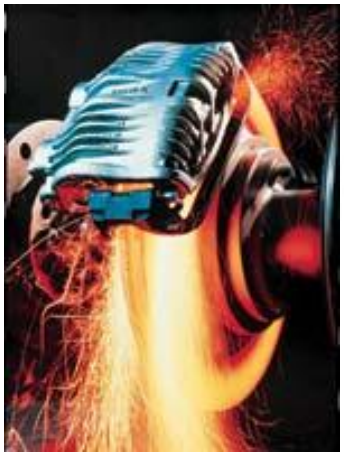
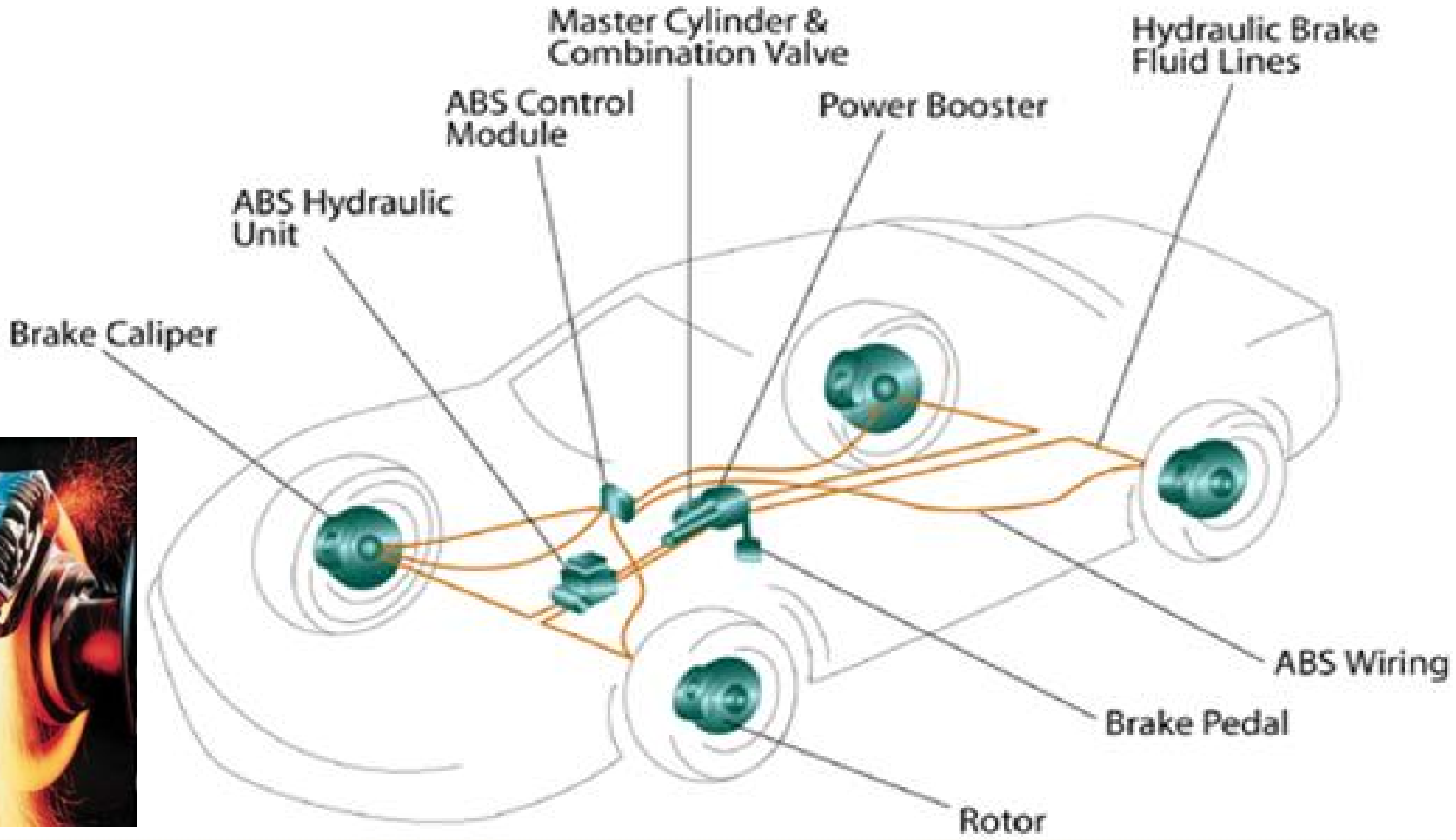
ATASA 5th Brake Systems

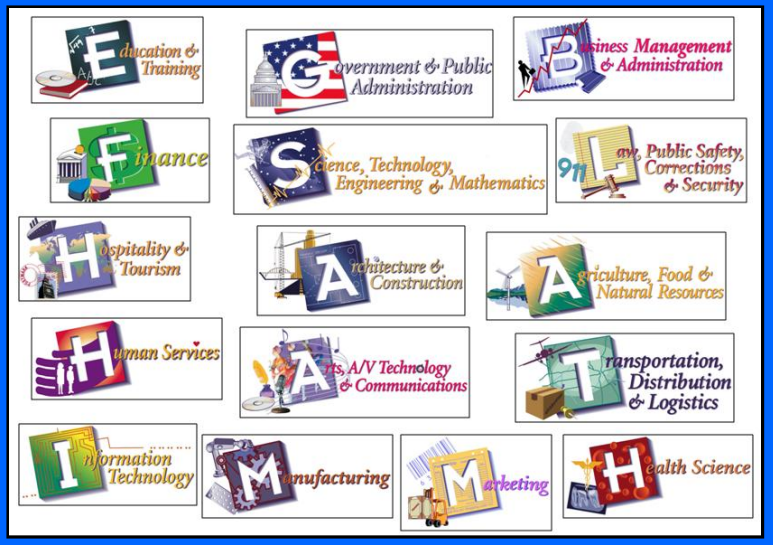
Please Read The Summary

ATASA 5TH Study Guide
Chapter 48 Pages: 1424 - 1456
Brake Systems
84 Points





Before We Begin…



Keeping in mind the Career Cluster of *Transportation , Distribution & Logistics*

Ask yourself:

What careers might be present in this slide series?

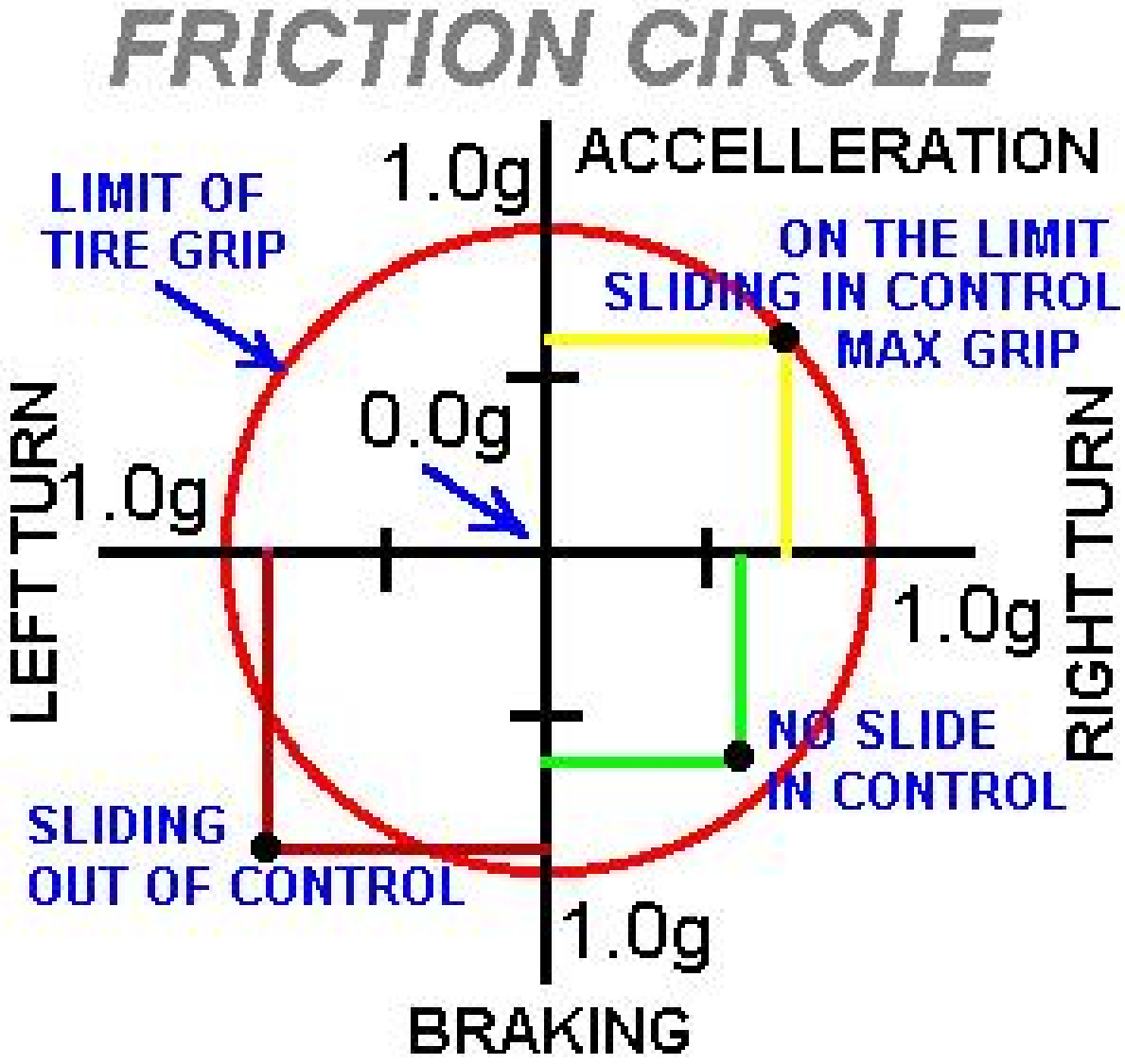
What careers might interest me?

How do these careers relate to my other high school classes?

What career cluster is my 4-year plan preparing me for?

ATASA 5th Brake Systems

1. The brake system uses _____ *(brakes, tires, road)* to slow and stop the motion of the vehicle.



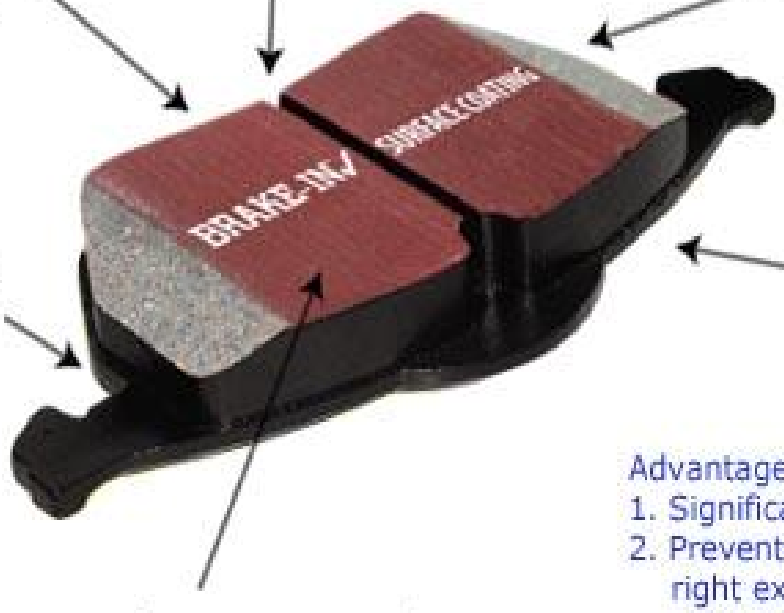
Friction
Fraction
Traction

ATASA 5th Brake Systems

New AF42/66 friction material which completely eliminates brake judder and produces a high friction long lasting brake pad.

All pads feature centre line slot which prevents heat expansion cracks and reduces brake noise.

All pads feature edge chamfers which have major technical benefits especially on European brake system pads (see blue notes below).



Unique powder coat finish to both pad and back plate gives lifetime resistance to corrosion and prevents moisture ingress.

Every pad in the Ultimax range features factory fitted noise reduction shims.

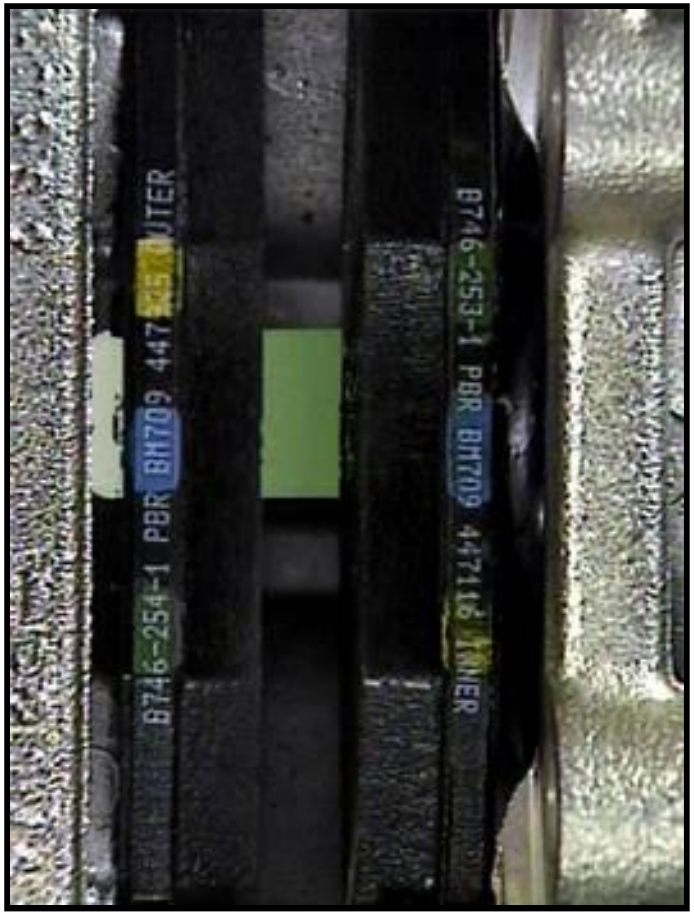
Unique Brake-In™ surface coating provides instant brake efficiency on installation and conditions the brake rotor removing glaze, black spotting etc. from disc surface.

Advantages of edge chamfers

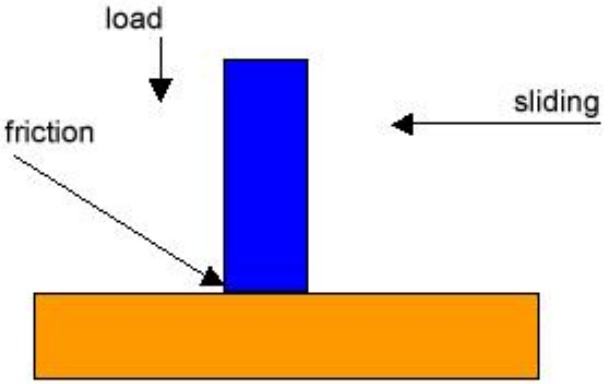
1. Significant reduction in brake noise.
2. Prevents "edge lifting" under left and right extremities of pad which can cause corrosion ingress and eventual pad de-bond.
3. Our own research has shown that chamfers can actually EXTEND pad life by virtue of improved pad efficiency.

ATASA 5th Brake Systems

2. _____ friction is the *moving* or *sliding* contact desired between the pads & rotors.



The following is a graphical example of Friction :



Static = still & not moving
Kinetic = moving or sliding

Static
Mechanical
Kinetic

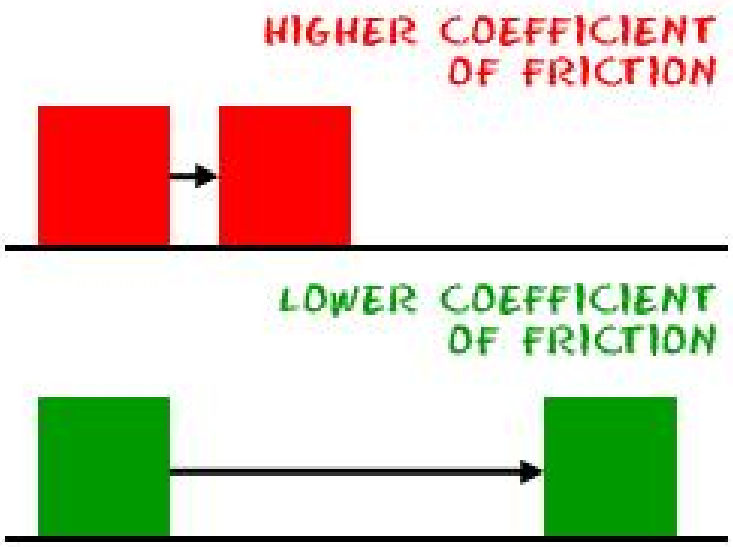
3. _____ friction is the ***stationary*** *or* ***still*** contact desired between the tires & the road surface.

FRICTION IS A FORCE THAT MOVES IN AN OPPOSITE DIRECTION TO MOVEMENT.

Static
Mechanical
Kinetic

4. **Amount of friction depends upon the type of _____ in contact, the _____ holding them together the surface finish or smoothness and the temperature of the rubbing surfaces.**

Measuring Friction



Measures of friction are based on the type of materials being observed. Concrete on concrete has a very high **coefficient of friction**. That coefficient is a measure of how easily one object moves in relationship to another. When you have a high coefficient of friction, you have a lot of friction and interaction between the materials. Concrete has a very high coefficient and **Teflon** has a very low coefficient. Teflon is used on many surfaces when they don't want objects to stick such as pots and pans.

Materials, Force
Materials, Area
Materials, Guy

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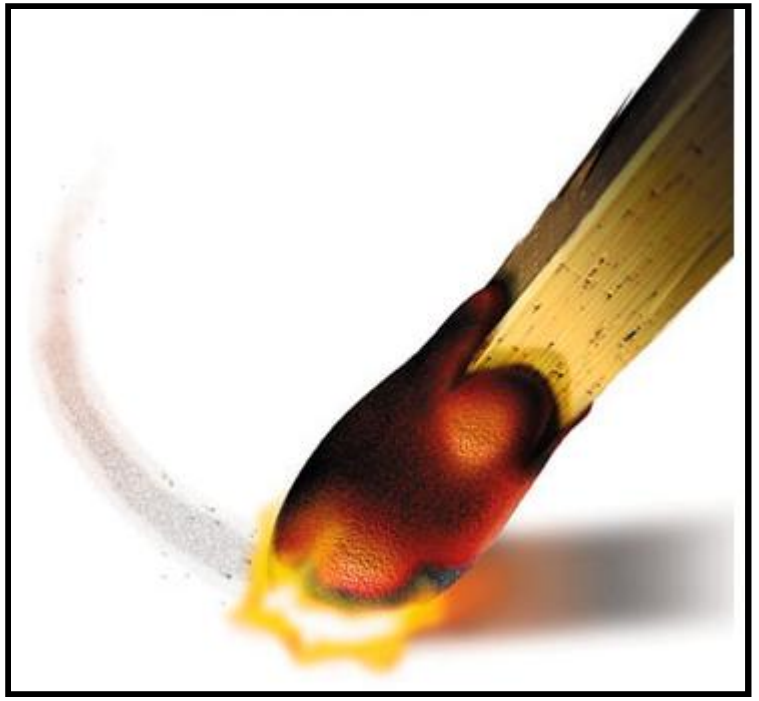
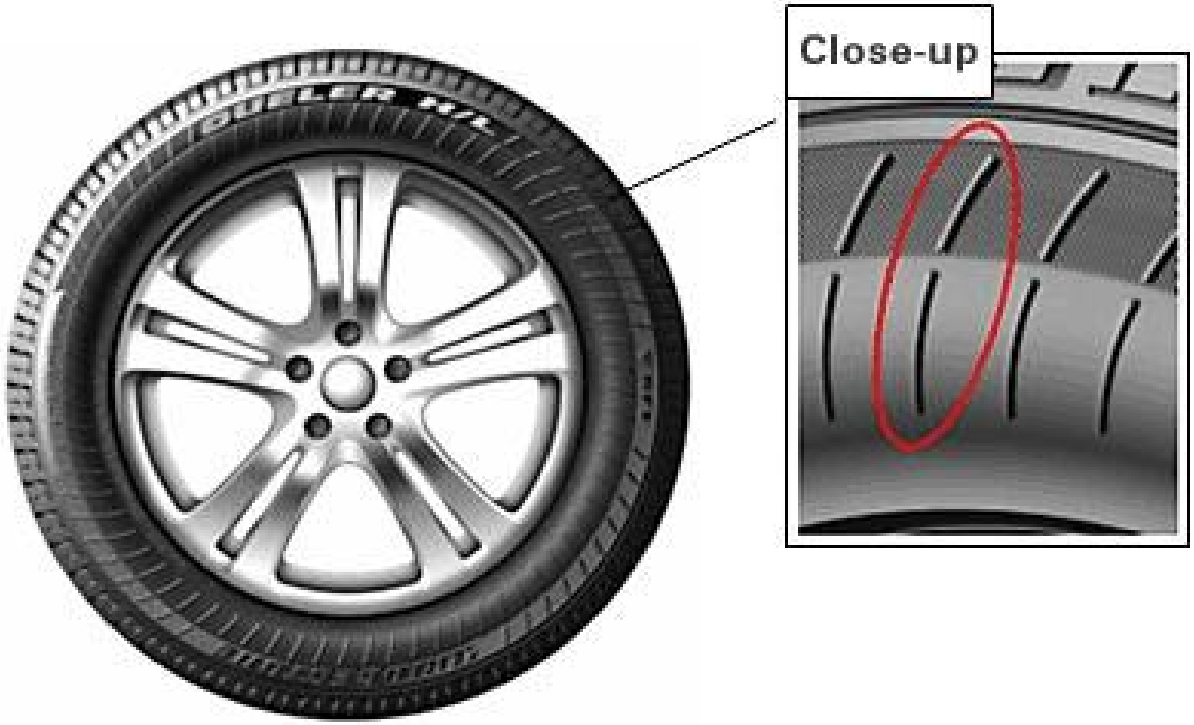
5. Friction always converts moving energy into _____.
In brake systems, *fade* is the result of excessive heat!

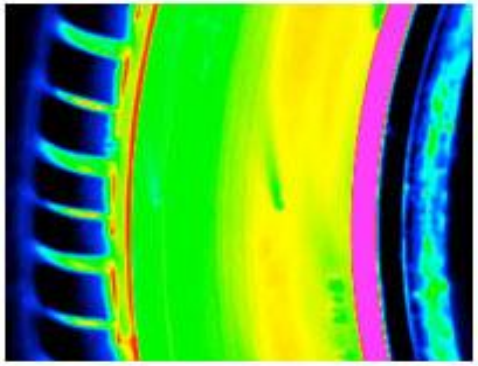
Cold
Ice
Heat



ATASA 5th Brake Systems



COOLING FIN

	Without COOLING FIN technology	With COOLING FIN technology
Thermo-vision Hot Cold		
	Compared with the surface temperature of the tire without COOLING FIN technology, the surface temperature of the tire with COOLING FIN technology is clearly lower.	

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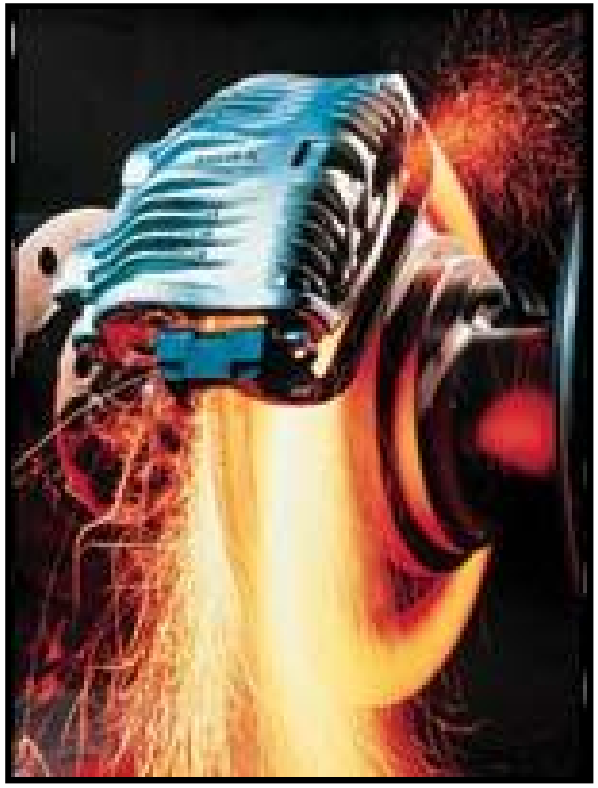
6. The greater the surface area of the brake friction materials, the _____ the heat can be dissipated.

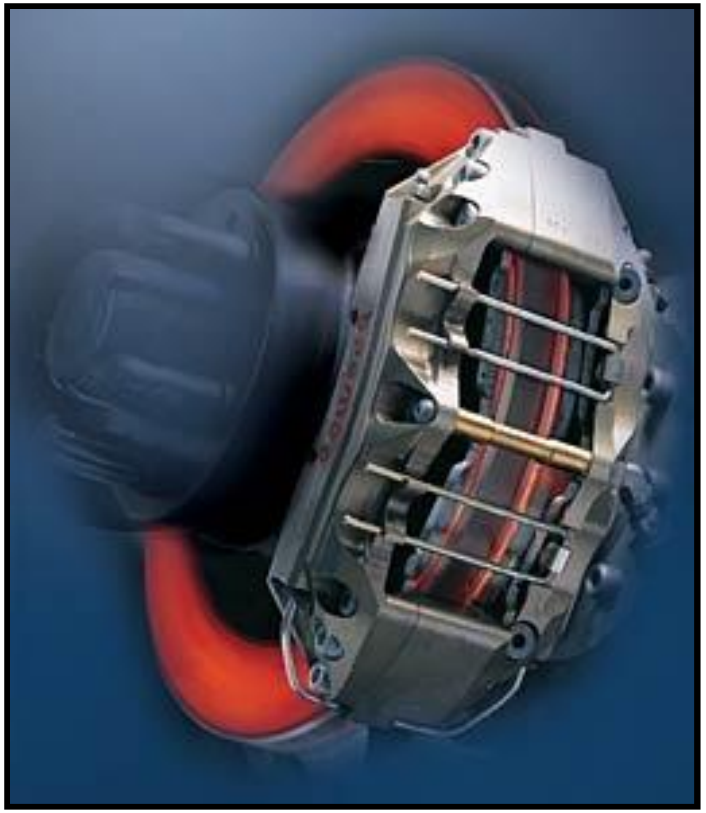
Faster
Equal To
Less

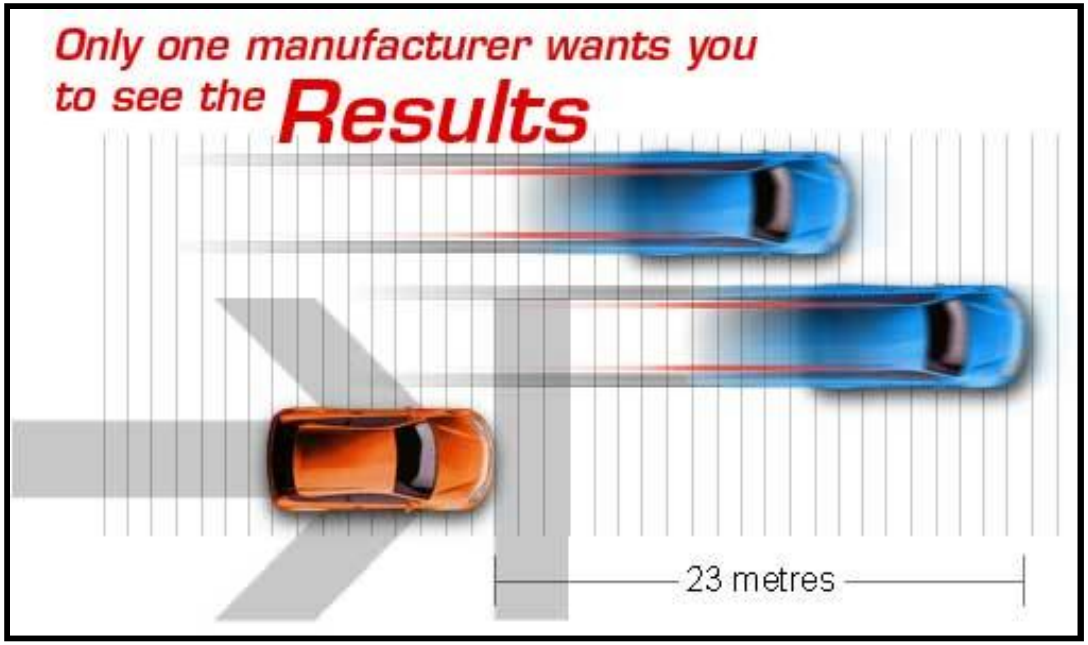


ATASA 5th Brake Systems

7. **Fade is the lowering of the _____ of friction due to overheated friction materials.**

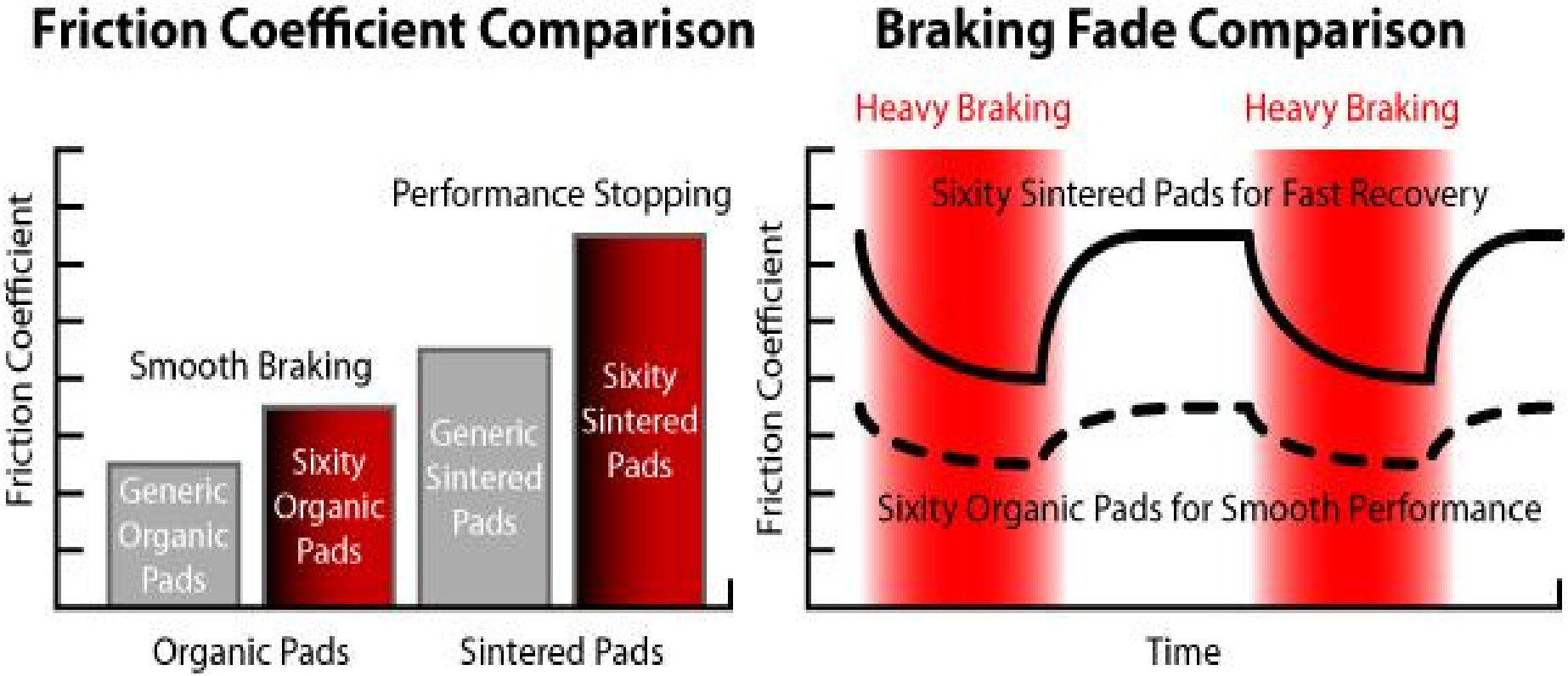
During brake fade it takes more pedal effort & hydraulic pressure to slow the vehicle due to heat…But the pedal still feels firm, not spongy!





Coefficient
Constant
Contemporary

ATASA 5th Brake Systems



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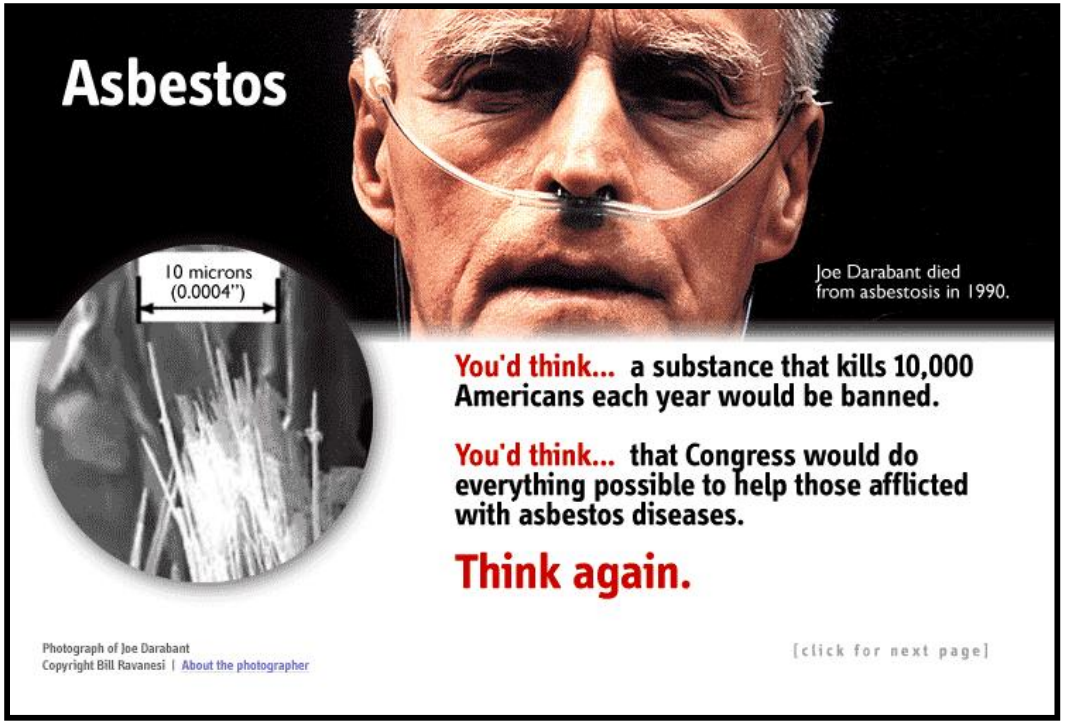
8. The friction materials on brake pads & shoes are often called _____. _____ has been banned for use in <u>brake & clutch linings</u> due to it's cancer-causing *(carcinogenic)* properties.



Linings, Asbestos
Linings, Metallic
Linings, Ceramic

ATASA 5th Brake Systems

9. **Nonasbestos _____** linings are used on many vehicles by the **OEM** ***(Original Equipment Manufacturers)***. They are economical, quiet, wear slowly although they fade more quickly.

Organic
Metallic
Ceramic

ATASA 5th Brake Systems

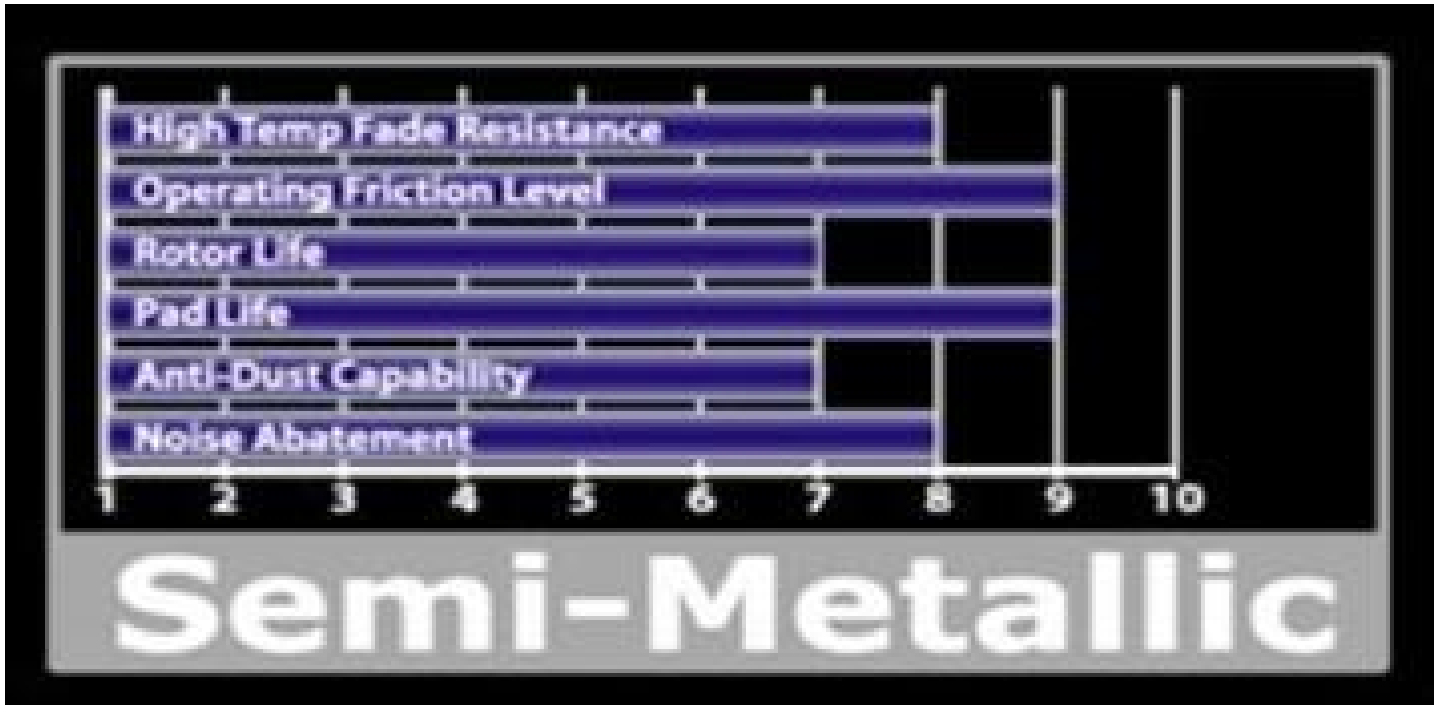
10. Fully _____ linings made of sintered iron are used in heavy duty applications because of good fade resistance. They are noisy, require more pedal pressure, & quickly wear drums & rotors.

By increasing the coefficient of friction of the brake pads, the results are the same as increasing the caliper piston diameter – higher forces will be generated for the same input. But as before, this force is not what stops the car. So why change brake pad materials in the first place? Because increasing the coefficient of friction can allow for the use of smaller/fewer caliper pistons and/or will reduce the amount of pedal force that the driver needs to apply in order to generate a given rotor output force.

Metallic
Asbestos
Ceramic

ATASA 5th Brake Systems

11. _____ linings made of a mixture of organic and synthetic fibers and certain metals molded together are harder & more fade resistant.
They need to be heated to at least 200° F to work best, so they are less efficient with parking brakes.



Semi-metallic
Asbestos
Ceramic

12. _____ linings are nonorganic, nonmetallic, and nonasbestos.
Fiberglass or Aramid fibers.

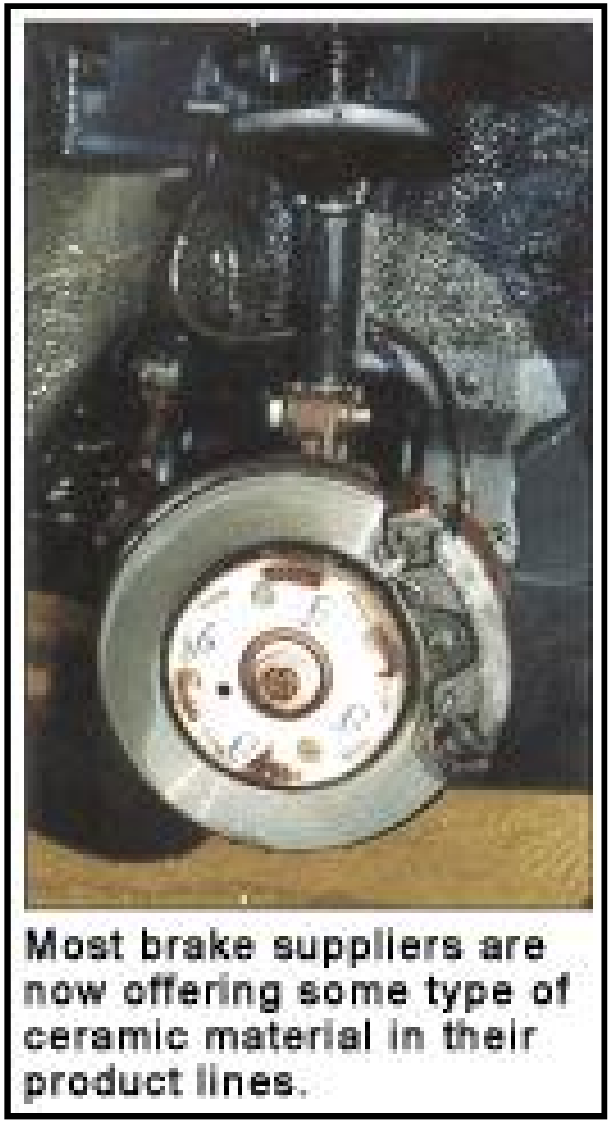
Synthetic
Asbestos
Ceramic

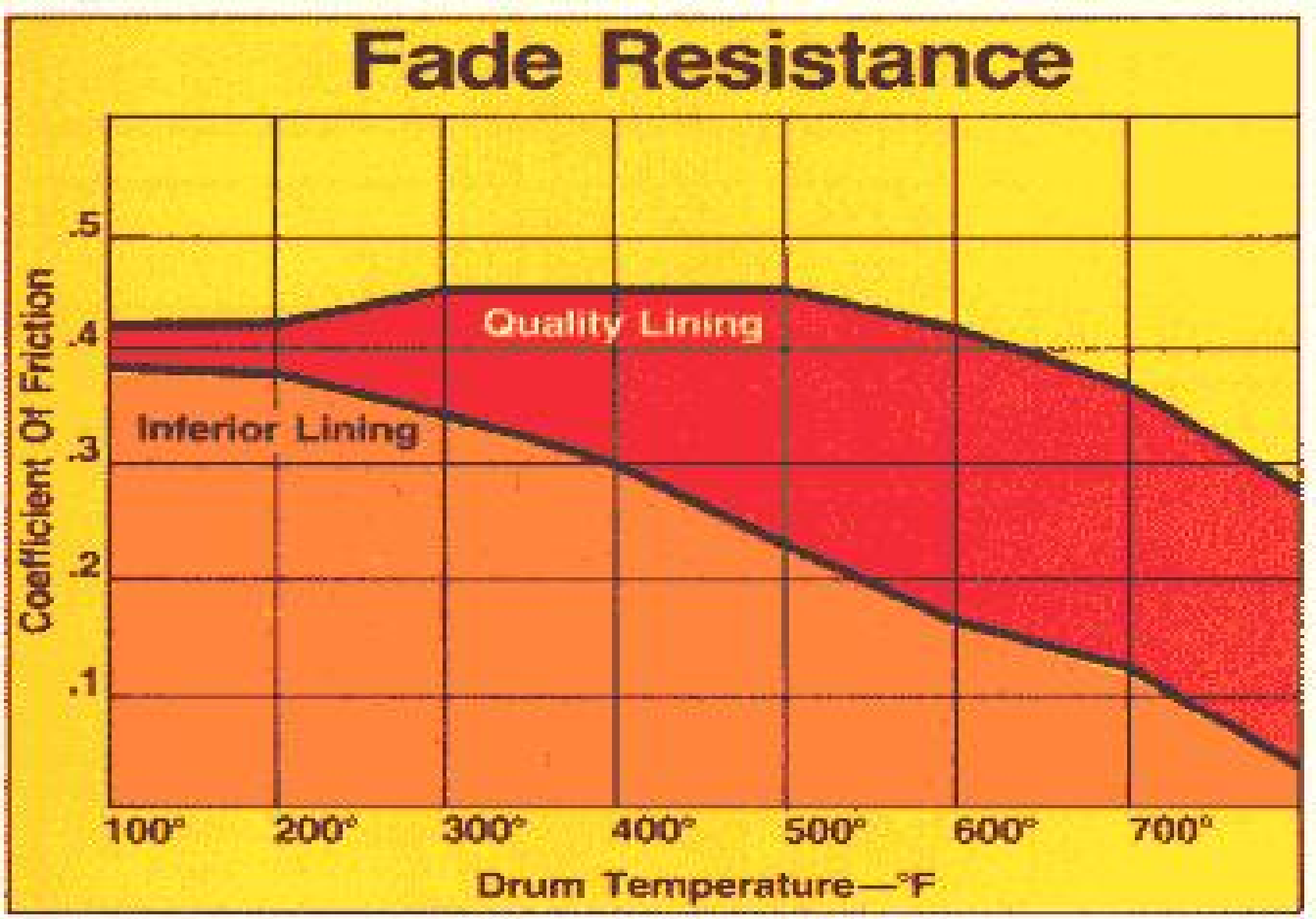
ATASA 5th Brake Systems

13. _____ - _____ & _____ linings are used on many FWD vehicles. They are quiet, produce very little dust, have a high heat resistance, and a good coefficient of friction.

Carbon - Metallic, & Ceramic
Asbestos – Metallic, & Cereal
Graphite – Steel, & Plastic

ATASA 5th Brake Systems





Fade resistance testing measures the ability of a lining material to maintain coefficient of friction with increasing temperature.

