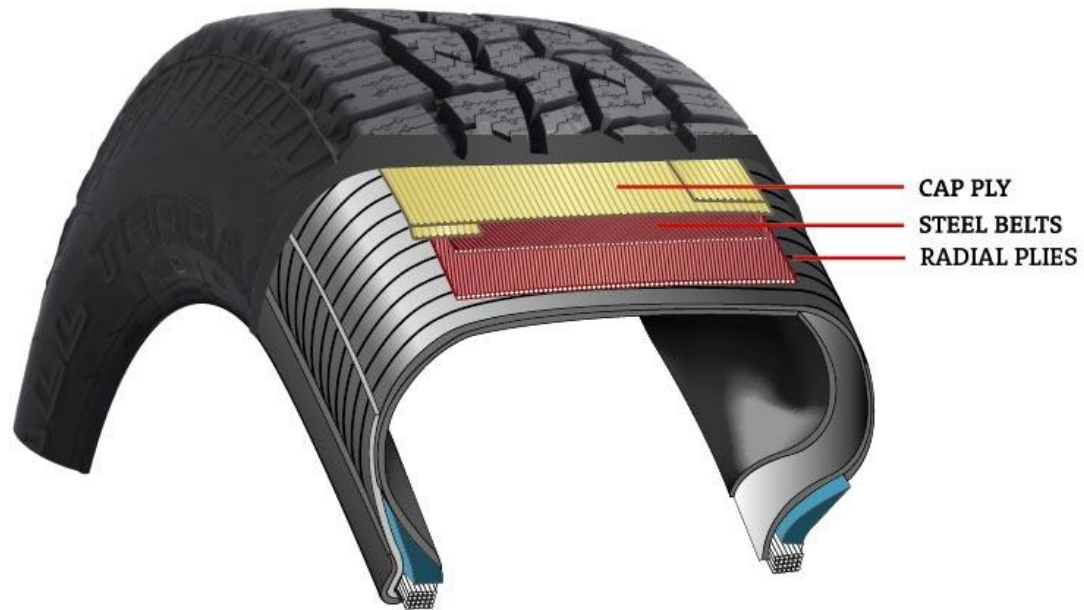
\*For tires having a maximum speed capability