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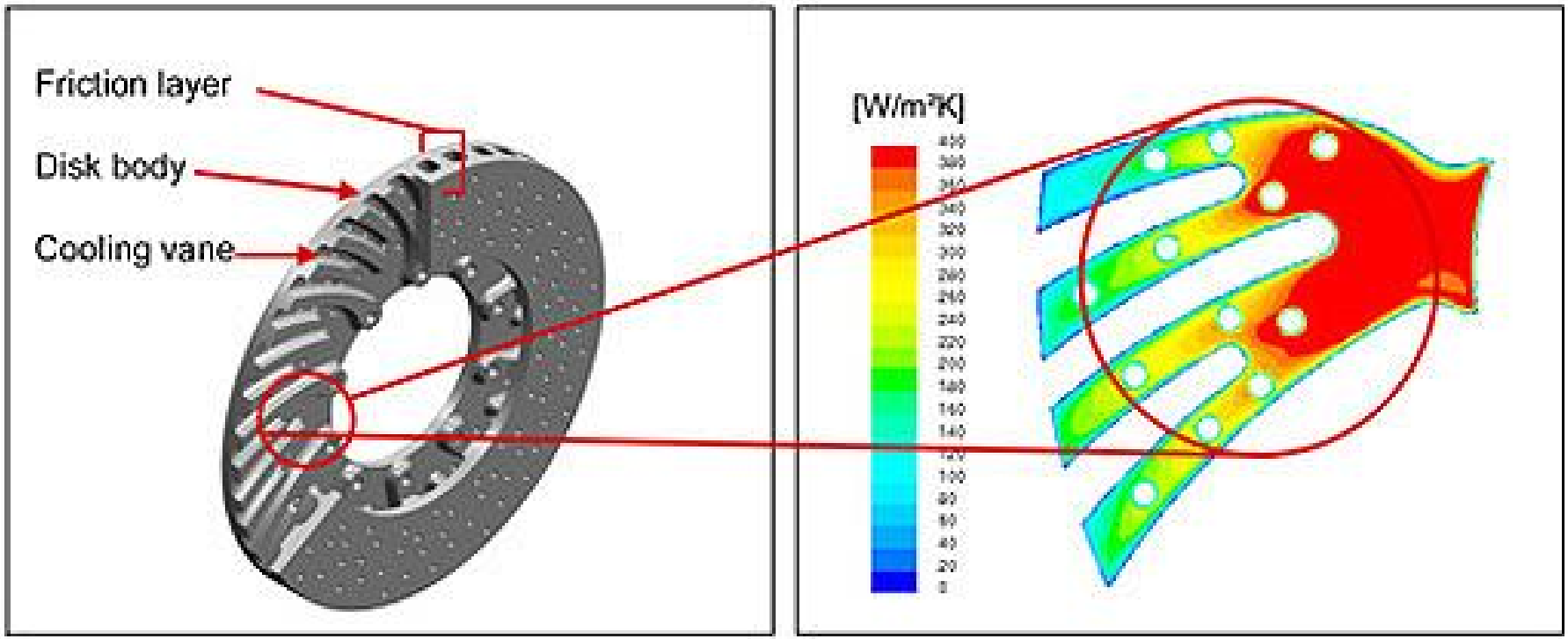

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According to a recent Babcox survey, more than 90 percent of brake technicians say they prefer to install "application-specific" brake linings. Application specific is another buzzword that's hot today and is used on a number of aftermarket friction product lines that include a broad spectrum of friction materials (ceramics, semi-metallics, low metallics & NAOs).

ATASA 5th Brake Systems

Ultimate stopping power in an ultra-low dust, low noise ceramic compound!

Hawk Performance has introduced a premium, high performance, ultra-low dust, low noise compound called Performance Ceramic.

Performance Ceramic is engineered to reduce brake NVH (Noise, Vibration and Harshness), creating a quieter performing brake pad. Furthermore, the ceramic brake pad formula has a linear friction profile that allows your ABS brake system to work more effectively. With Performance Ceramic you can expect reduced brake pad wear, lower dust output levels and a rotor-friendly brake pad.

Performance Ceramic – quiet, clean & fast stopping!

Key Features:

*** Increased stopping power**
*** Increased rotor life**
*** Extended pad life**
*** Ultra-low dust**
*** Extremely quiet**
*** Stable friction output**

ATASA 5th Brake Systems

HPS - High Performance Street disc brake pads are world renowned for increasing stopping power on your street legal vehicle. Increasing the performance of your vehicles braking system is easy when you choose Hawk Performance's HPS braking compound. This unique Ferro-Carbon formula was developed for street performance using the safety and quality of Aerospace and Motorsports severe-duty friction technology.

The High Performance Street compound offers a higher coefficient of friction over stock brake pads and can provide you 20-40% more stopping power and higher resistance to brake fade than most standard replacement pads. Less fade means you'll have a highly durable brake pad with less brake dust..

HPS Ferro-Compound Features:

*** Increased stopping power**
*** High friction/torque hot or cold**
*** Gentle on rotors**
*** Extended pad life**
*** Low dust**
*** Virtually noise-free**

ATASA 5th Brake Systems

HP+

Hawk Performance's HP Plus brake pad compound is ideal for Autocross and Track Day drivers looking for a high performance race compound that can take the heat of the track and get you home safely without having to change the pads.

HP Plus utilizes a unique Ferro-Carbon, high-tech friction material that was developed and manufactured for sport driving in autocross, Solo II and "track day" applications. The Ferro-Carbon formulation offers lower wear rates and higher torque values than other competitive materials.

Extremely high coefficient of friction makes HP Plus the perfect upgrade over stock for high performance streetcars used in autocross competition or that experience repetitive, heavy braking.

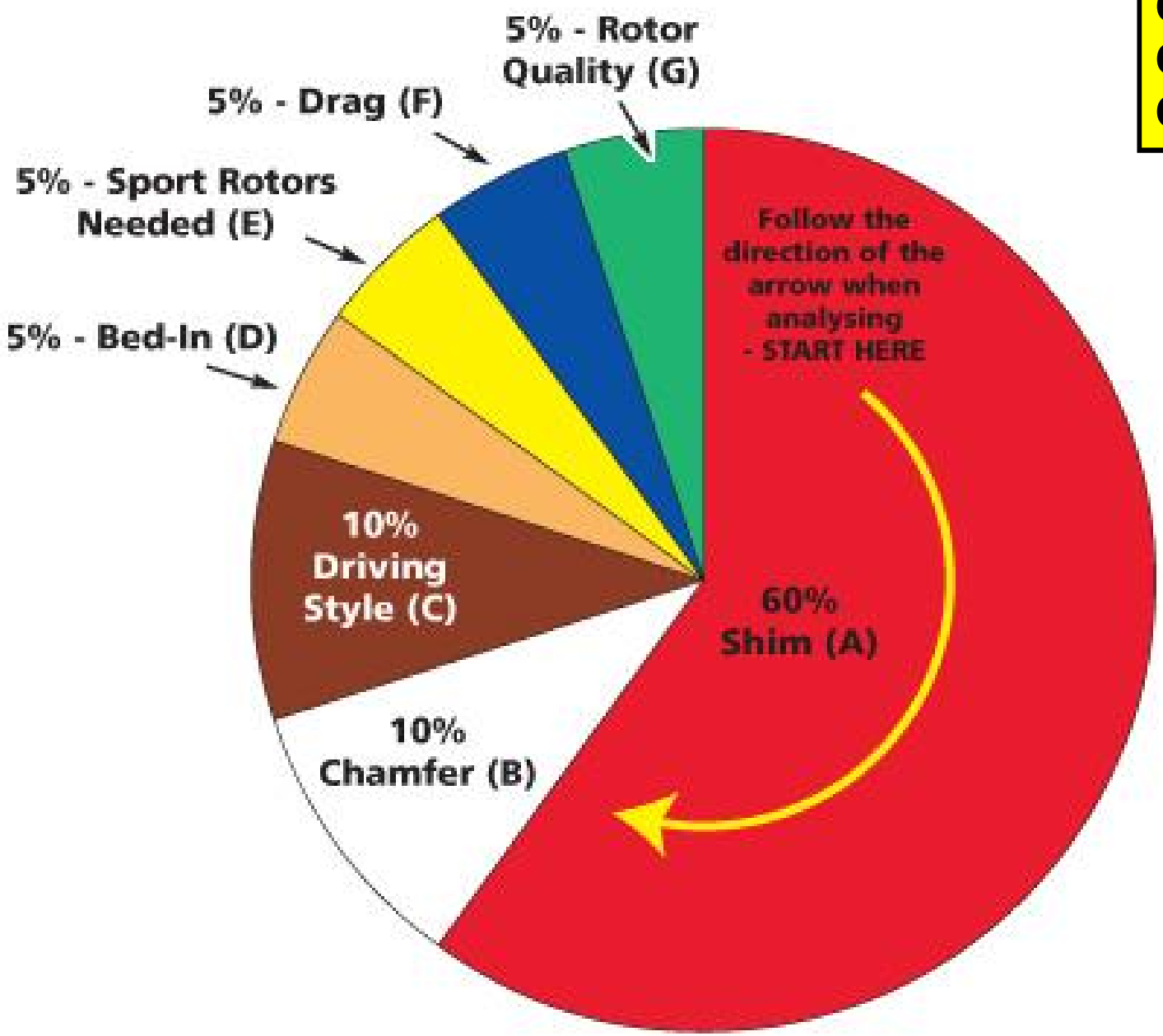
Key Features:

*** Extremely High Friction Output**
*** Fade Resistant**
*** Worthy for Autocross & Club Racing Events**

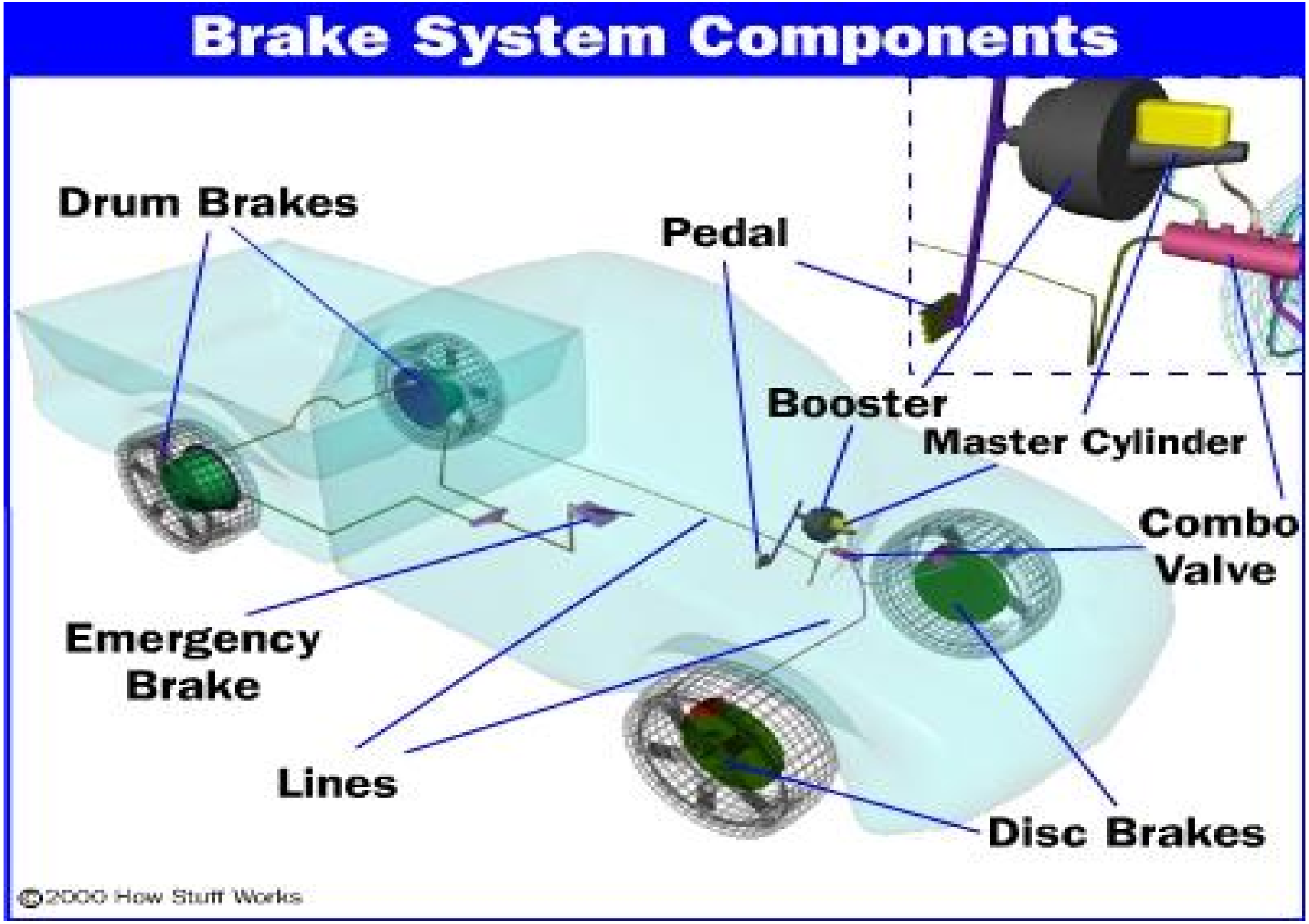
Warning! Due to the dramatic friction levels produced by this product to achieve "race-level" braking, rotor wear, noise, dust, and pad life may be affected.

ATASA 5th Brake Systems

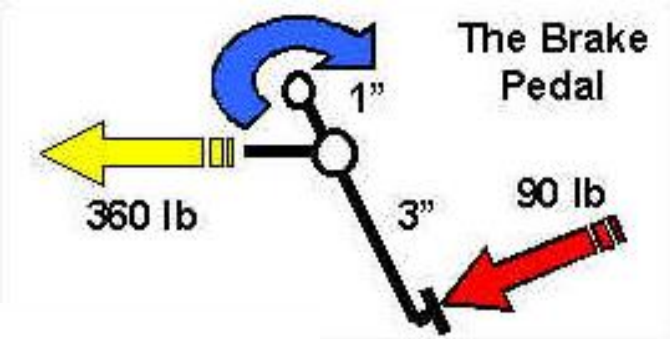
Complaint
Cause
Correction



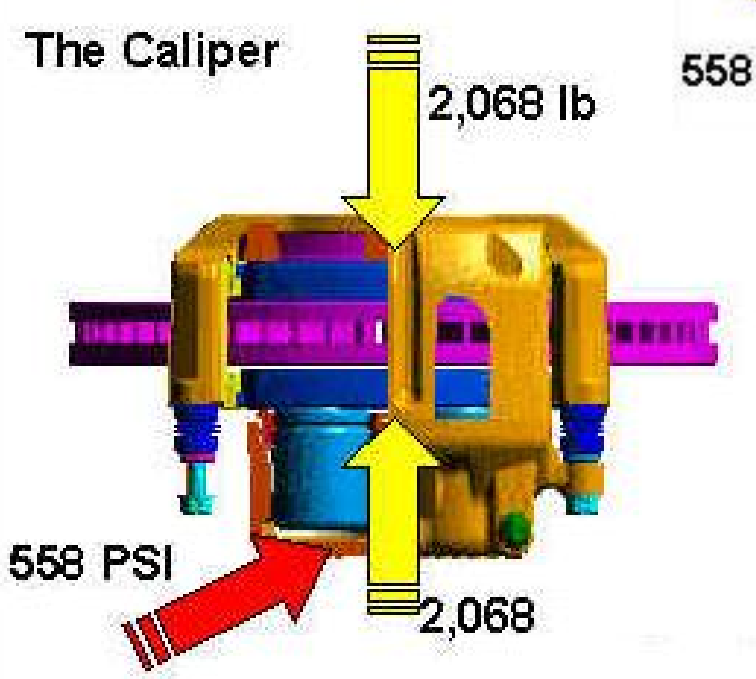
ATASA 5th Brake Systems



ATASA 5th Brake Systems

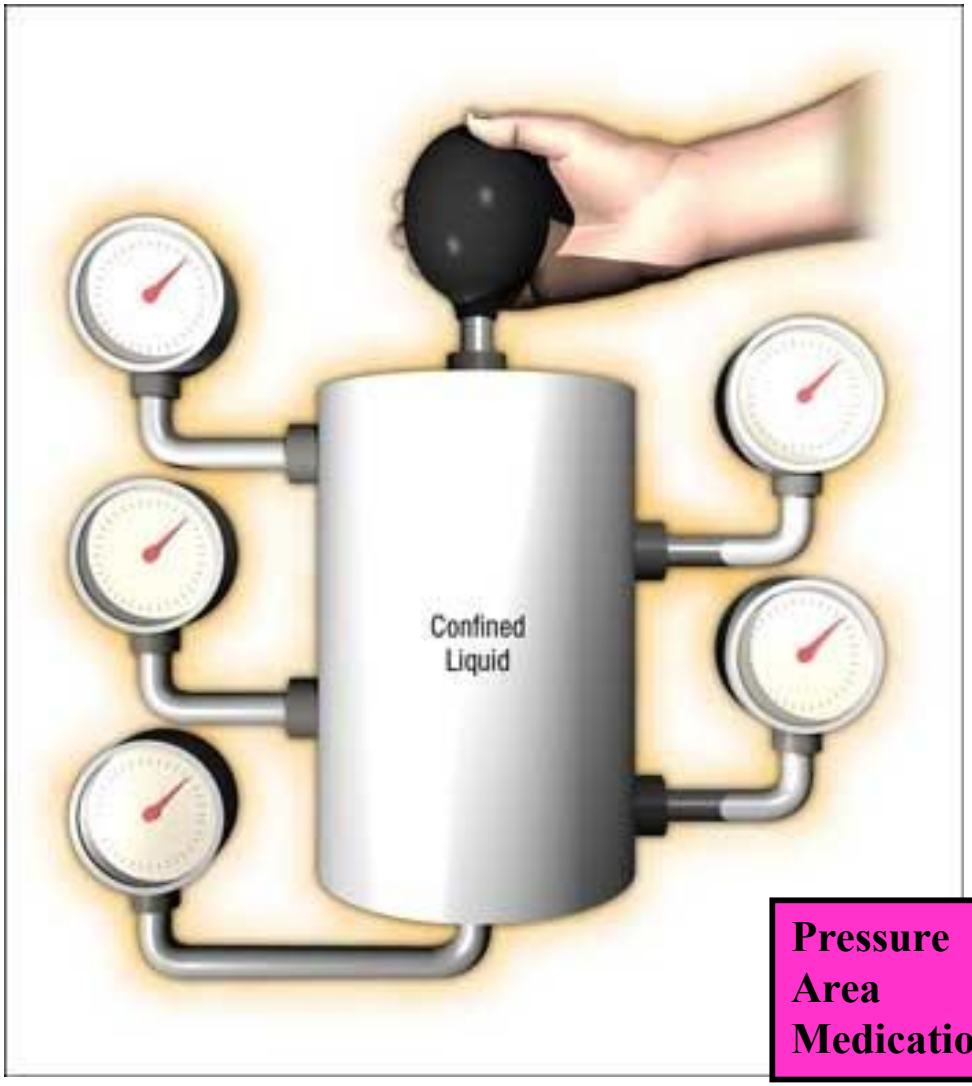


The Master Cylinder

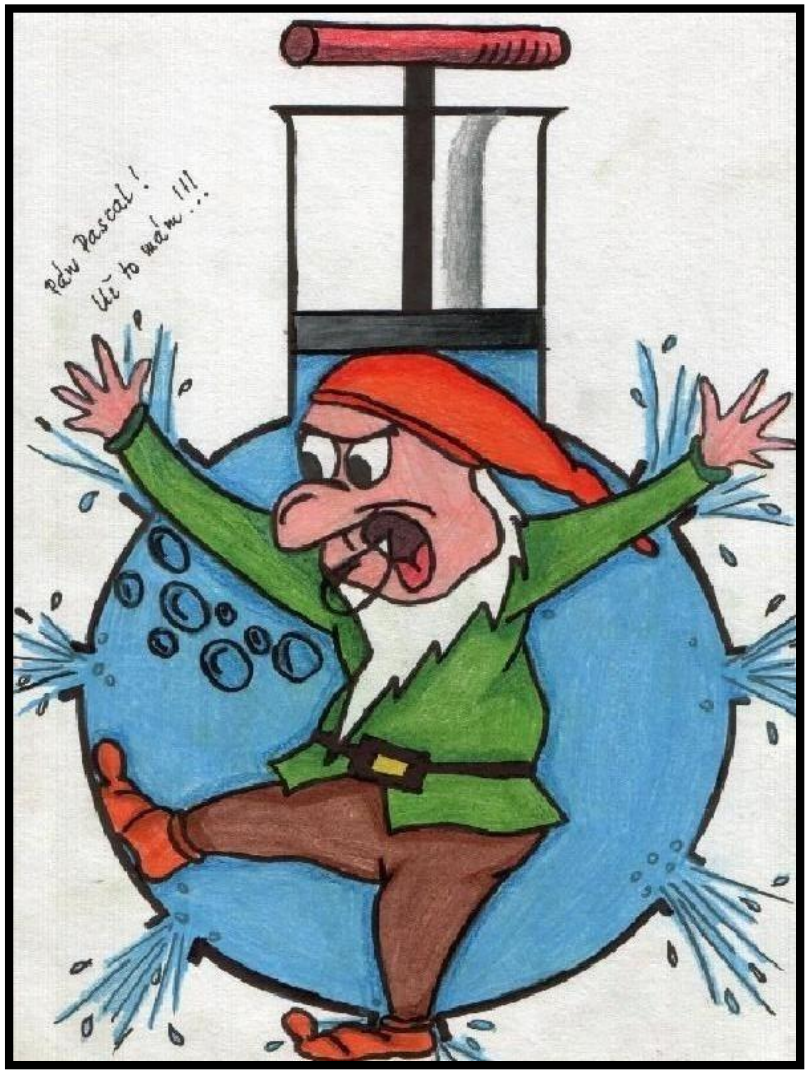


ATASA 5th Brake Systems

14. Pascal's law states that _____ applied to a confined liquid is transmitted equally to all parts of the system. ***Pressure developed in the master cylinder is the same throughout the whole brake system.***

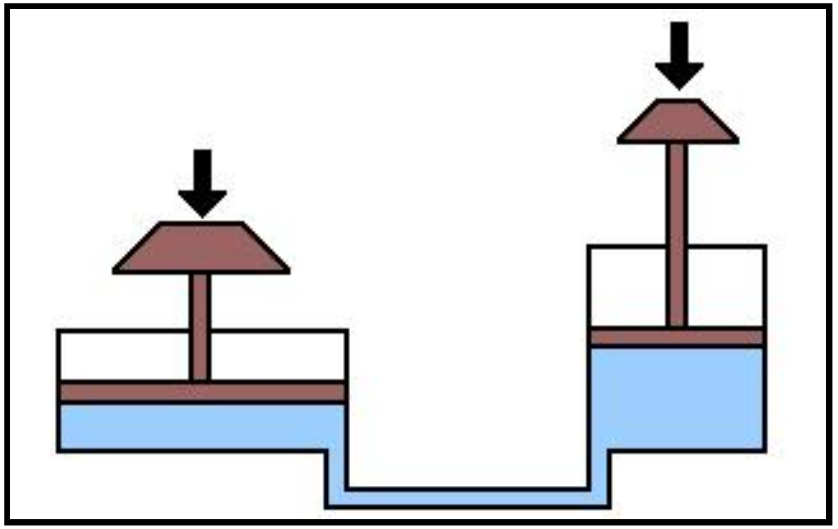


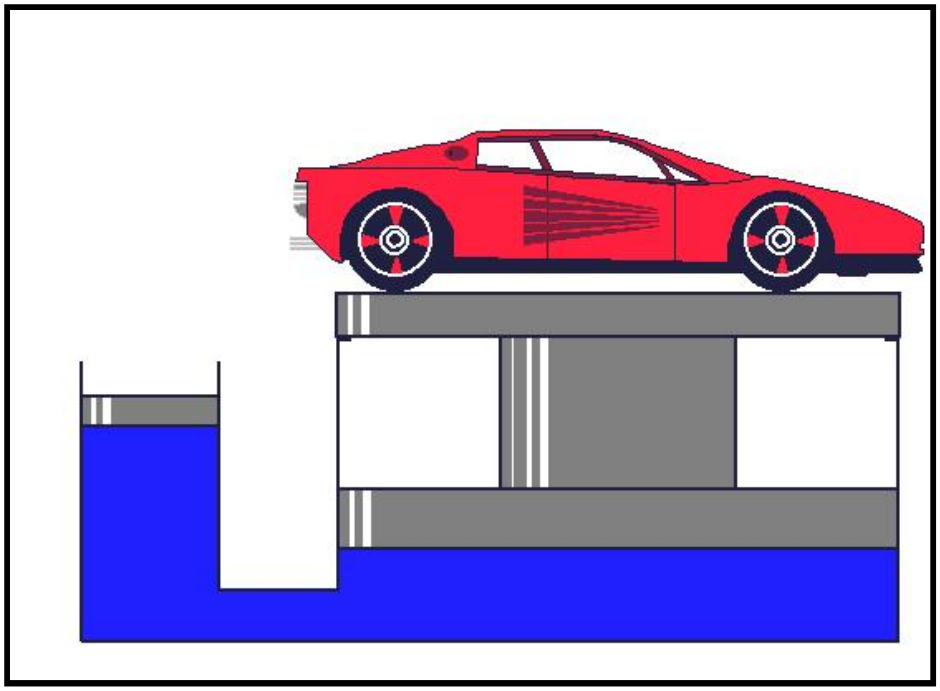
Pressure
Area
Medication



ATASA 5th Brake Systems

15. _____ can be increased or decreased in a hydraulic system by varying the _____ *(area)* of the output piston, but travel distance is sacrificed.
Bigger piston = more force, but less travel.



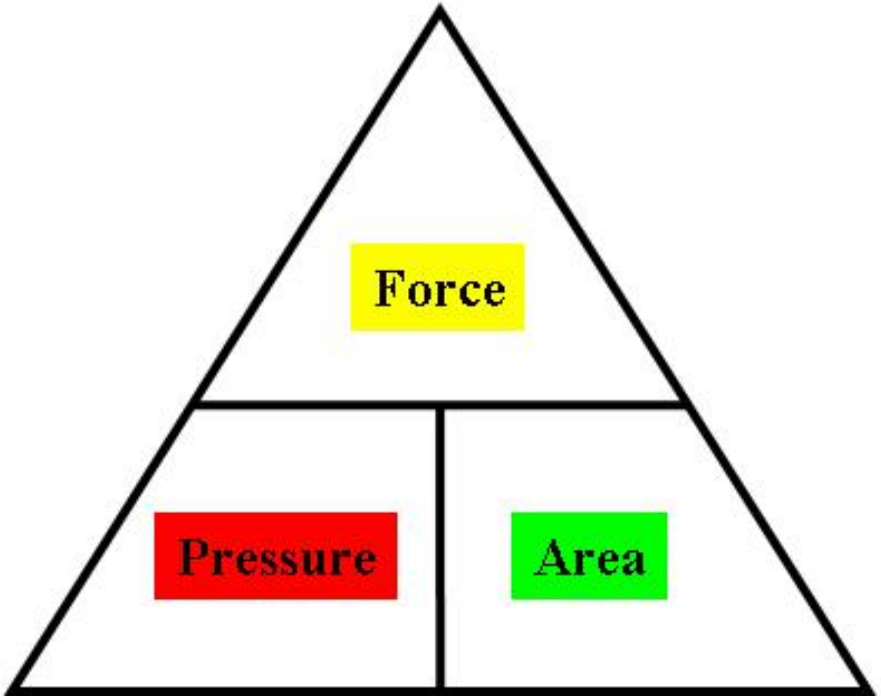


http://home.wxs.nl/~brink494/hydr.htg/pascal.gif

Force, Size
Force, Material
Traction, Volume

ATASA 5th Brake Systems

16. The amount of _____ acting on brake pads is determined by the _____ applied multiplied by the _____ of the output piston.
Pascal's Law formula is similar to Ohm's Law formula.



Pascal's Law

Force = Pressure x Area

Pressure = Force ÷ Area

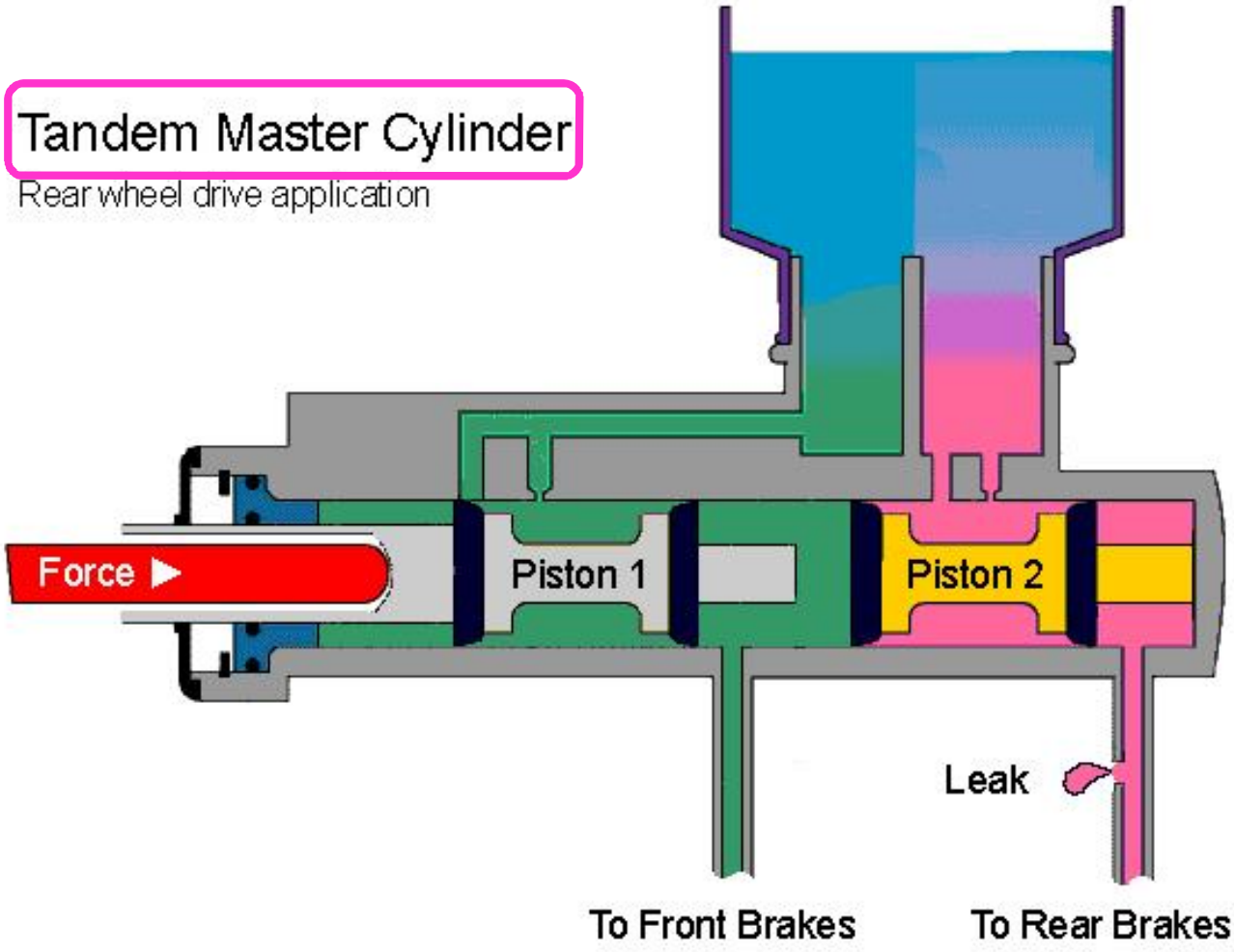
Area = Force ÷ Pressure

Force, Pressure, Area
Force, Volume, Radius
Force, Amplification, Size

ATASA 5th Brake Systems

17. Dual braking systems use _____ master cylinders and can be either _____/_____ split or *diagonally split*.

Diagonal systems maintain a higher % of braking under hydraulic failure.

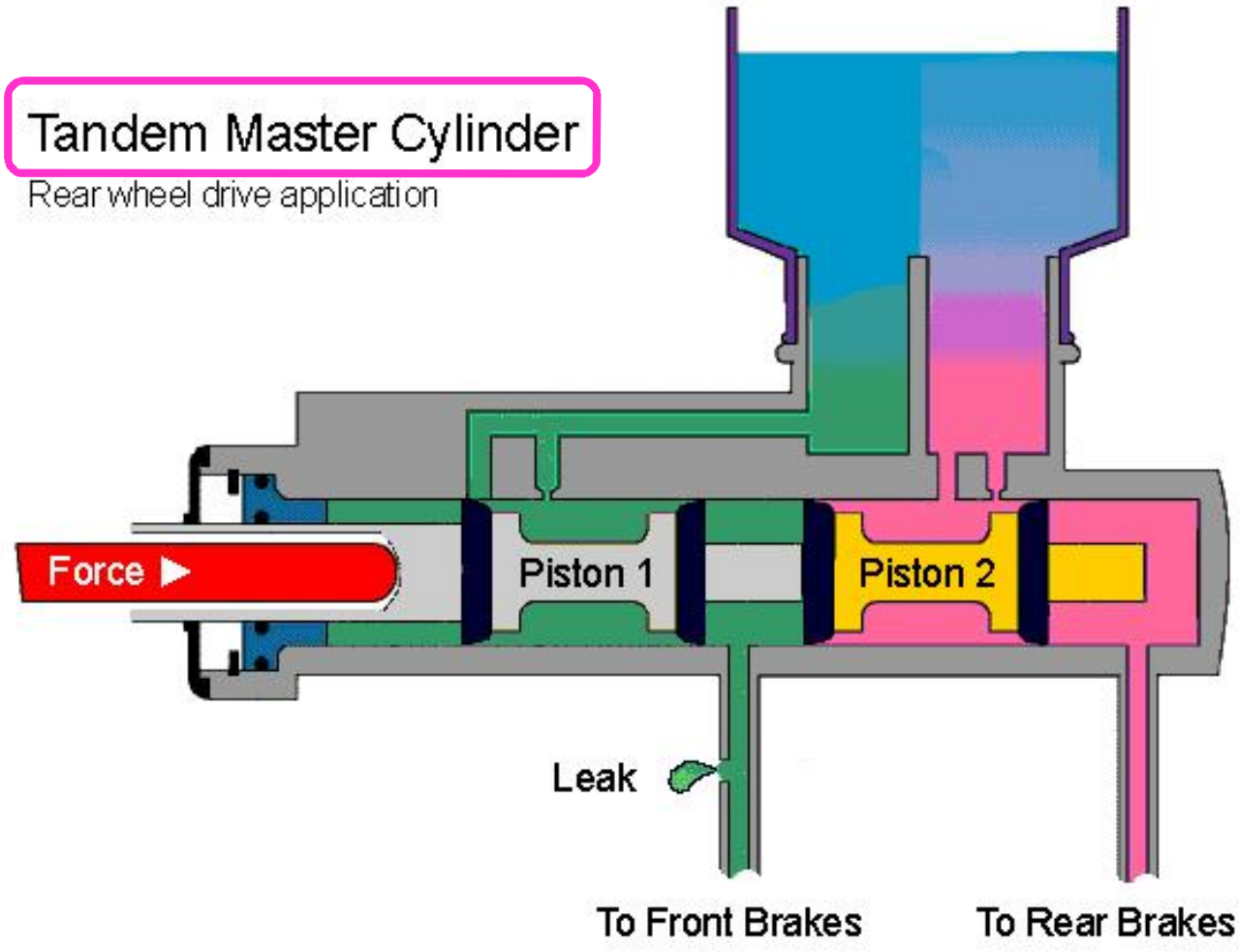


Tandem, Front/Rear
Single, Front/Rear
Dynamic, Front/Rear

ATASA 5th Brake Systems

17. Dual braking systems use _____ master cylinders and can be either _____/_____ split or *diagonally split*.

Diagonal systems maintain a higher % of braking under hydraulic failure.



Tandem, Front/Rear
Single, Front/Rear
Dynamic, Front/Rear

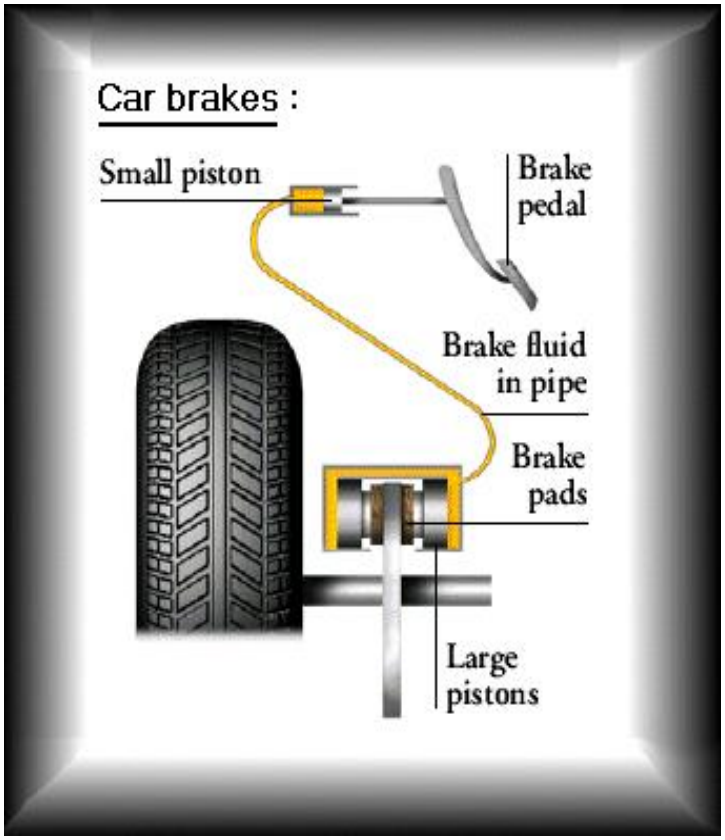
ATASA 5th Brake Systems

Brake Fluid Pressure Gauges

Brake Pad Pressure Gauge

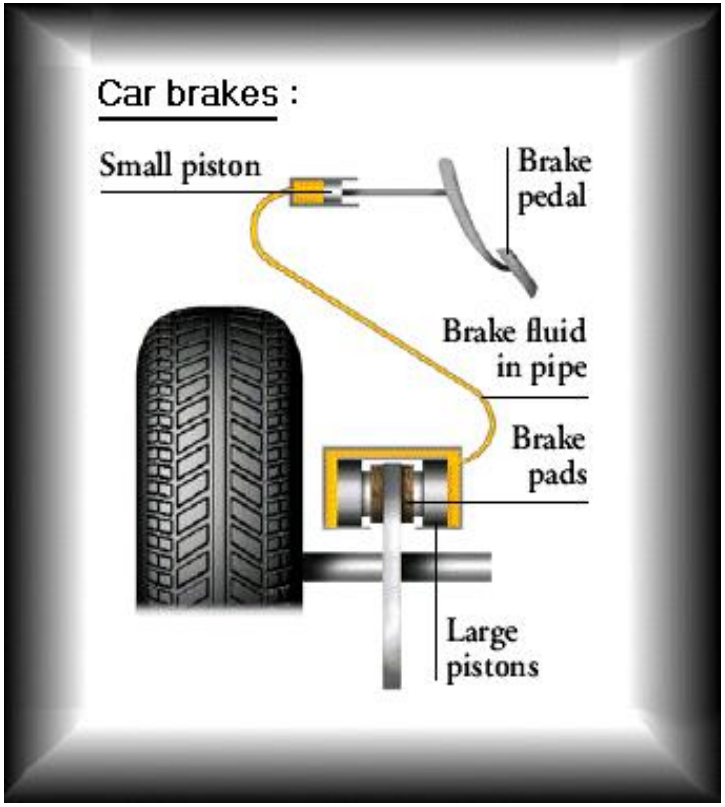
ATASA 5th Brake Systems

18. ***Brake fluid*** **is not _____ based! It must flow freely *(same viscosity)* at extremely high & very low temperatures *(500° to -100°)*. It serves as a _____ & must be compatible with many materials. It must fight _____ & rust. Brake fluid is _____, making it a *desiccant* material, which means it readily absorbs moisture or water from the air.** ***Brake fluid is rated by SAE & <u>DOT #3 or #4 or #5.</u>***
DOT-5 brake fluid is a silicone-based fluid.

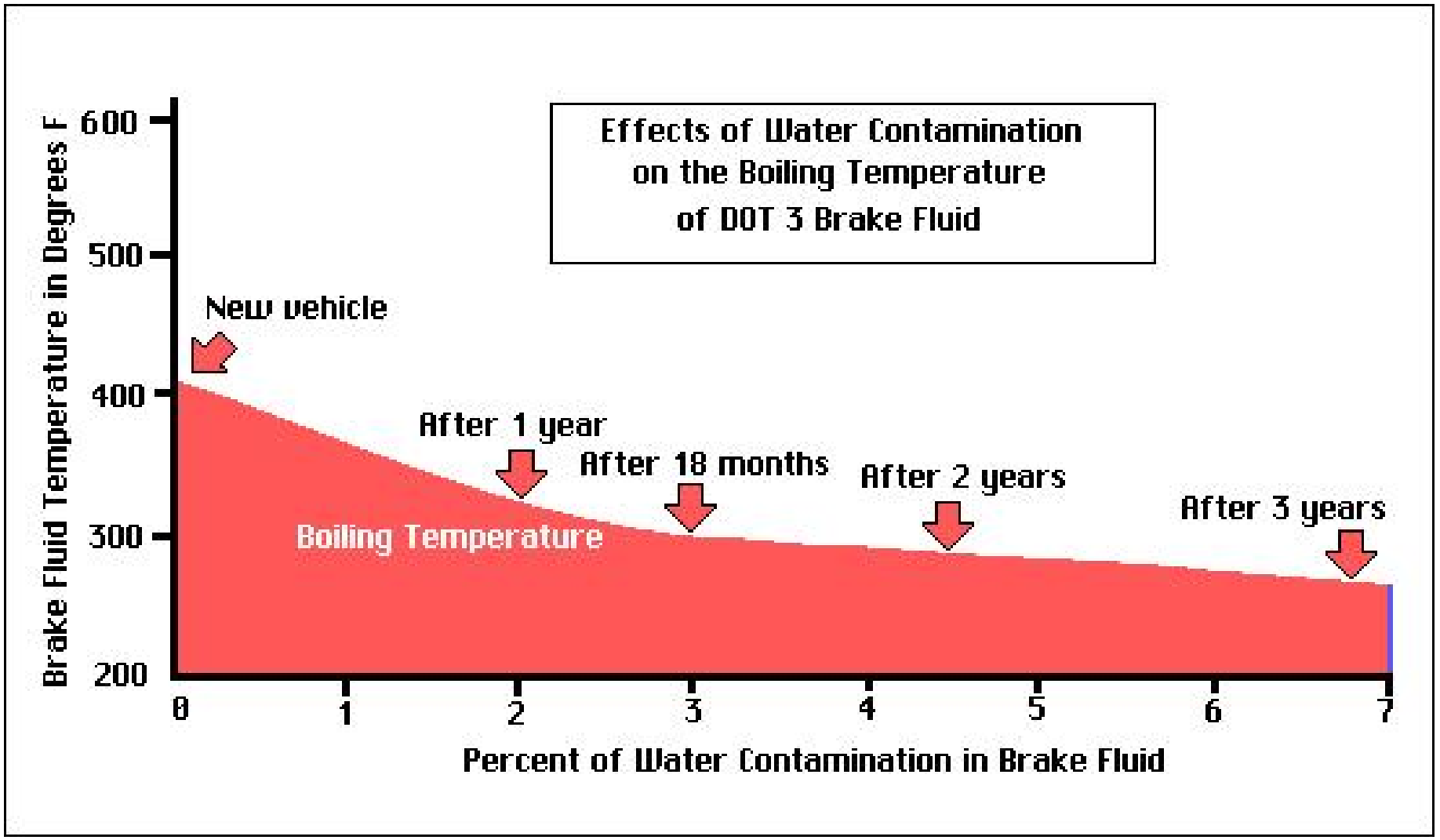


ATASA 5th Brake Systems

18. ***Brake fluid*** **is not PETROLEUM based! It must flow freely *(same viscosity)* at extremely high & very low temperatures *(500° to -100°)*. It serves as a LUBRICANT & must be compatible with many materials. It must fight CORROSION & rust. Brake fluid is HYGROSCOPIC, making it a *desiccant* material, which means it readily absorbs moisture or water from the air.** ***Brake fluid is rated by SAE & DOT #3 or #4 or #5.***
DOT-5 brake fluid is a silicone-based fluid.



ATASA 5th Brake Systems



ATASA 5th Brake Systems

19. There is a *brake fluid flush service interval* because of _____ & copper contamination.

Boiling Point	DOT 3	DOT 4	DOT 5 (silicone-based)	DOT 5.1 (non-silicone based)
Dry	401°F	446°F	500°F	500°F
Wet	284°F	311°F	365°F	365°F

Moisture
Asbestos
Lead

ATASA 5th Brake Systems

BrakeStrip uses FASCAR® copper testing technology (the only standard for brake fluid testing), as created by Phoenix Systems.

Independent studies have revealed that copper testing is 35 times more effective than moisture testing.

To test, you dip one end of the BrakeStrip in the suspect fluid for one second. Then shake off the excess.

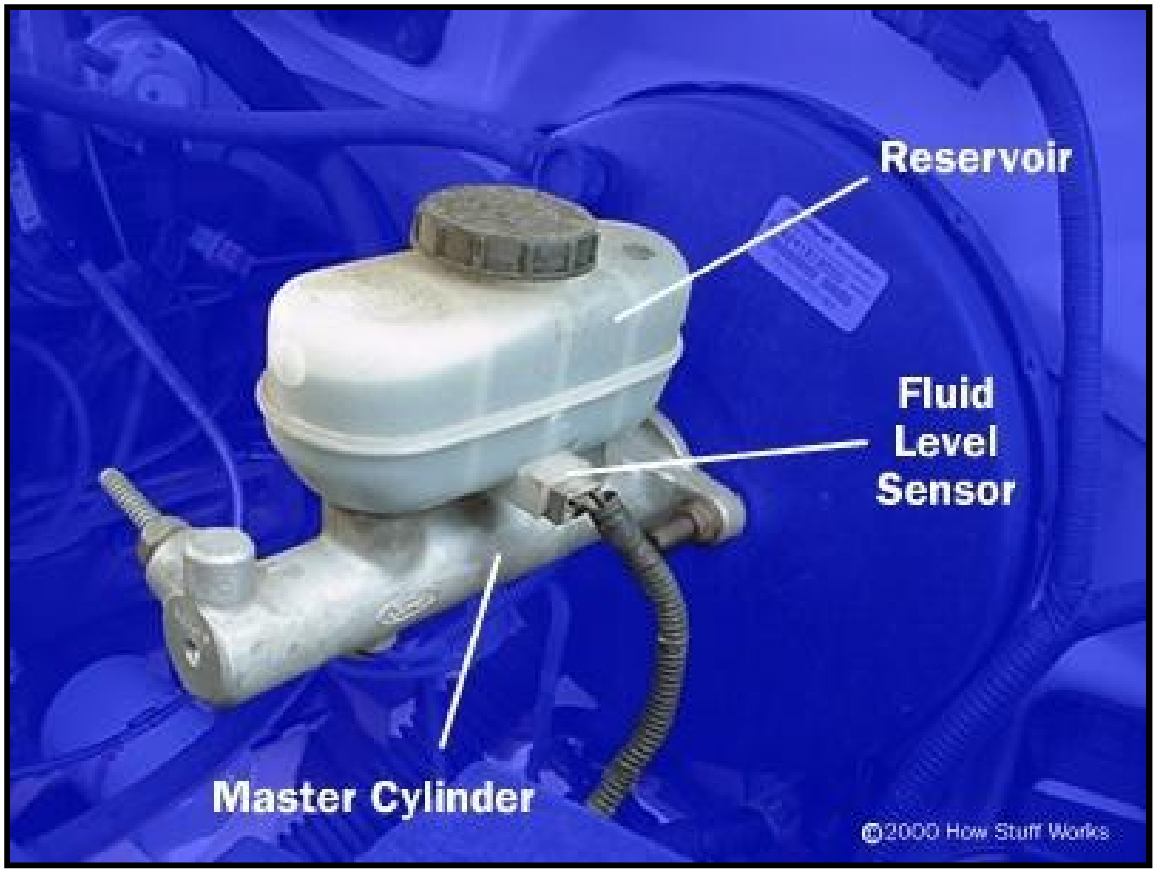
Wait one minute for the reaction to complete. To determine the FASCAR rating, compare the color of the strip with the variegated examples on the packaging tube.

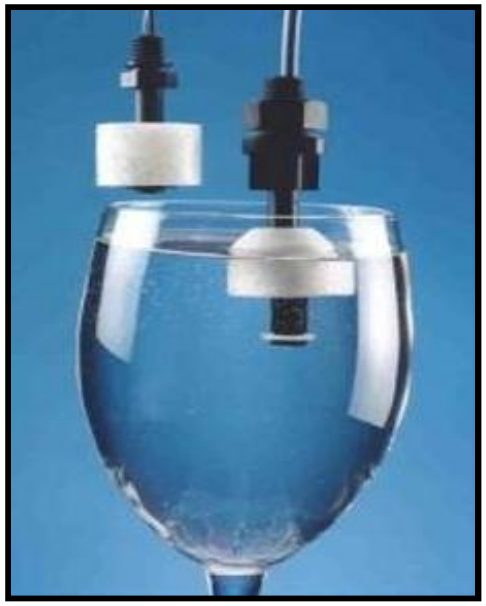
As preventive maintenance, Phoenix Systems recommend flushing the system and replacing the fluid when the color (purple) closely matches the 100ppm (parts per million) level.

The MAP (Motorist Assurance Program, an independent body that sets standards for the automotive industry) criterion requires fluid replacement when it tests at 200ppm.

ATASA 5th Brake Systems

20. Many vehicles have brake fluid _____ sensors located on or in the master cylinder.

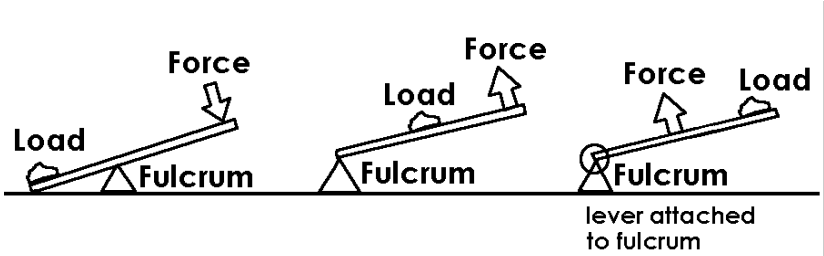


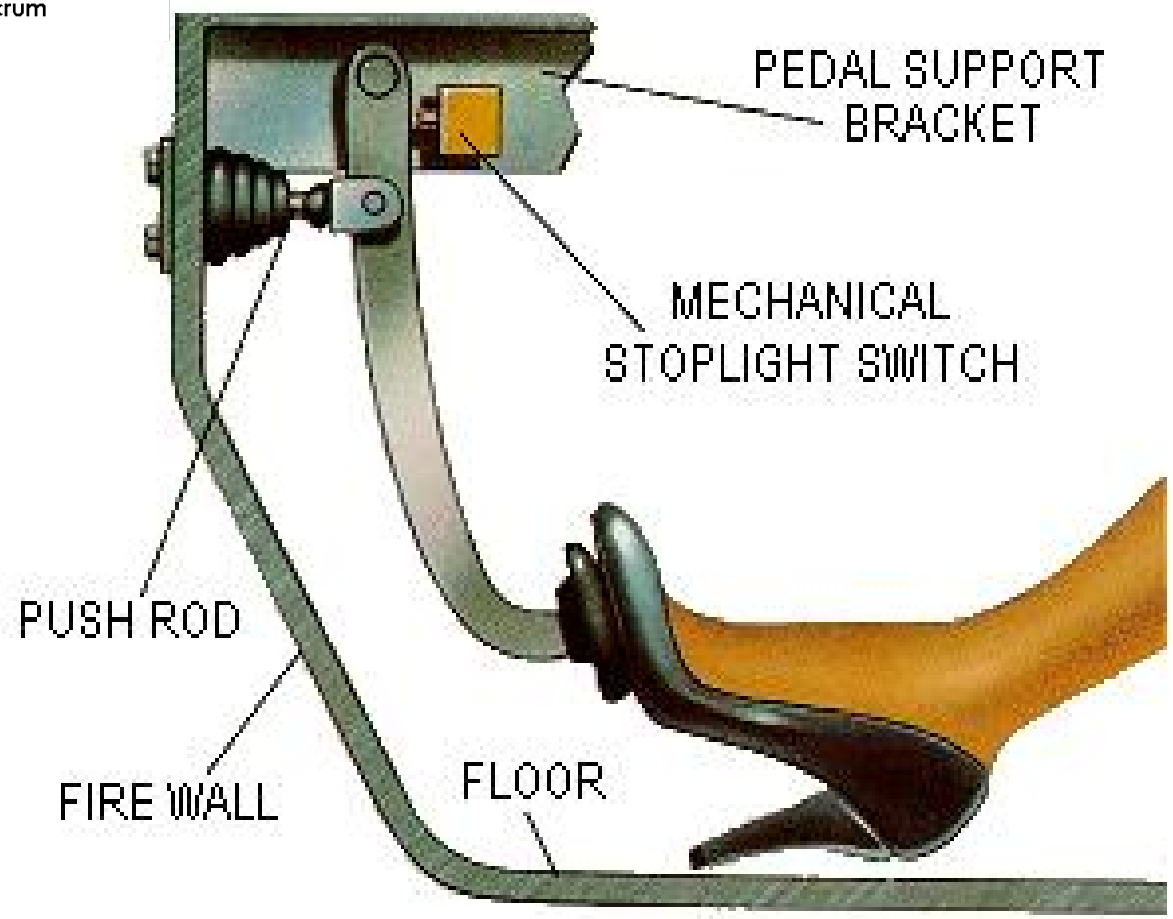


Pedal
Volume
Level

ATASA 5th Brake Systems

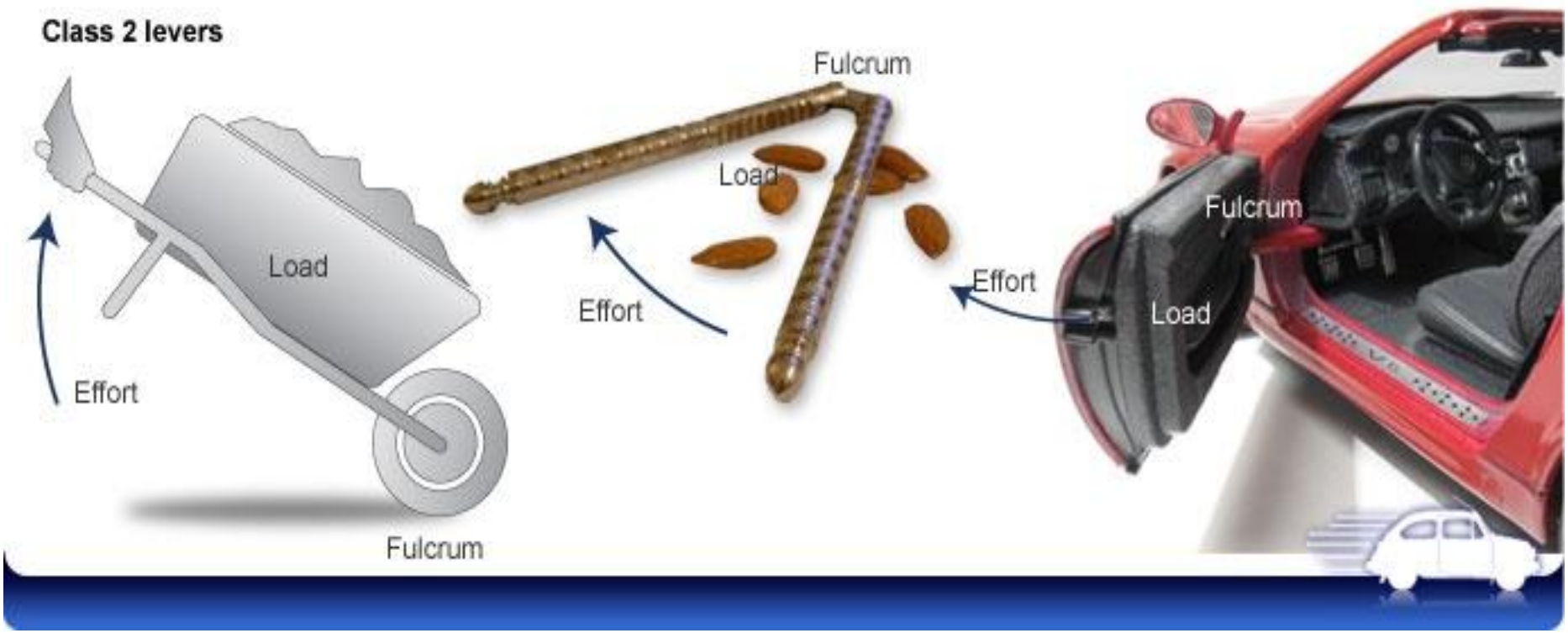
21. The brake _____ is a lever w/mechanical advantage to increase the force applied by the driver.





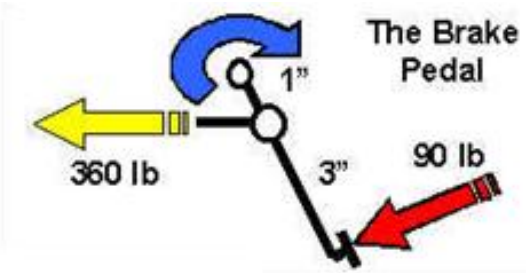
Pedal
Master
Slave

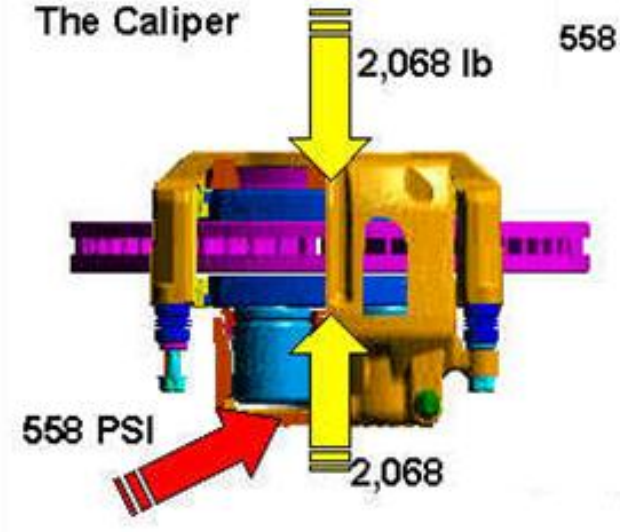
ATASA 5th Brake Systems



ATASA 5th Brake Systems

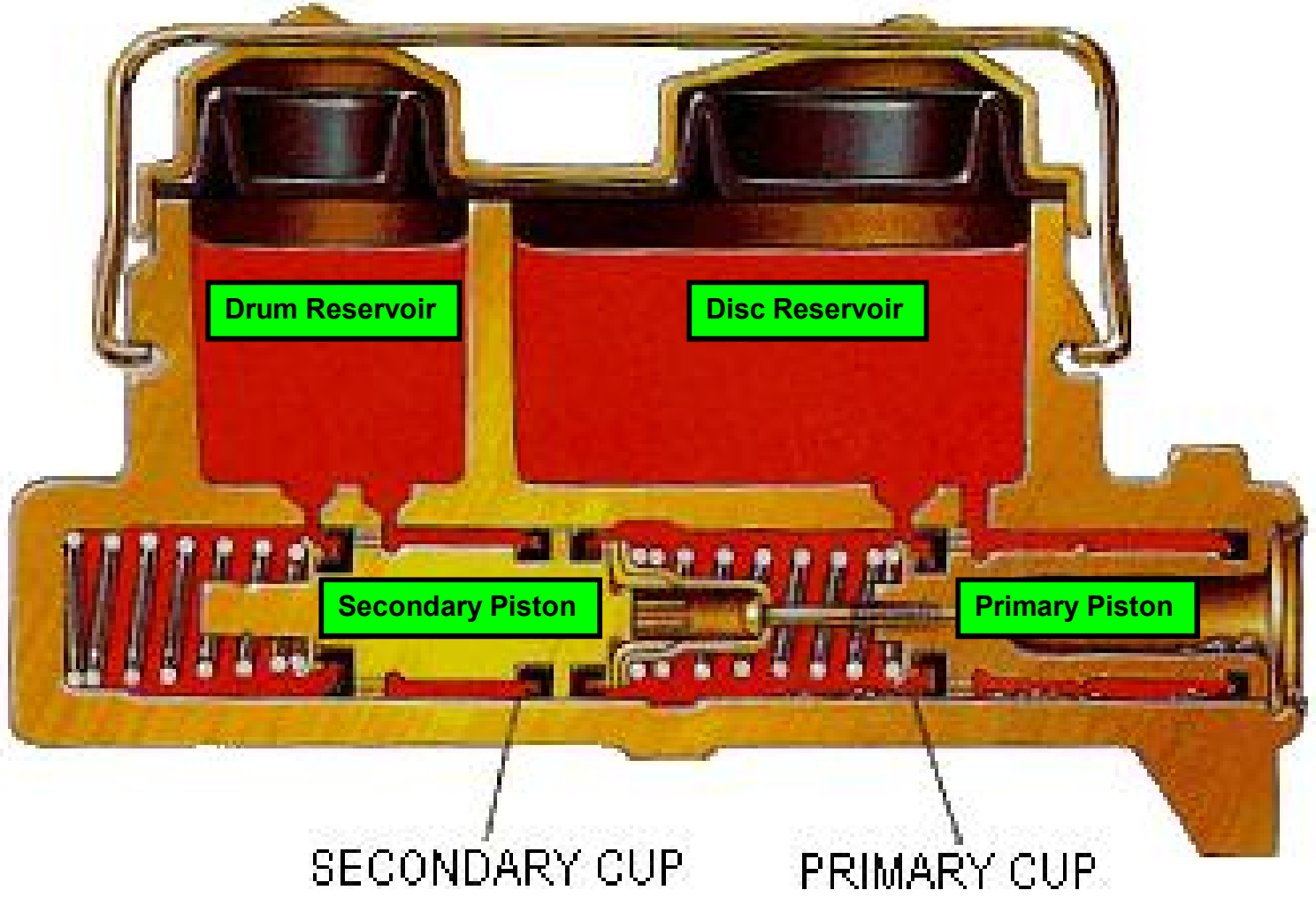
22. The _____ _____ converts the mechanical force of the driver's foot to hydraulic pressure. ***Rubber cups inside prevent fluid leaks out of and air leaks into the cylinder.***





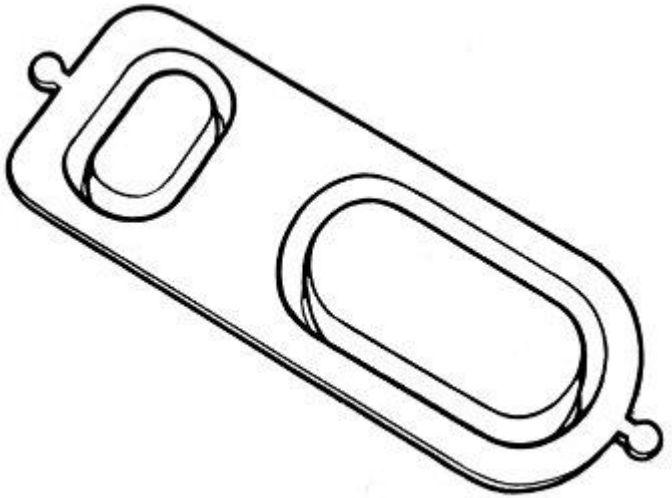
Master Cylinder
Slave Cylinder
Wheel Cylinder

23. Master cylinders have internal _____ springs, primary & secondary pistons with primary *(fluid sealing)* cups & secondary *(air sealing)* cups.
The primary piston is nearest the pedal push rod.



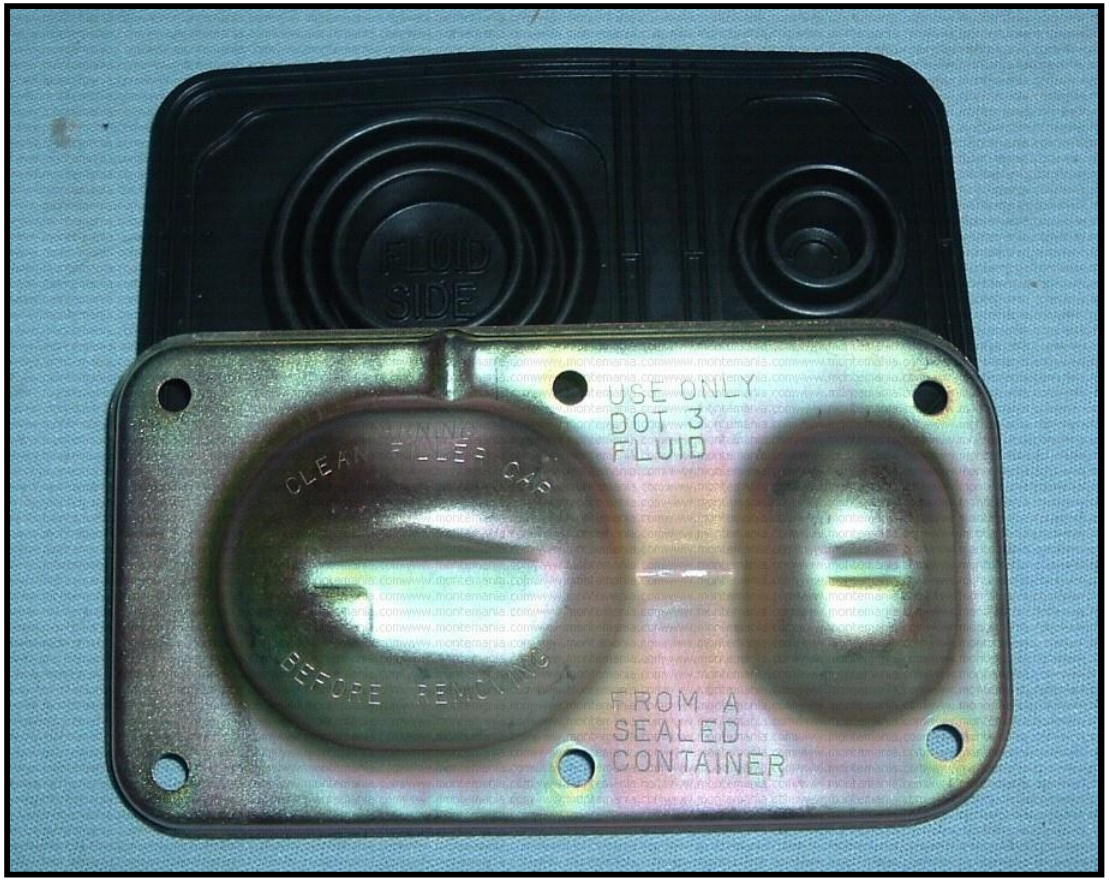
Reclaiming
Return
Reject

24. The rubber diaphragm in the _____ cover keeps the fluid air tight while allowing it to change levels without creating a vacuum or a pressure inside the reservoir.

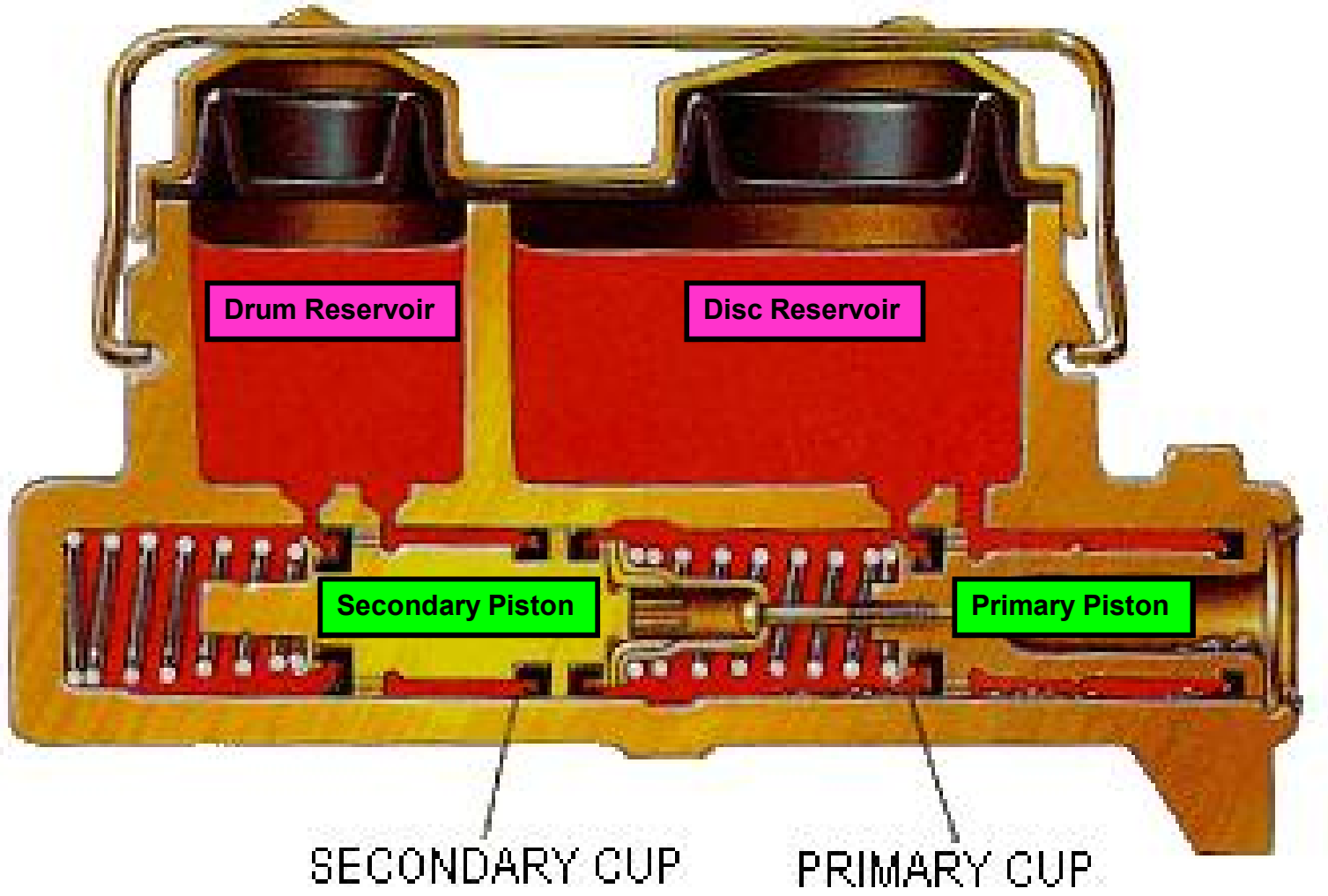


Reservoir
Clutch
Restrictor

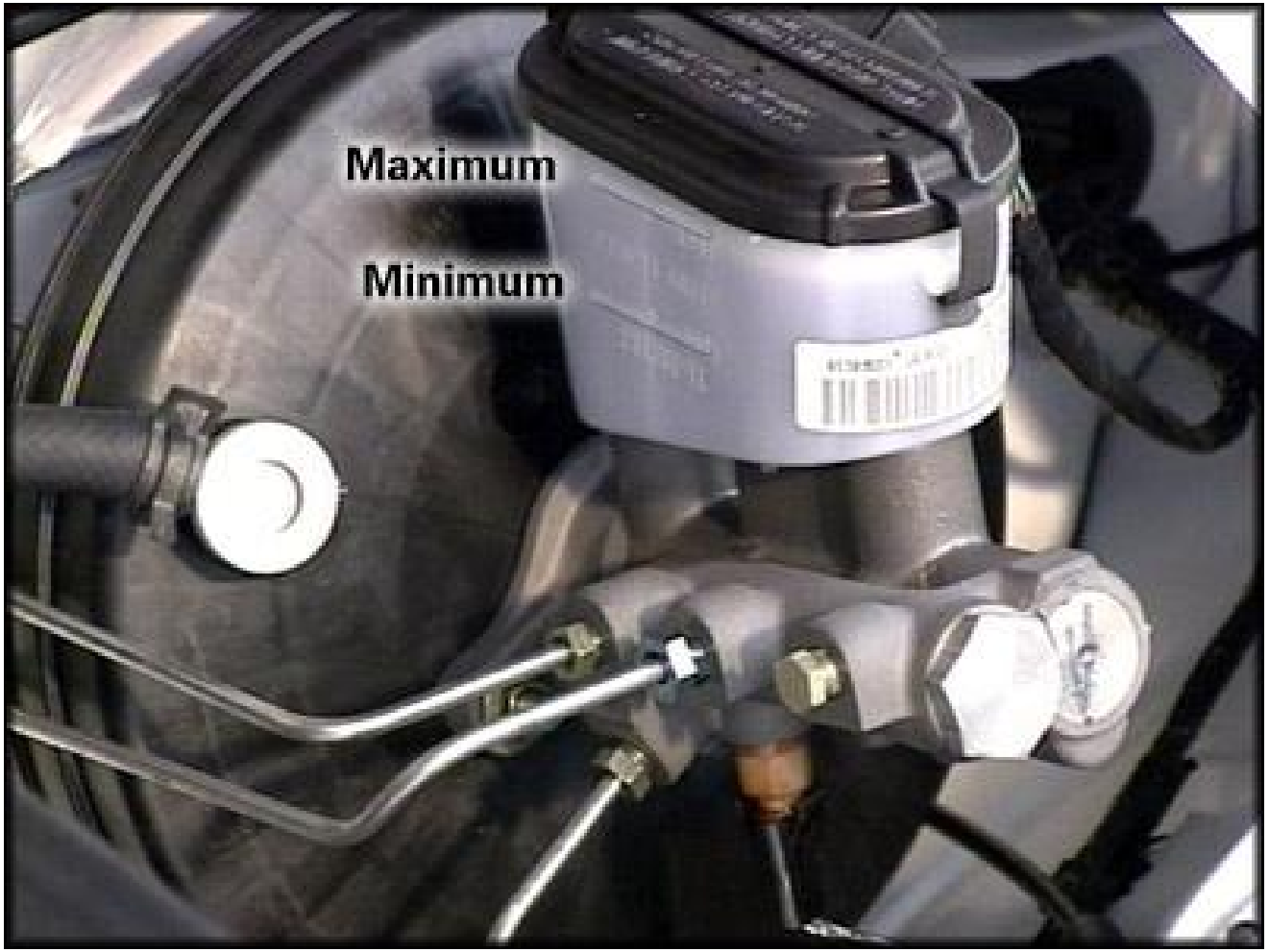
ATASA 5th Brake Systems



25. The _____ brake fluid reservoir is typically larger than the _____ brake fluid reservoir.



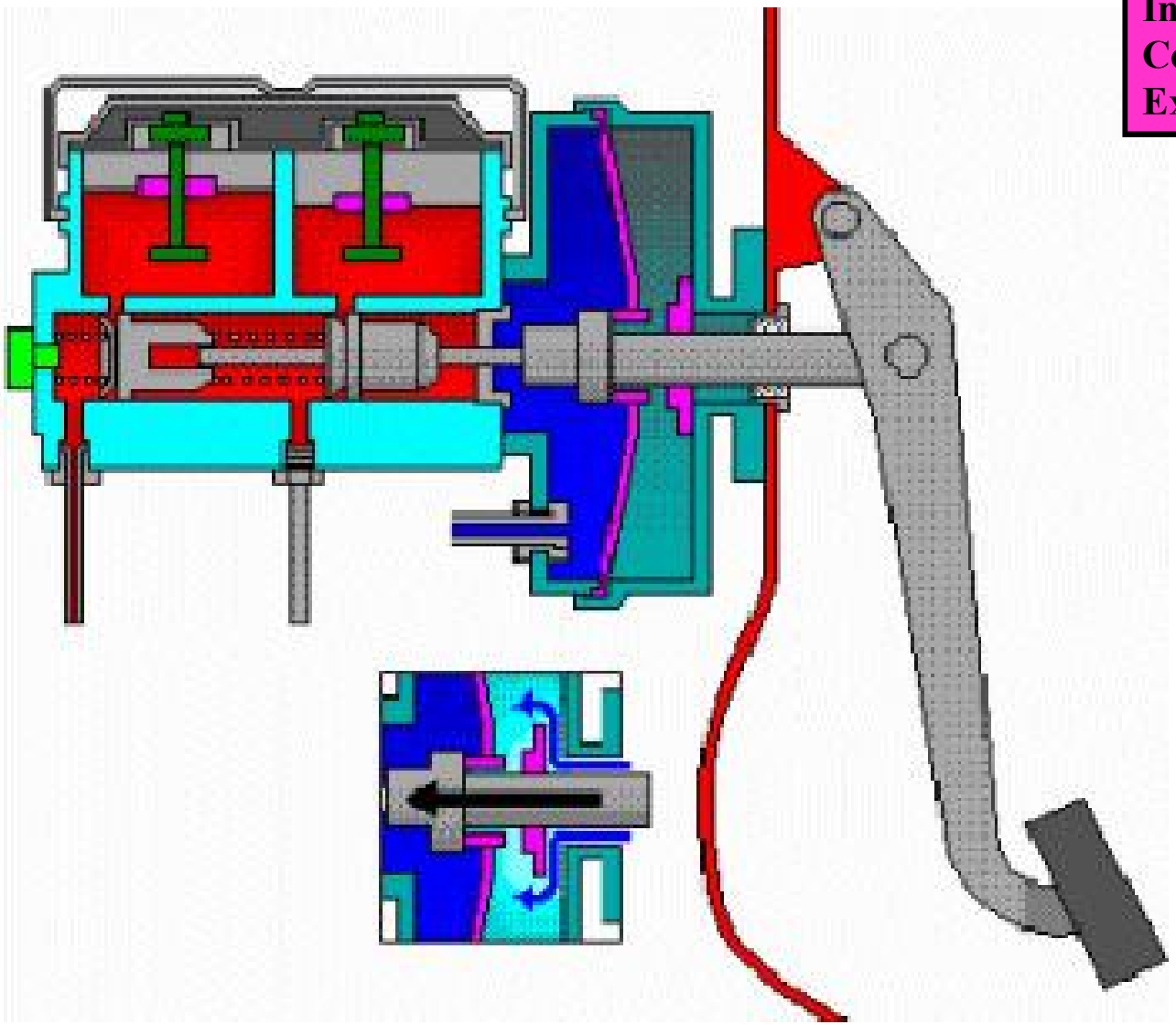
ATASA 5th Brake Systems



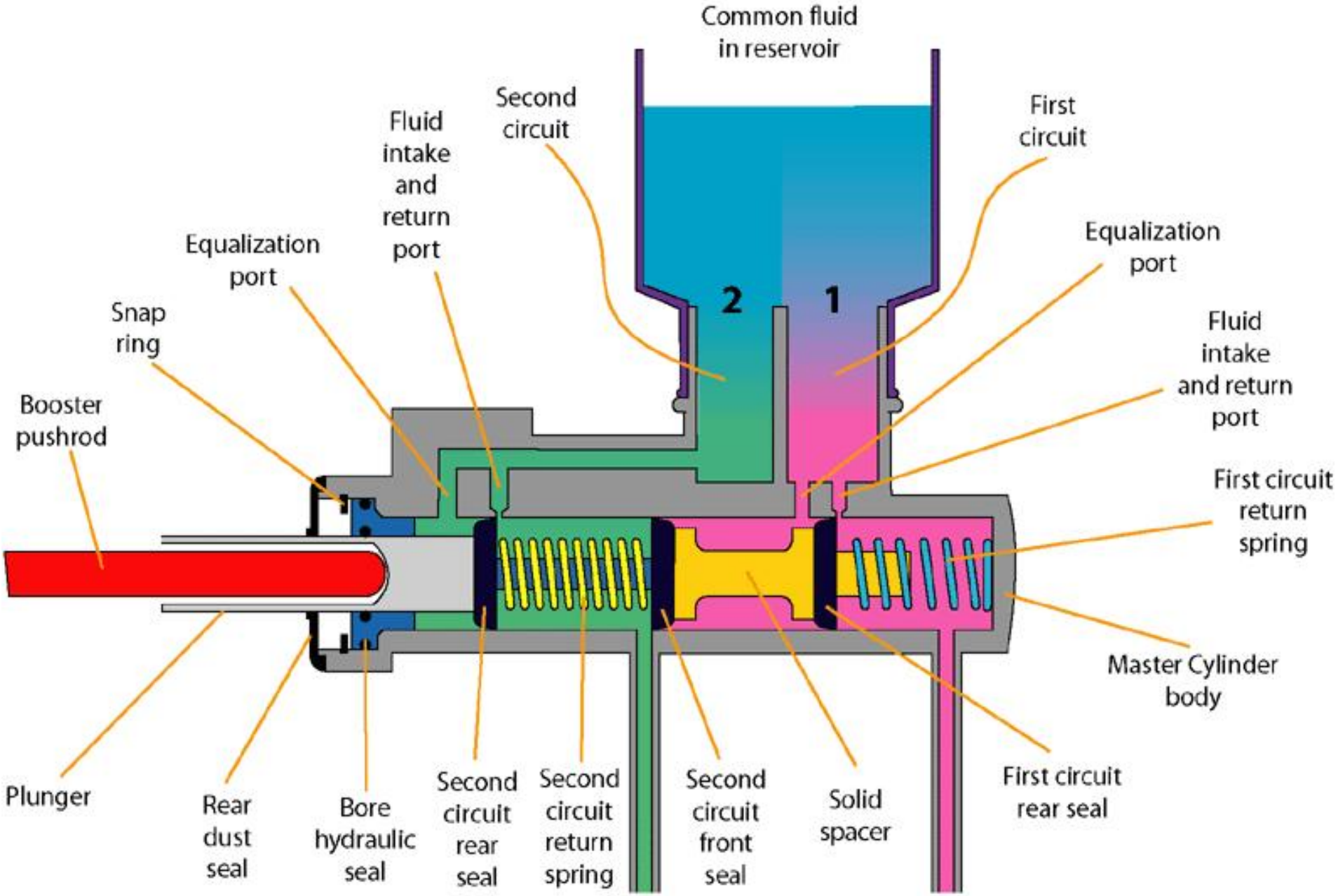
ATASA 5th Brake Systems

26. When the brakes are released, *fluid returns to the reservoir* through _____ ports.

Intake (return)
Compensating or Replenishing
Exhaust

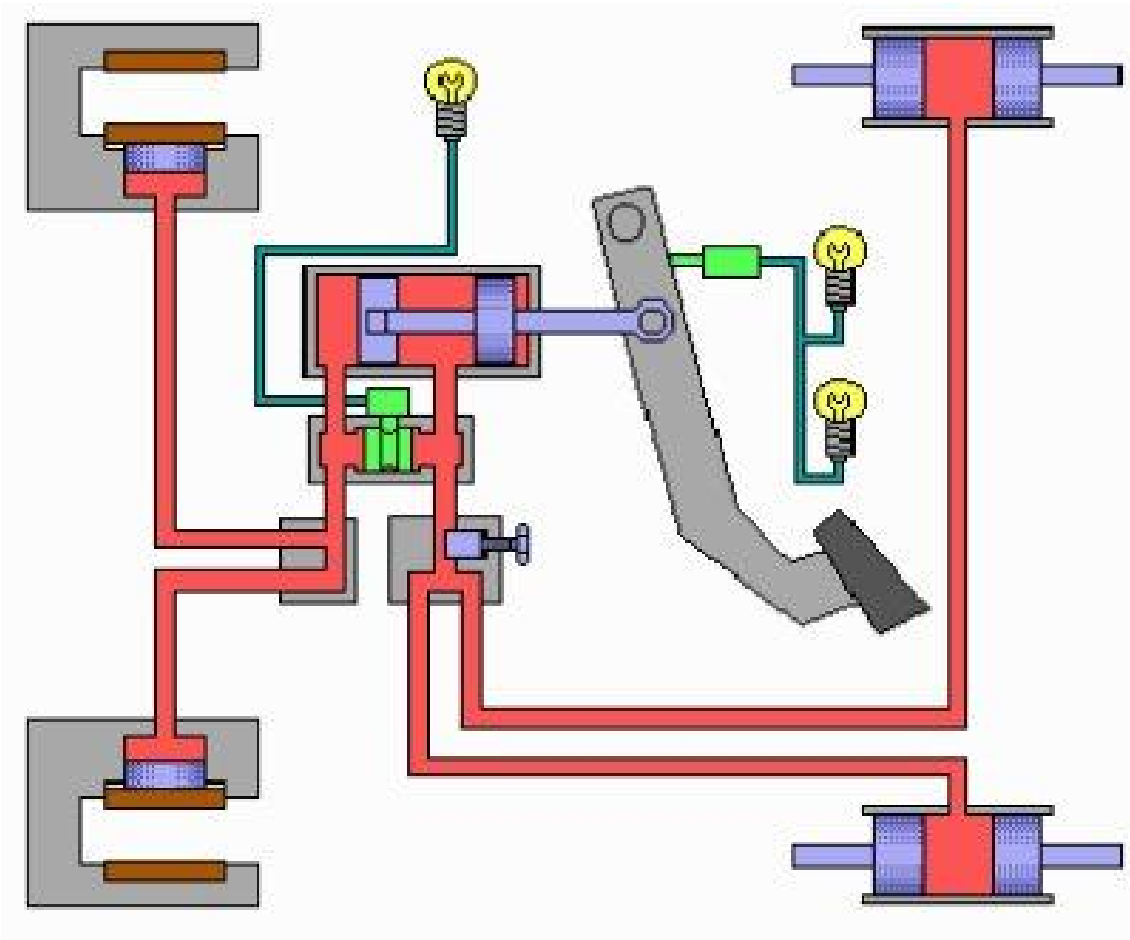


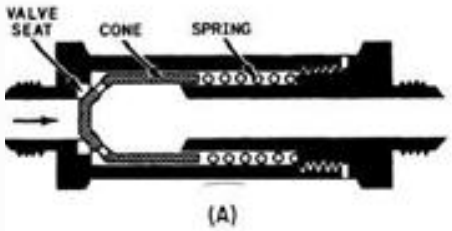
ATASA 5th Brake Systems

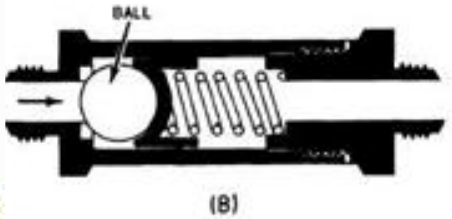


ATASA 5th Brake Systems

27. Master cylinder <u>outlet ports for drum brakes</u> have a _____ pressure check valve used to maintain a static pressure *(6-25 psi)* in the system at all times preventing air leaks inward & fluid leaks outward past the wheel cylinder cups. *These valves can be eliminated with cup expanders.*







Residual
Release
Retraction

ATASA 5th Brake Systems

28. _____-_____-__ *(fast-fill)* master cylinders move a larger volume of fluid to the front disc brakes to <u>quick take up</u> the distance between the pads & rotors on vehicles fit with low drag calipers.

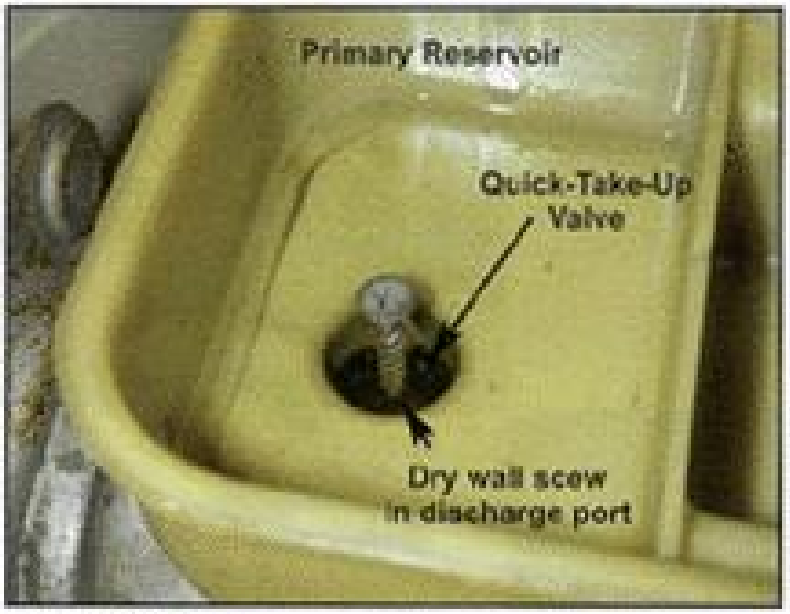
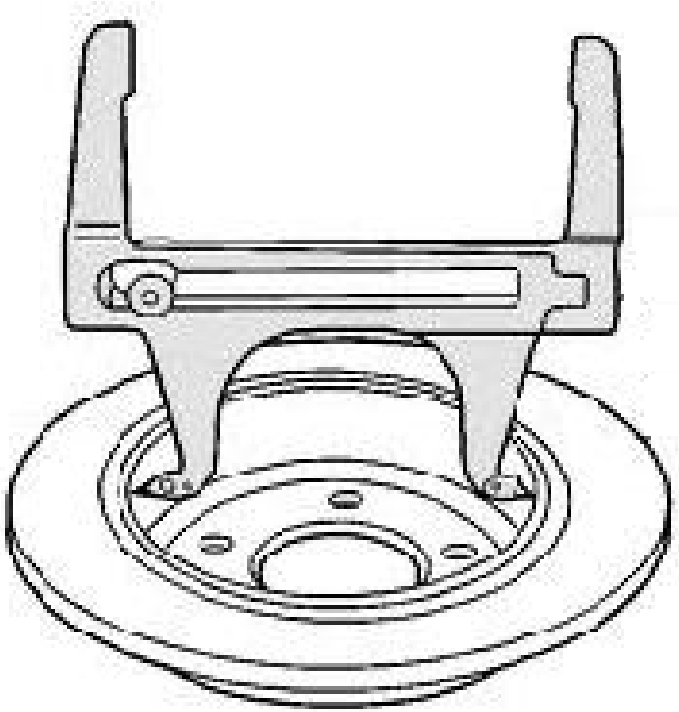


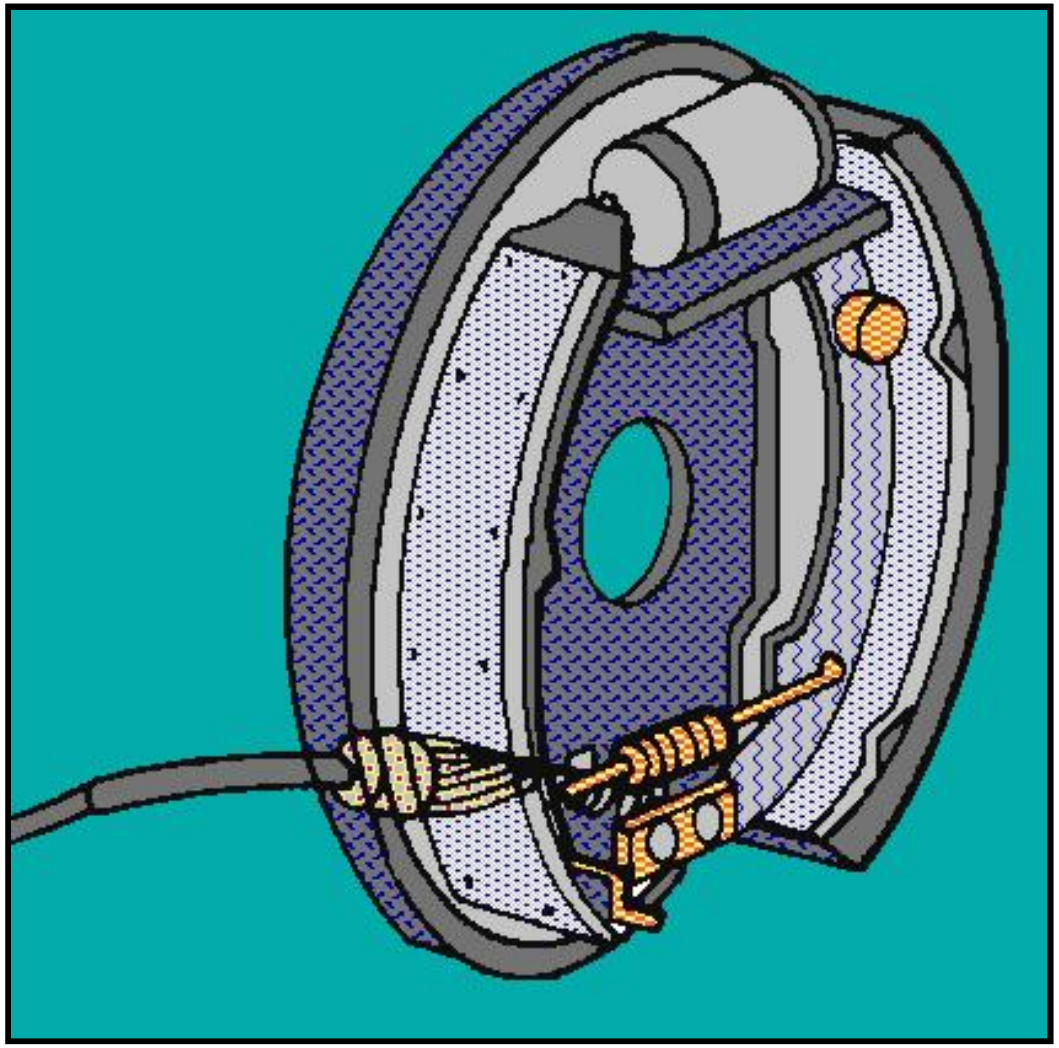
Figure 15

Slow-take-up
Quick-take-up
Fast-break-up

ATASA 5th Brake Systems

29. Note: Low brake pedal can be caused by excessive _____-to-_____ clearance or _____ in the system. ***Although the typical customer complaint associated with air in the hydraulic system is spongy pedal feel.***



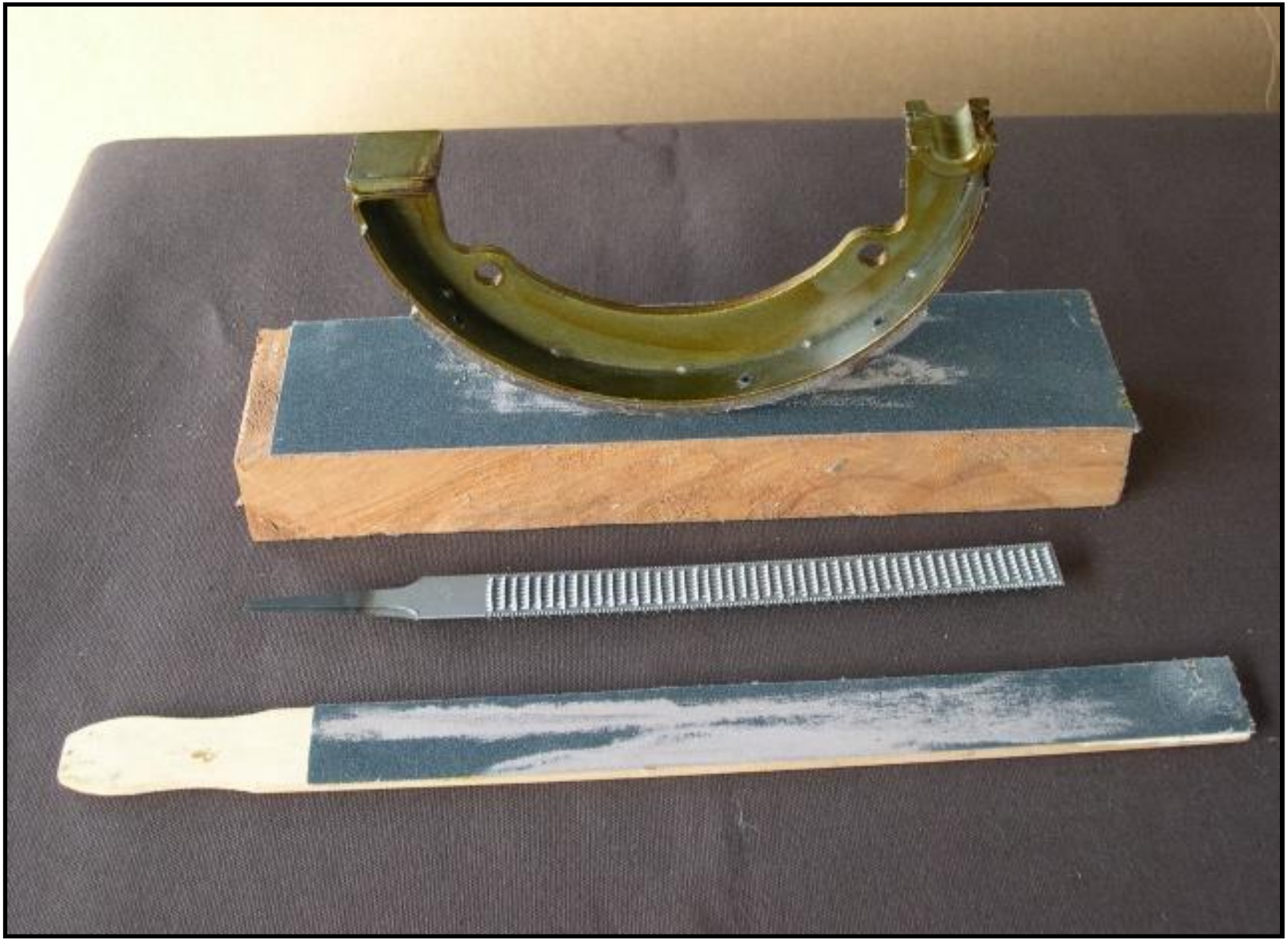


Shoe-to-Drum, Air
Pad-to-Rotor, Air
Foot-to-Pedal, AIr

ATASA 5th Brake Systems

Shoes are now arc-ground during production to fit .030” oversized drums.