# Radial vs Bias tires

## RADIAL CONSTRUCTION



## BIAS CONSTRUCTION



# Tread depth



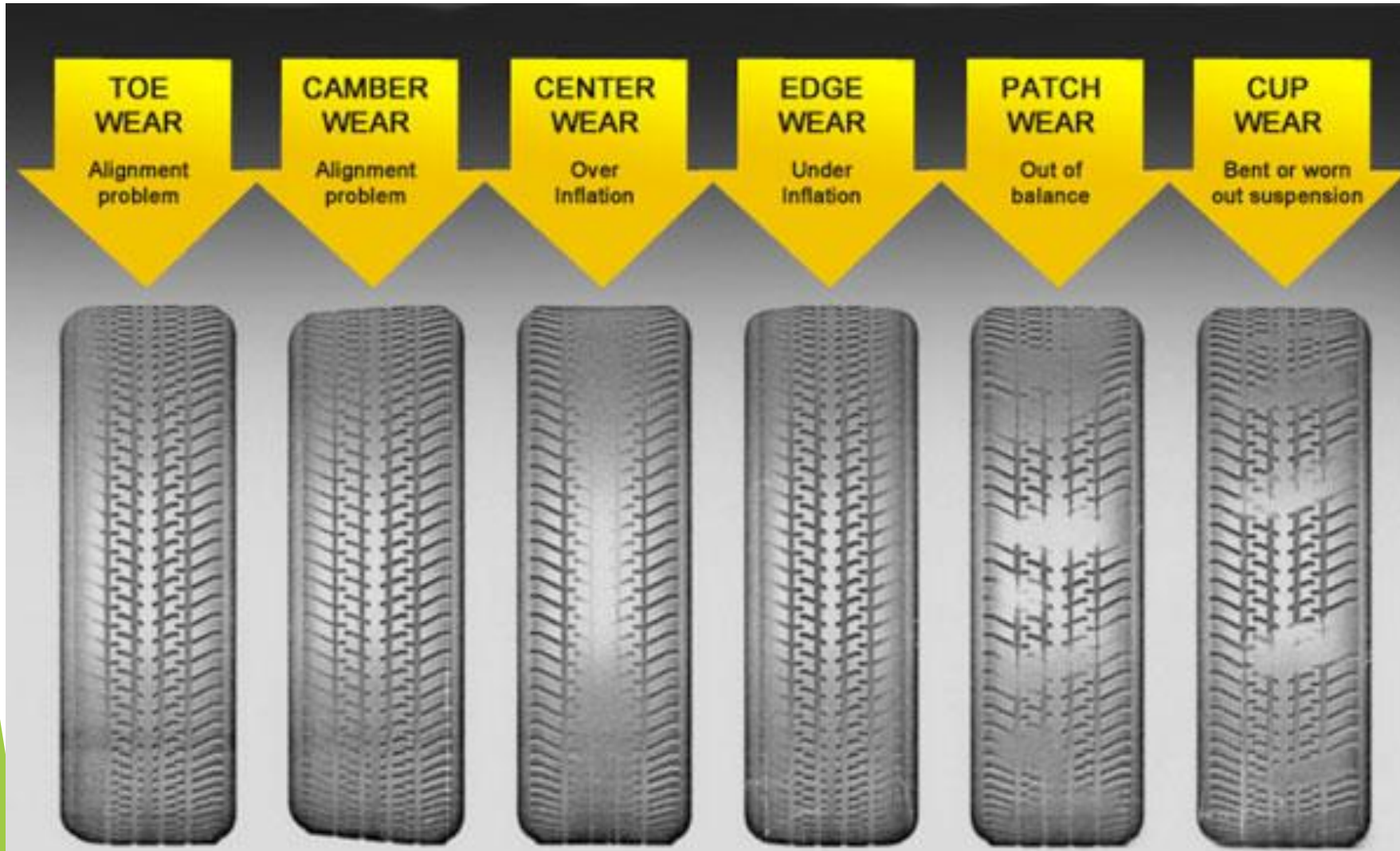
# Uniform Tire Quality Grading System



# Date Code



# Tire wear



# IMPROPER INFLATION PRESSURE

Over Inflation



Under Inflation



Correct Inflation



# Tire wear

- ▶ Mis-use/abuse
- ▶ Pressure
- ▶ Worn or weak suspension &/or steering
- ▶ Alignment
- ▶ Balancing
- ▶ Lack of rotation
- ▶ Combination of these



# Tire placard



MFD. BY RIVIAN AUTOMOTIVE, LLC.



GVWR:  
8532 LB (3870 KG)

10/21

GAWR FRONT:  
4134 LB (1875 KG)

WITH TIRES:  
275/65R20

RIM:  
20X8.5J

COLD TIRE PRESSURE  
331 KPA, 48 PSI

GAWR REAR:  
4960 LB (2250 KG)

WITH TIRES:  
275/65R20

RIM:  
20X8.5J

COLD TIRE PRESSURE  
331 KPA, 48 PSI

THIS VEHICLE CONFORMS TO  
SAFETY STANDARDS IN EFFECT

VIN: 7FCTGAAL3NN000070  
TYPE: TRUCK



## TIRE AND LOADING INFORMATION

SEATING CAPACITY	TOTAL : 5	FRONT : 2	REAR : 3
------------------	-----------	-----------	----------

The combined weight of occupants and cargo should never exceed 644 kg or 1419 lbs.

TIRE	SIZE	COLD TIRE PRESSURE
FRONT	275/65R20	331 kPa, 48 PSI
REAR	275/65R20	331 kPa, 48 PSI
SPARE	NONE	NONE

SEE OWNER'S  
MANUAL FOR  
ADDITIONAL  
INFORMATION

# Tire repair

## Puncture Repair Procedures for Passenger and Light Truck Tires

The excerpts are cited from the U.S. Tire Manufacturers Association's "Puncture Repair Procedures for Passenger and Light Truck Tires" wall chart, which contains the industry recommended puncture repair procedures.

Repairs must be performed by **removing the tire from the rim/wheel assembly** to perform a complete inspection to assess all damage that may be present. Repairs are limited to the **tread area only** (see graphic).

**A plug by itself or a patch by itself is an unacceptable repair.**

Puncture injury cannot be greater than **1/4-inch (6mm)** in diameter; **DO NOT** make repairs where the injury damage extends into the shoulder/belt edge area **OR** where the injury extends at an angle into the shoulder area. If there is any question that the injury extends into the shoulder/belt edge area, then the tire must be taken out of service.



For complete USTMA puncture repair procedures, see "Puncture Repair Procedures for Passenger and Light Truck Tires" wall chart or visit [www.ustires.org](http://www.ustires.org).

Repairs **cannot overlap**. A rubber stem, or plug, must be applied to **fill the puncture injury** and a patch must be applied to seal the innerliner. A common repair unit is a one-piece combination unit with a stem and patch.

Not all tires can be repaired. Specific repair limits should be based on recommendations or repair policy of the tire manufacturer and/or type of tire service.

**NEVER** repair a tire that has an existing, improper repair; the tire must be scrapped.

**NEVER** perform an outside-in tire repair or on-the-wheel repair.

**Ask your tire service professional if industry repair procedures are used. Also, some tire manufacturers may have repair limits or restrictions for some tires, such as runflat tires and others.**



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1400 K St. NW, Washington, DC, 20005  
202-682-4800 • Fax 202-682-4854  
[www.ustires.org](http://www.ustires.org)

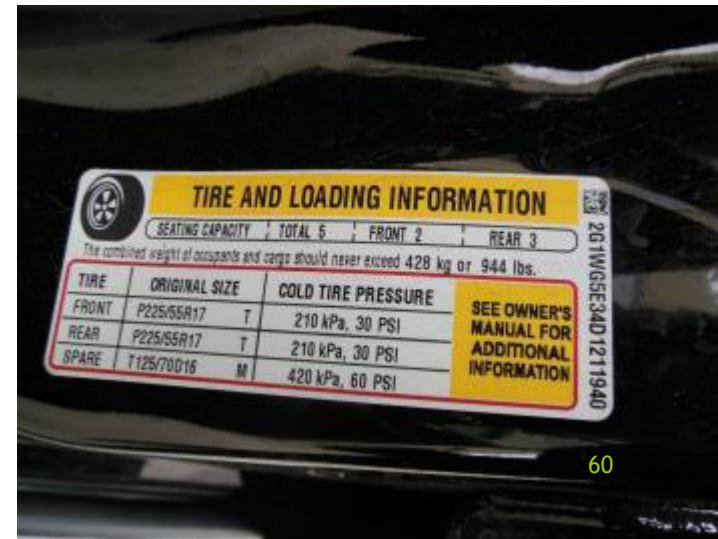
# Tire repair

## \* IMPORTANT!

- **Not all tires can be repaired.** Specific repair limits should be based on recommendations or repair policy of the tire manufacturer and/or type of tire service (e.g. service description, run-flat technology, commercial service applications, etc.).
- **For all tires, repair units cannot overlap.** The number of repairs should be limited first by the tire manufacturer's recommendations and repair policy and then by application and the individual tire's condition as determined by the inspection process detailed in Steps 1 and 2.
- **Some run-flat technology tires cannot be repaired.** Consult tire manufacturer for their repair policy and, if applicable, for their recommended repair procedures.
- **Industry recommended repair methods include:** (1) Two-piece stem and patch repair components, and (2) one-piece patch/stem combination repair units. For punctures angled greater than 25°, two-piece stem and patch repair components are recommended (see Step 2). **NEVER** use only a plug (stem) or **NEVER** use only a patch to repair a puncture.

# TREAD ACT

- ▶ Effective 2007 and newer model year (MY).
- ▶ Requires that a warning light when pressure drops **25%** of the cold inflation pressure as shown on the door placard



# Pressure and Temperature

TEMPERATURE	TIRE PRESSURE (PSI)	CHANGE FROM COLD PLACARD INFLATION PRESSURE
120°F (49°C)	37	+5
110°F (43°C)	36	+4
100°F (38°C)	35	+3
90°F (32°C)	34	+2
80°F (27°C)	33	+1
70°F (21°C)	32	0
60°F (16°C)	31	-1
50°F (10°C)	30	-2
40°F (4°C)	29	-3
30°F (-1°C)	28	-4
20°F (-7°C)	27	-5
10°F (-12°C)	26	-6
0°F (-18°C)	25	-7
-10°F (-23°C)	24	-8
-20°F (-29°C)	23	-9

# TPMS



# TPMS





Questions  
????