ATASA 5th Brake Systems

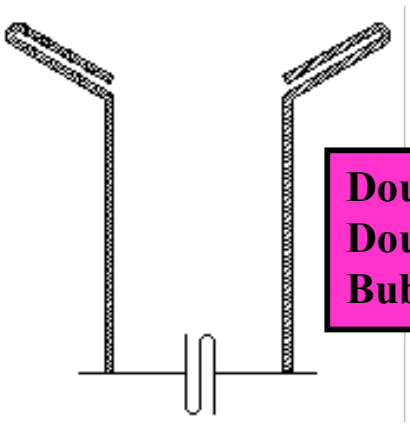


30. Rigid brake lines are made of *copper-fused*, _____-wall, *steel tubing* with a *tin-plated exterior*.

Single
Quadruple
Double

ATASA 5th Brake Systems

31. Steel lines use fittings with either 37° inverted _____ flares or ISO metric _____ flares.



Double, Bubble
Double, Trouble
Bubble, Bath

ATASA 5th Brake Systems

ATASA 5th Brake Systems

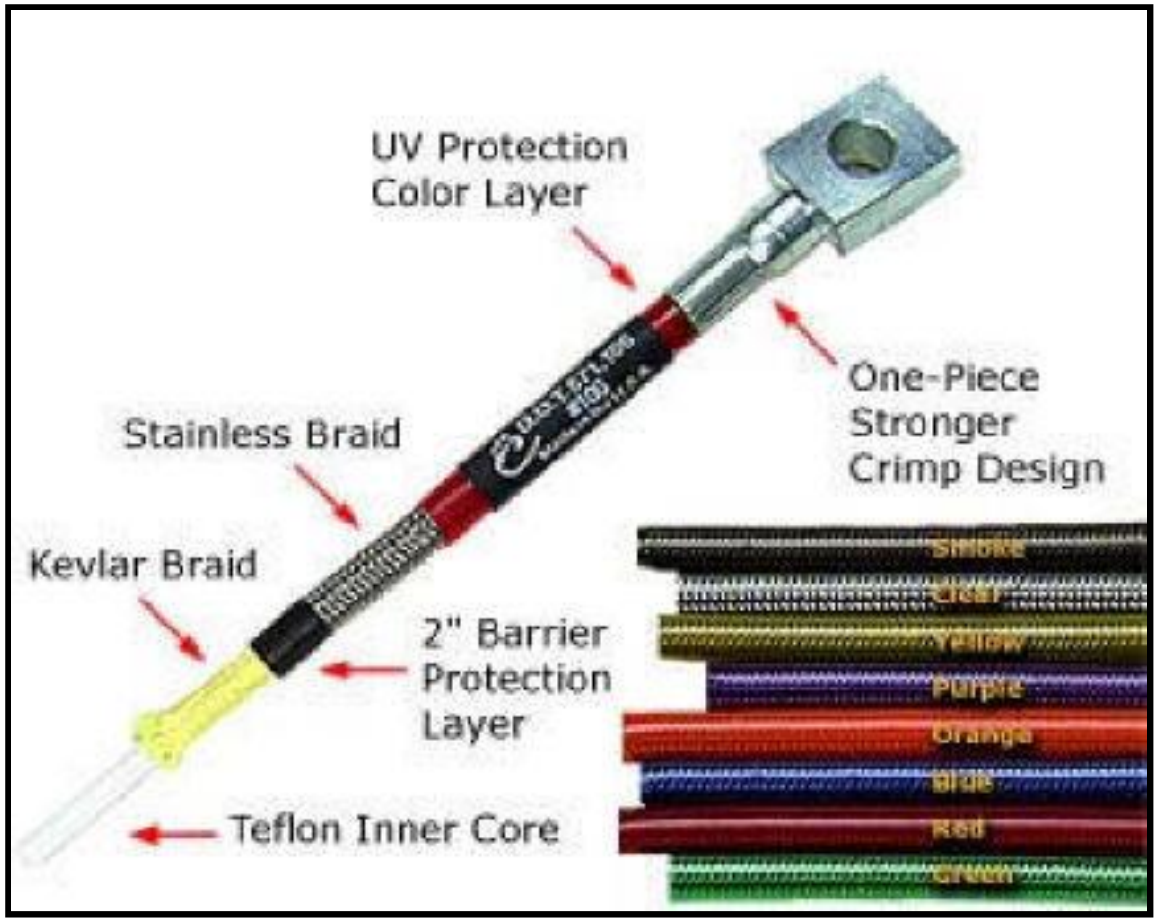
Don't use Compression Fittings on Brake Lines

ATASA 5th Brake Systems

Compression Fittings are Unacceptable for Brake Line Repair

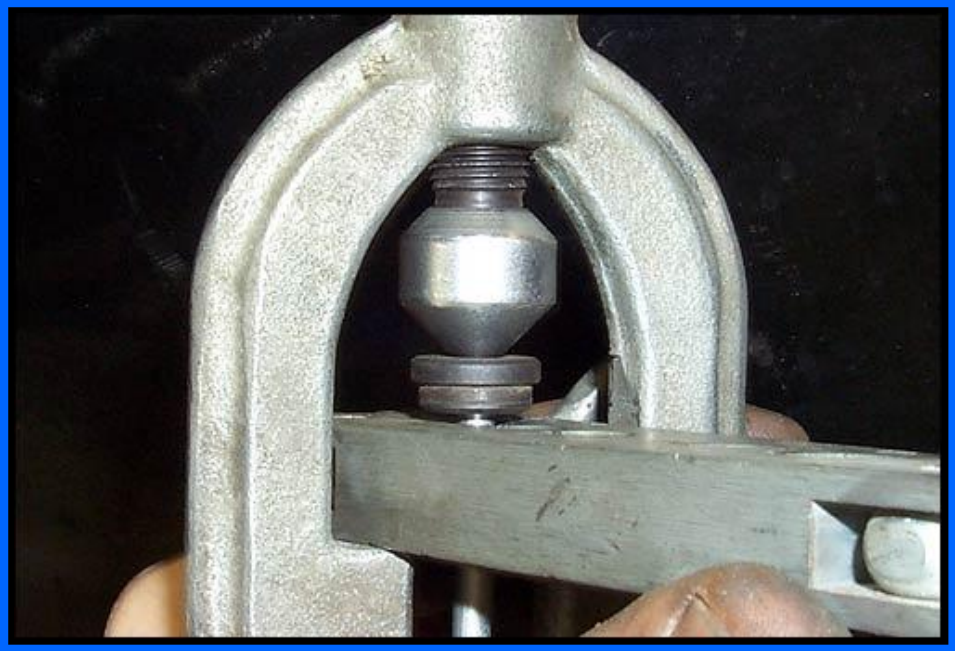
Use for Compression Fittings for Auto Trans Cooler Lines

ATASA 5th Brake Systems



Brake Hose Banjo Bolts
NOTE: 2 Washers Needed!

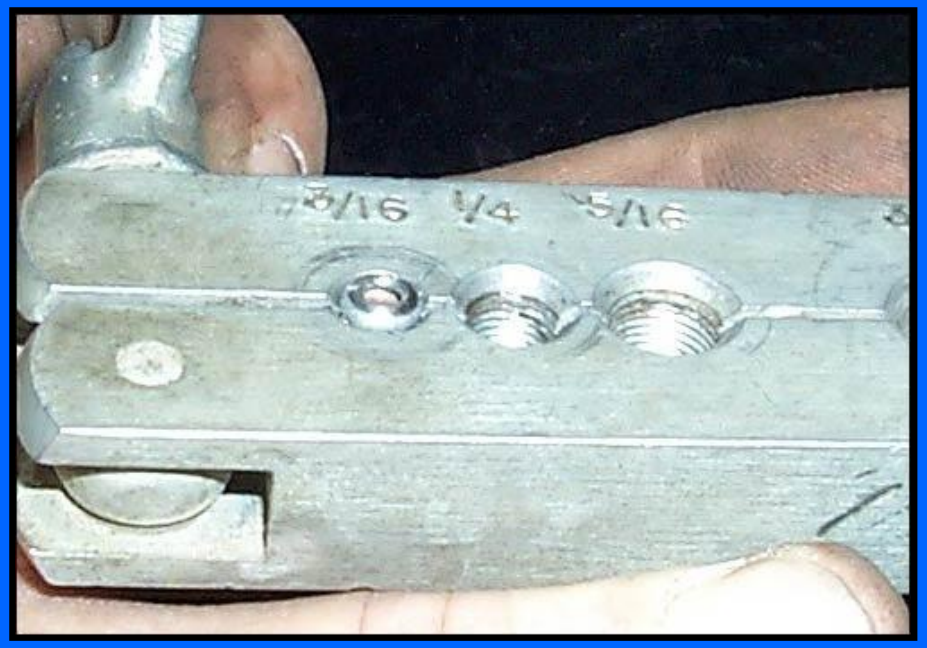
ATASA 5th Brake Systems



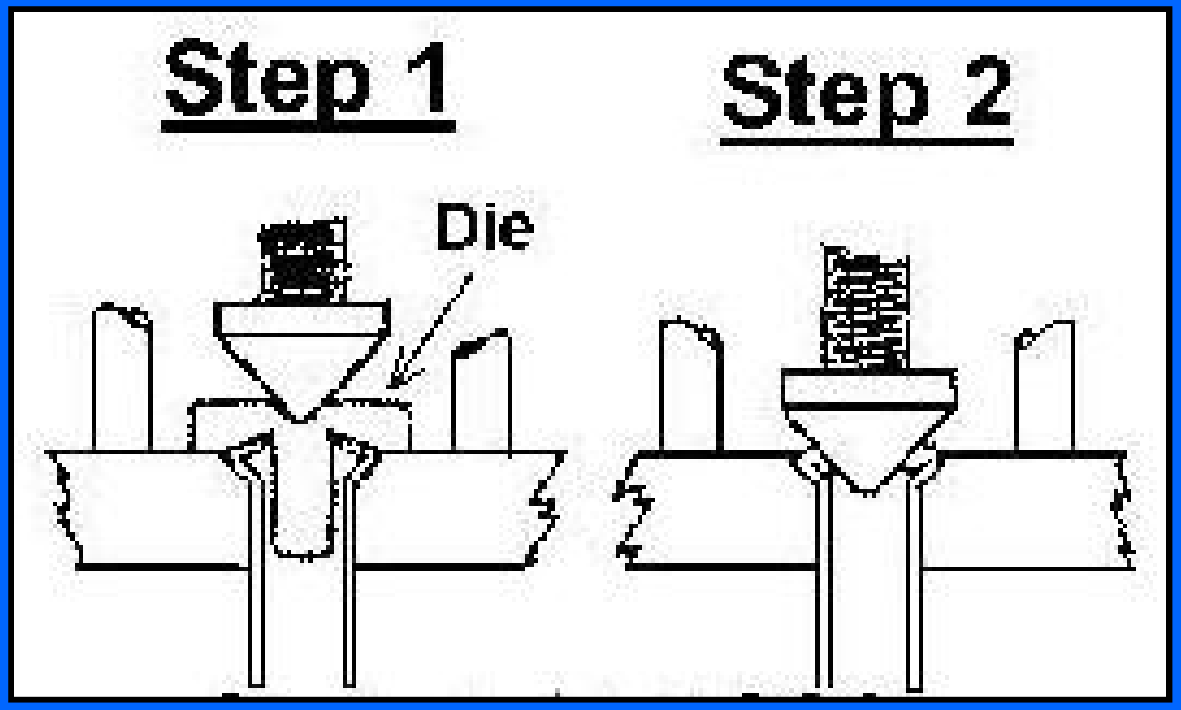
ATASA 5th Brake Systems

Double Flare On Brake Tubing

ATASA 5th Brake Systems

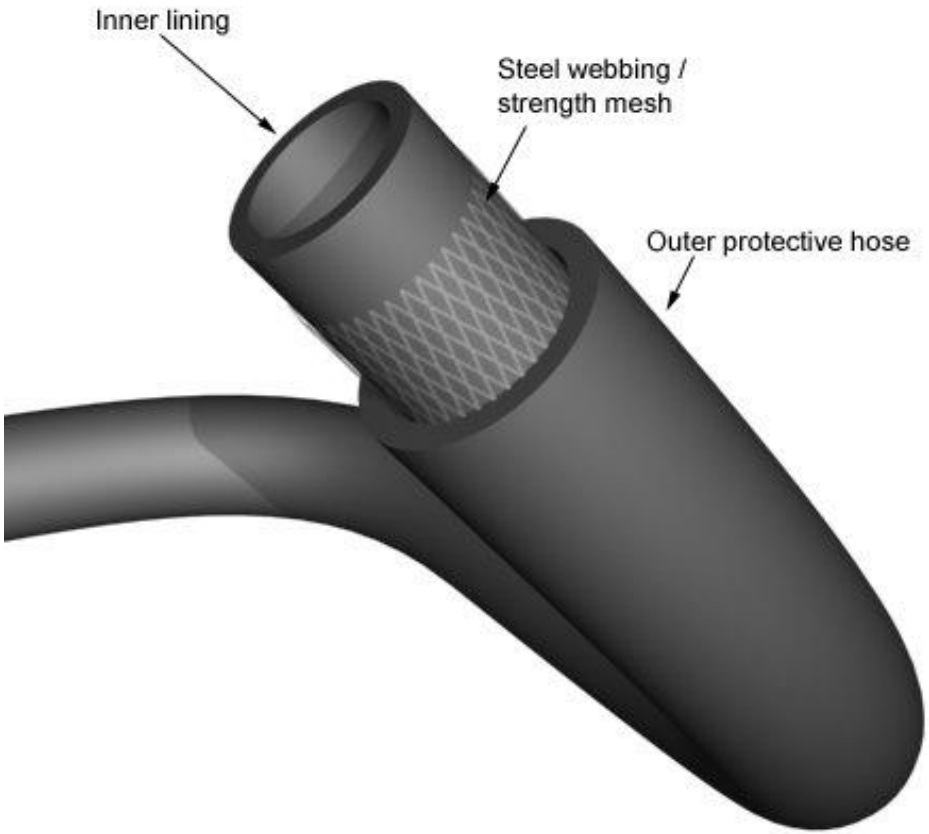


ATASA 5th Brake Systems



ATASA 5th Brake Systems

32. Brake hoses consist of multiple layers of fabric impregnated with _____ rubber.



Neoprene
Synthetic
Nickel & Dime

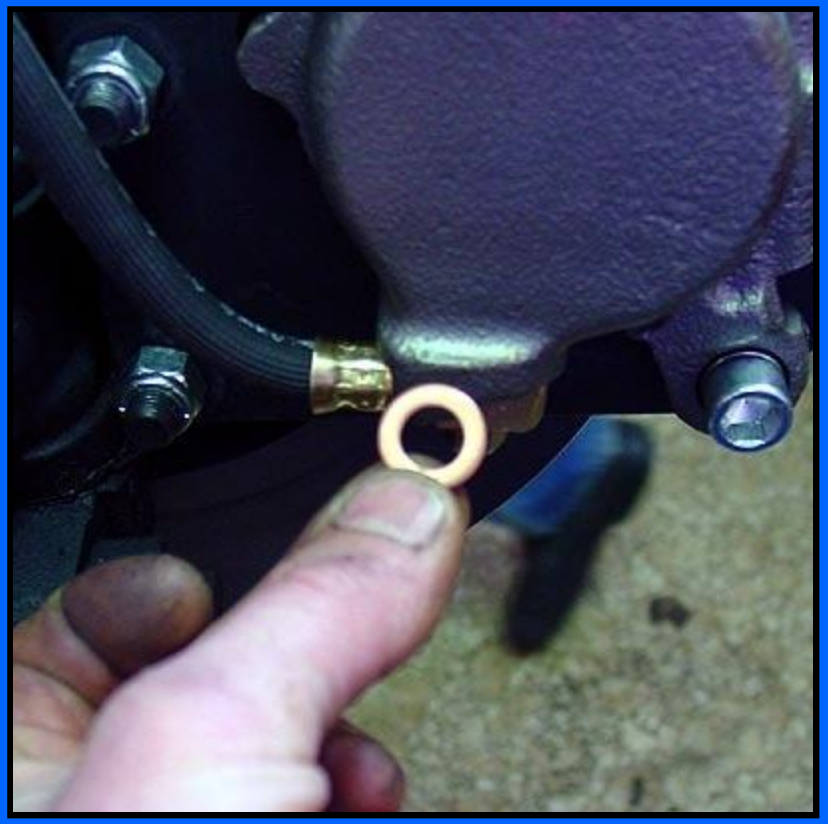
ATASA 5th Brake Systems

Banjo Connections

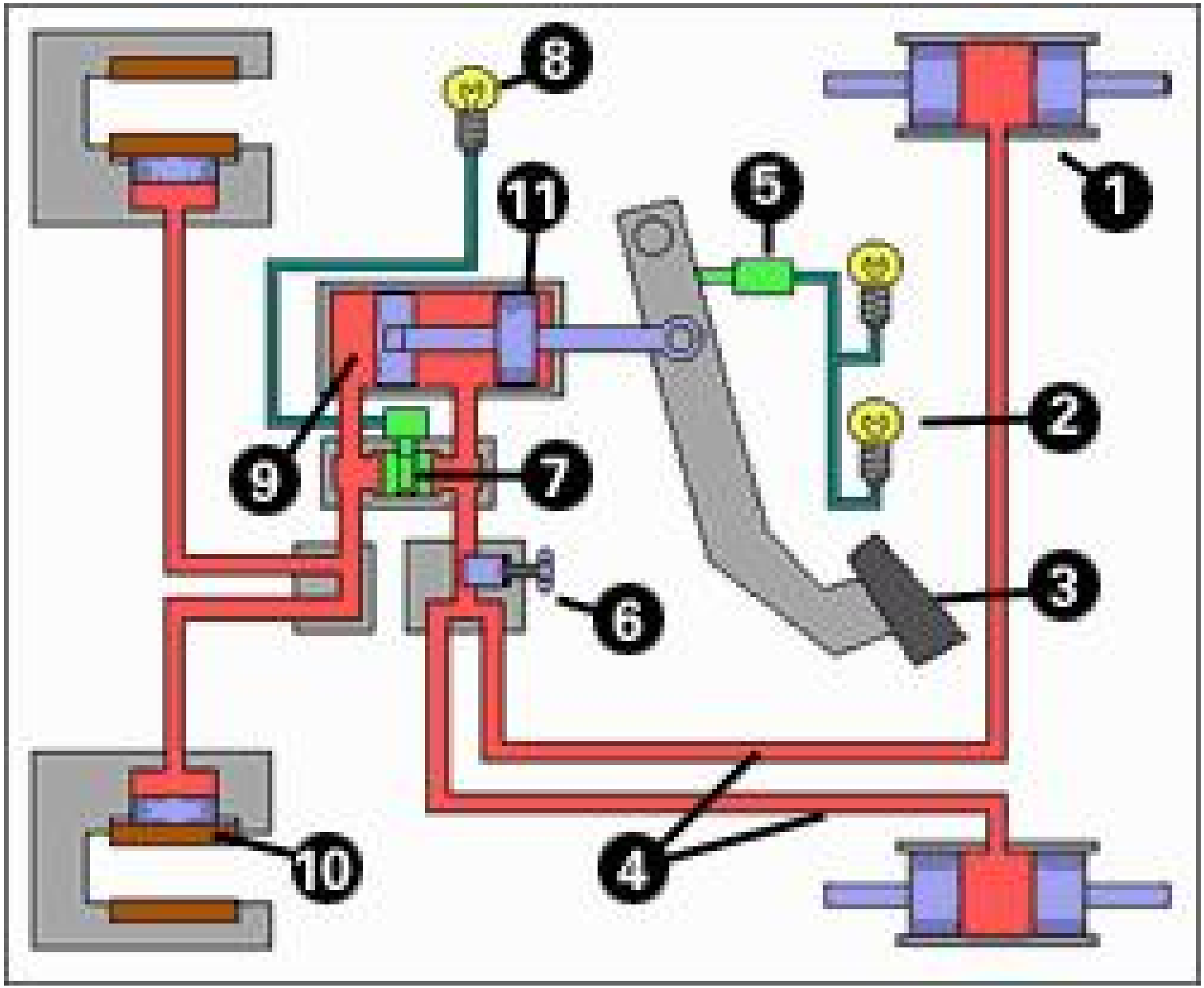
ATASA 5th Brake Systems

ATASA 5th Brake Systems

ATASA 5th Brake Systems



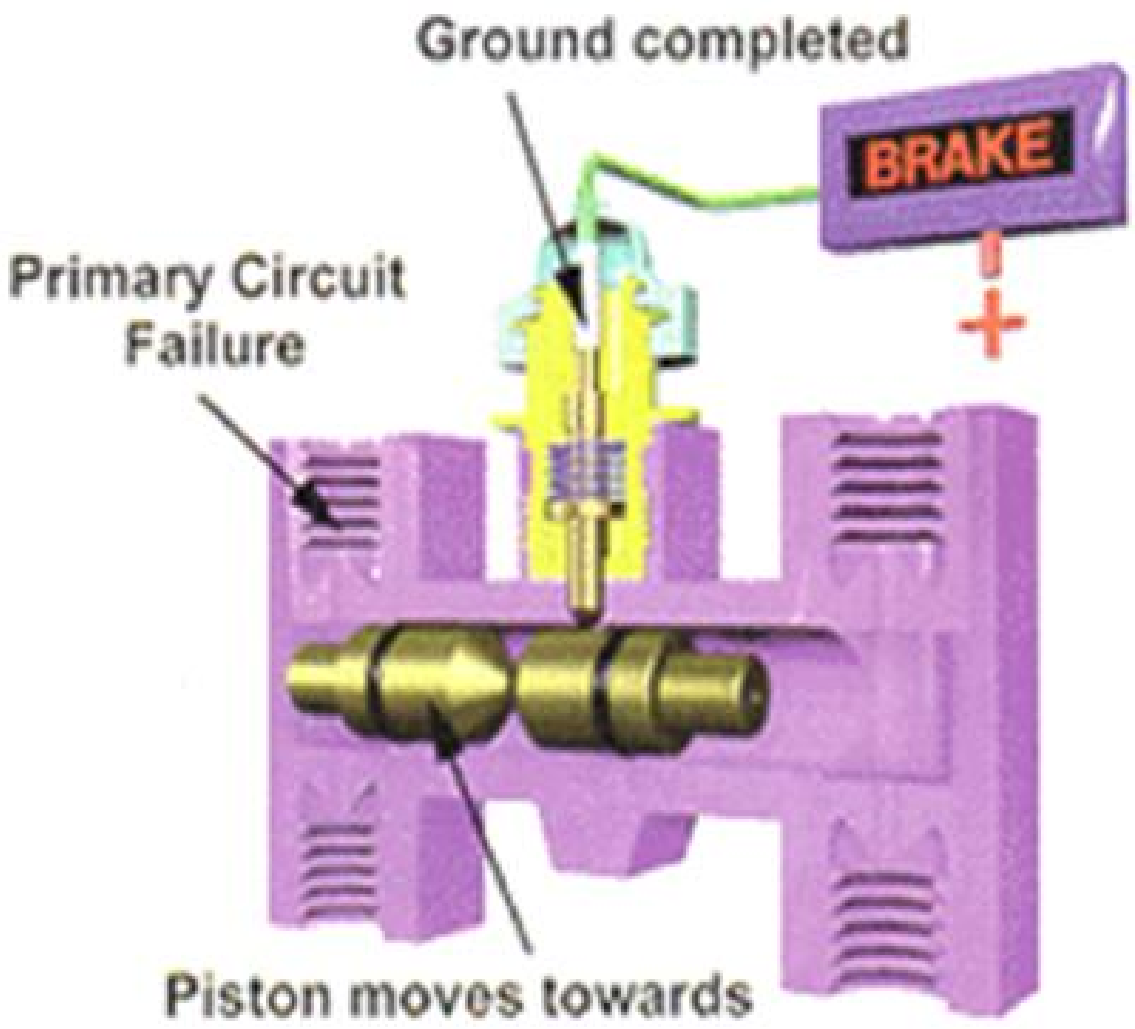
ATASA 5th Brake Systems



ATASA 5th Brake Systems

ATASA 5th Brake Systems

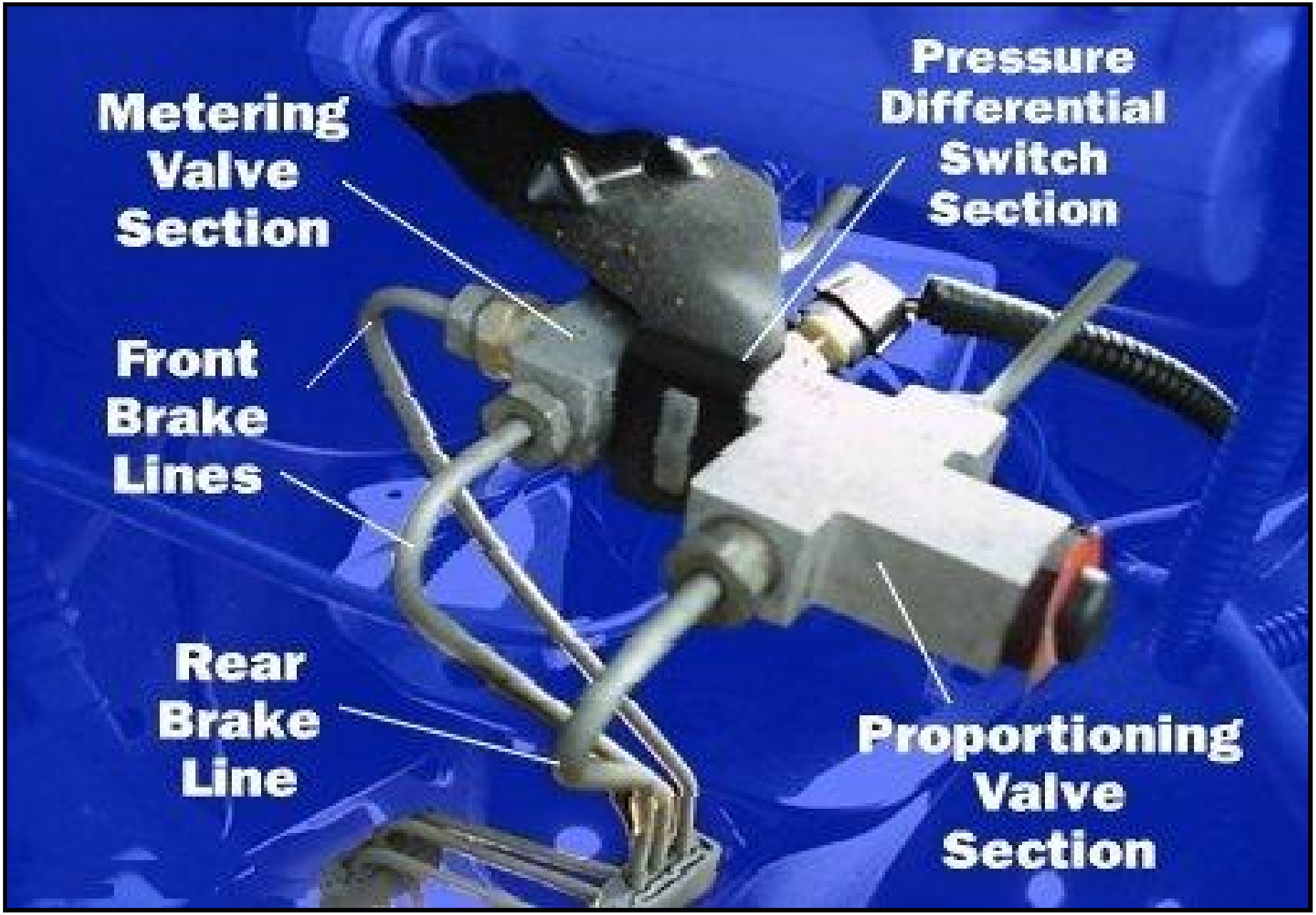
33. The _____ _____ valve operates the red brake warning light on the instrument cluster in the case of a major pressure variation in ½ the brake system. *(hydraulic failure)*



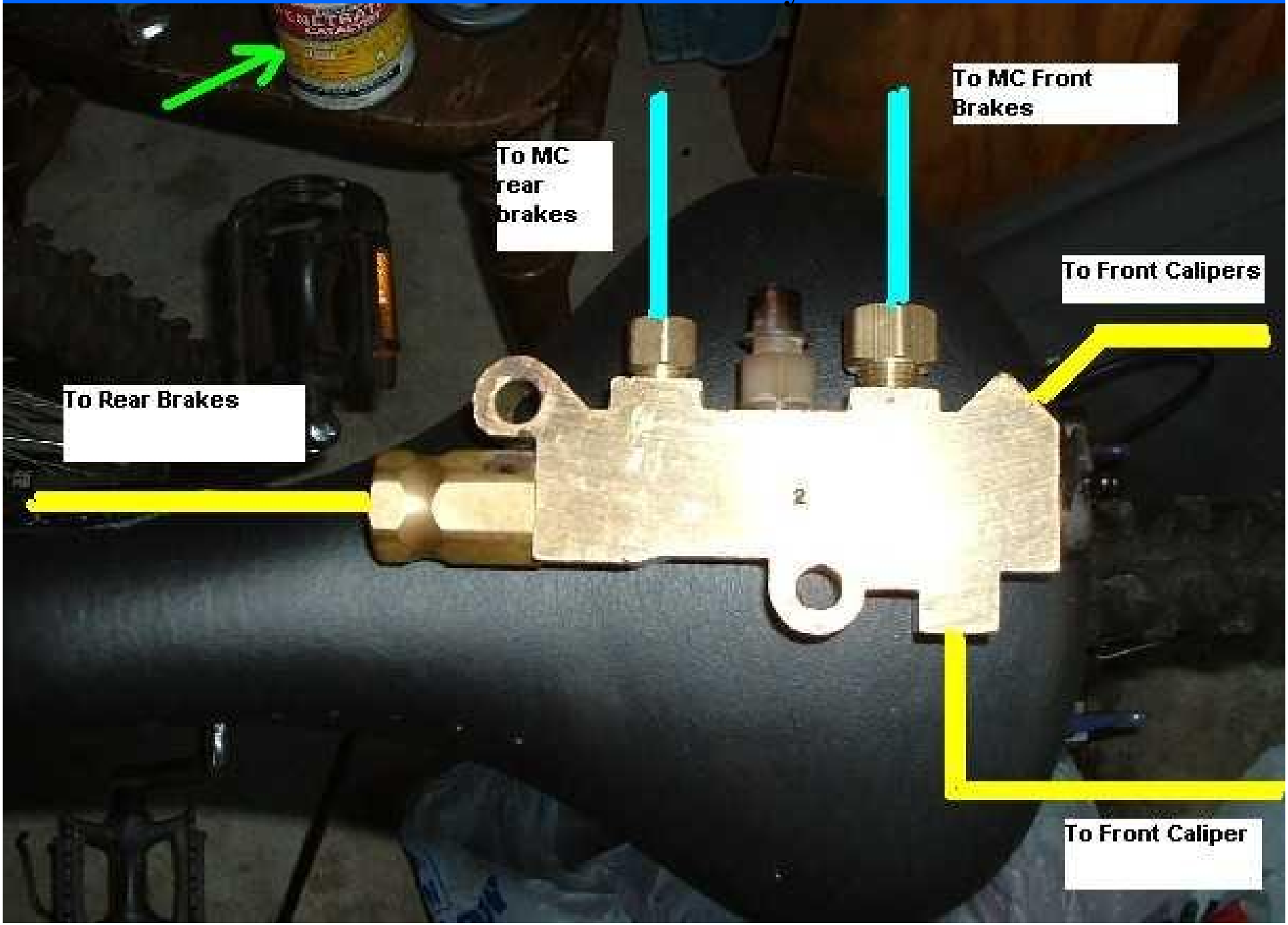

Combination Valve

Pressure Differential
Metering
Proportioning

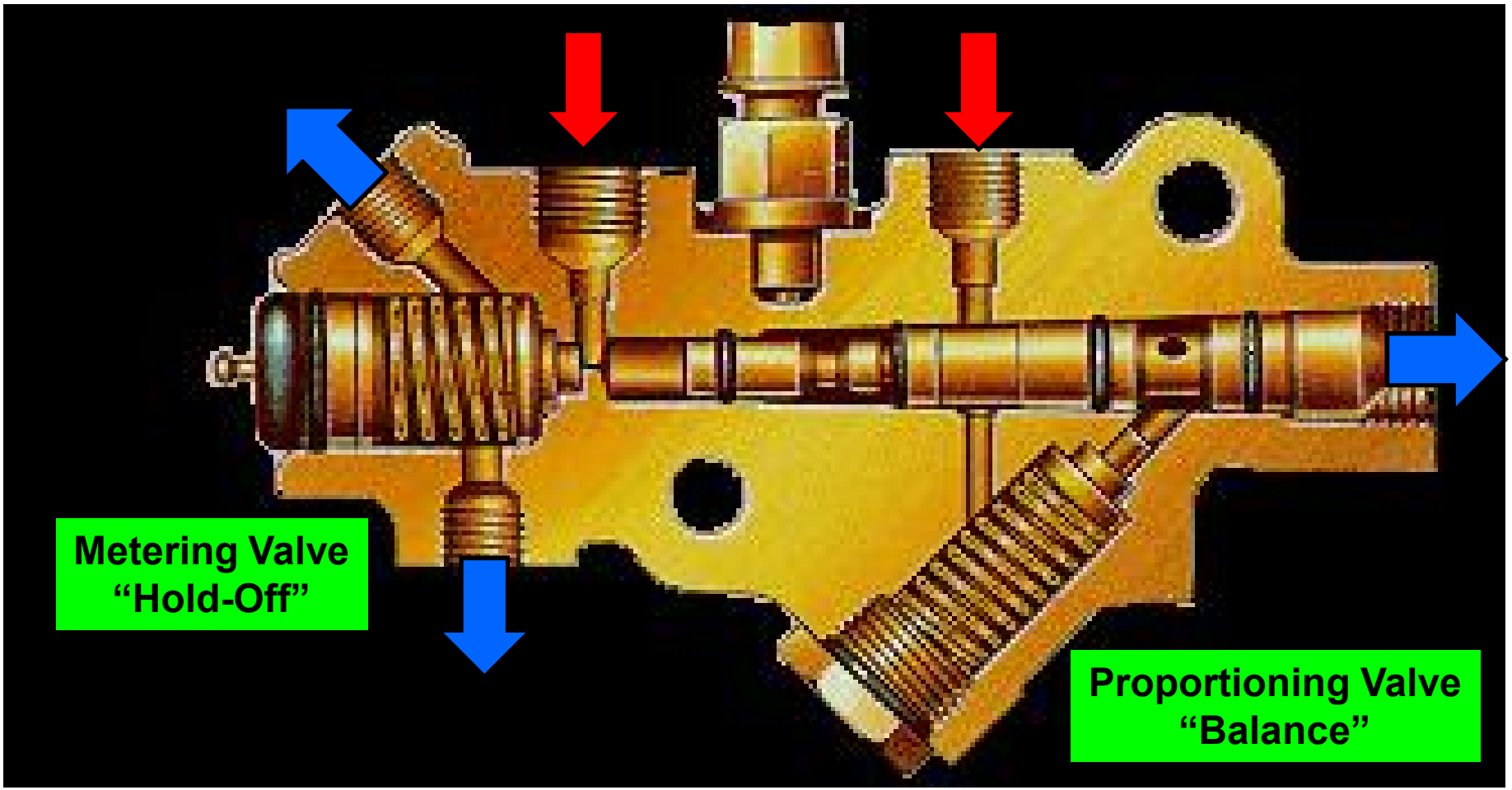
ATASA 5th Brake Systems

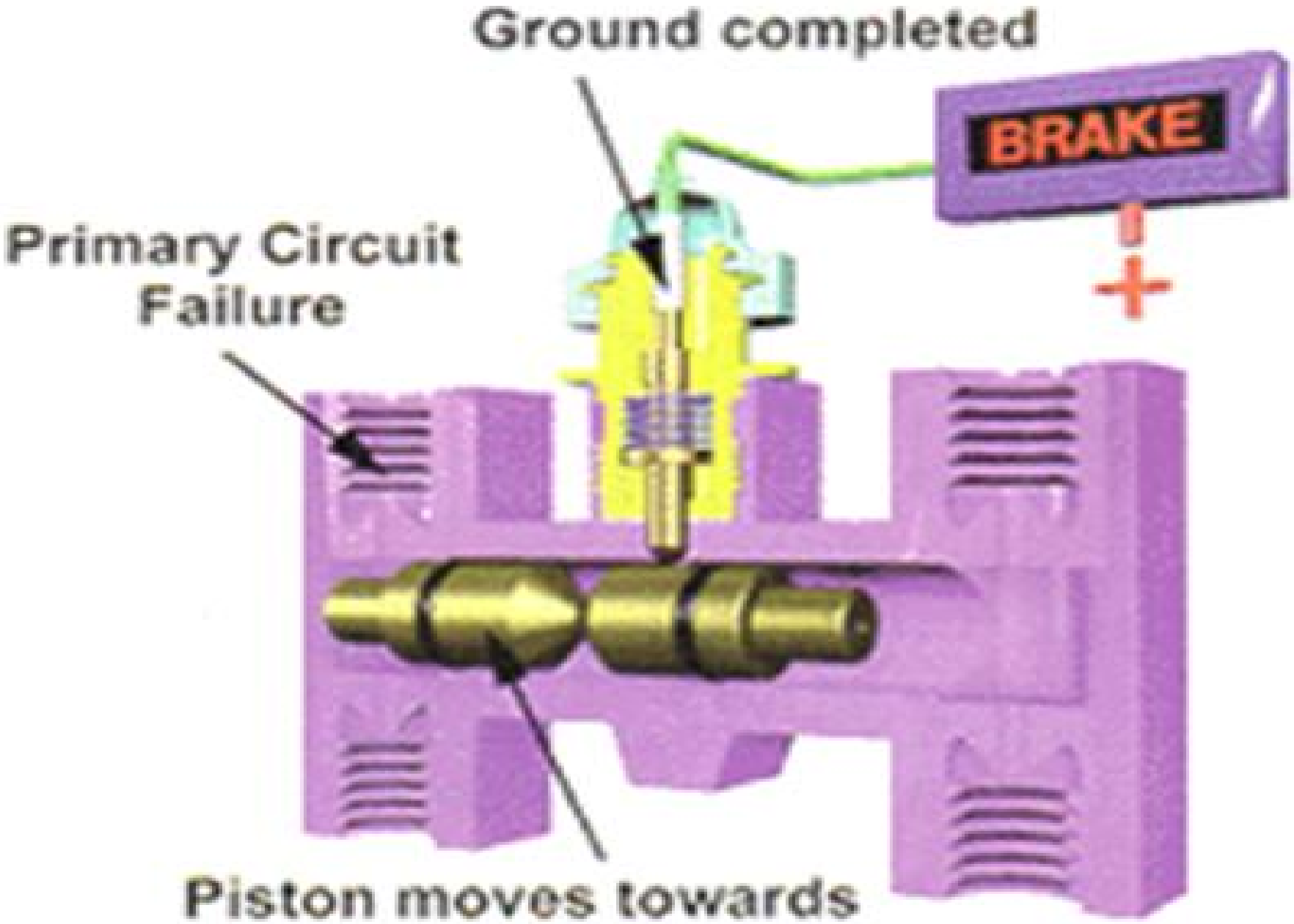


ATASA 5th Brake Systems

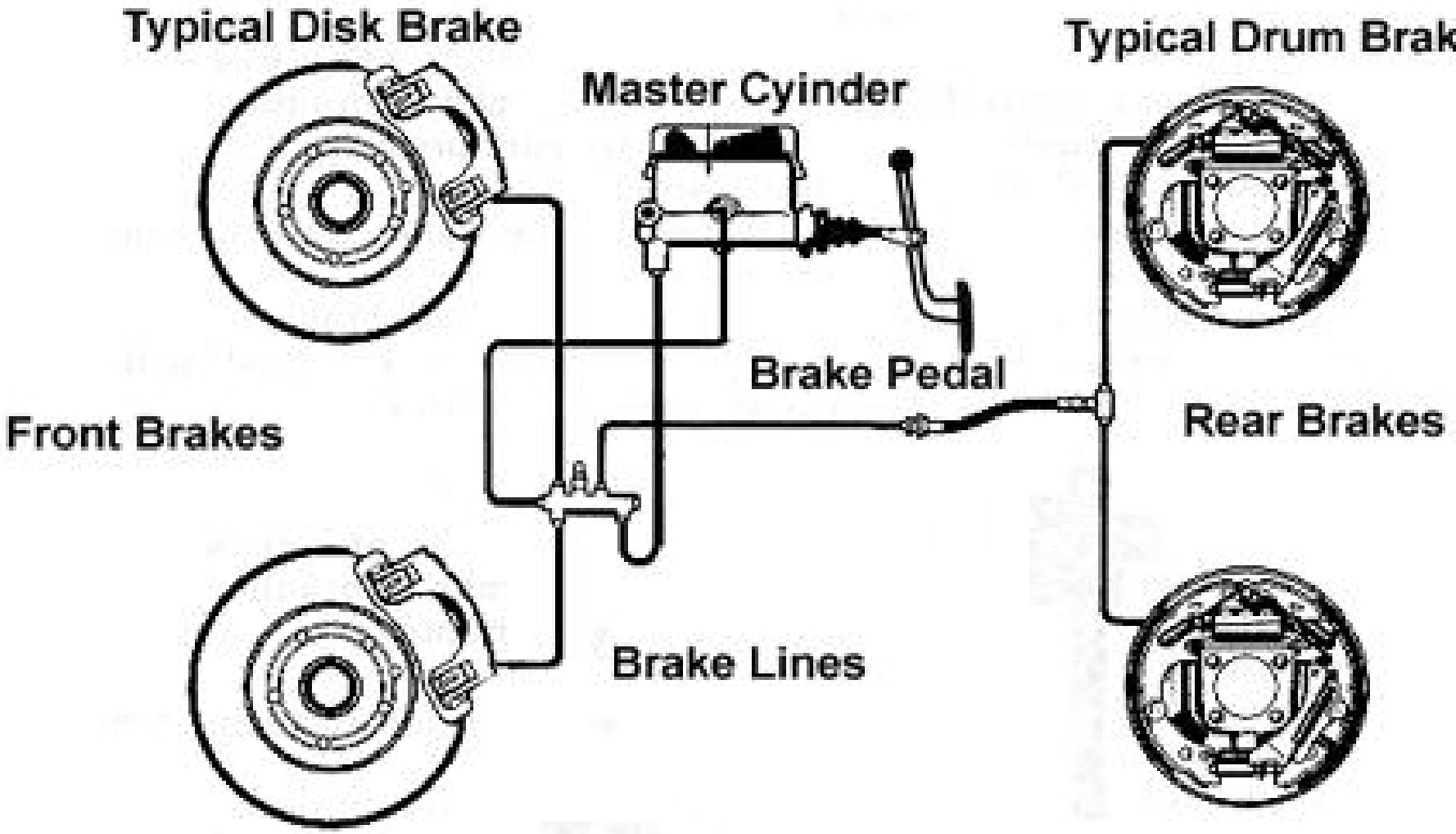


ATASA 5th Brake Systems

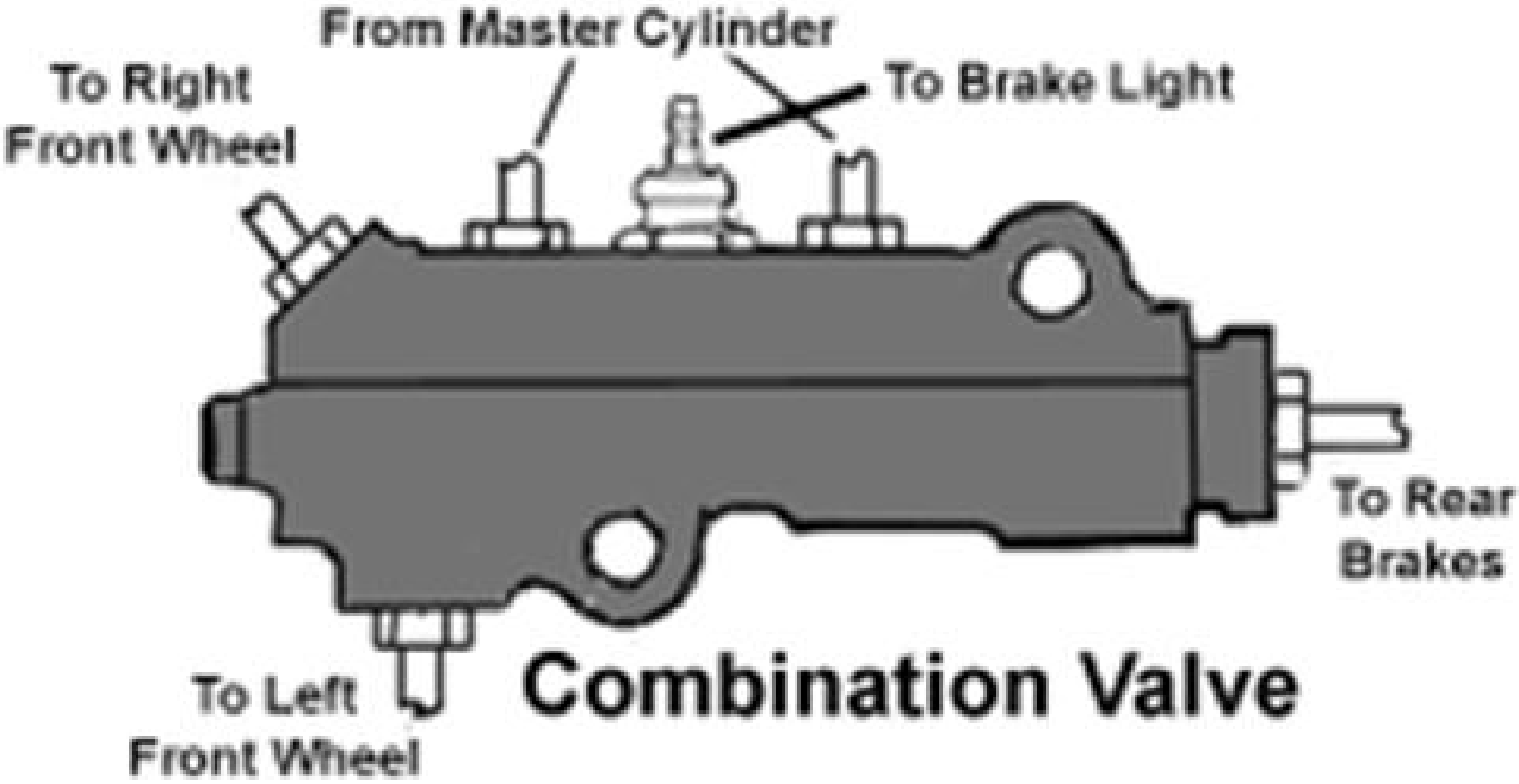



Ground completed
BRAKE
+
Primary Circuit Failure
Piston moves towards

ATASA 5th Brake Systems

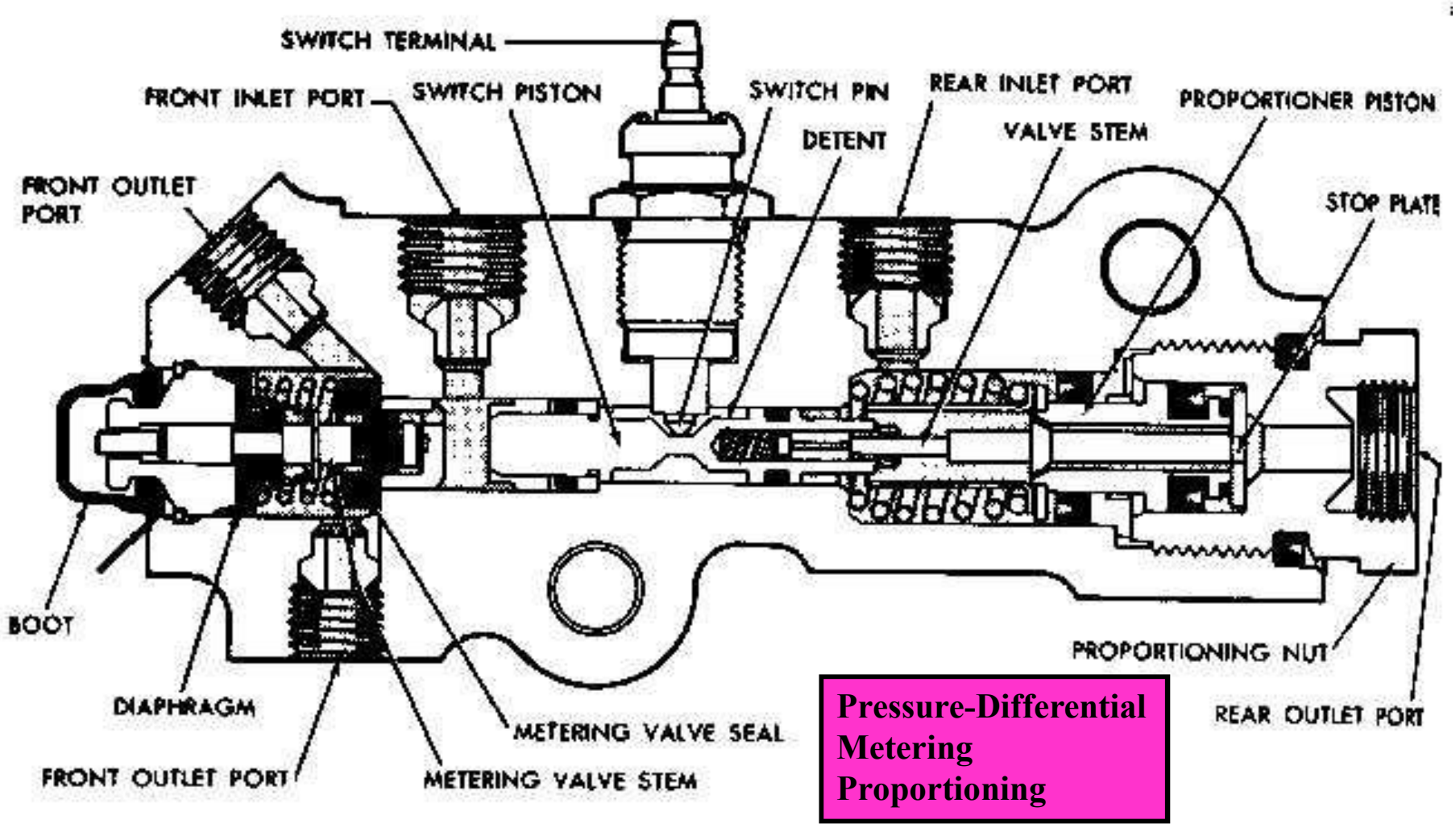


Typical Automotive Braking System


From Master Cylinder
To Right
Front Wheel
To Brake Light
To Rear
Brakes
To Left
Front Wheel
Combination Valve