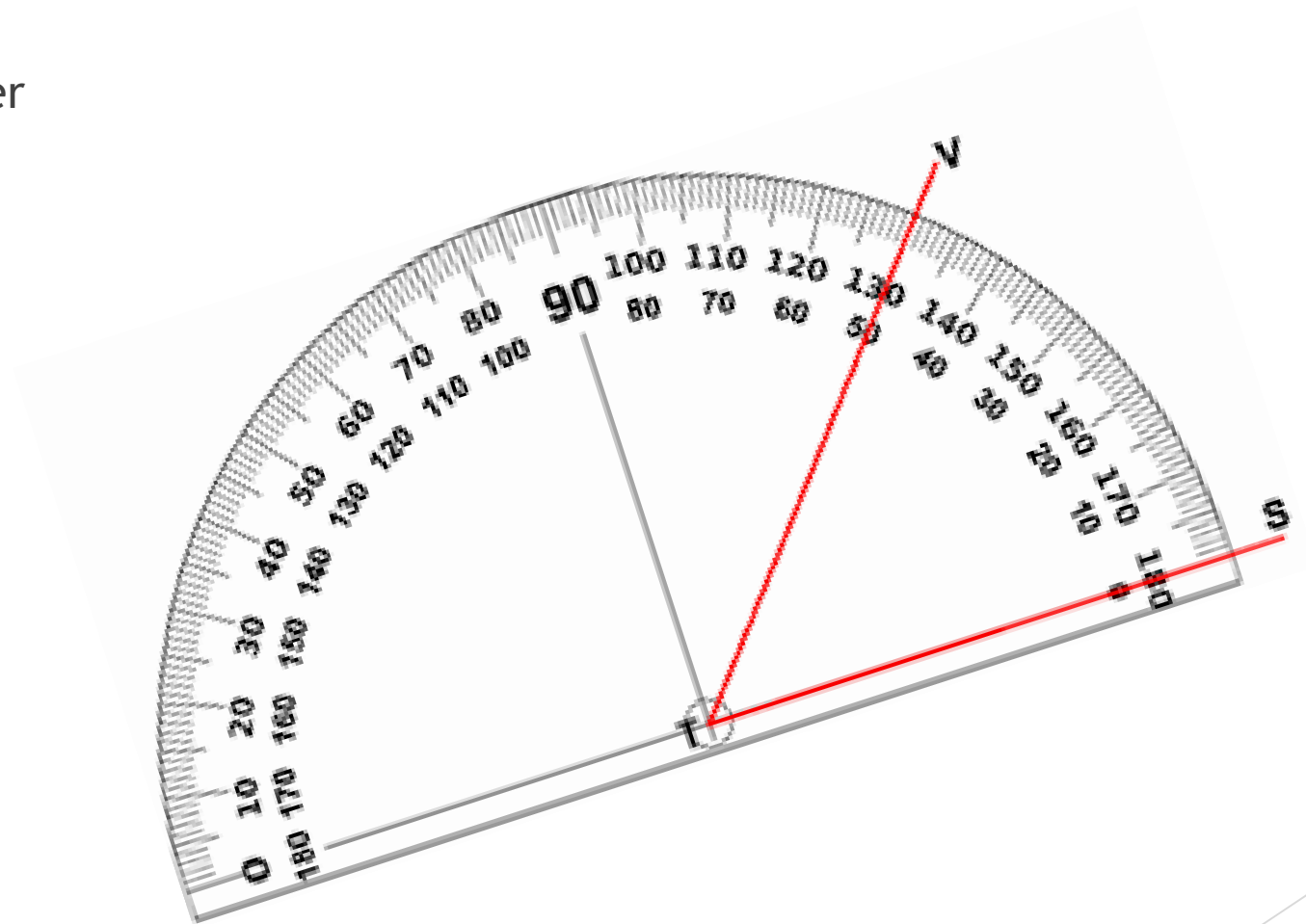


# Alignment Related Problems

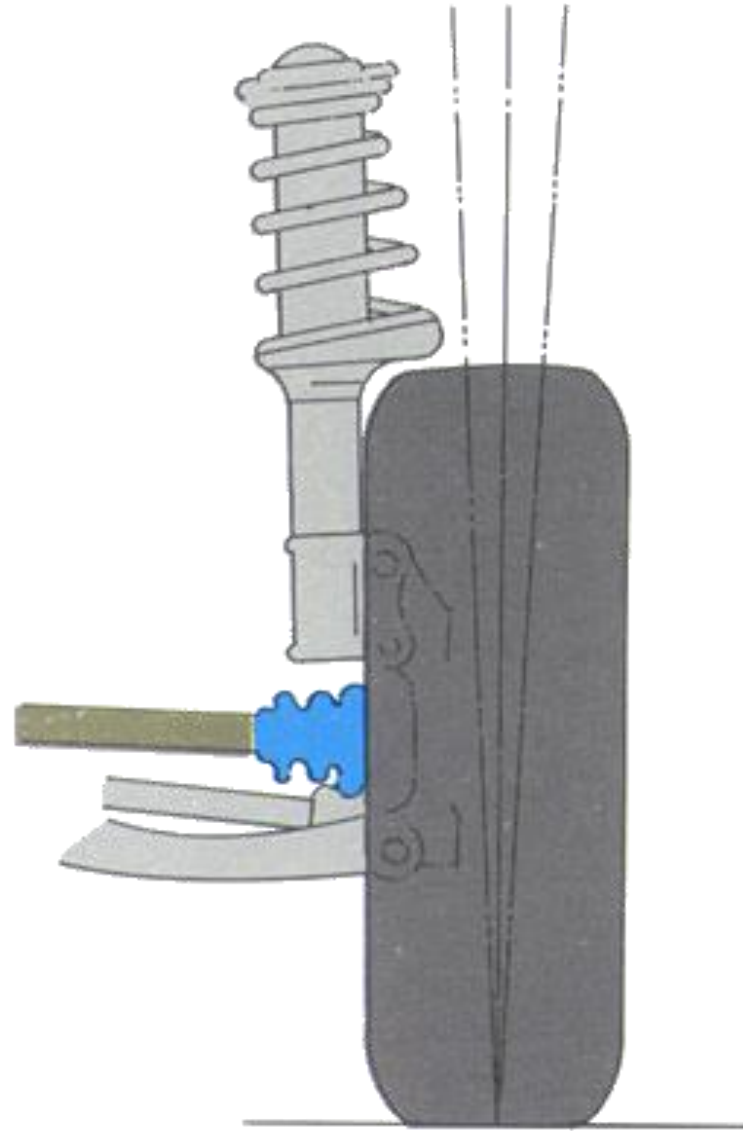
- ▶ Pull
- ▶ Lead Or Drift
- ▶ Road Crown Effects
- ▶ Wander
- ▶ Stiff Steering Or Slow Return To Center
- ▶ Tire Wear
- ▶ Steering wheel off center