ATASA 5th Brake Systems

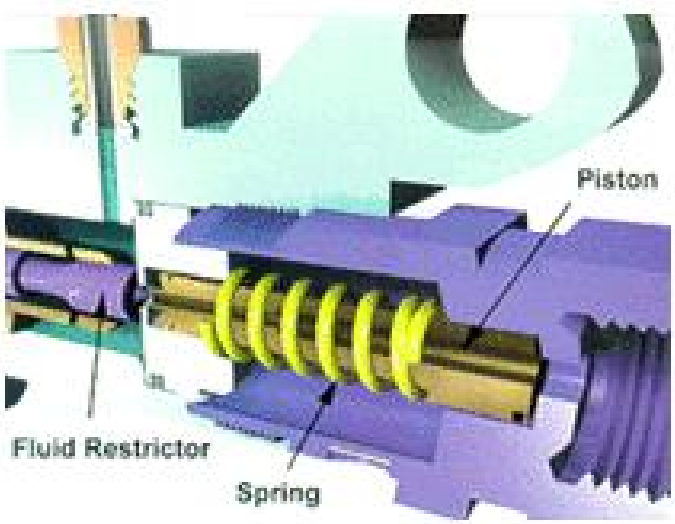
34. A _____ valve in the front system holds off (delays) pressure until pressure builds up in the rear brakes. This prevents the fronts from operating too soon & locking under light braking.

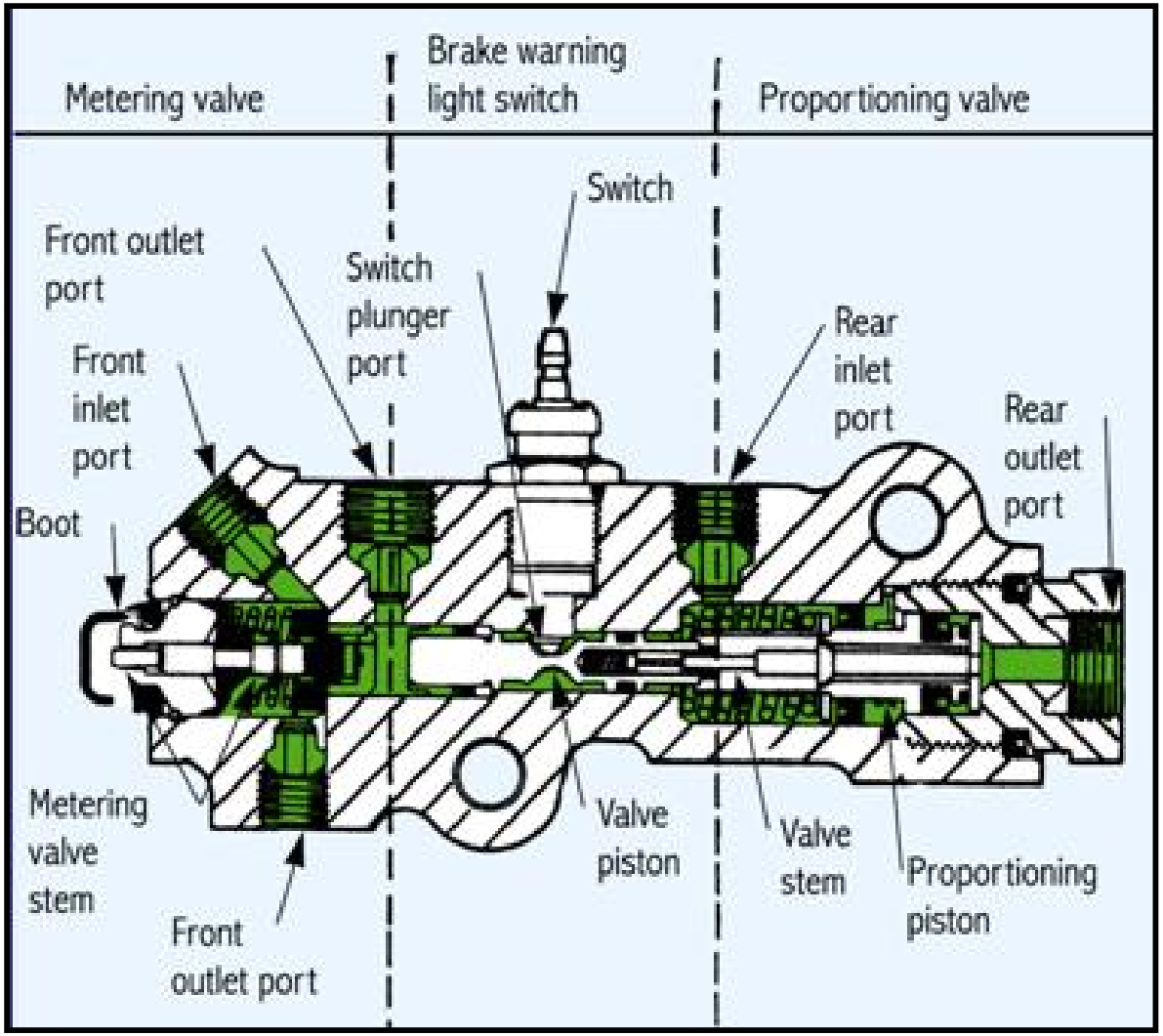


Pressure-Differential Metering Proportioning

ATASA 5th Brake Systems

35. A _____ valve in the rear system restricts fluid flow to maintain a balance between the front and rear hydraulic systems, especially during hard stops.

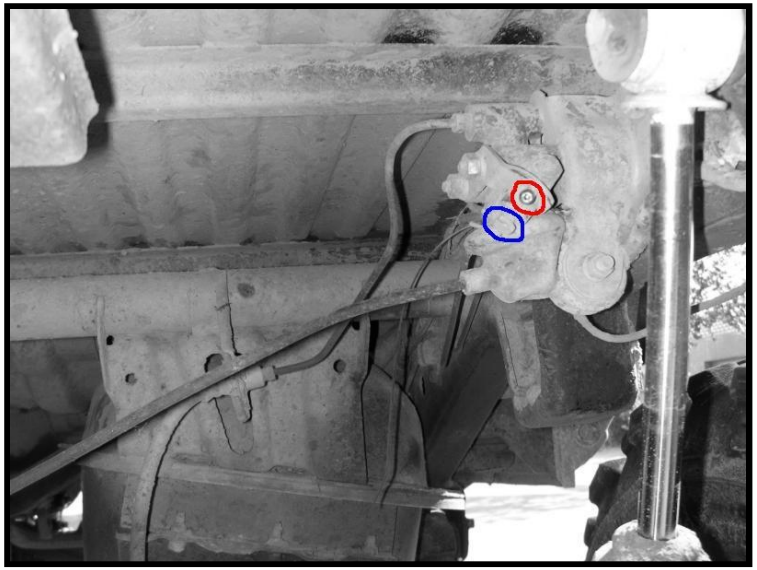




Pressure-Differential
Metering
Proportioning

ATASA 5th Brake Systems

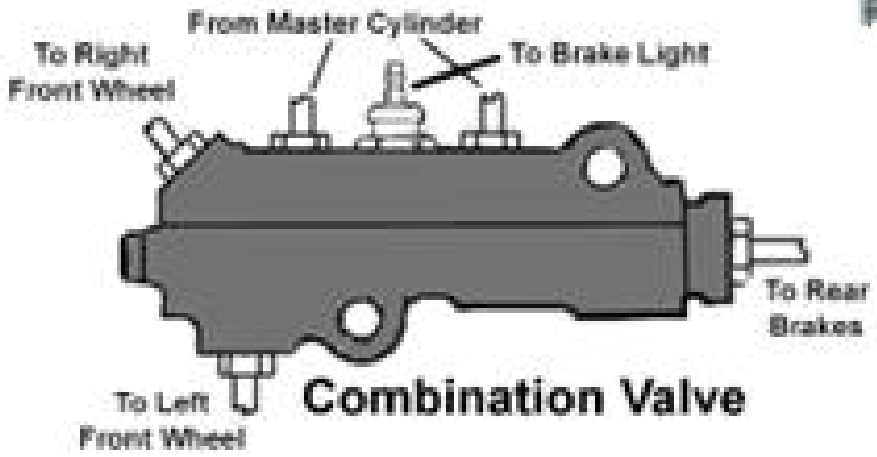
36. Light trucks as well as some passenger cars use _____-sensing *(load)* proportioning valves.

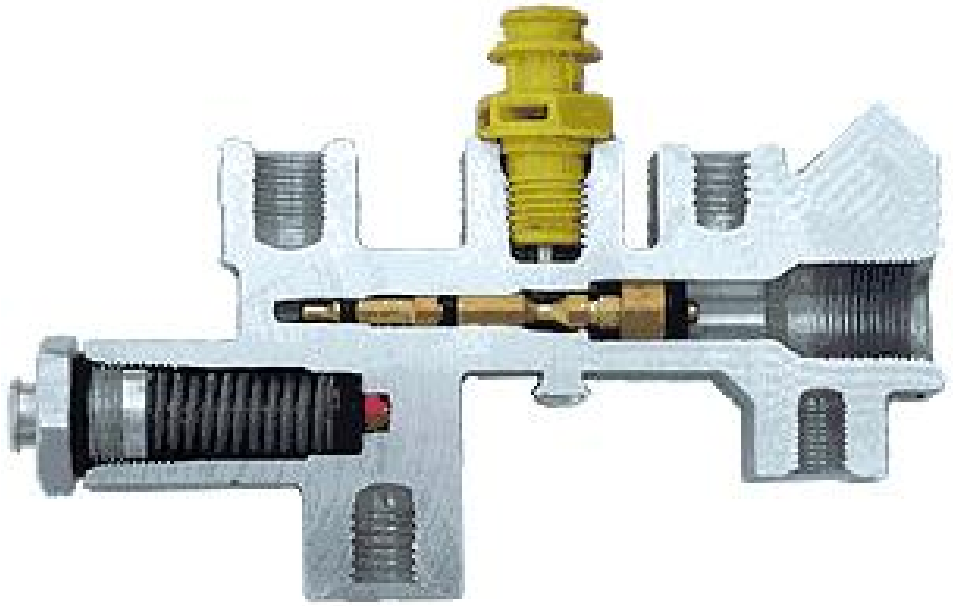


Load or Height
Static or Dynamic
Clear or Cloudy

37. Combination valves can be _____-function or _____-function.
(pd m & p, pd & m, pd & p)

pressure differential, metering, & proportioning (TRIPLE)
pressure differential & metering (DUAL)
pressure differential & proportioning (DUAL)





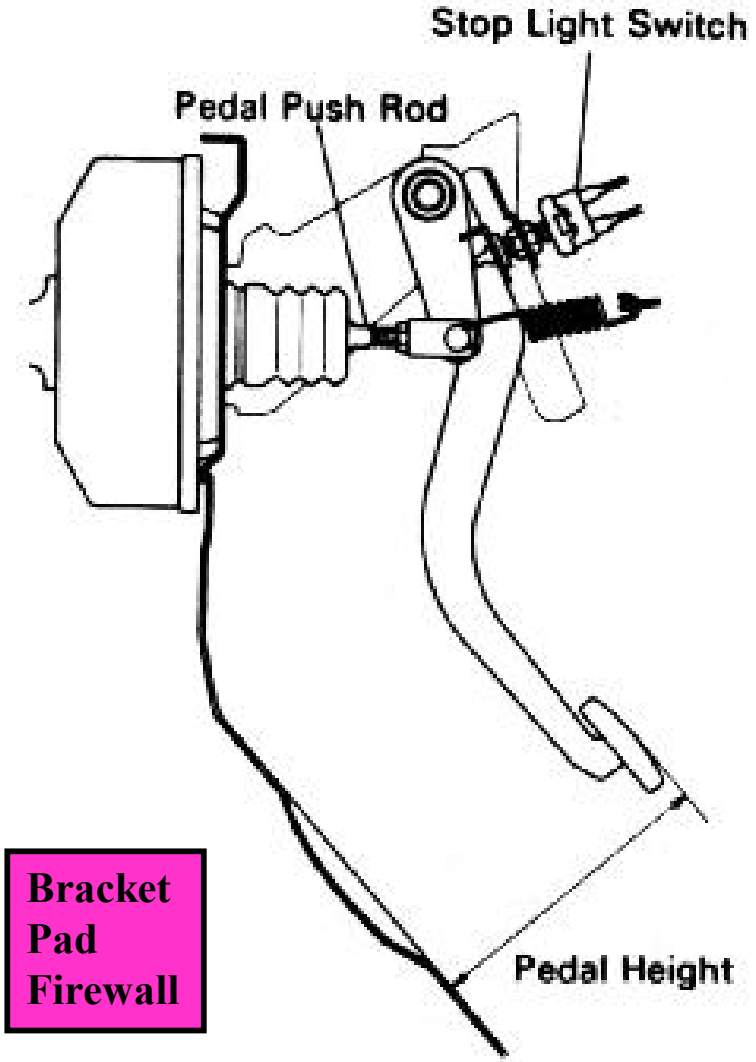
Triple or Dual
Three or Two
Single or Mingle

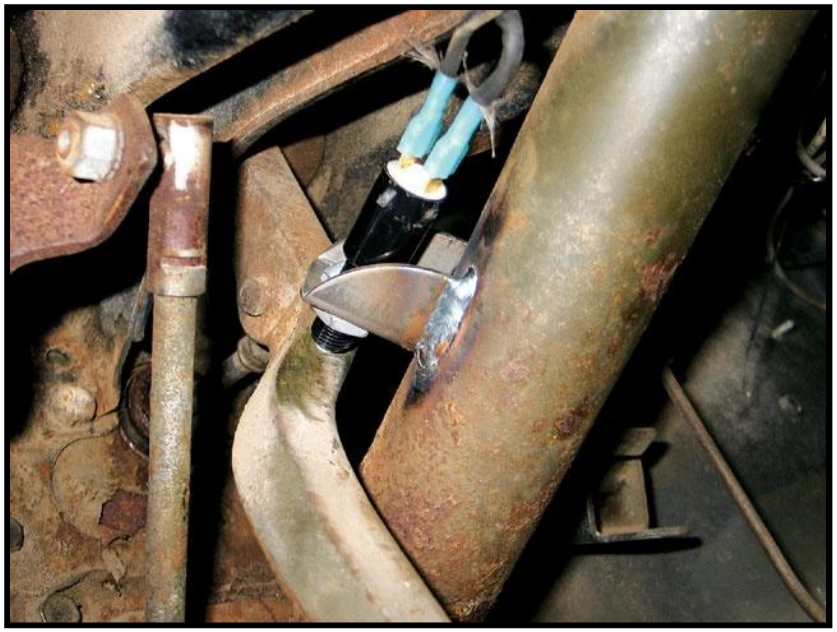
38. Instrument clusters feature a failure warning lamp, fluid level lamp & _____ brake lamp.

Parking
Barking
Sparking

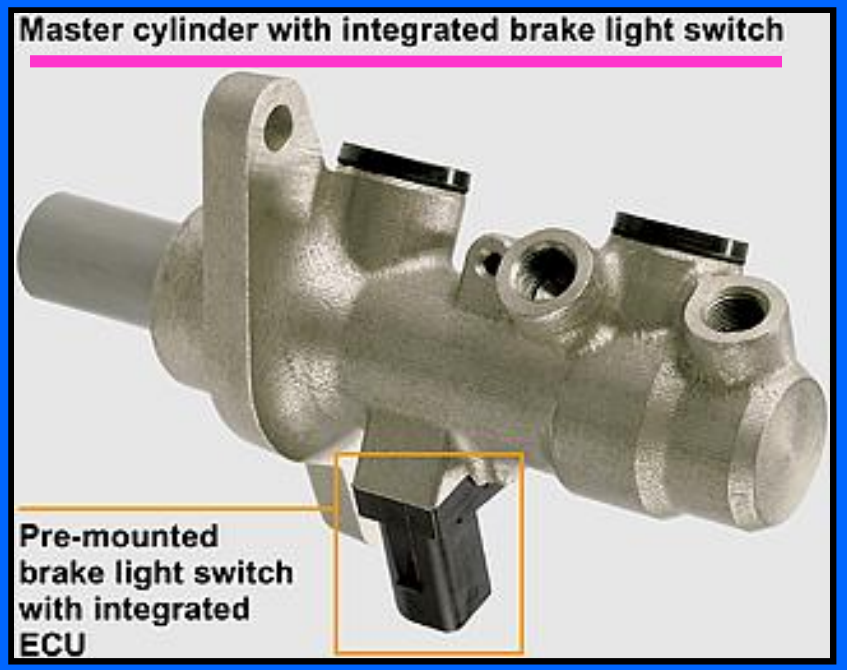
ATASA 5th Brake Systems

39. Most stop light switches are mounted to the brake pedal _____. They are used to operate the cruise cancel function as well as the shift interlock function. ***Hydraulic switches are MC-mounted.***



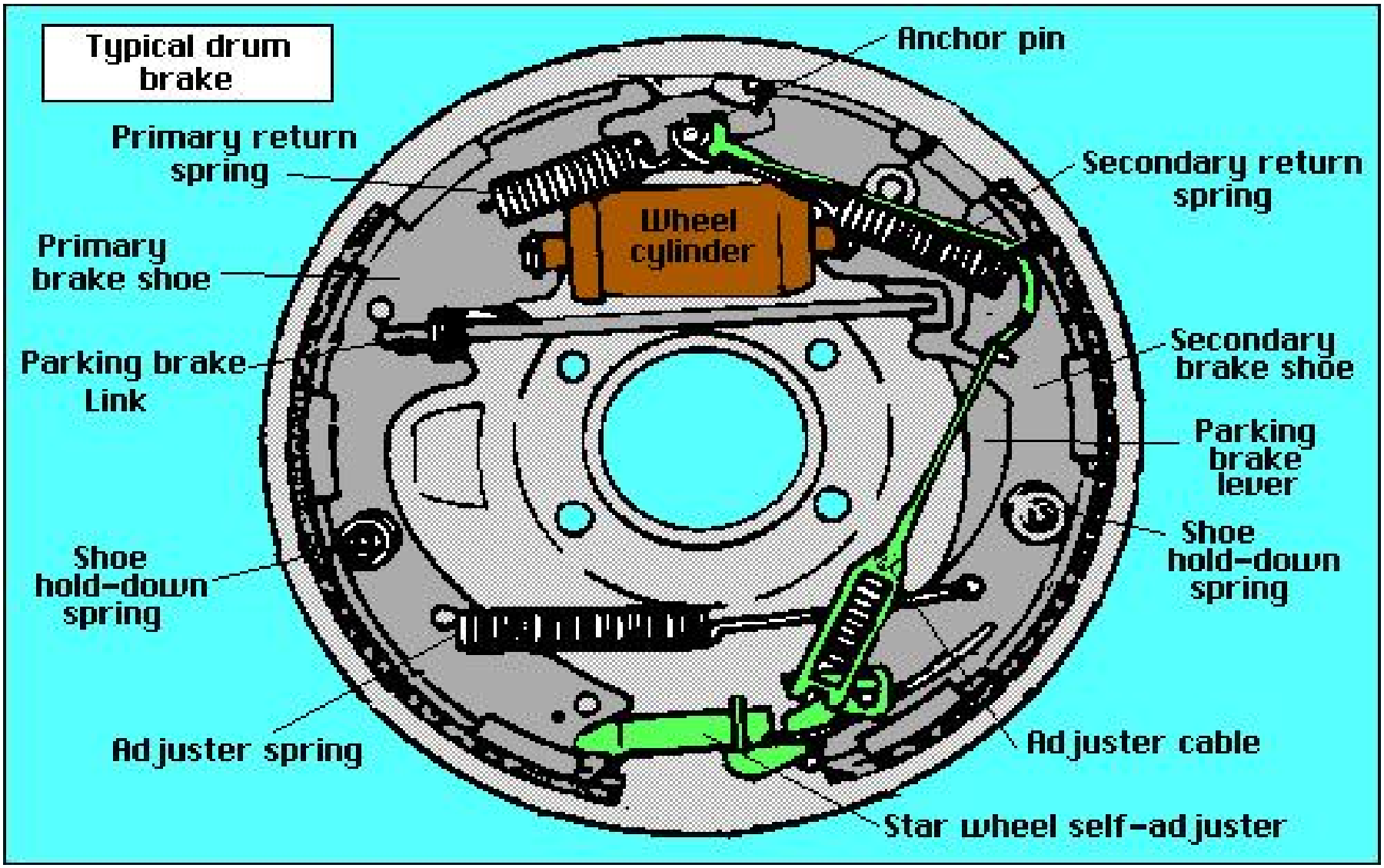


ATASA 5th Brake Systems



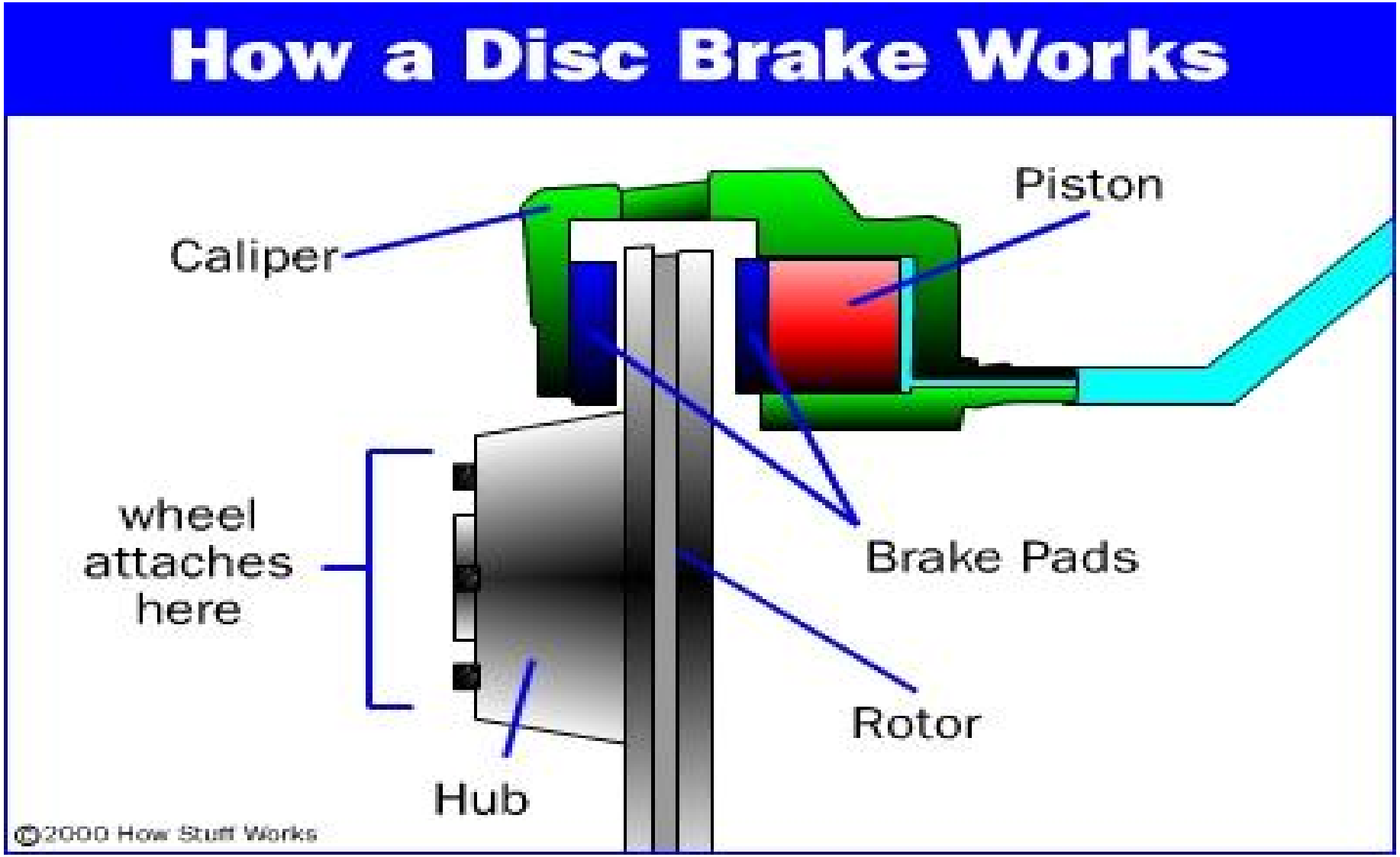
ATASA 5th Brake Systems

40. On drum brake systems, brake _____ apply force against the inside of brake _____.



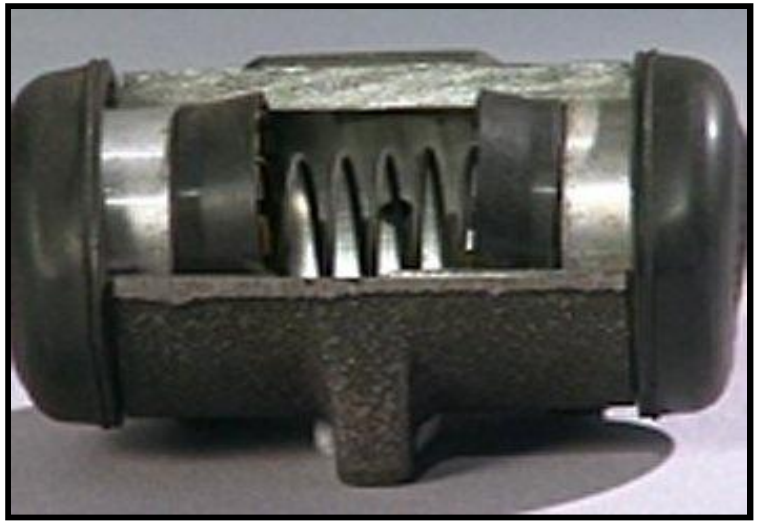
ATASA 5th Brake Systems

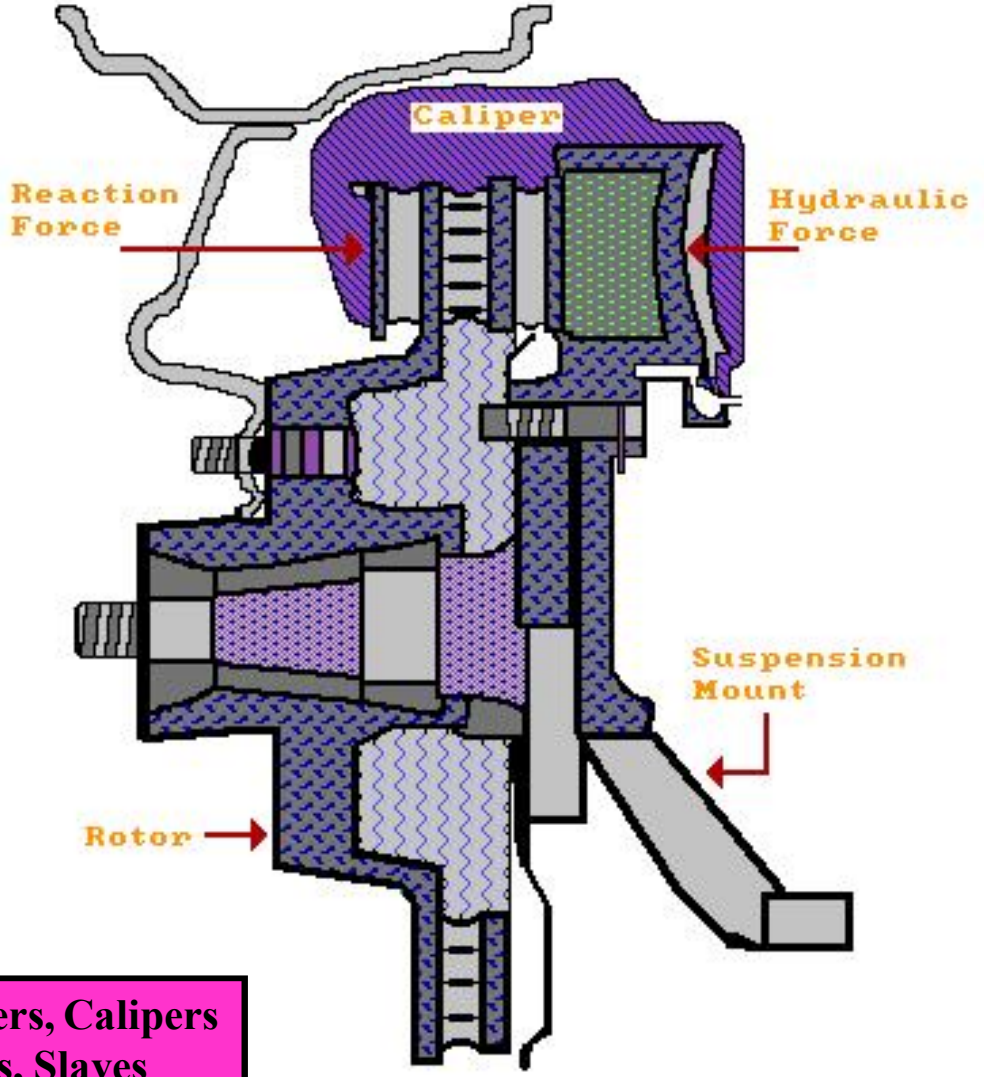
41. Brake _____ apply force against the machined external parallel surfaces of brake _____.



ATASA 5th Brake Systems

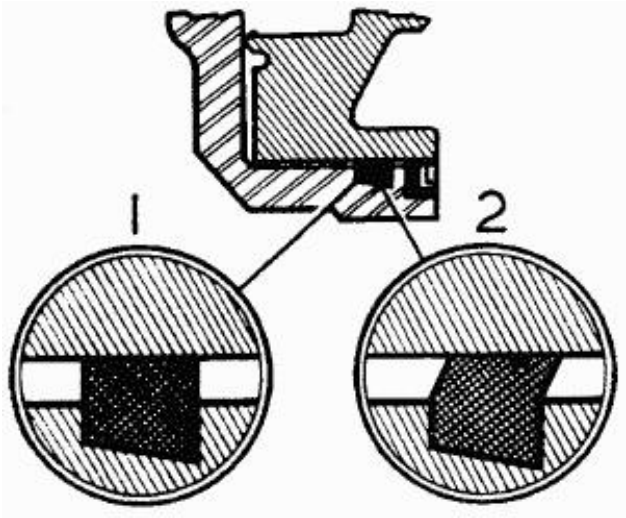
42. Wheel _____ move brake *shoes* while _____ move brake *pads*.

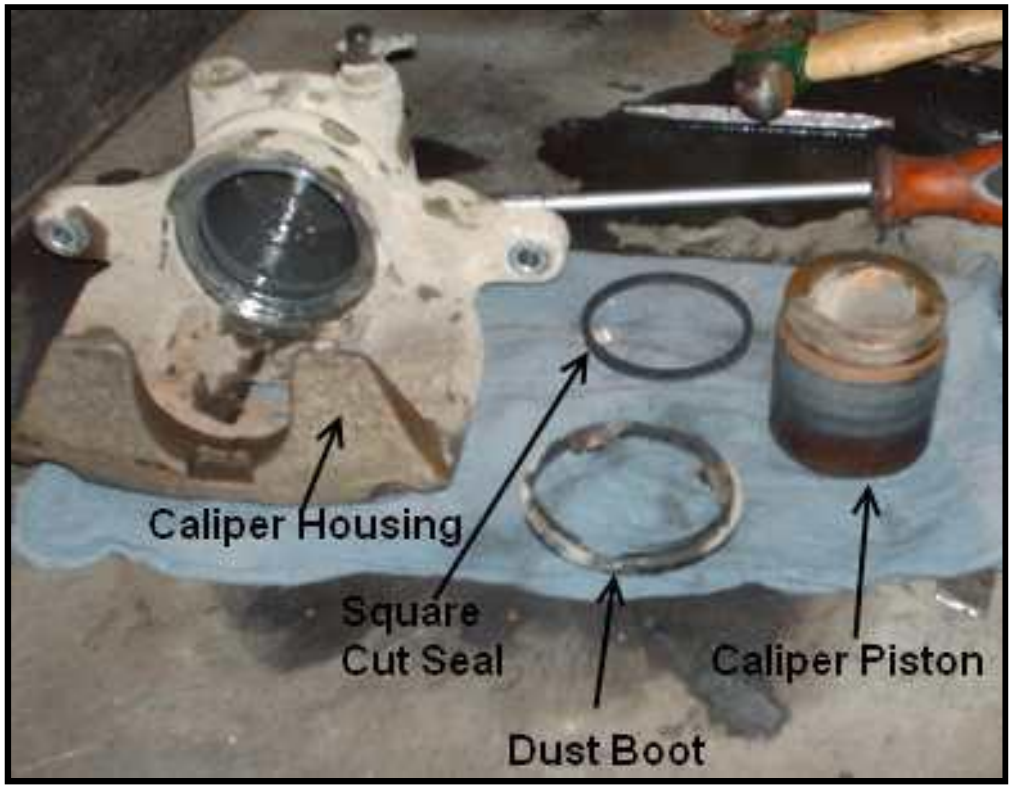


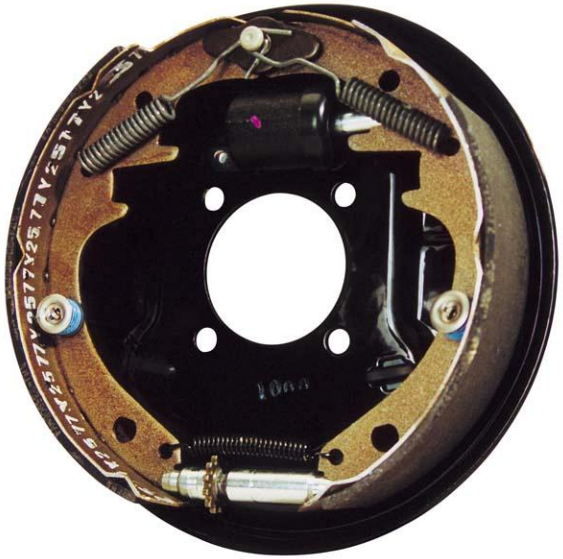


Cylinders, Calipers
Masters, Slaves
Pistons, Push Rods

43. Brake shoes are *unapplied* by return _____.
Brake pads are *retracted* by _____-cut seals.

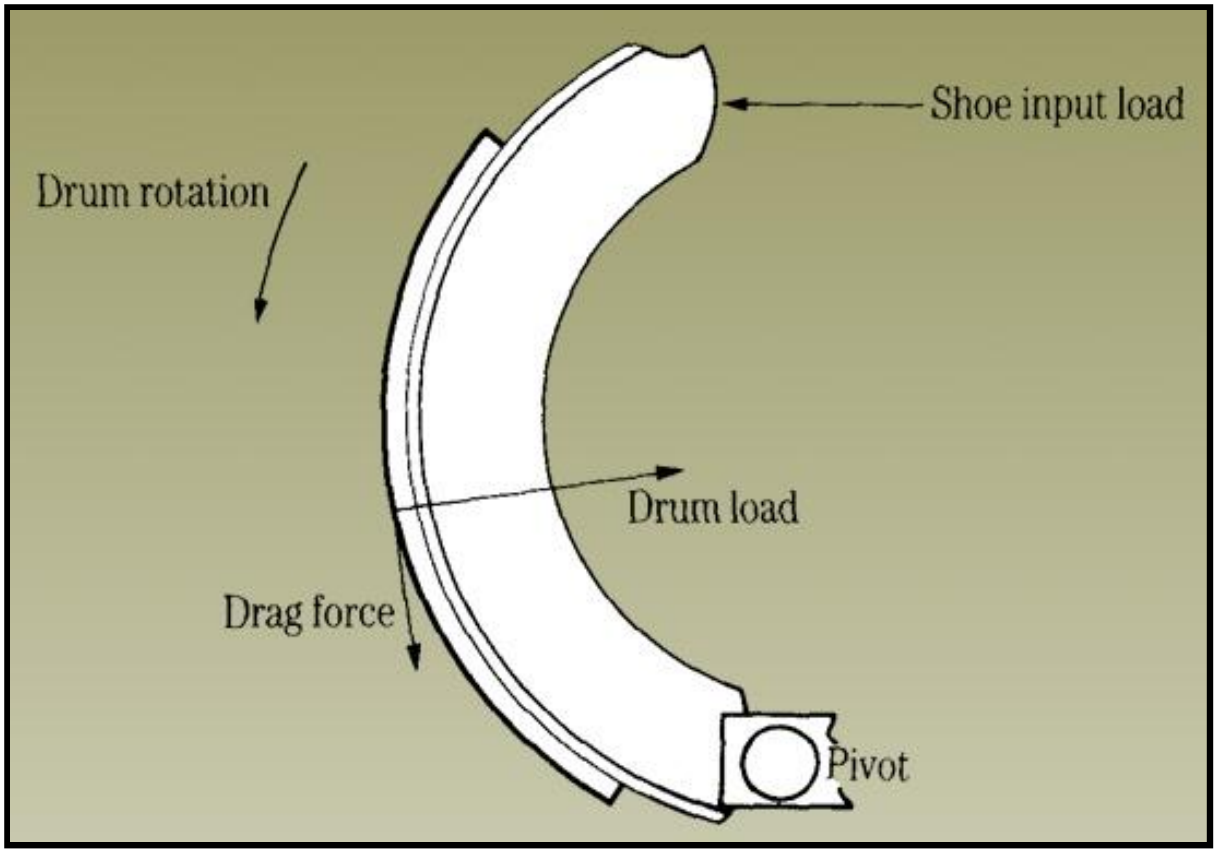




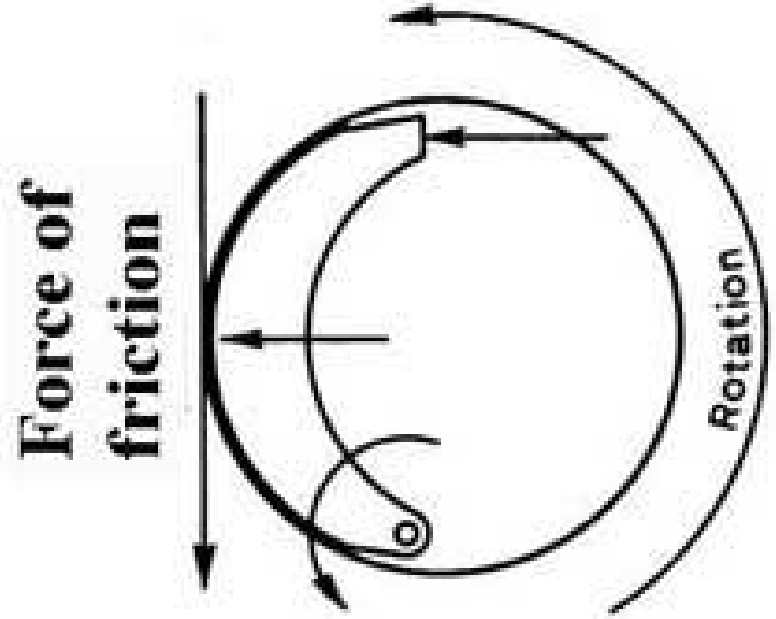


Rings, Triangular
Springs, Square
Springs, Round

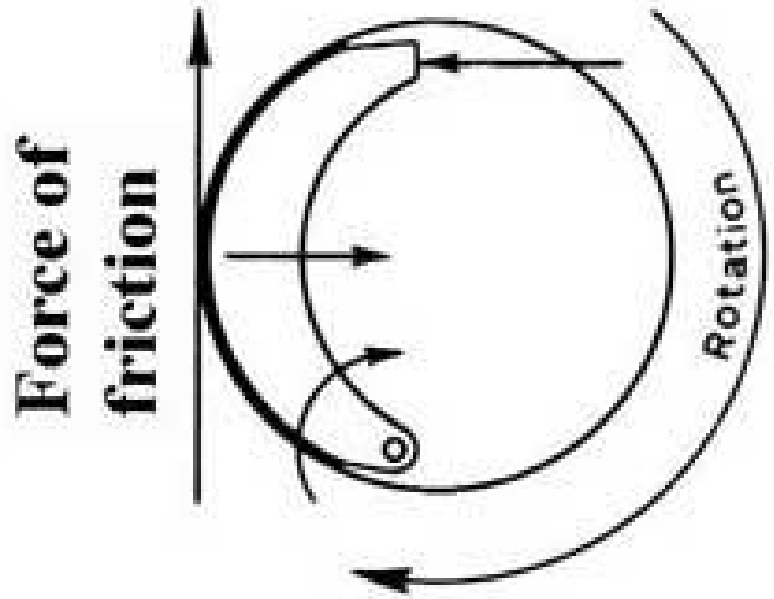
44. Disc brakes are non-_____-_____ so they require more force to achieve the same braking effort as self-energizing drum brakes.
Disc brakes will always be power-assisted.