# Critical Alignment Angles

- ▶ Camber
- ▶ Caster
- ▶ Toe

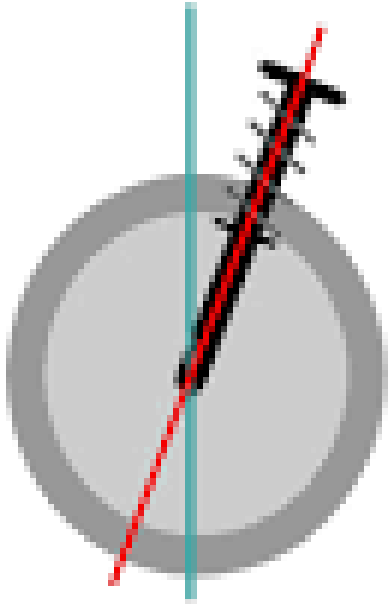


# CAMBER

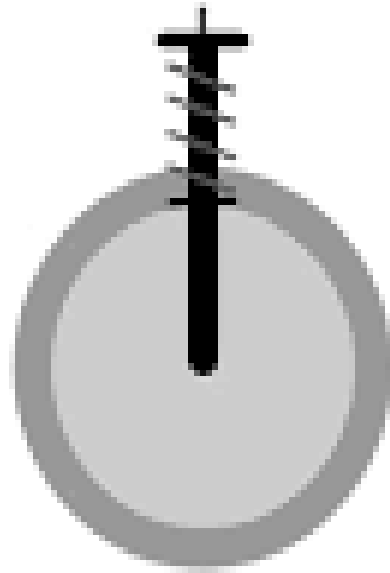


# CASTER

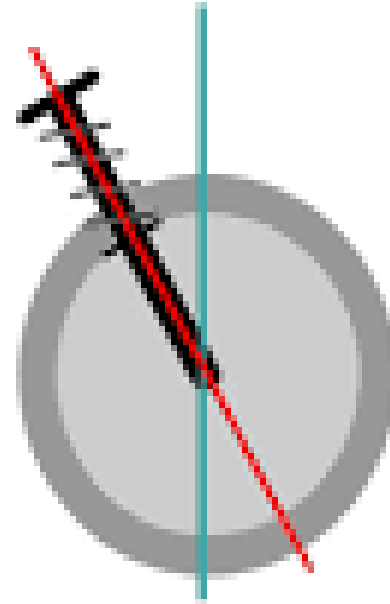
**POSITIVE  
CASTER**



**NEUTRAL  
CASTER**

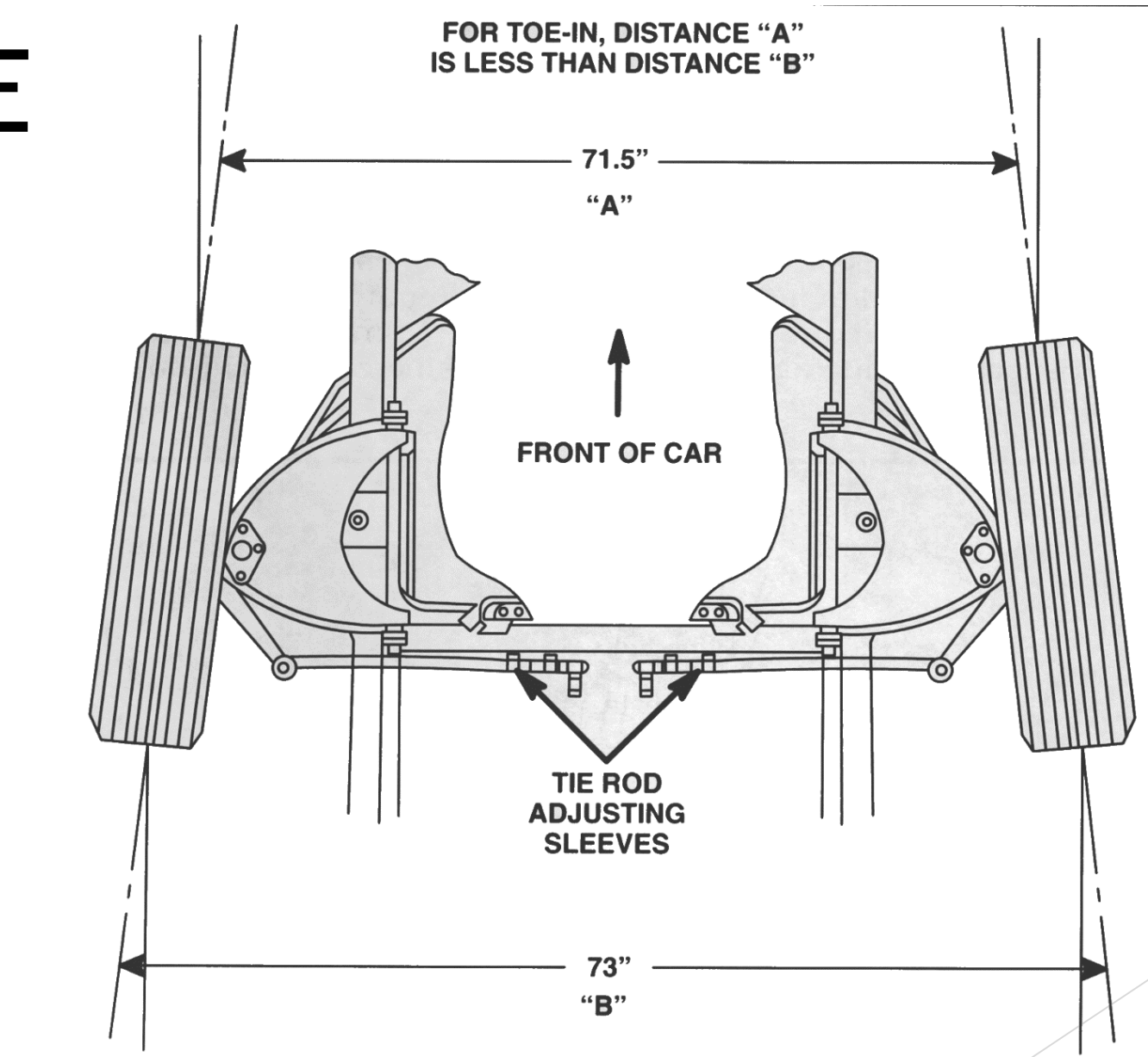