Self-Energizing
Servo-Acting
Self-Bleeding

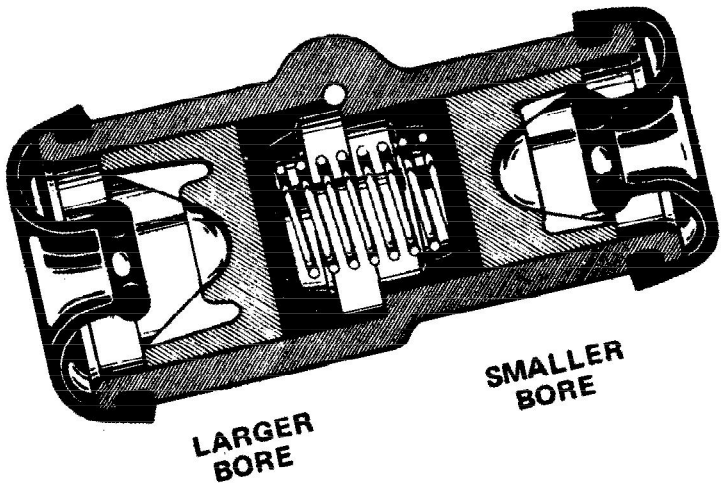


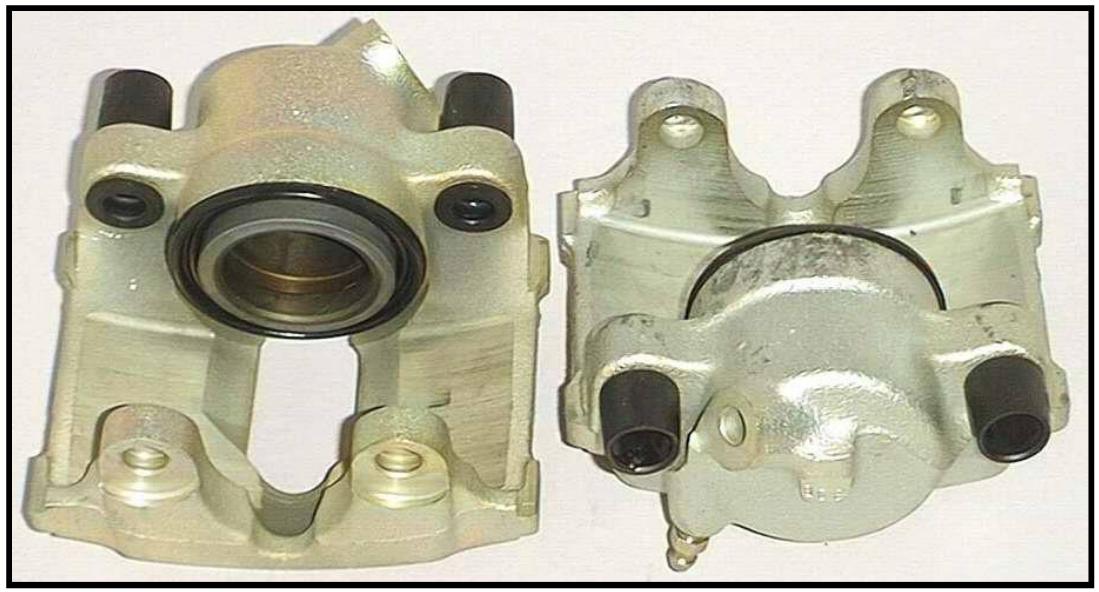
Leading shoe
self-servo effect

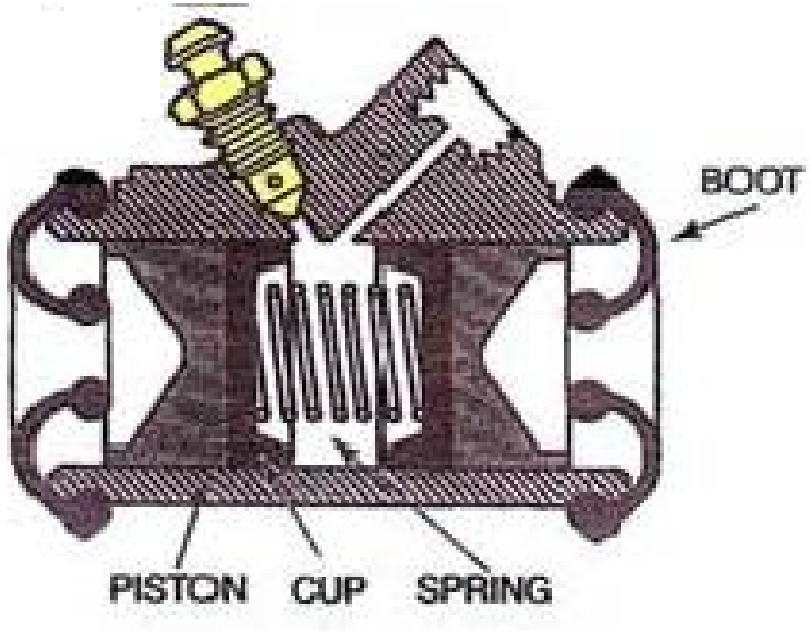


Trailing shoe
no self-servo effect

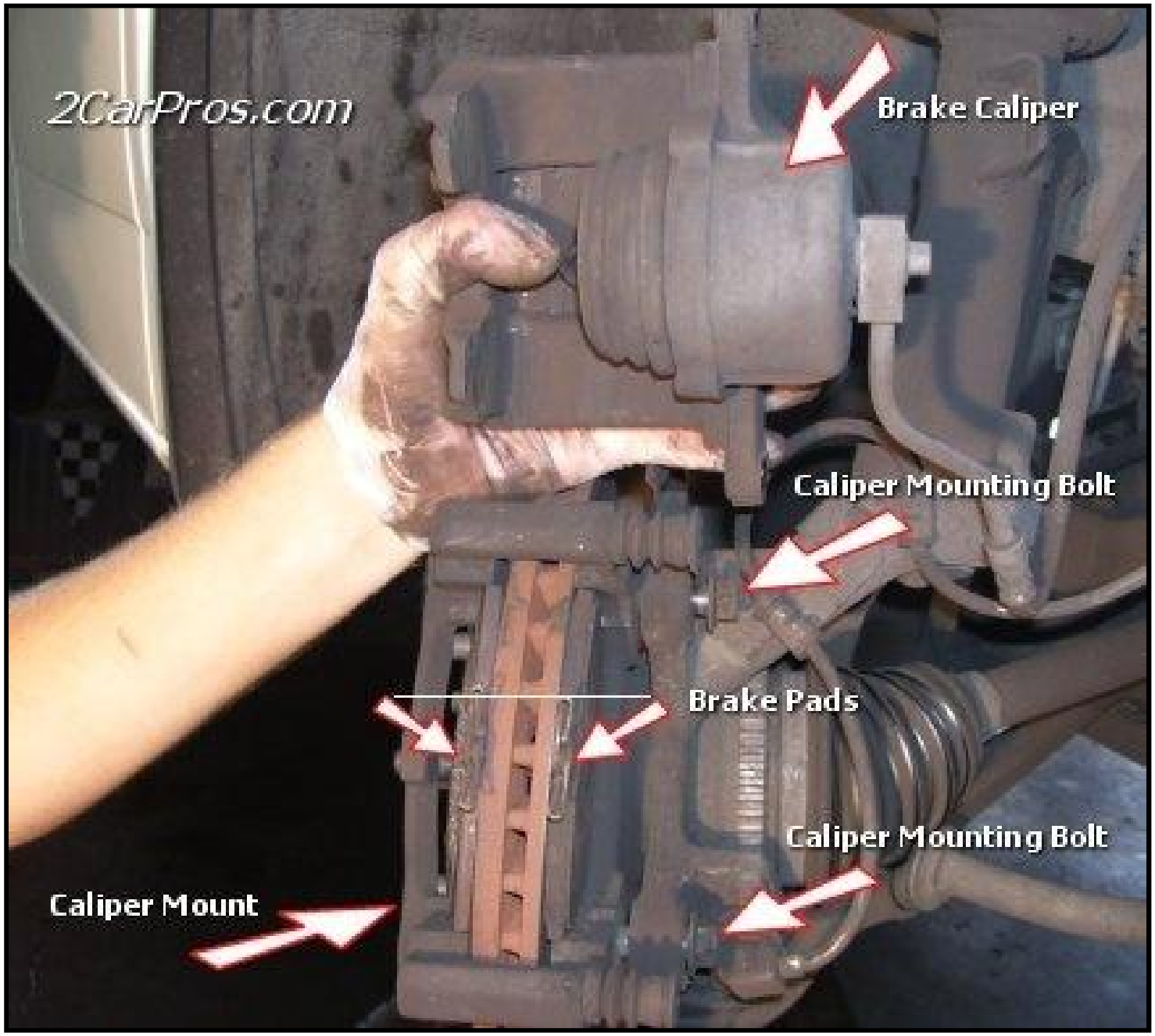
ATASA 5th Brake Systems







ATASA 5th Brake Systems



ATASA 5th Brake Systems

ATASA 5th Brake Systems

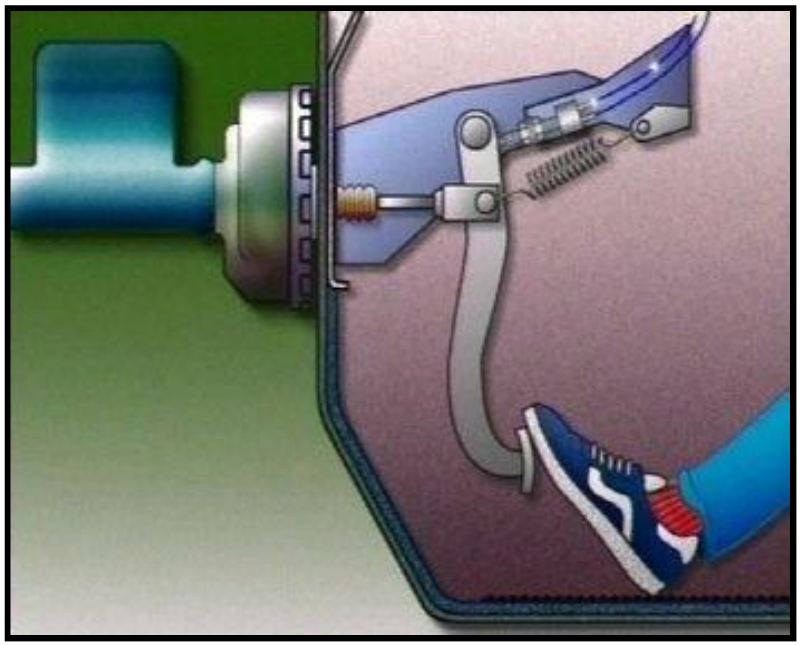
45. Systems are routinely _____ *to remove fluid contaminated* with moisture, dirt, or the wrong fluids. *After flushing a system, bleed the brakes following the procedure outlined by the OEM.*

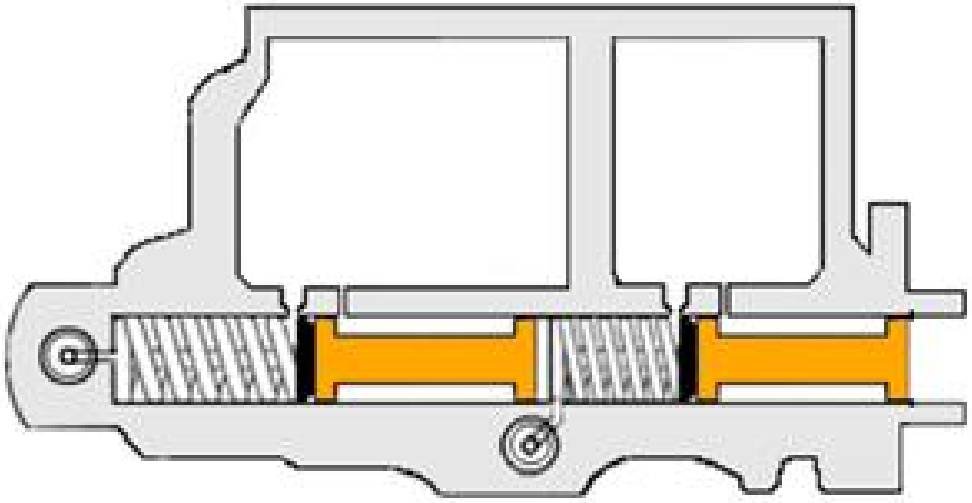
Flushed
Gutted Out
Overhauled

ATASA 5th Brake Systems

46. Hydraulic brake system leaks *(pedal sinks)* can be either _____ or _____.

Pedal sinking to the floor indicates system leakage…look for fluid loss!



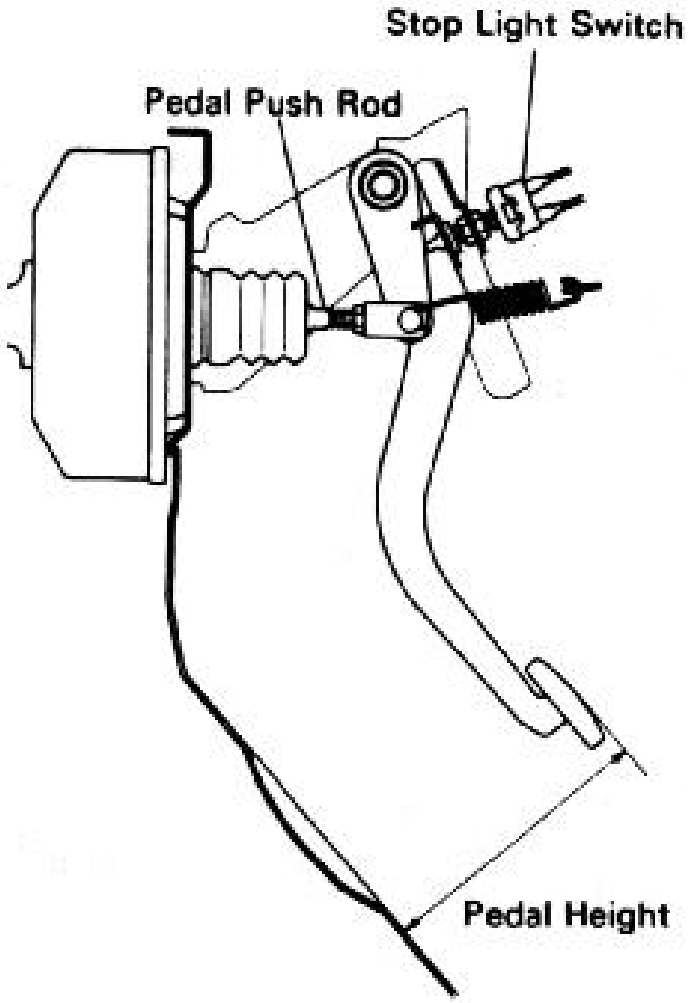


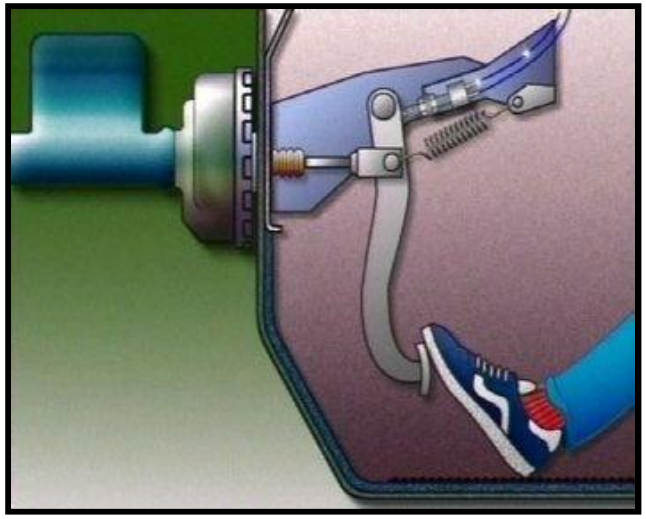
Internal or External
Intrinsic or Extrinsic
Inlet or Outlet

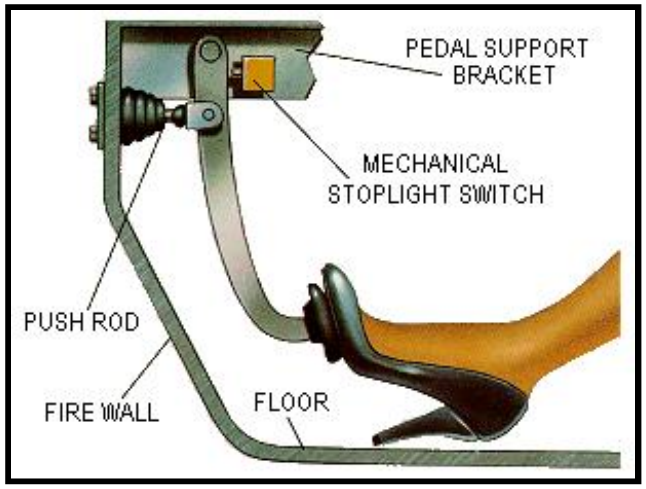
ATASA 5th Brake Systems

ATASA 5th Brake Systems

47. Pedal feel should be firm, not spongy, have sufficient _____ distance off of the floor when fully depressed, and return quickly when released. ***Pedal sinking indicates system leakage.***



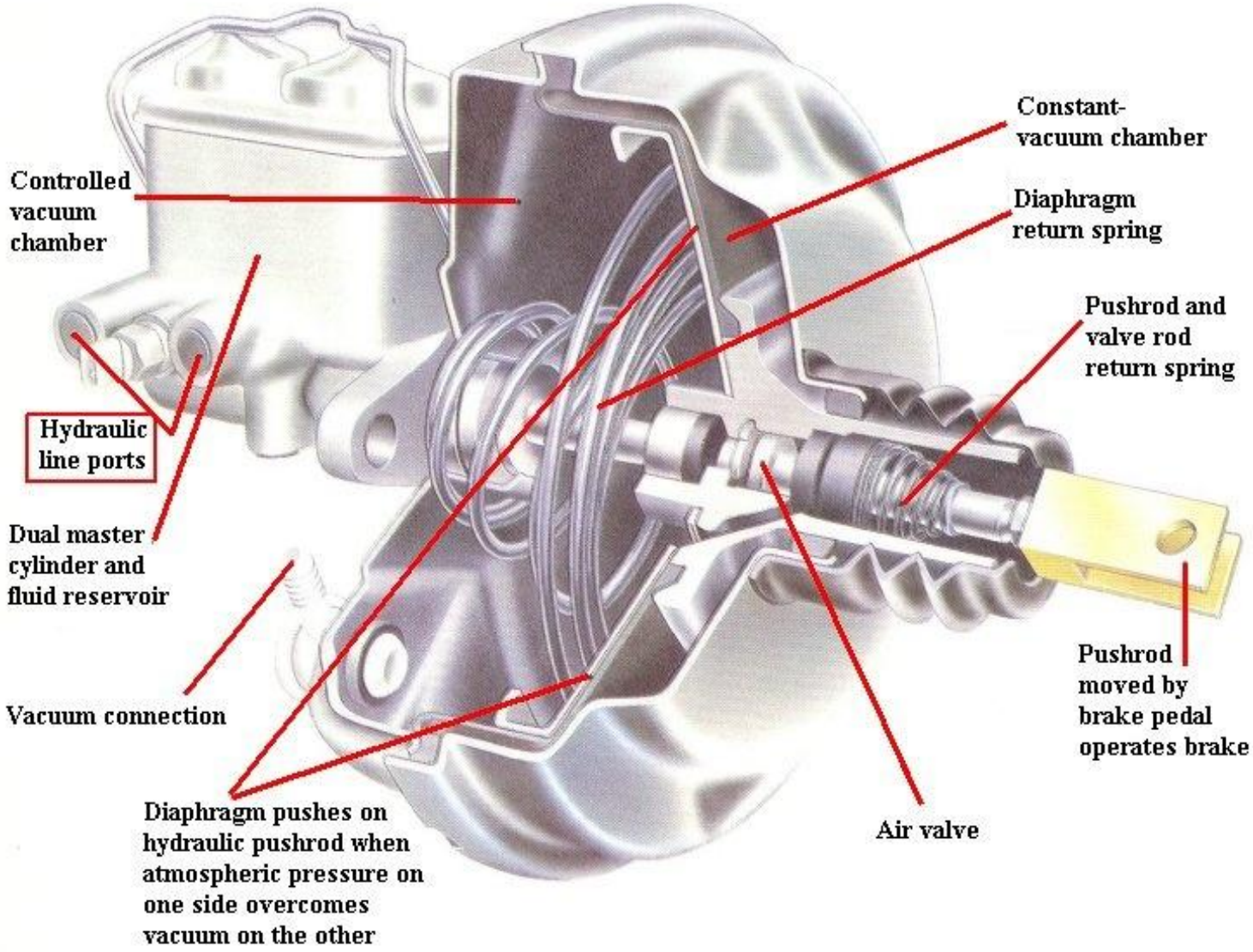




Reserve
Refresh
Reverse

48. When _____ the engine *w/the pedal depressed*, pedal movement toward the floor is normal.

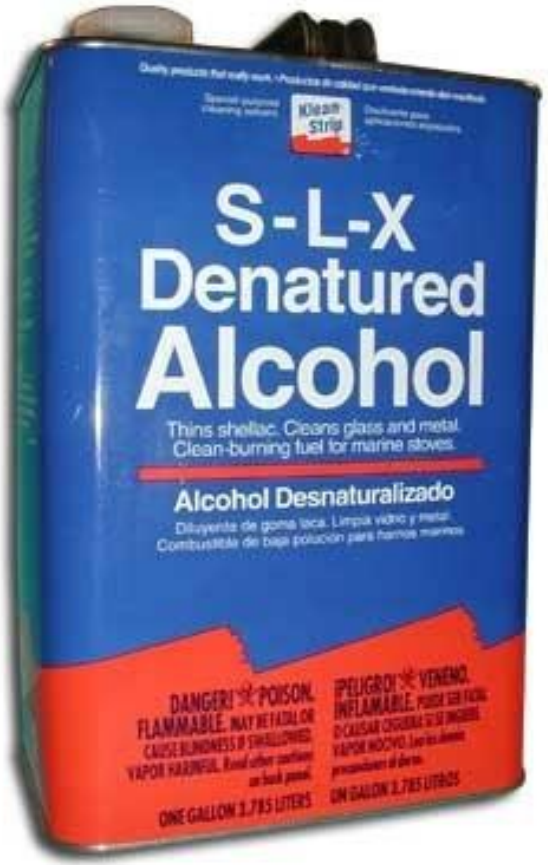
Starting
Tuning
Flushing

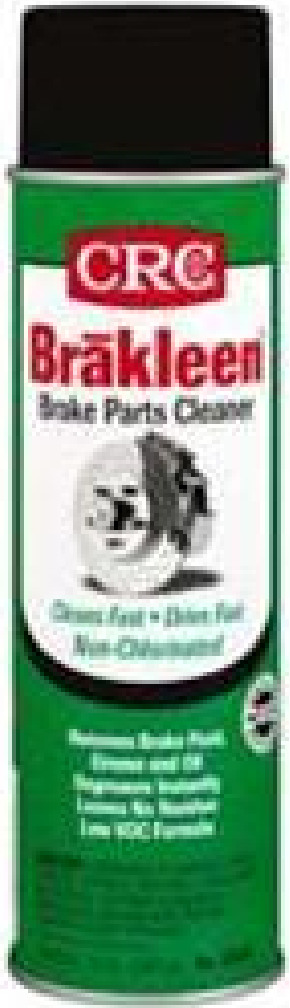


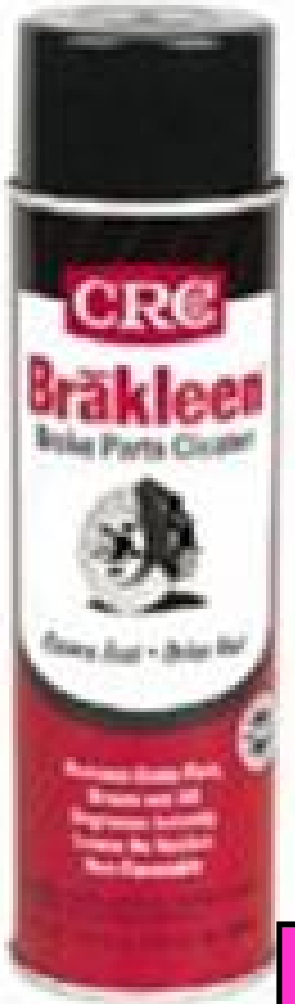
ATASA 5th Brake Systems

ATASA 5th Brake Systems

49. Hydraulic parts should only be cleaned w/brake _____, brake solvent, or denatured _____.







Fluid, Alcohol Cleaner, Vinegar Baking Soda, Water

50. System *bleeding* is done in order to remove trapped _____ which would cause a *spongy pedal*.

Air
Moisture
Oil

ATASA 5th Brake Systems

Pressure Bleeder

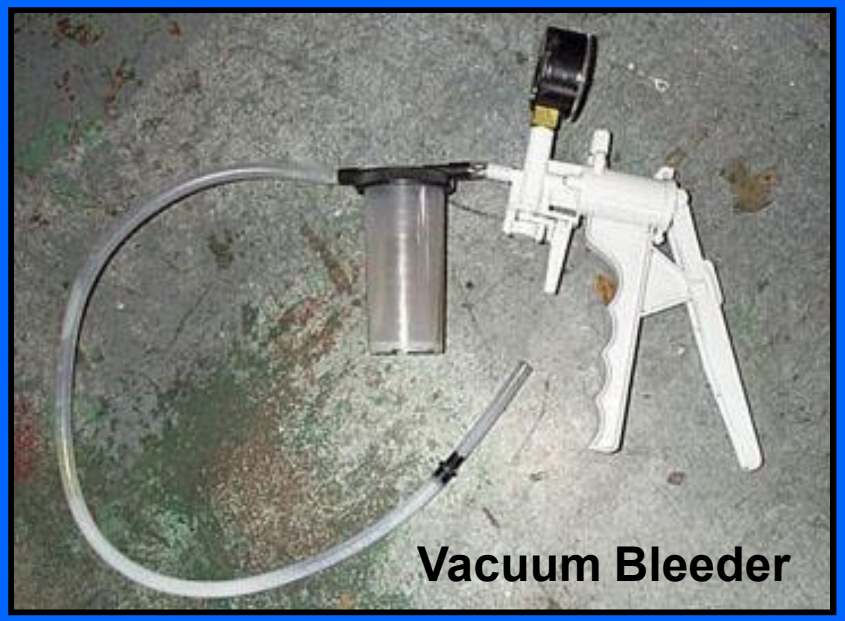
ATASA 5th Brake Systems

Vacuum Bleeder

ATASA 5th Brake Systems

Vacuum Bleeders

ATASA 5th Brake Systems



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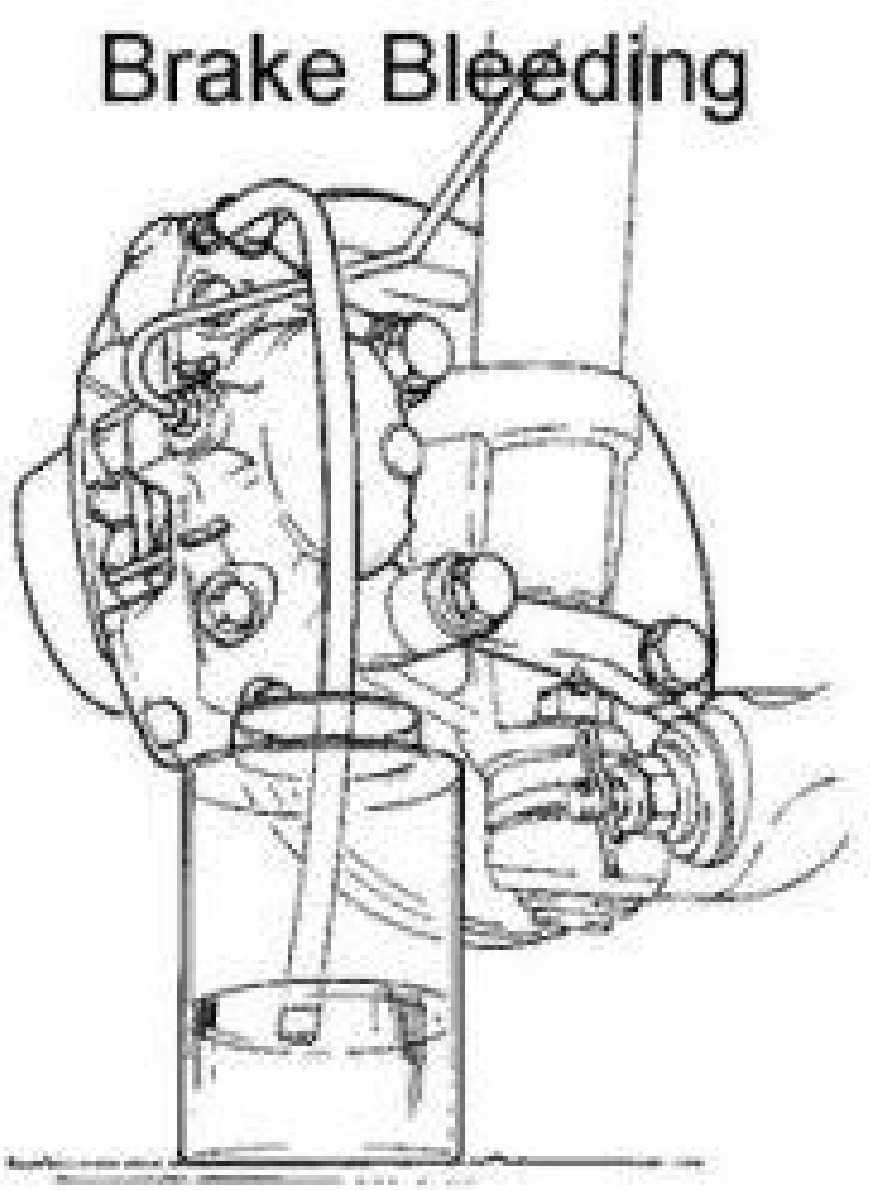
Automatic Bleeder Screws


Brake Bleeding

ATASA 5th Brake Systems

ATASA 5th Brake Systems

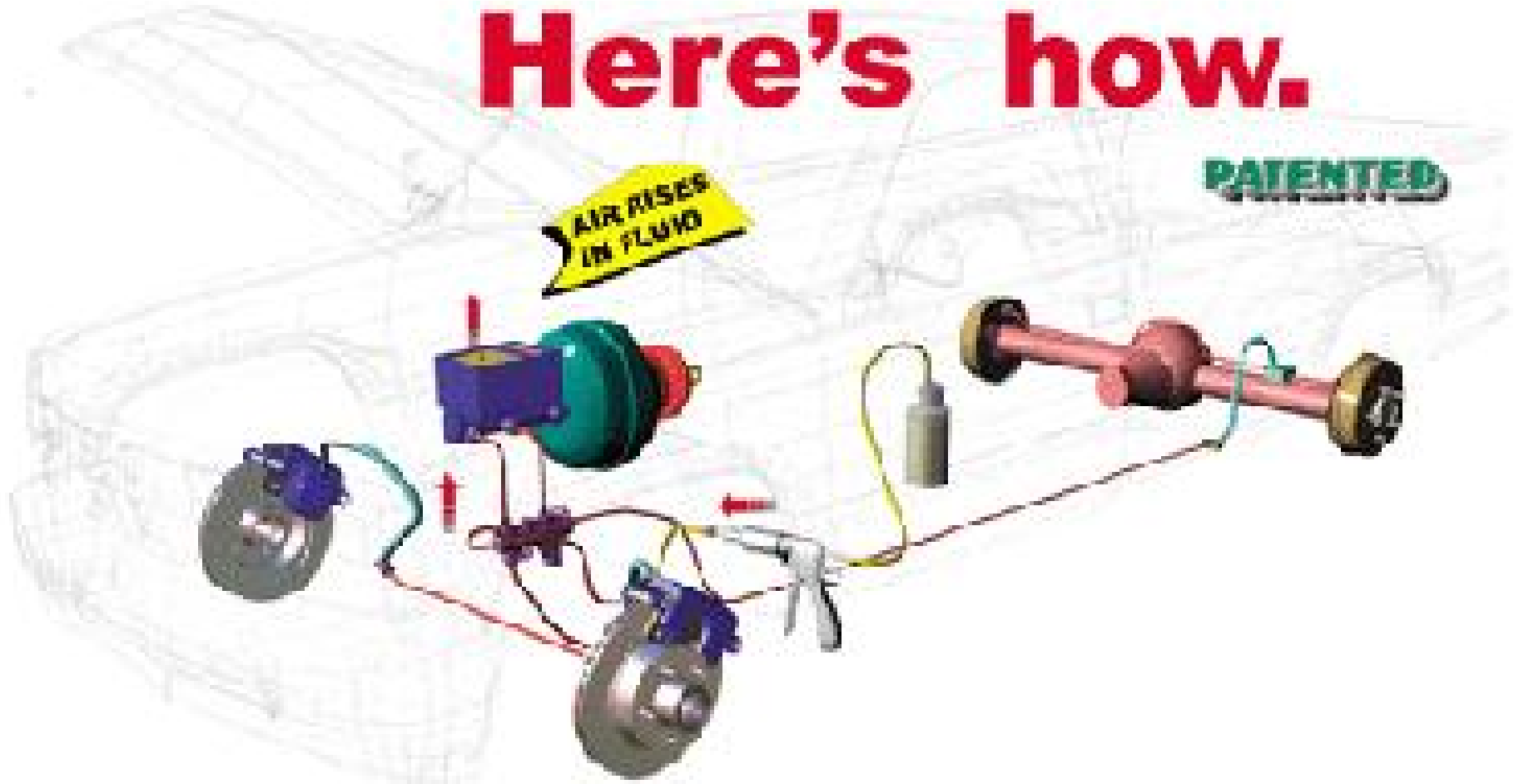
ATASA 5th Brake Systems

ATASA 5th Brake Systems

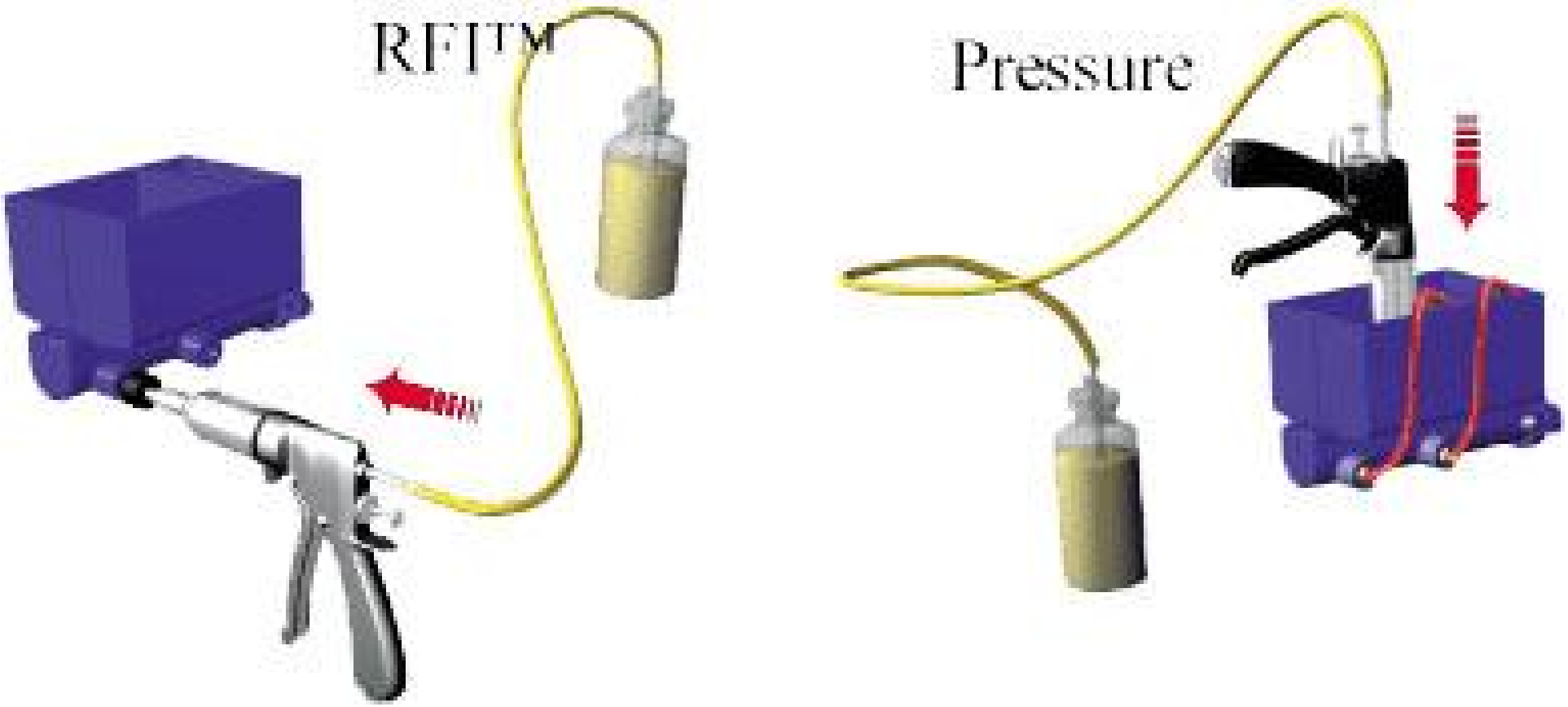
ATASA 5th Brake Systems

ATASA 5th Brake Systems

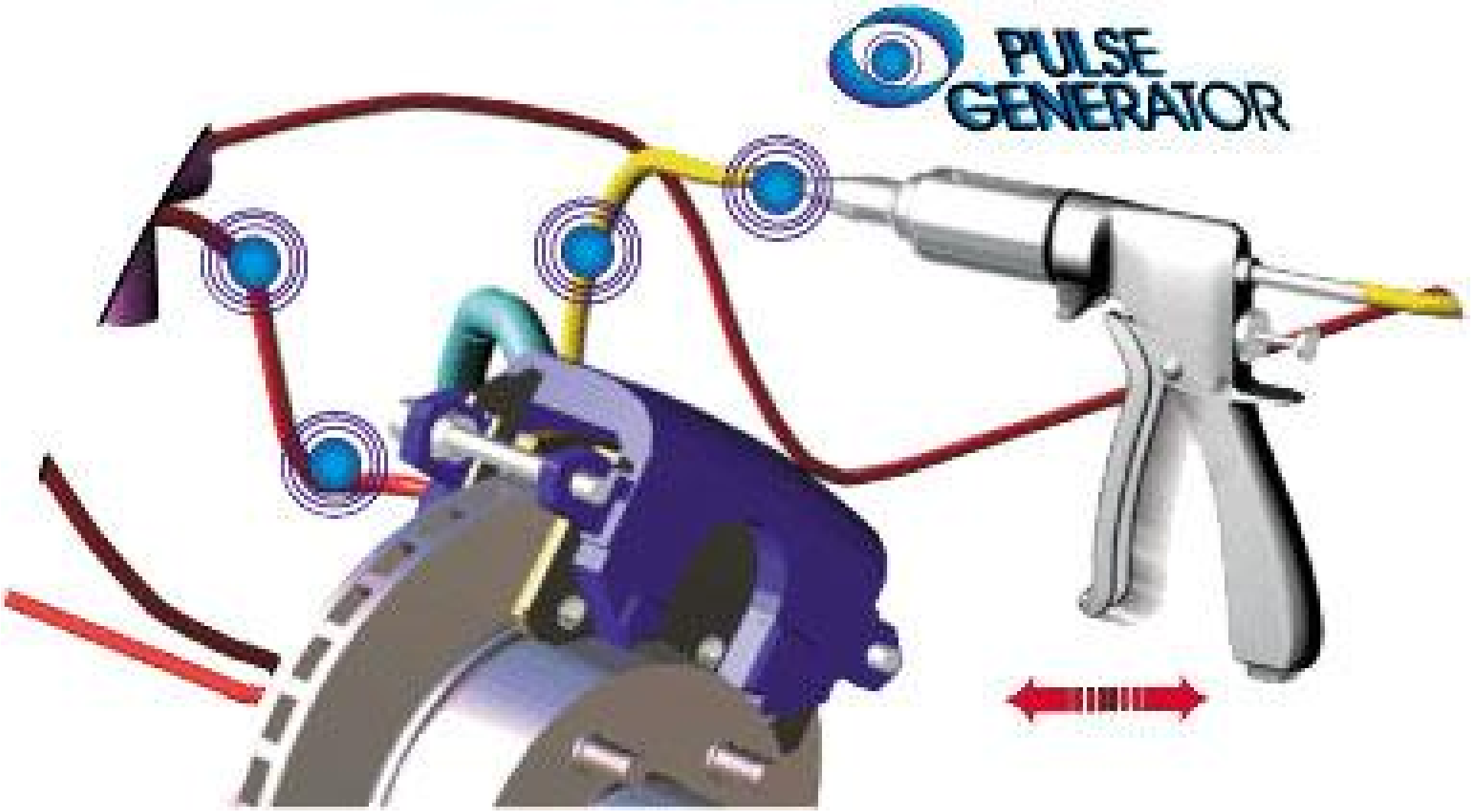
ATASA 5th Brake Systems



Bench



New Techniques



Pulse Generator

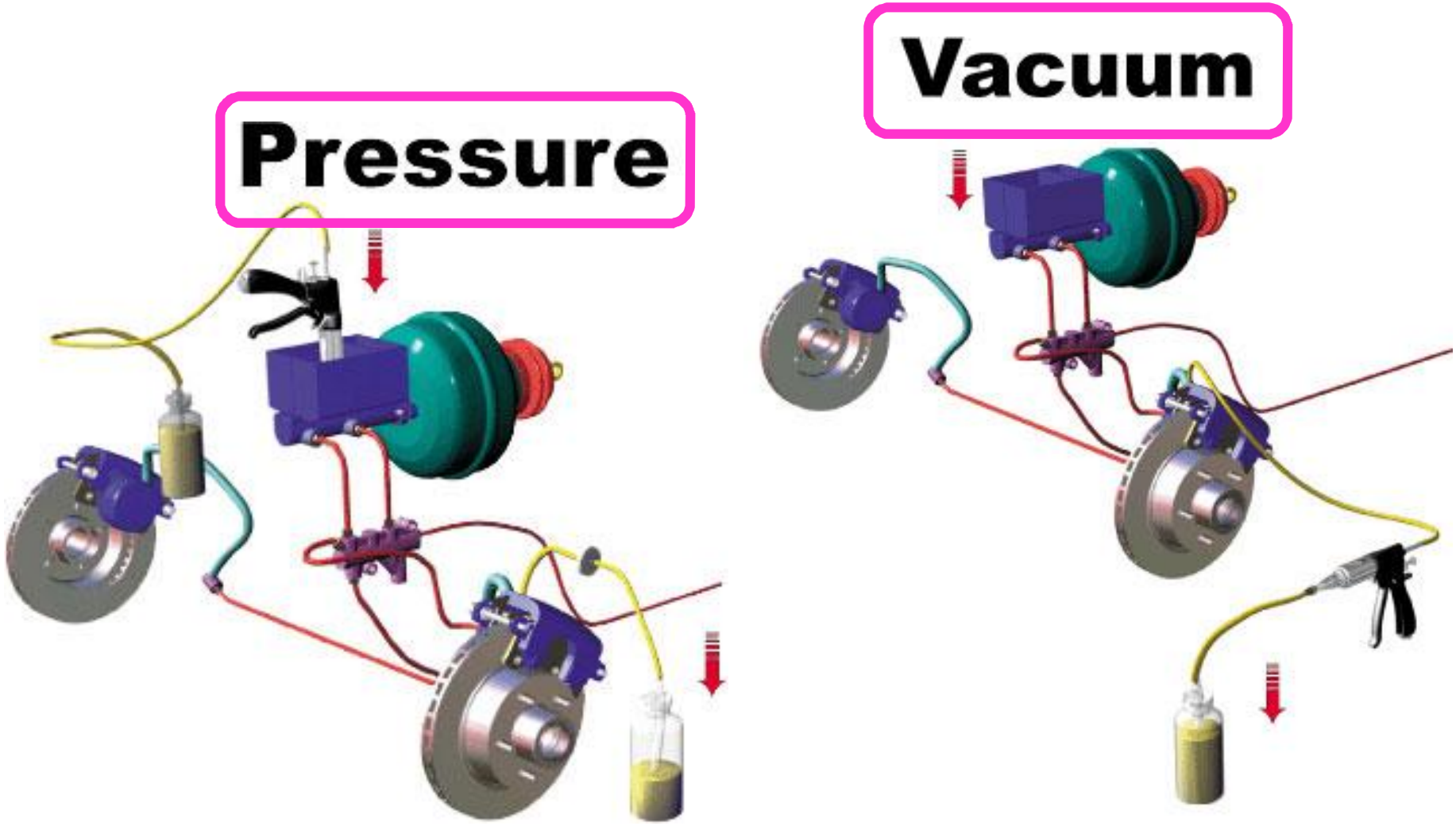
A technique developed by Phoenix Systems, uses the Injector to create pulsations which generate a force within the system which acts to overcome the surface tension of the trapped air.

This Pulse Generation helps to force trapped air out of a system.

It's like tapping on a caliper, slave, master or line, at the same time.

Cross Bleed and Flush

51. Bleeding can be done by either forcing fluid under _____ or pulling fluid with a _____ through the system and out of the bleeder screws. On some vehicles, scan tools can energize the ABS pumps to assist with bleeding. *Note: 2012 & newer must have ABS &ESC!*



52. The bleeding sequence is based on the principle s of starting at the _____ point in the system and working downward, then starting at the wheel _____ from the master cylinder and working to the closest.

This varies in front/rear vs. diagonally split systems & ABS vs. non-ABS

Warning! Before bleeding the system, high pressure must be released from the accumulator and power unit. A special ALB-T wrench (Part No. 07HAA-SG00100) or equivalent must be used to bleed the power unit valve under the red cap. System pressures may be as much as 3000 PSI. A face shield should be worn and the connections covered with a rag when bleeding the system. Note: If ABS light comes on and stays on, remove the 15 amp fuse to erase codes and turn off light.

Bleeding Sequence:

- Left Front (1)
- Right Front (2)
- Right Rear (3)
- Left Rear (4)

Bleed Procedure:

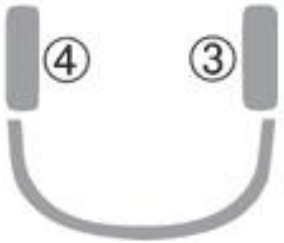
Aftermarket Approach

- OEM Did Not Supply:

Special/OEM Procedures

- OEM Did Not Supply:

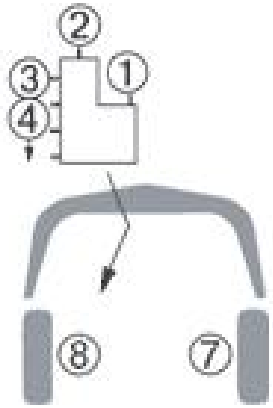
Highest, Farthest
Lowest, Closest
Middle, Nearest



ATASA 5th Brake Systems

Bleeding Sequence:

- Master Cylinder, If Serviced (1) (2) (3) (4)
- Right Rear (5)
- Left Rear (6)
- Right Front (7)
- Left Front (8)



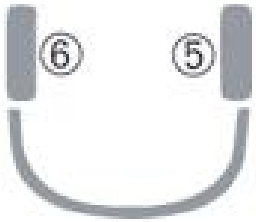
Bleed Procedure:

Aftermarket Approach

- OEM Did Not Supply:

Special/OEM Procedures

- With ABS, bleed the base brake system then connect a Scan tool to the DLC. Access the brake bleeding function of the Scan tool and follow the instructions on the screen. Disconnect the Scan tool and bleed the base brake system again.



ATASA 5th Brake Systems

53. _____ bleeding is done with the force of the brake pedal and requires either two people or one person and a bottle of brake fluid with a submerged tube attached to the bleeder screw.

Manual
Pressure
Vacuum

Wrench says: **"Pump it up"** ***(bleeder screw is closed & it's OK to pump)***

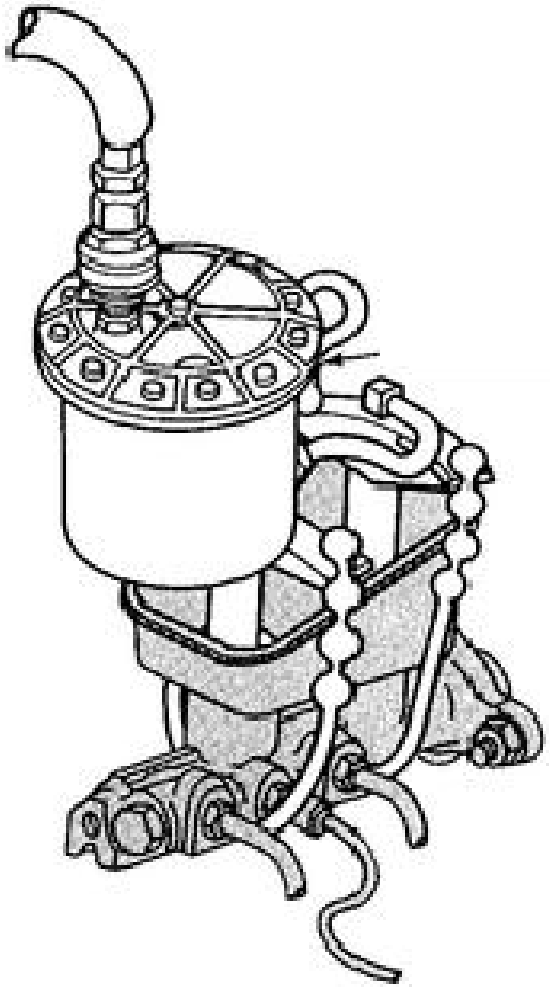
Foot says: "**Pumped up**" ***(pedal has been pumped 5 to 10 times slow)***

Foot says: "**Down**" ***(pedal has hit the floor & is being held there – close the bleeder)***

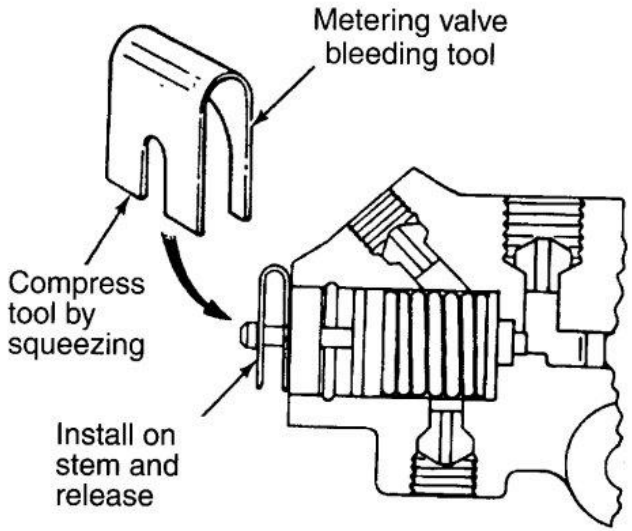
54. _____ bleeding can be done by one person applying recommended pressure to the MC.

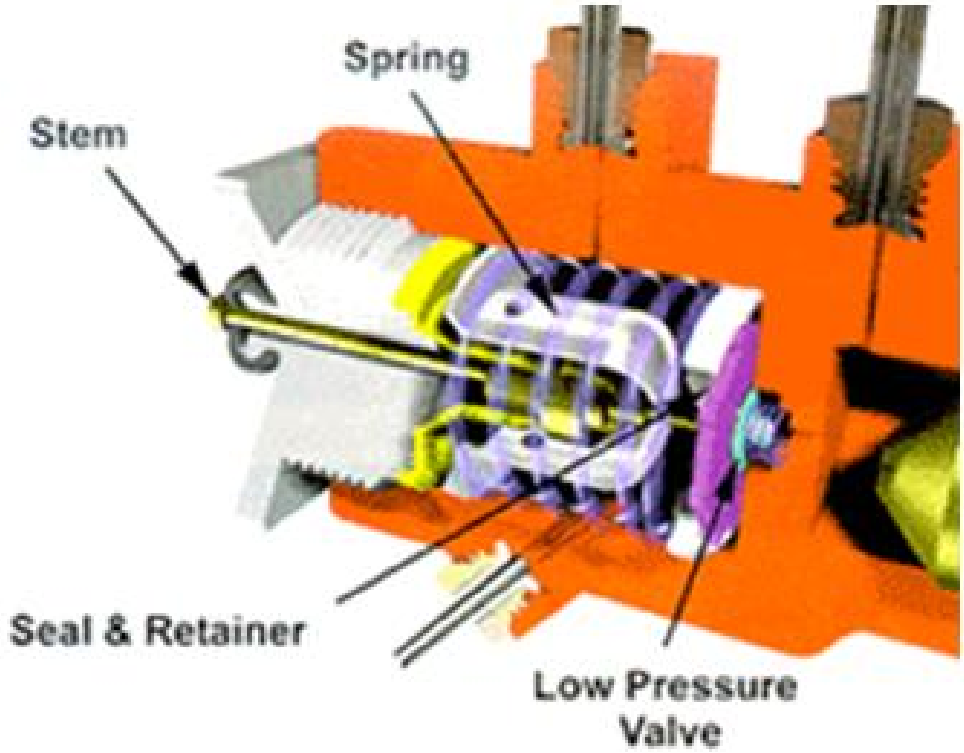
Manual
Pressure
Vacuum

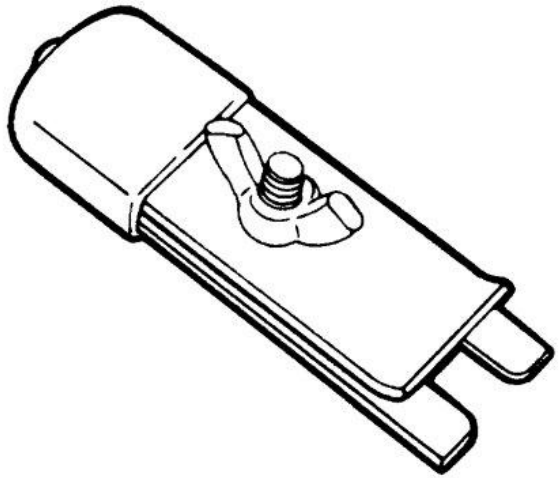
ATASA 5th Brake Systems



55. The metering valve must be held _____ *during pressure bleeding of the front system.* *(hold-off)*







Tool holds metering valve open so fronts can be bled

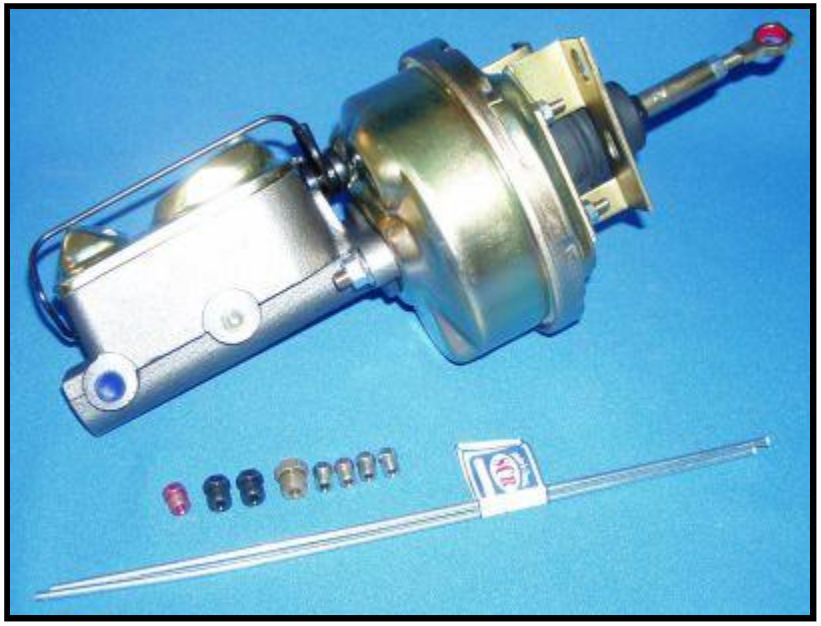
By Hand
Open
Closed

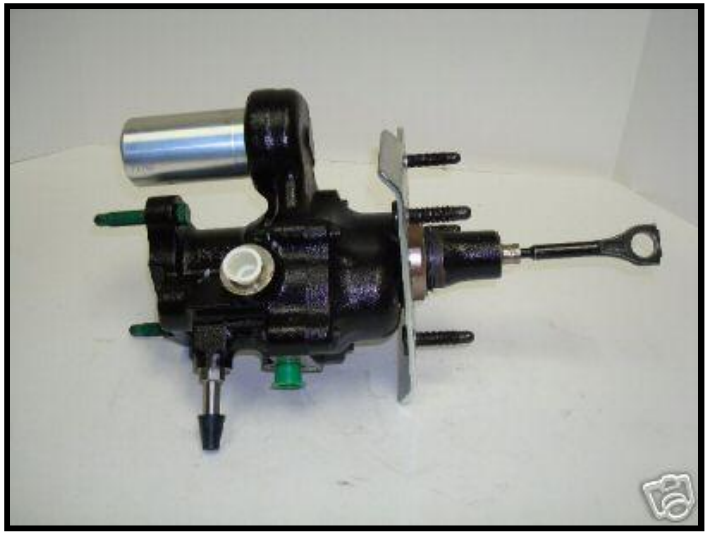
ATASA 5th Brake Systems

Note: scan tools can energize the ABS pump to bleed the system.

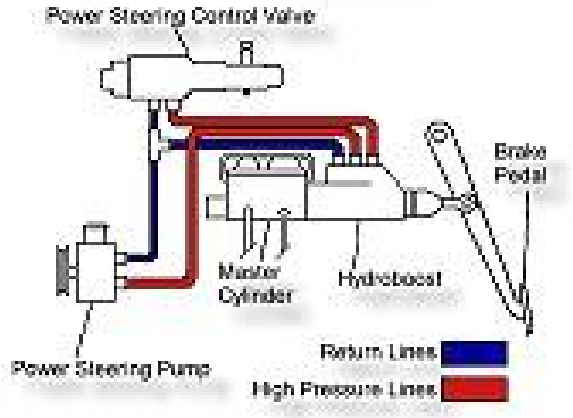
ATASA 5th Brake Systems

56. Two designs of power brakes are the ____ assist and the _____ assist.



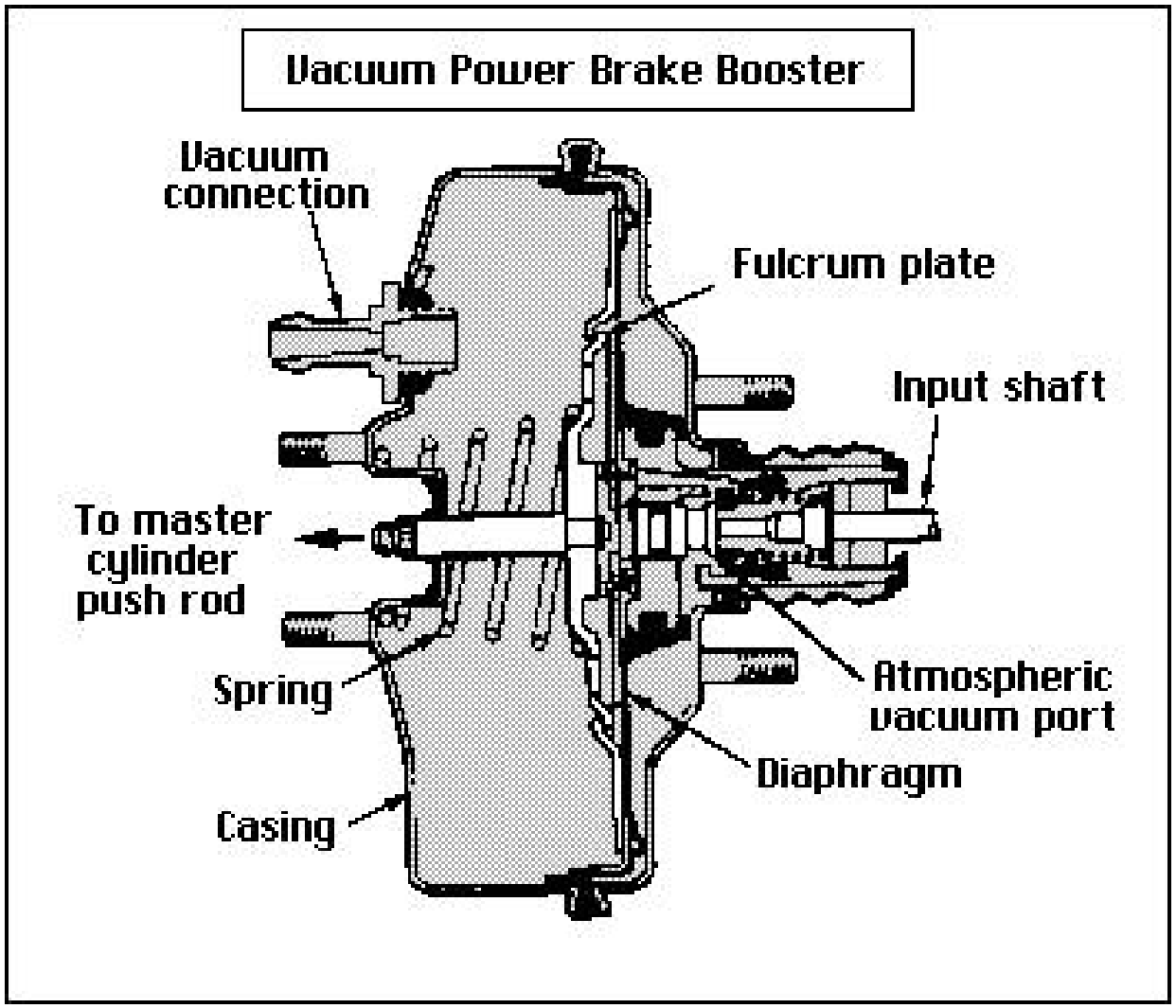


Vacuum, Hydraulic
Vacuum, Electric
Vacuum, Pneumatic



ATASA 5th Brake Systems

57. The vacuum-_____ *power brake booster* balances the diaphragm using engine vacuum until the brake pedal is depressed allowing atmospheric pressure to assist w/application.



Suspended
Apprehended
Pneumatic

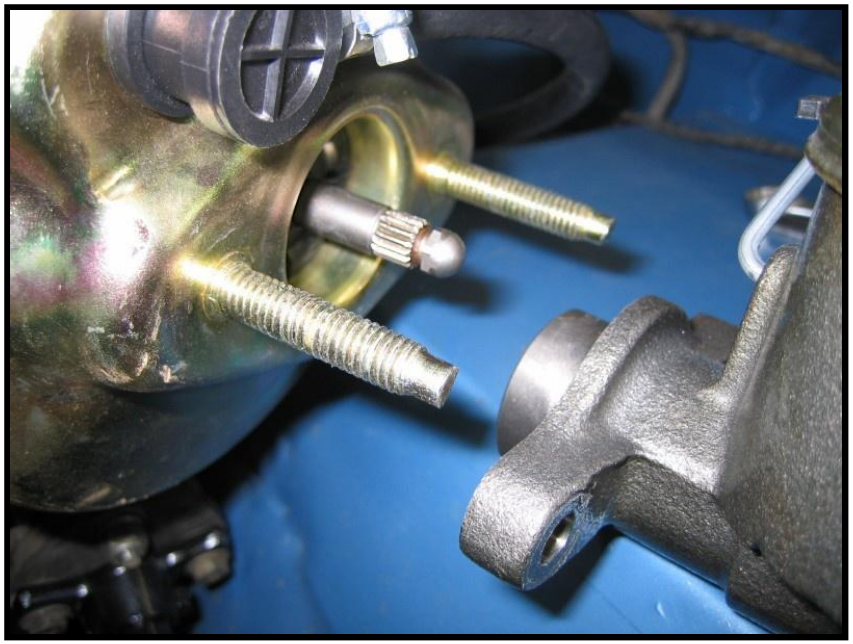
ATASA 5th Brake Systems

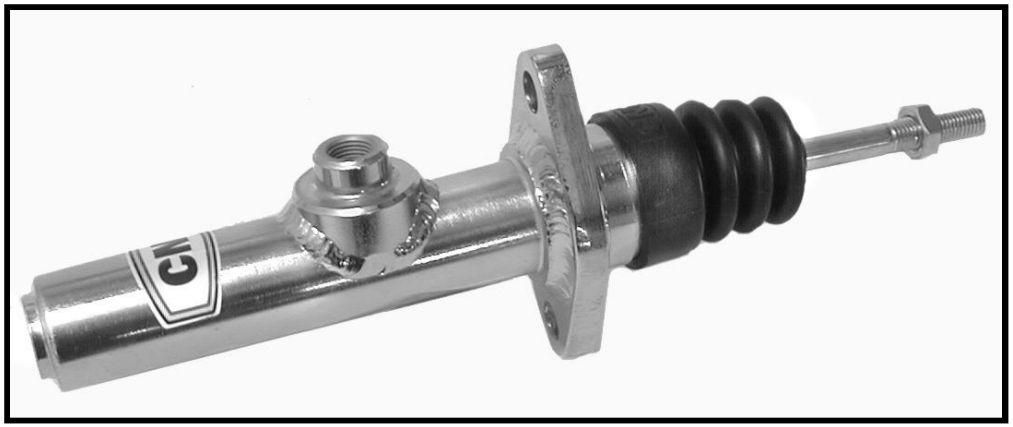
59. _____ brake boosters use *power steering fluid pressure* or nitrogen-charged, high pressure accumulators to assist with brake application. (Hydro-boost® & Powermaster®)

Hydraulic
Vacuum
Pneumatic

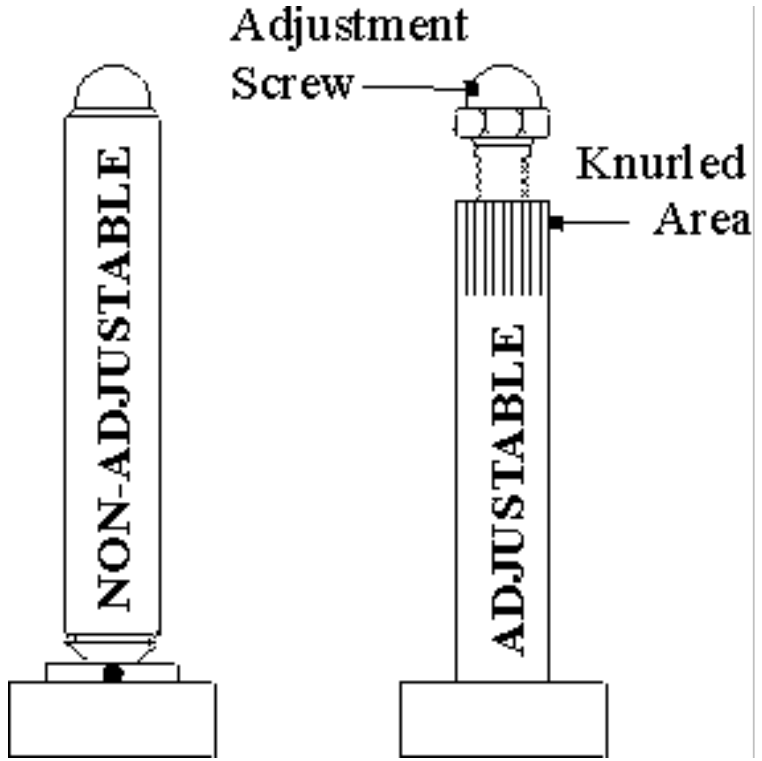
ATASA 5th Brake Systems

58. Improper master cylinder _____ adjustment can cause either dragging brakes *(too long)*, or excessive pedal travel (too short). It will also have an effect on power booster operation.



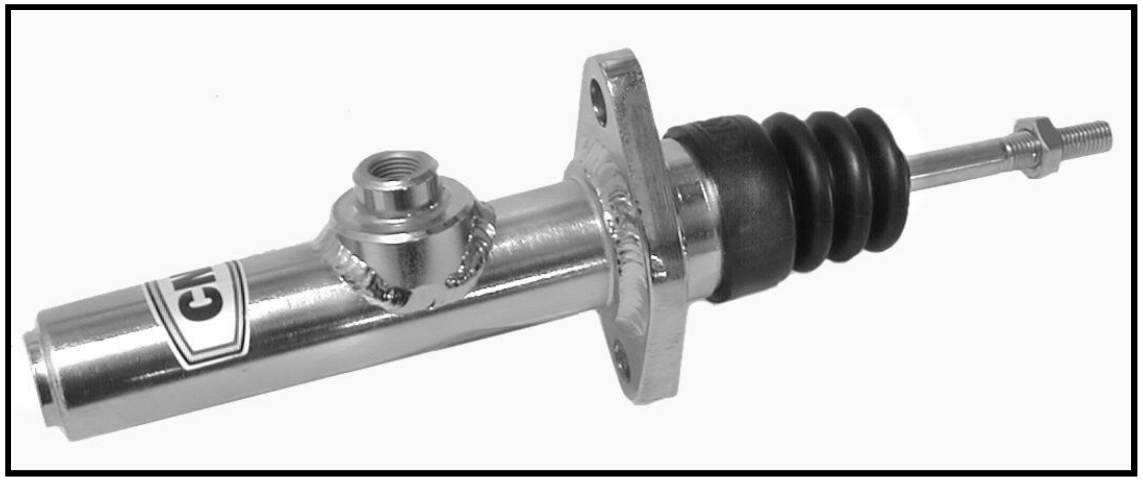


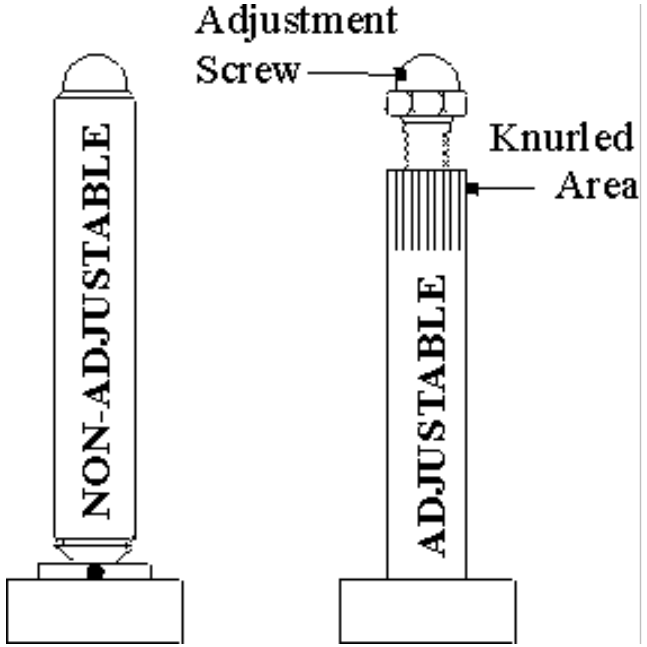
Push Rod
Connecting Rod
Wrist Pin

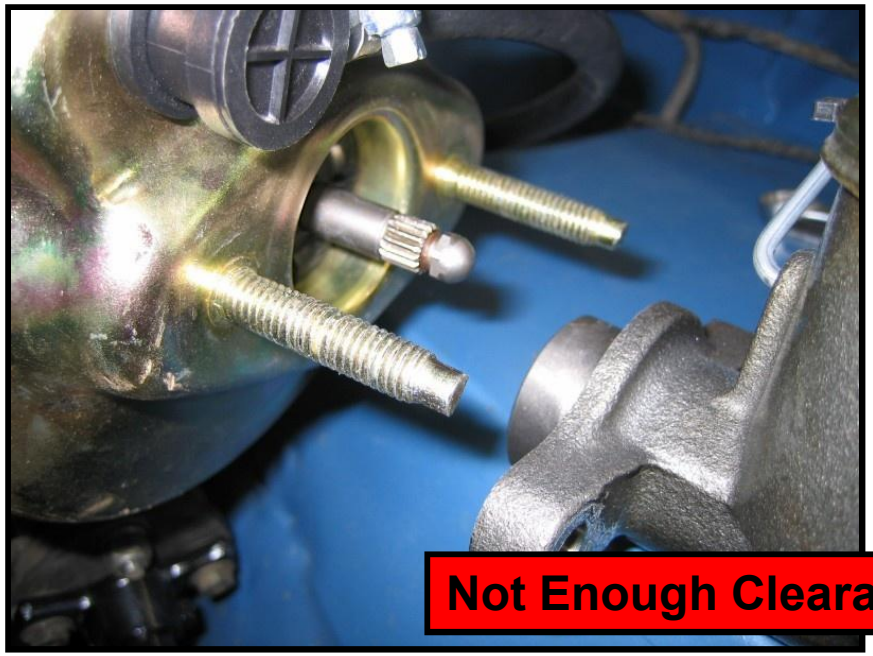


ATASA 5th Brake Systems

Too Much Clearance = Low Pedal When Applied







Not Enough Clearance = Brakes Drag When Not Applied

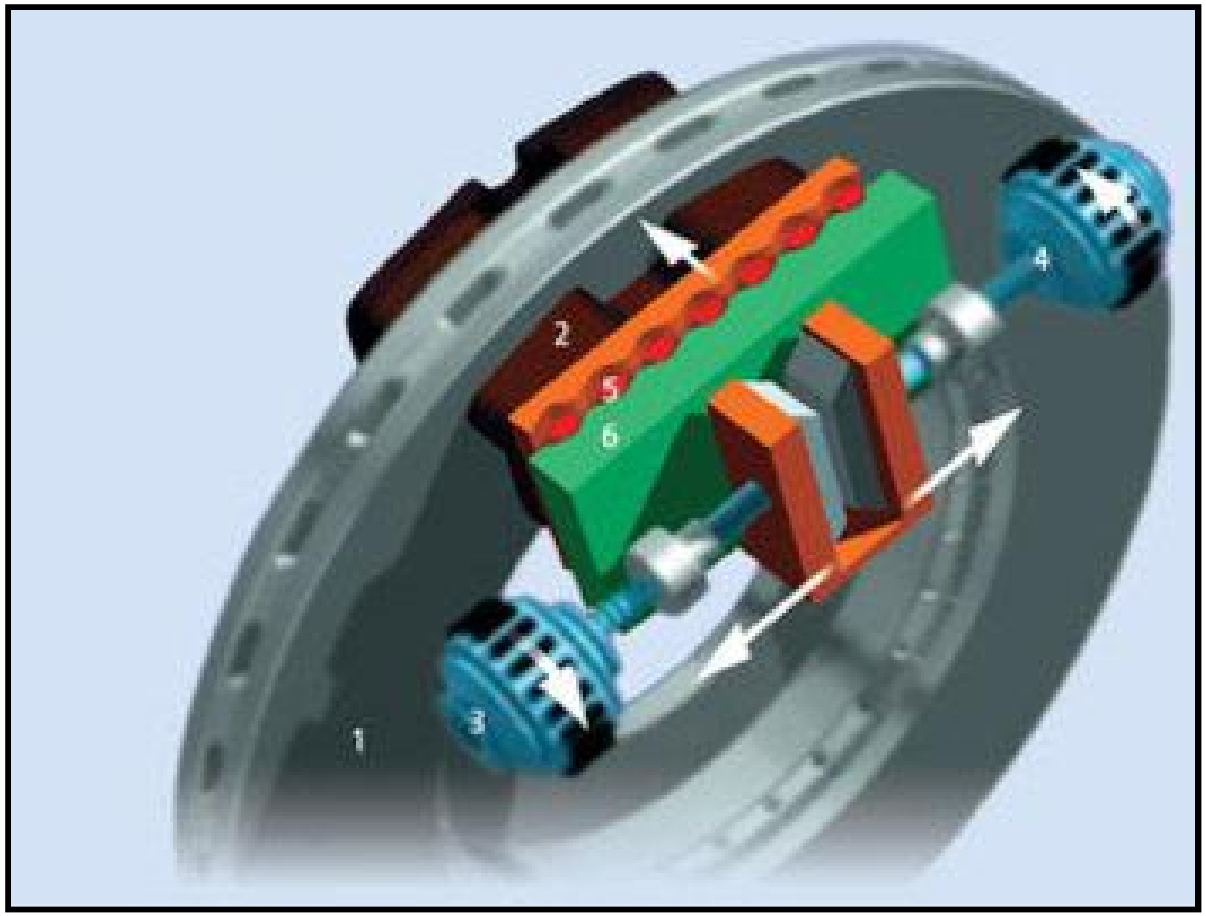
60. To depressurize the accumulator in a hydro-boost system, turn the engine _____ then depress and release the brake pedal up to ten times before disconnecting any brake lines or hoses.

WARNING: This is also an important step to take when working with ABS!

Over
Off!
Sideways

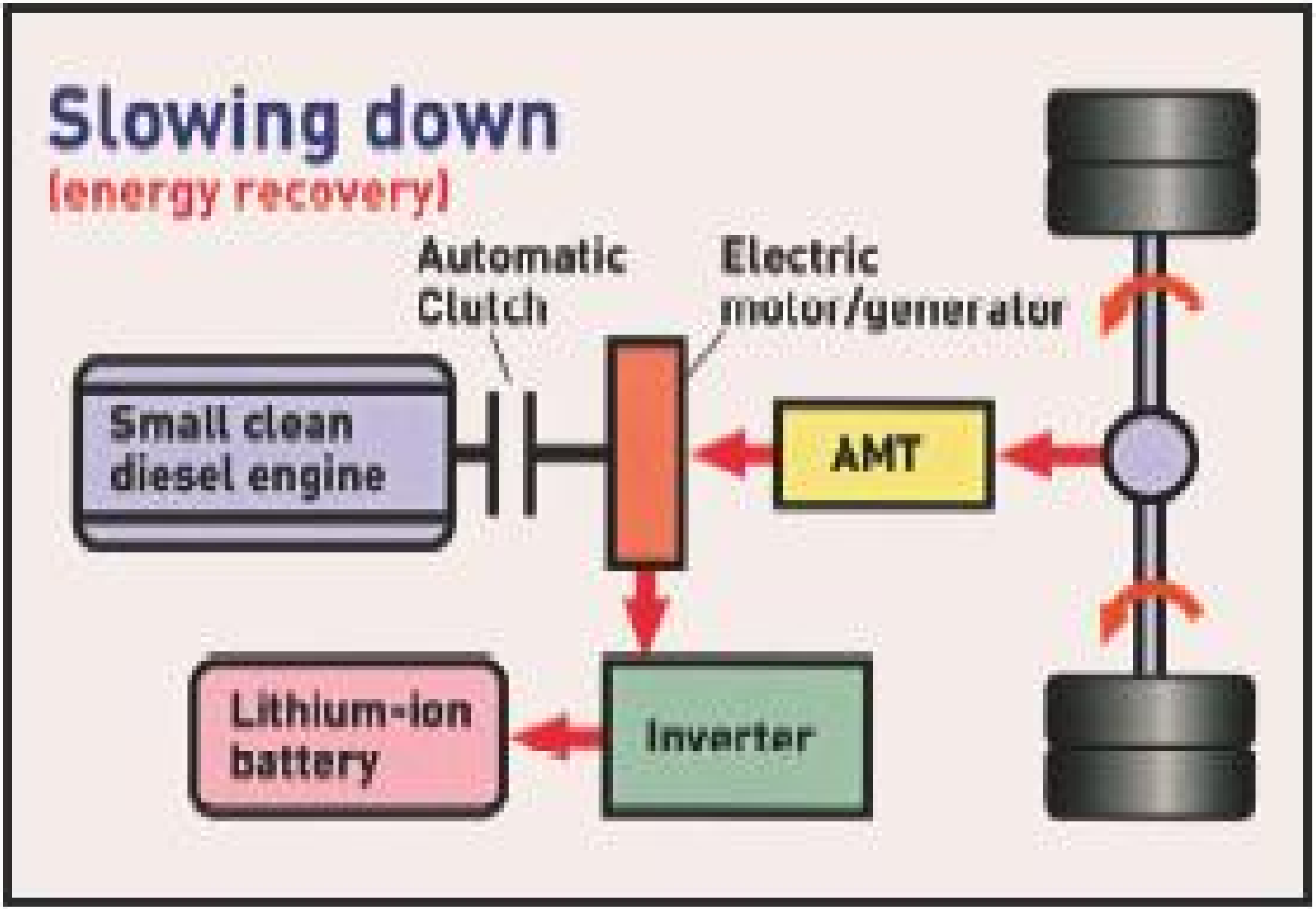
61. Electric _____ _____ are becoming more common and are seen as a first step toward brake-by-wire systems.

Advantages include automatic apply when the ignition is switched off or the driver's door is opened & hill-hold from rolling backward on manual transmission cars.

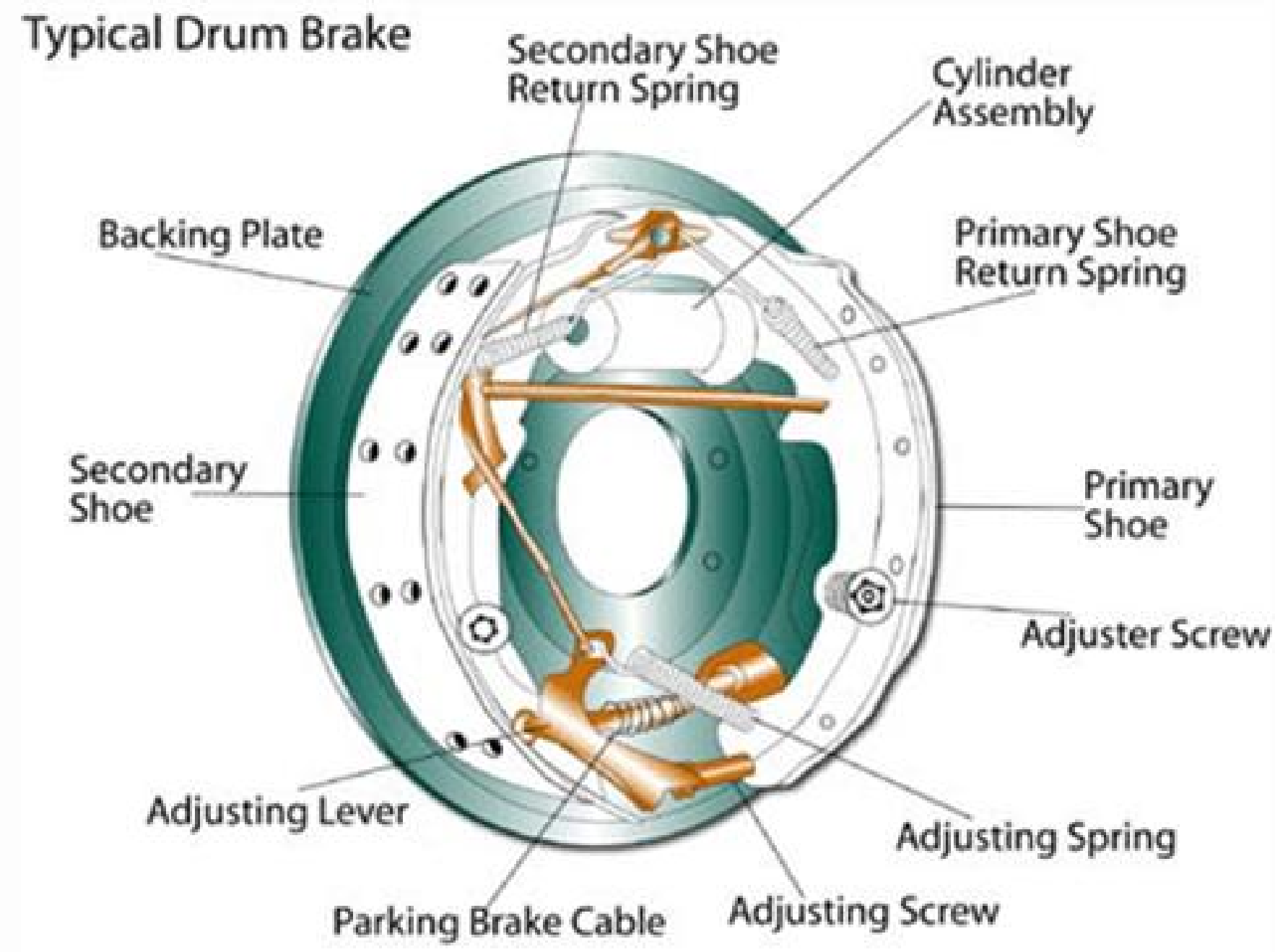


Power Brakes
Trailer Brakes
Front Brakes

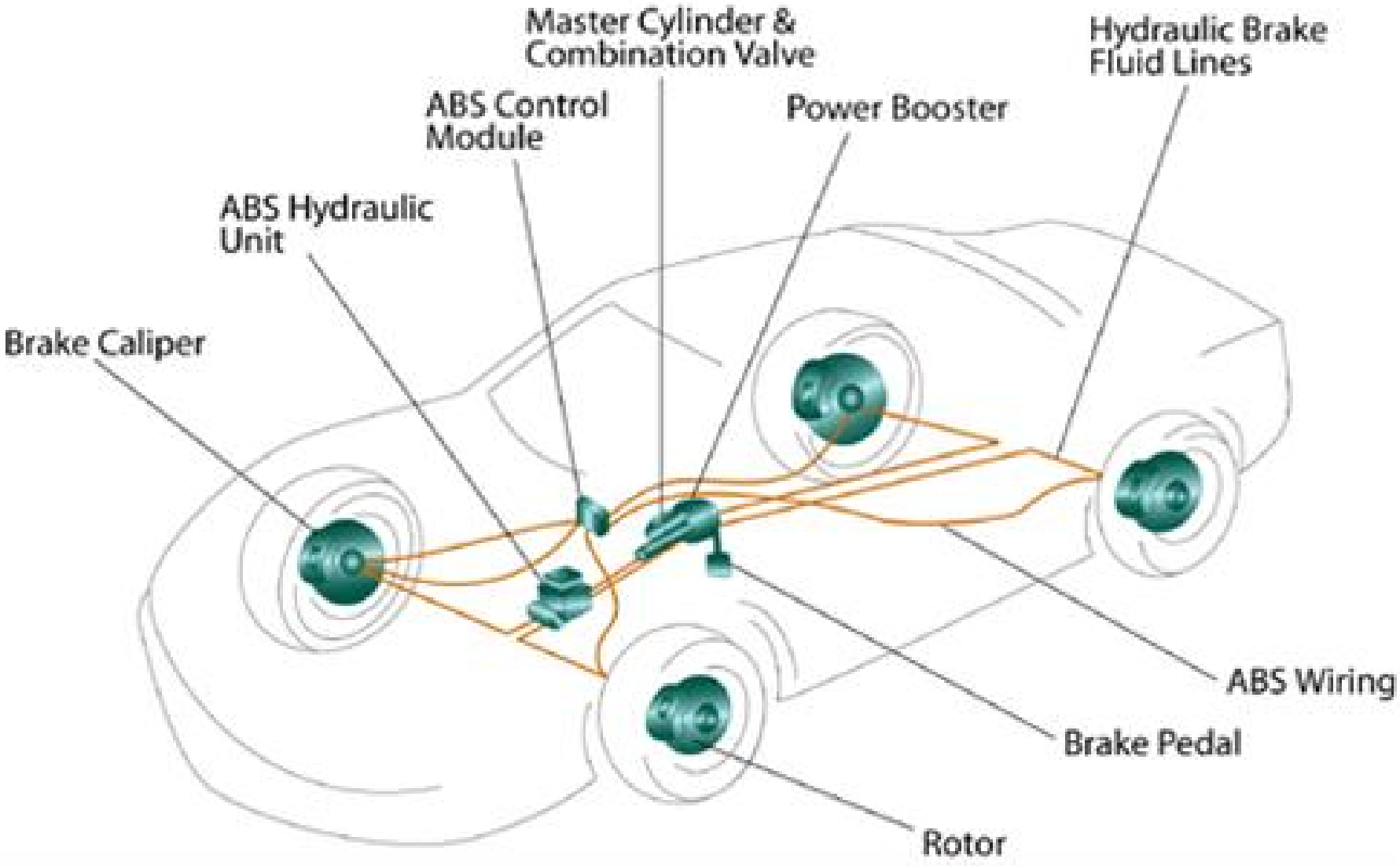
ATASA 5th Brake Systems


Slowing down
(energy recovery)
Automatic Clutch
Electric motor/generator
Small clean diesel engine
AMT
Lithium-ion battery
Inverter