**NEGATIVE  
CASTER**

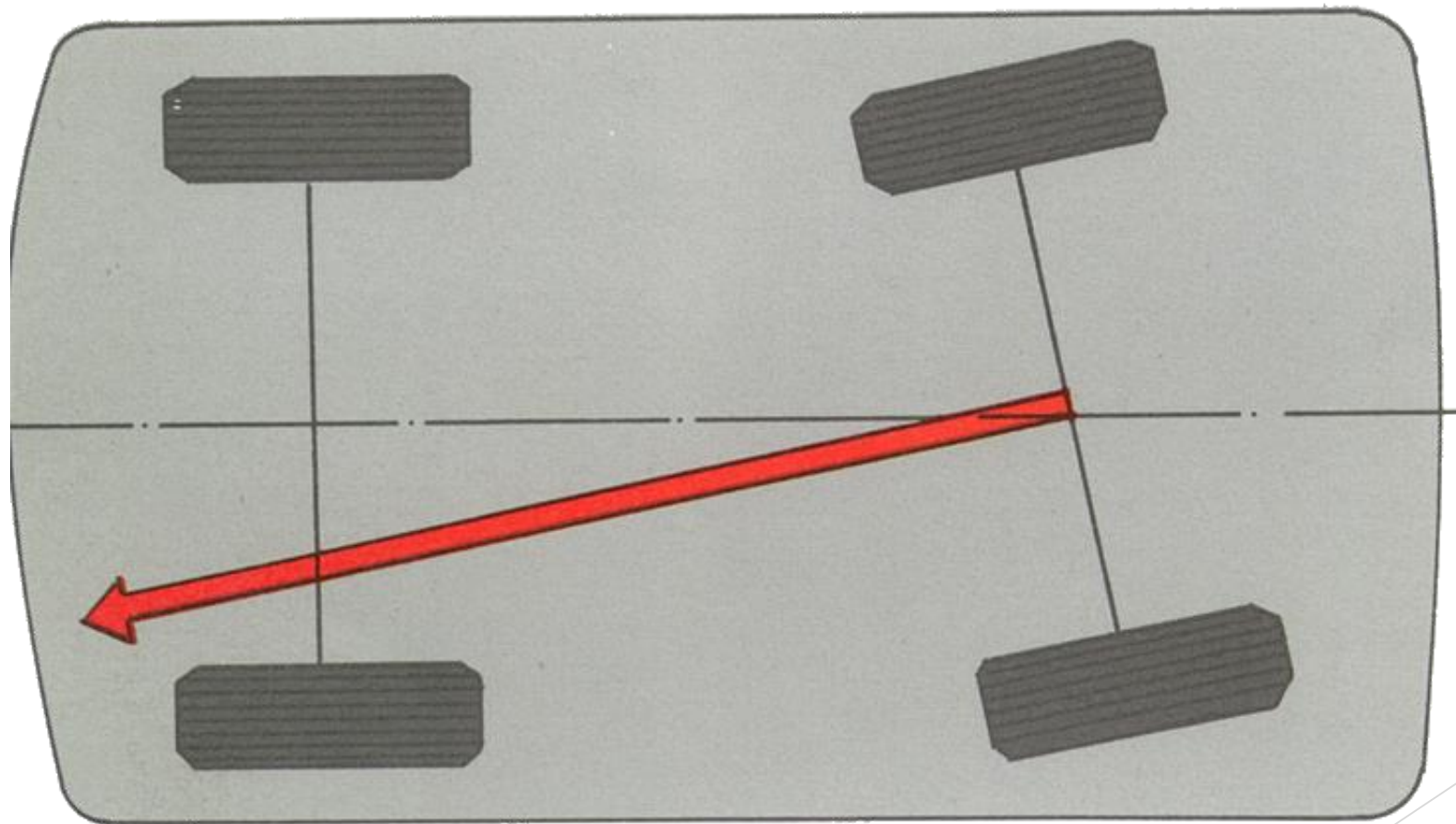


← FRONT OF VEHICLE

# TOE



# Thrust Angle



# Alignment pull



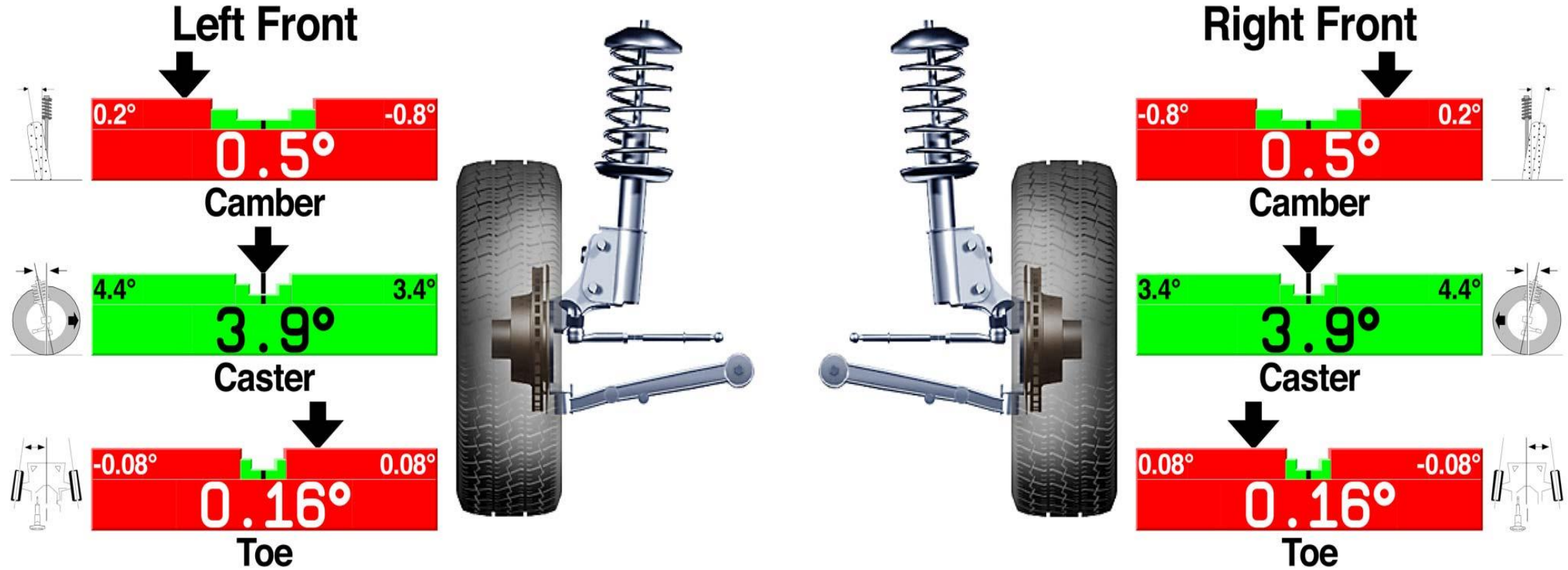
# Advanced diagnostic angles

- ▶ Steering angle Inclination
- ▶ Included angle
- ▶ Toe-out-on-turns
- ▶ Scrub radius
- ▶ Set-back
- ▶ Ride height
  
- ▶ Mostly used after an accident



# Alignment

## Before Measurements



# Adjusting Alignment changing align geometry

- ▶ Cams
- ▶ Eccentrics
- ▶ Slots
- ▶ Threaded rods
- ▶ Sub frame shift
  
- ▶ Aligner demo





Questions  
????