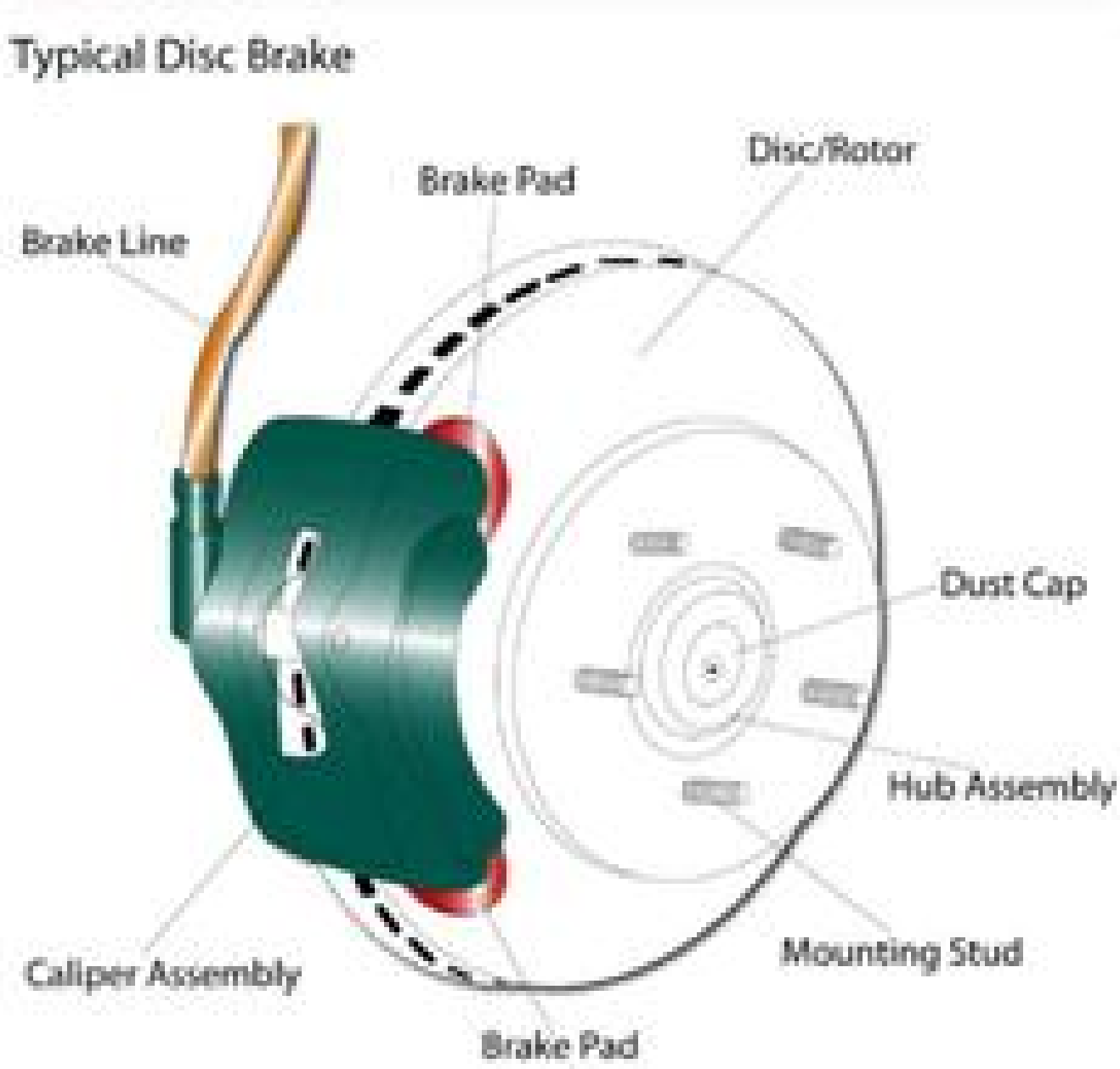
ATASA 5th Brake Systems



Brake System: Overview

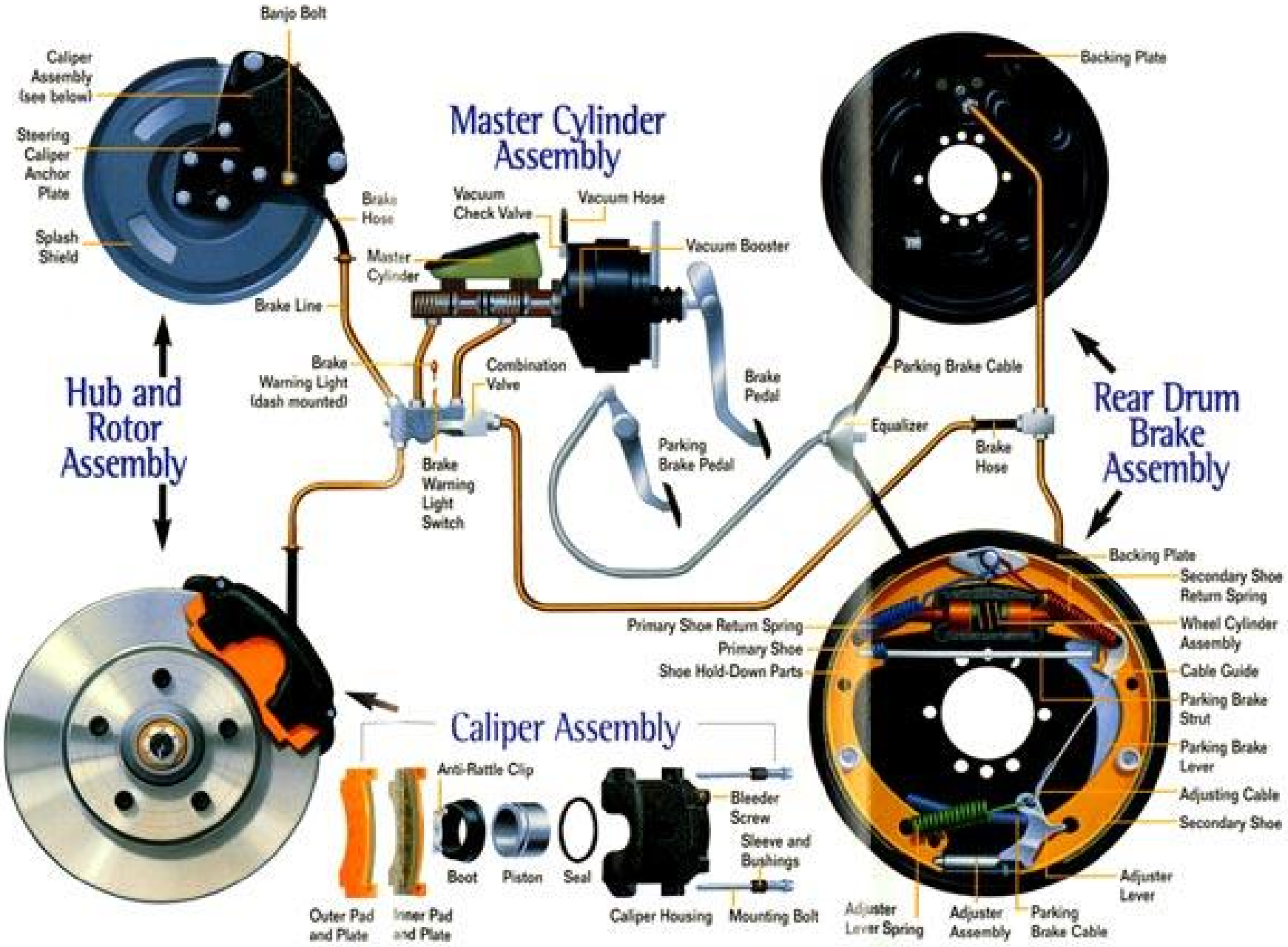


ATASA 5th Brake Systems

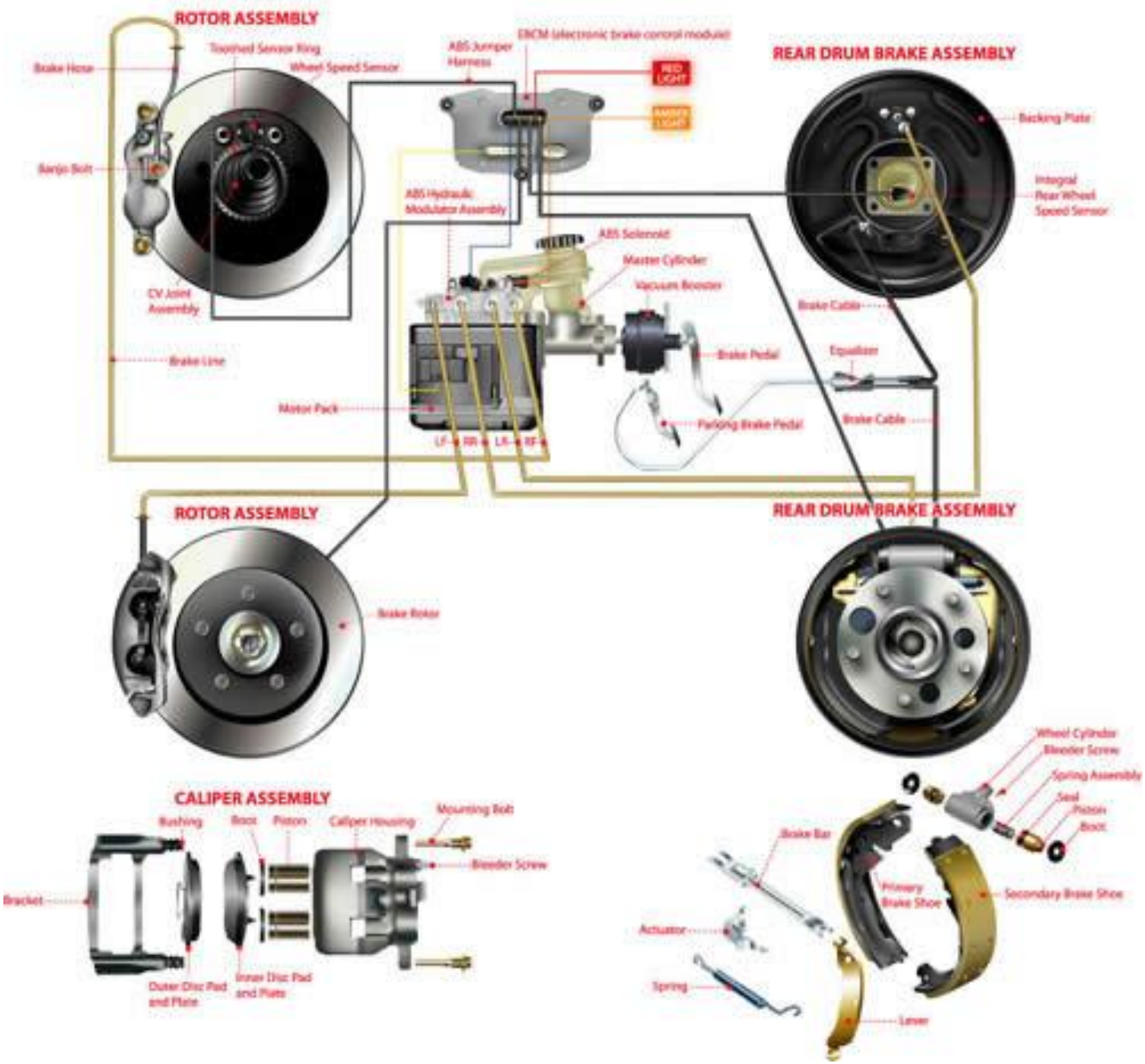


ATASA 5th Brake Systems

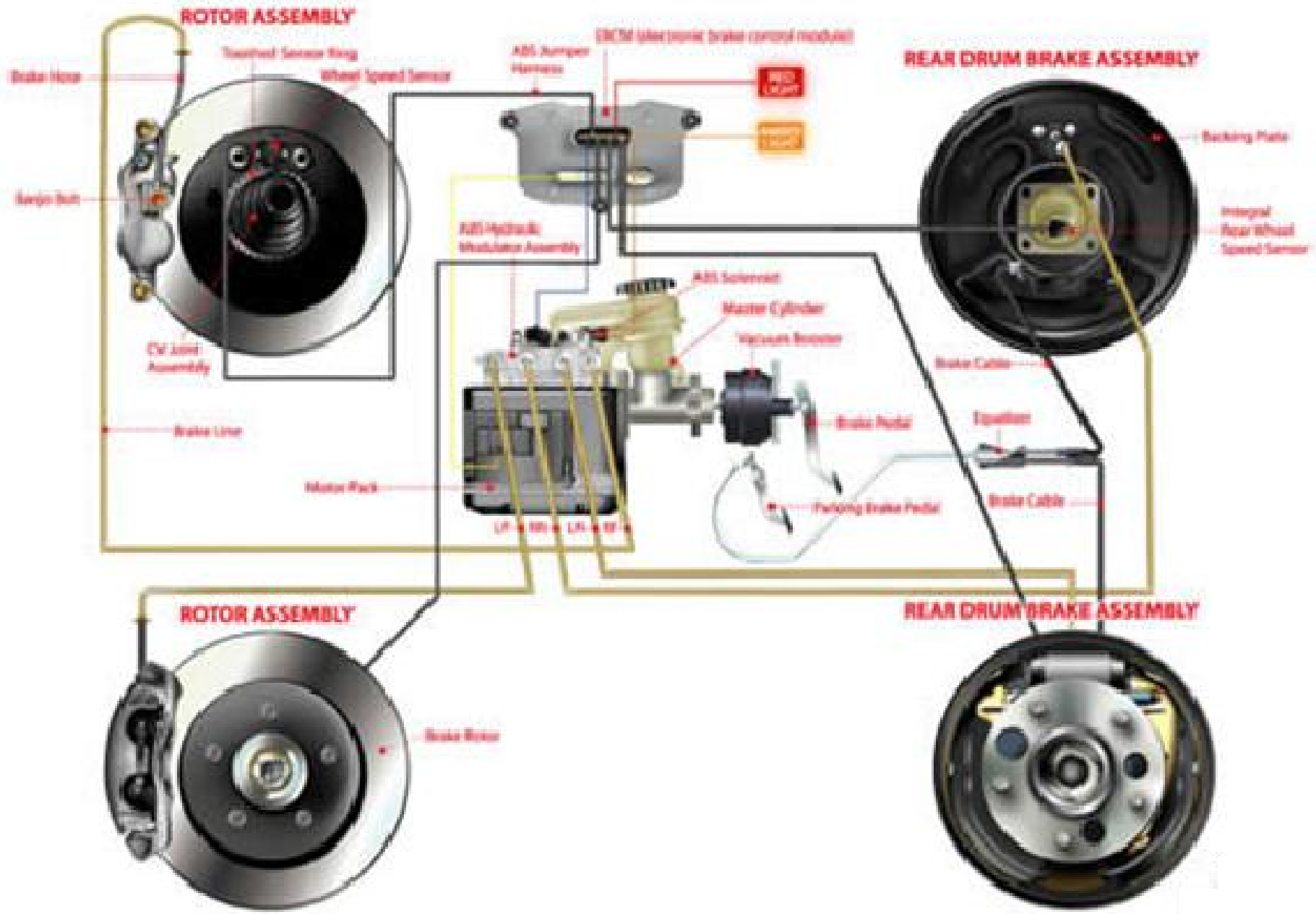
ATASA 5th Brake Systems



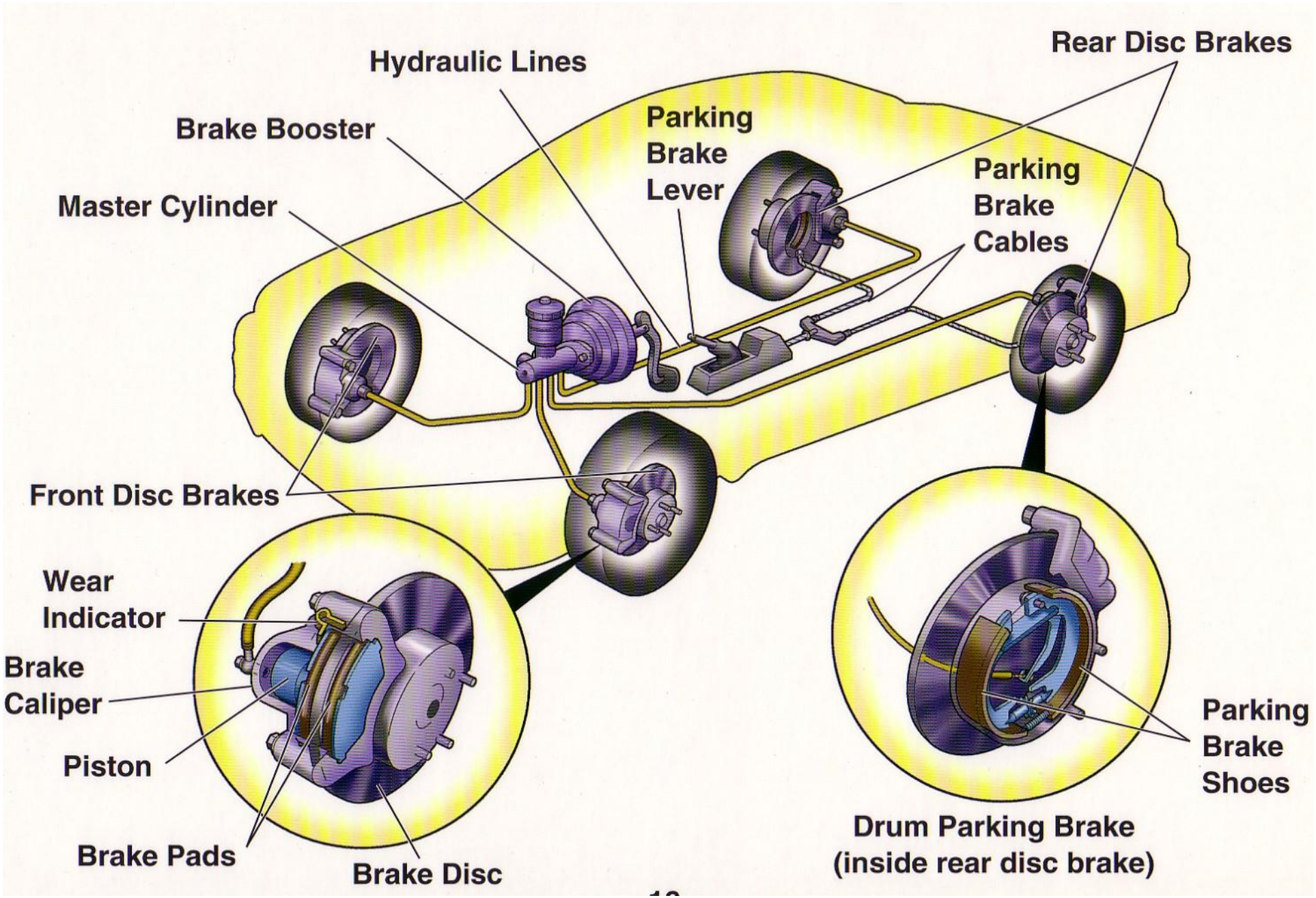
ATASA 5th Brake Systems



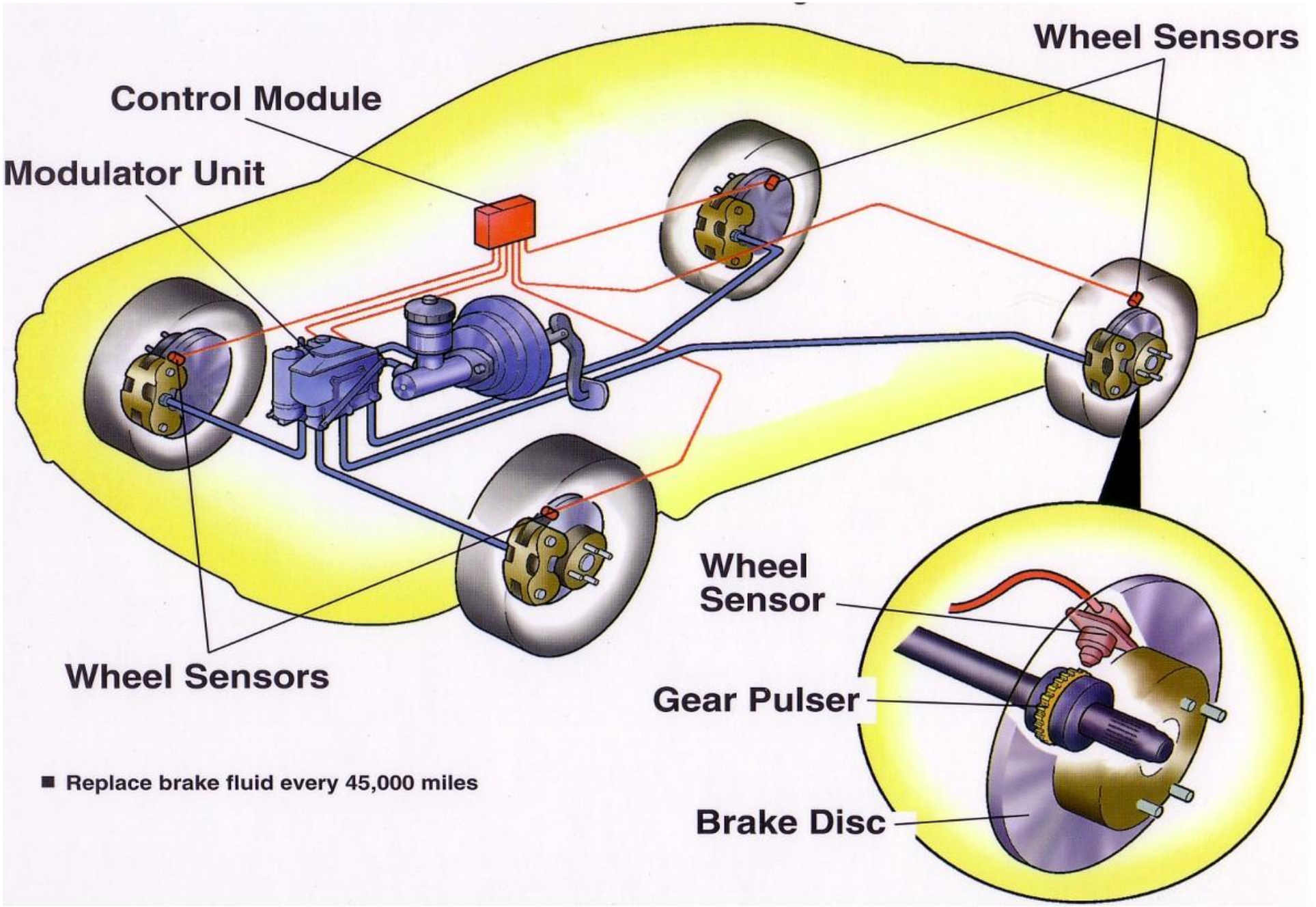
ATASA 5th Brake Systems



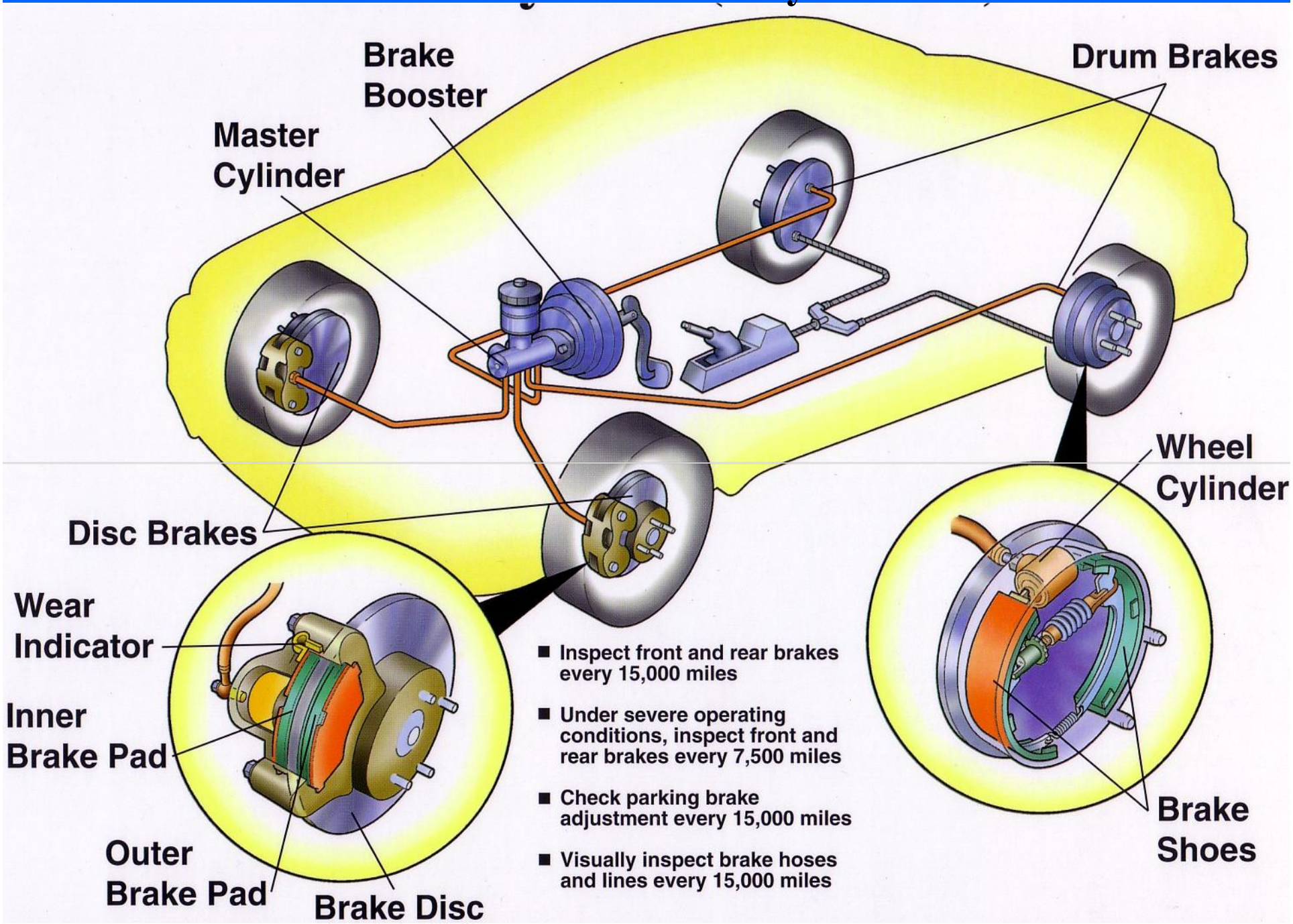
ATASA 5th Brake Systems



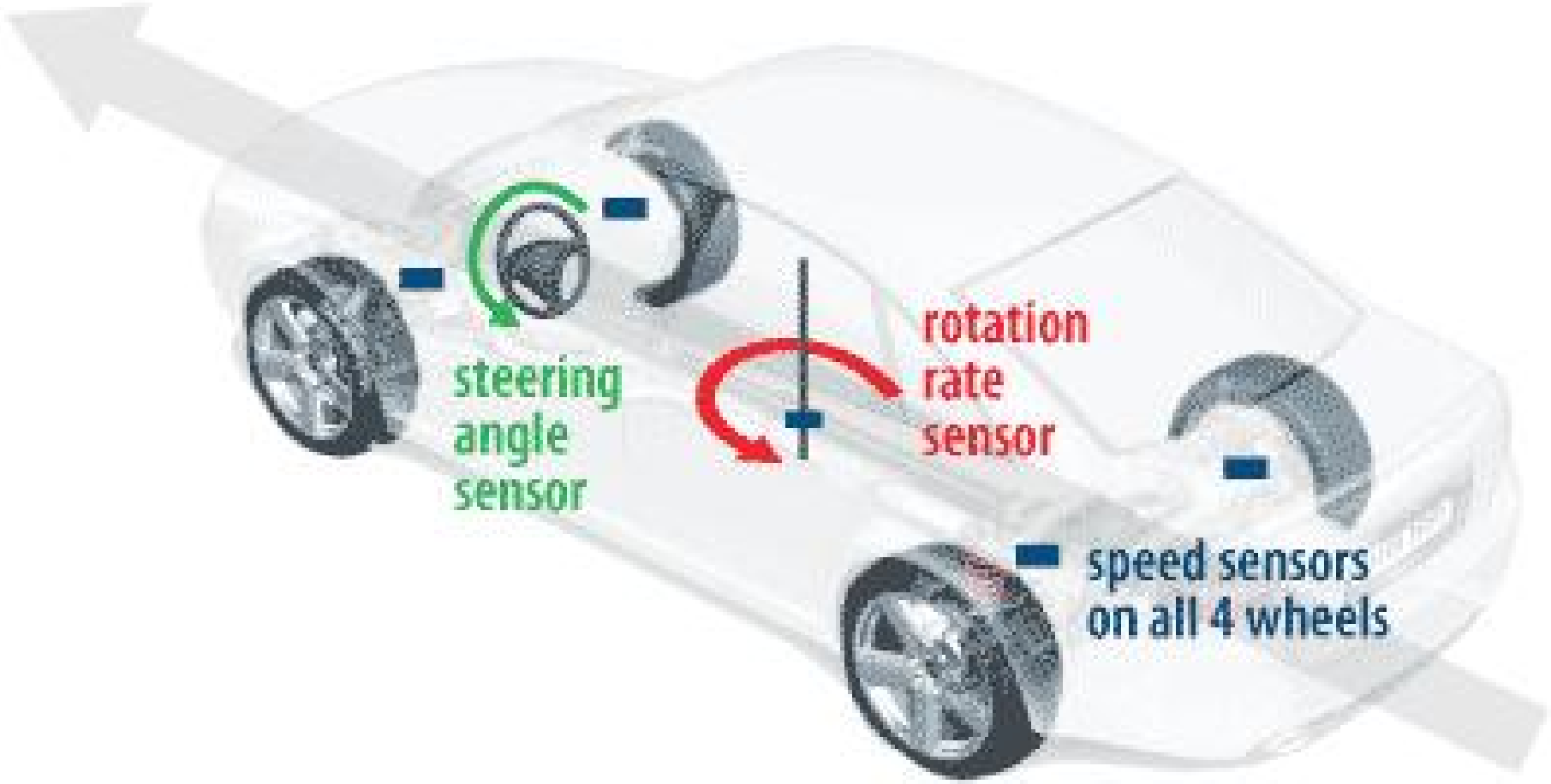
ATASA 5th Brake Systems



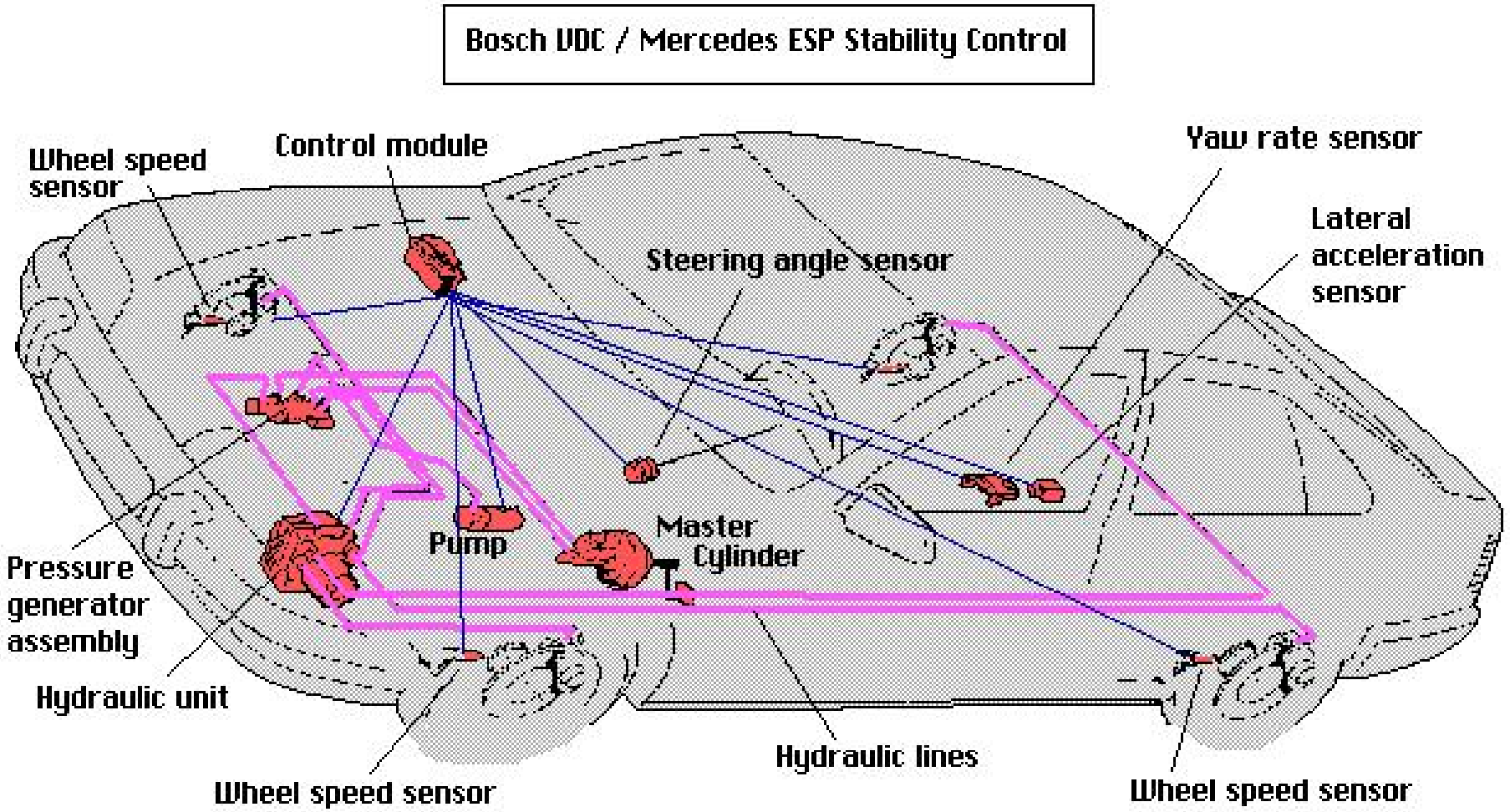
ATASA 5th Brake Systems



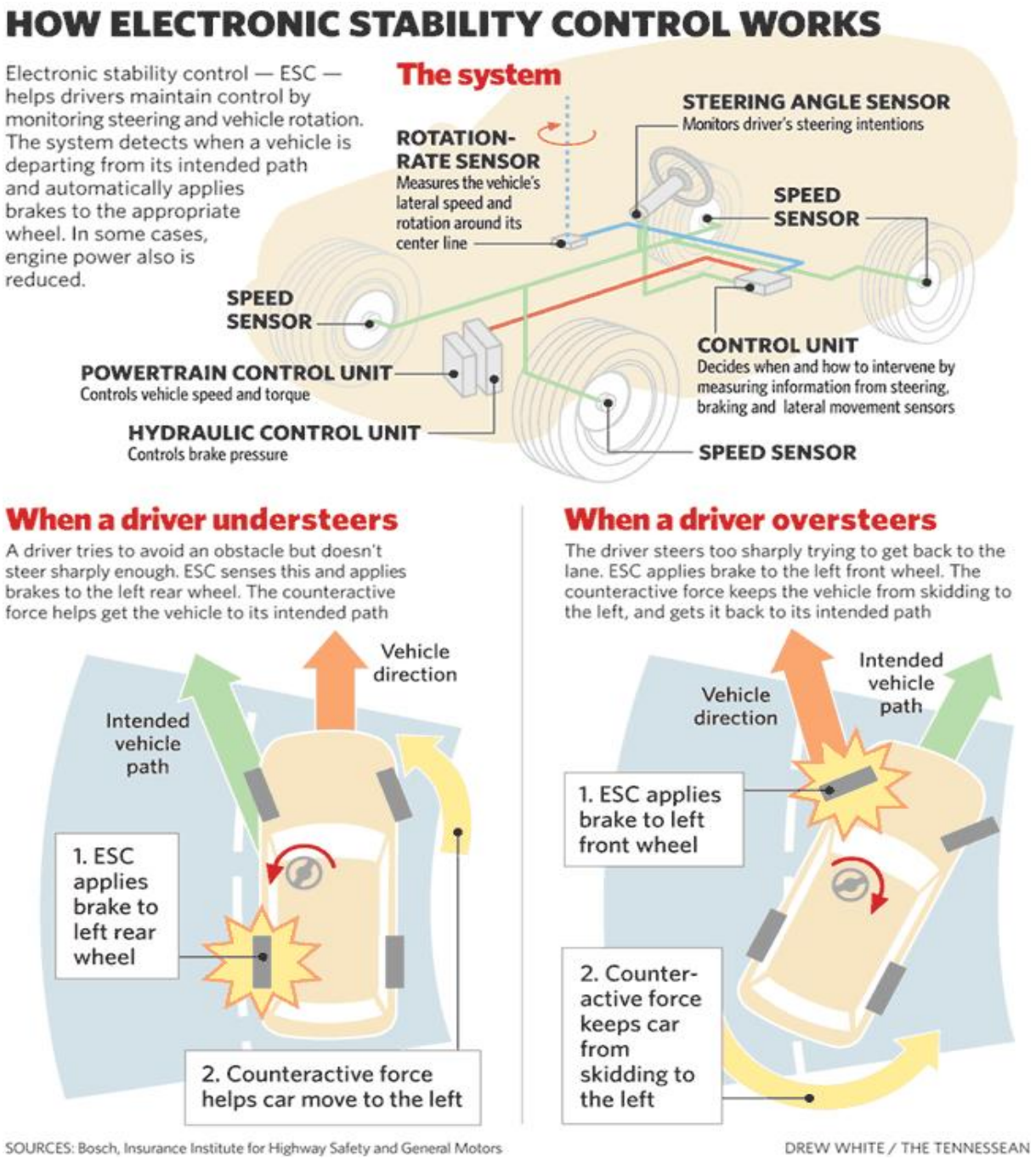
ATASA 5th Brake Systems



ATASA 5th Brake Systems

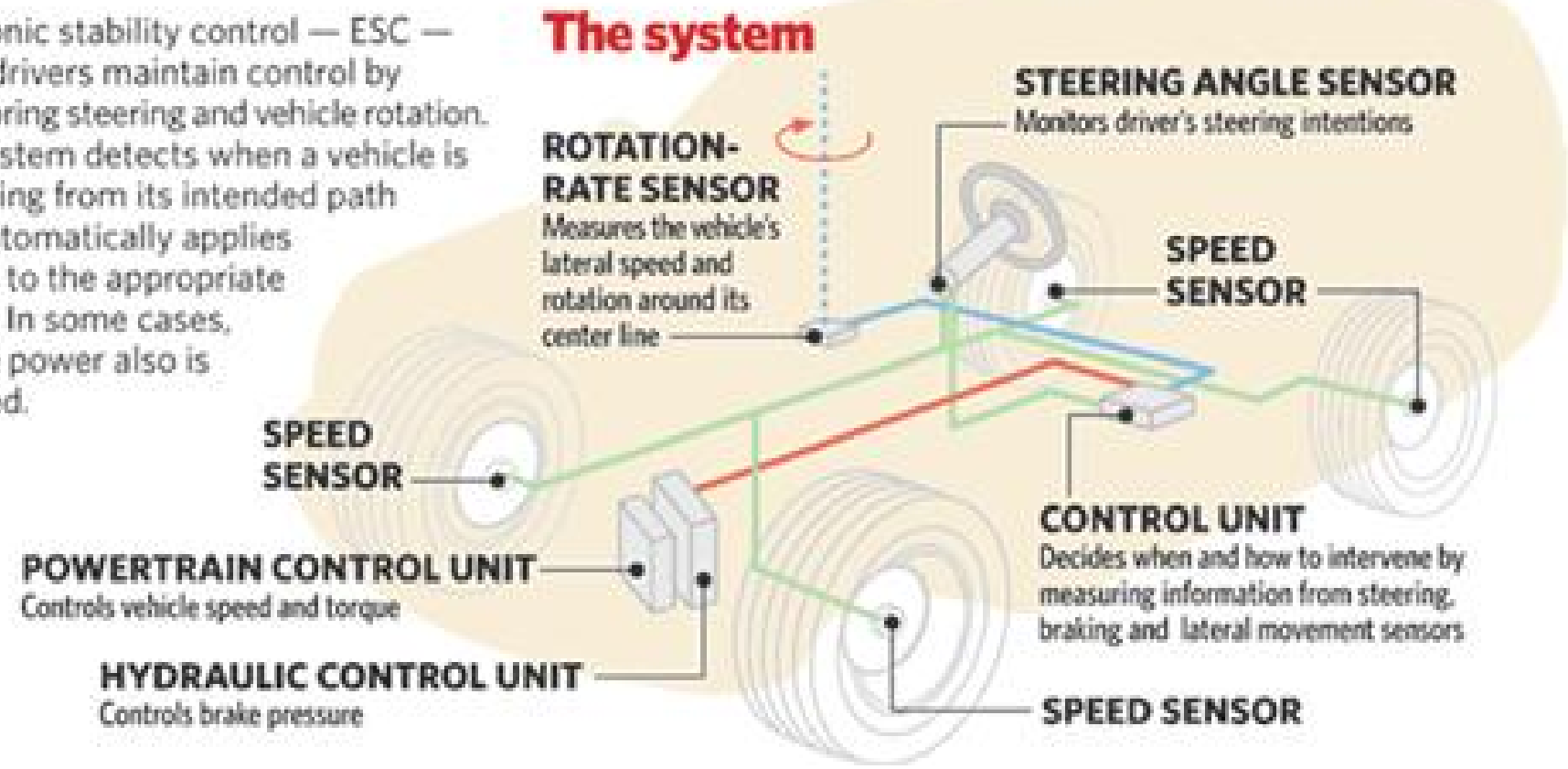


ATASA 5th Brake Systems



HOW ELECTRONIC STABILITY CONTROL WORKS

Electronic stability control — ESC — helps drivers maintain control by monitoring steering and vehicle rotation. The system detects when a vehicle is departing from its intended path and automatically applies brakes to the appropriate wheel. In some cases, engine power also is reduced.



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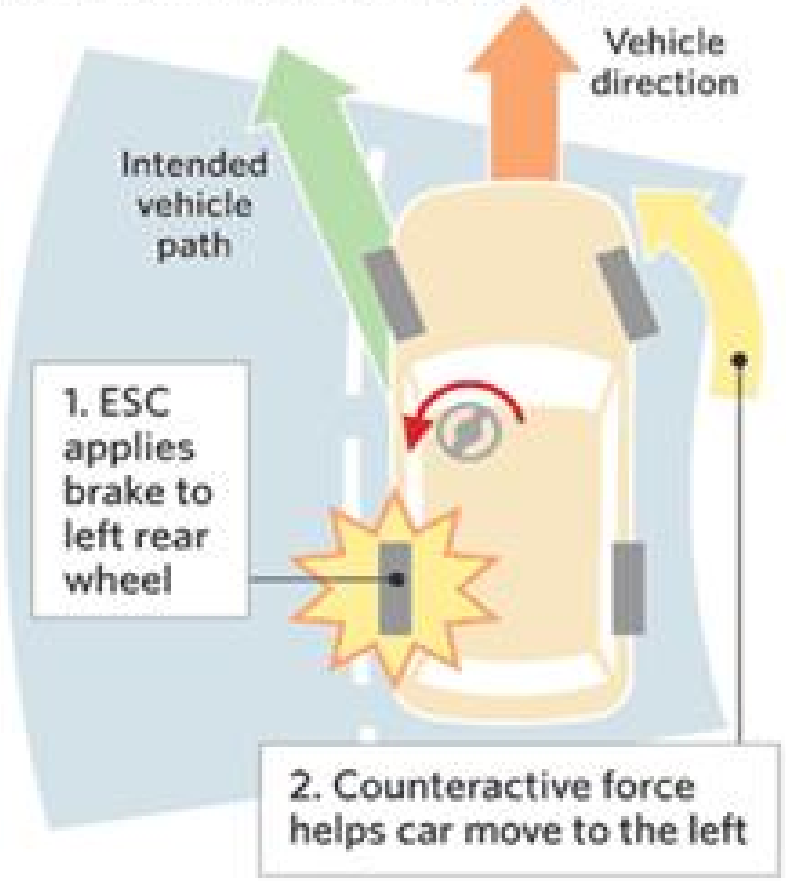
When a driver understeers

A driver tries to avoid an obstacle but doesn't steer sharply enough. ESC senses this and applies brakes to the left rear wheel. The counteractive force helps get the vehicle to its intended path



When a driver oversteers

The driver steers too sharply trying to get back to the lane. ESC applies brake to the left front wheel. The counteractive force keeps the vehicle from skidding to the left, and gets it back to its intended path

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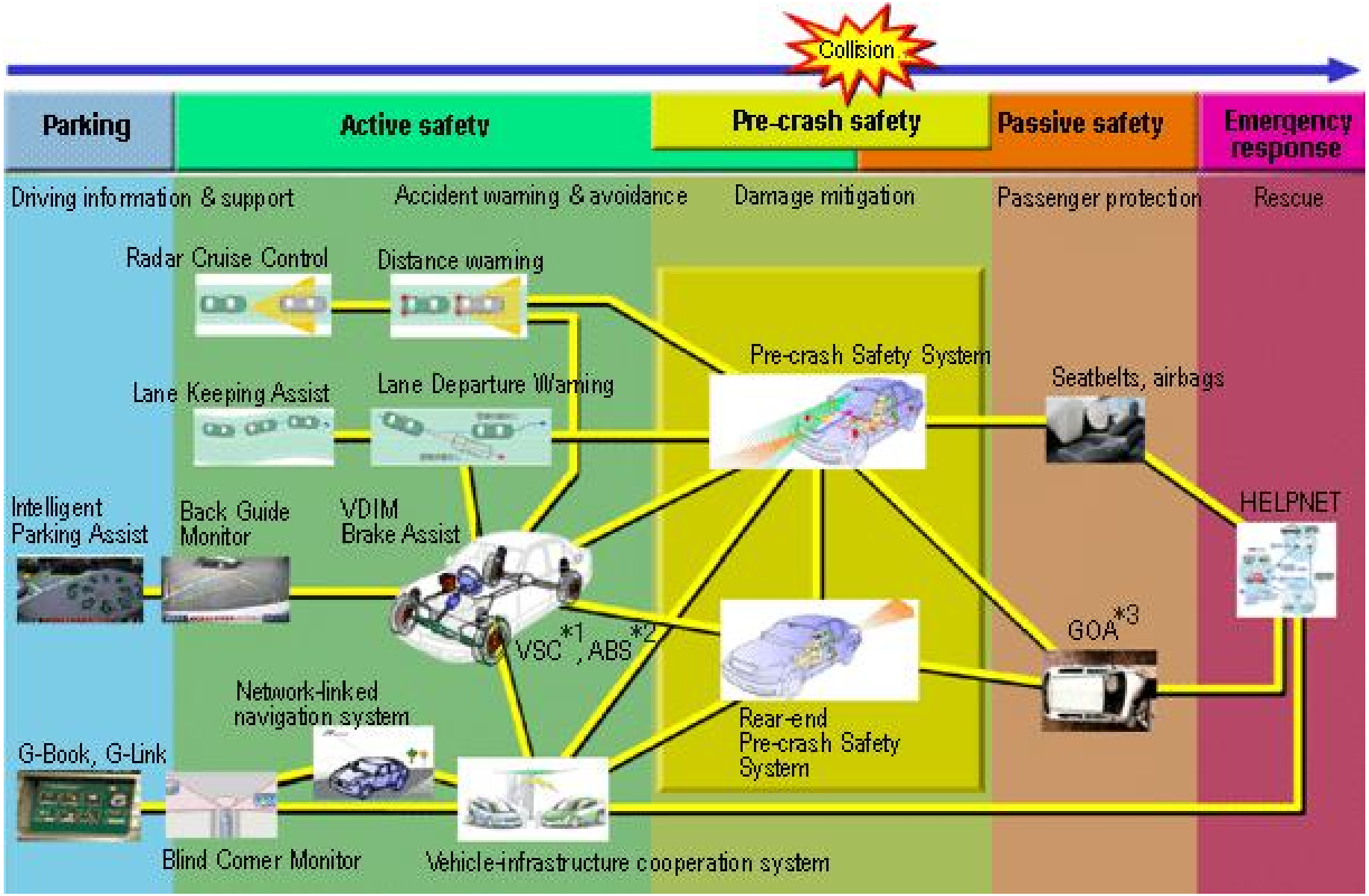

ATASA 5th Brake Systems

ATASA 5th Brake Systems

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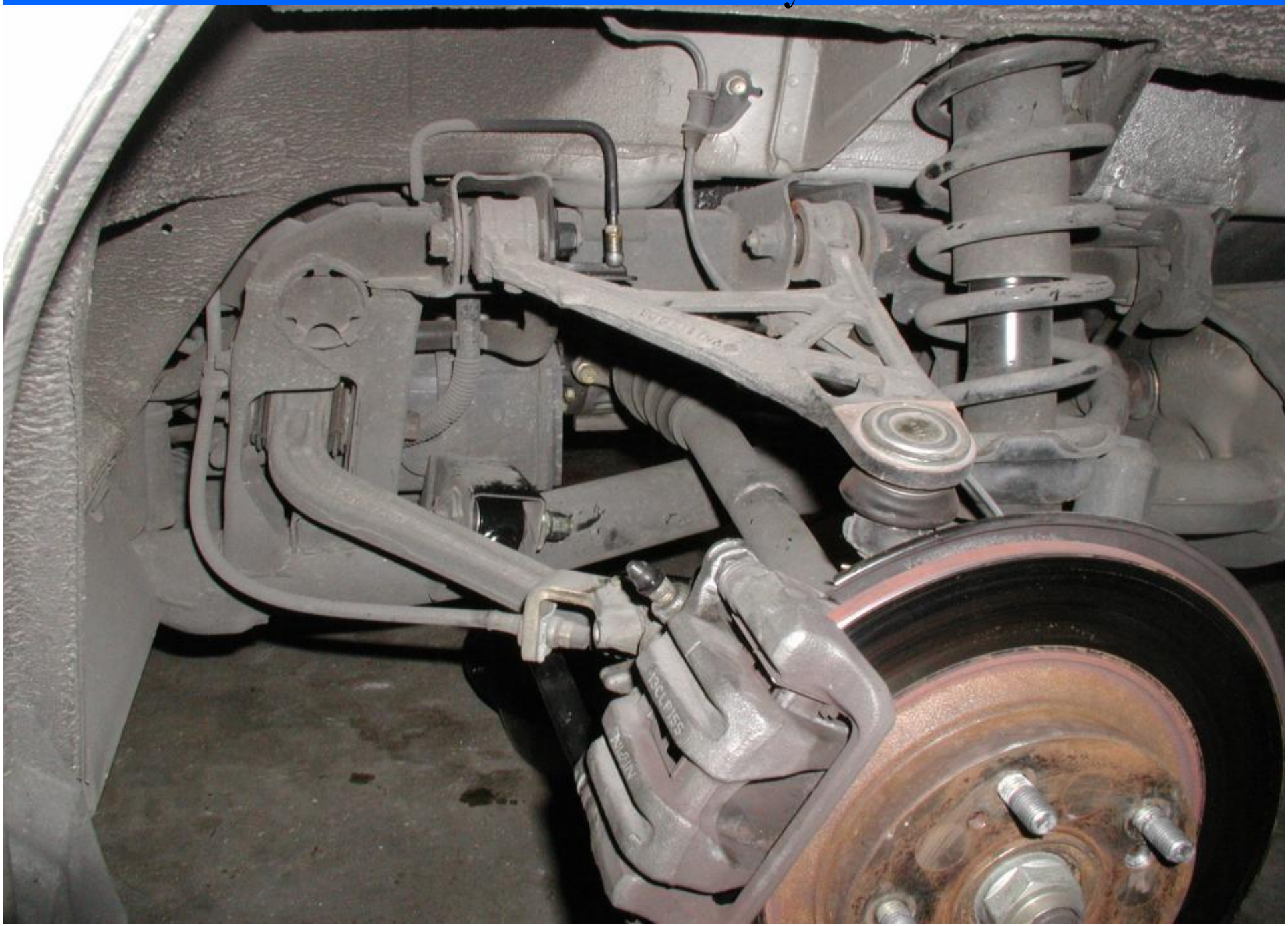
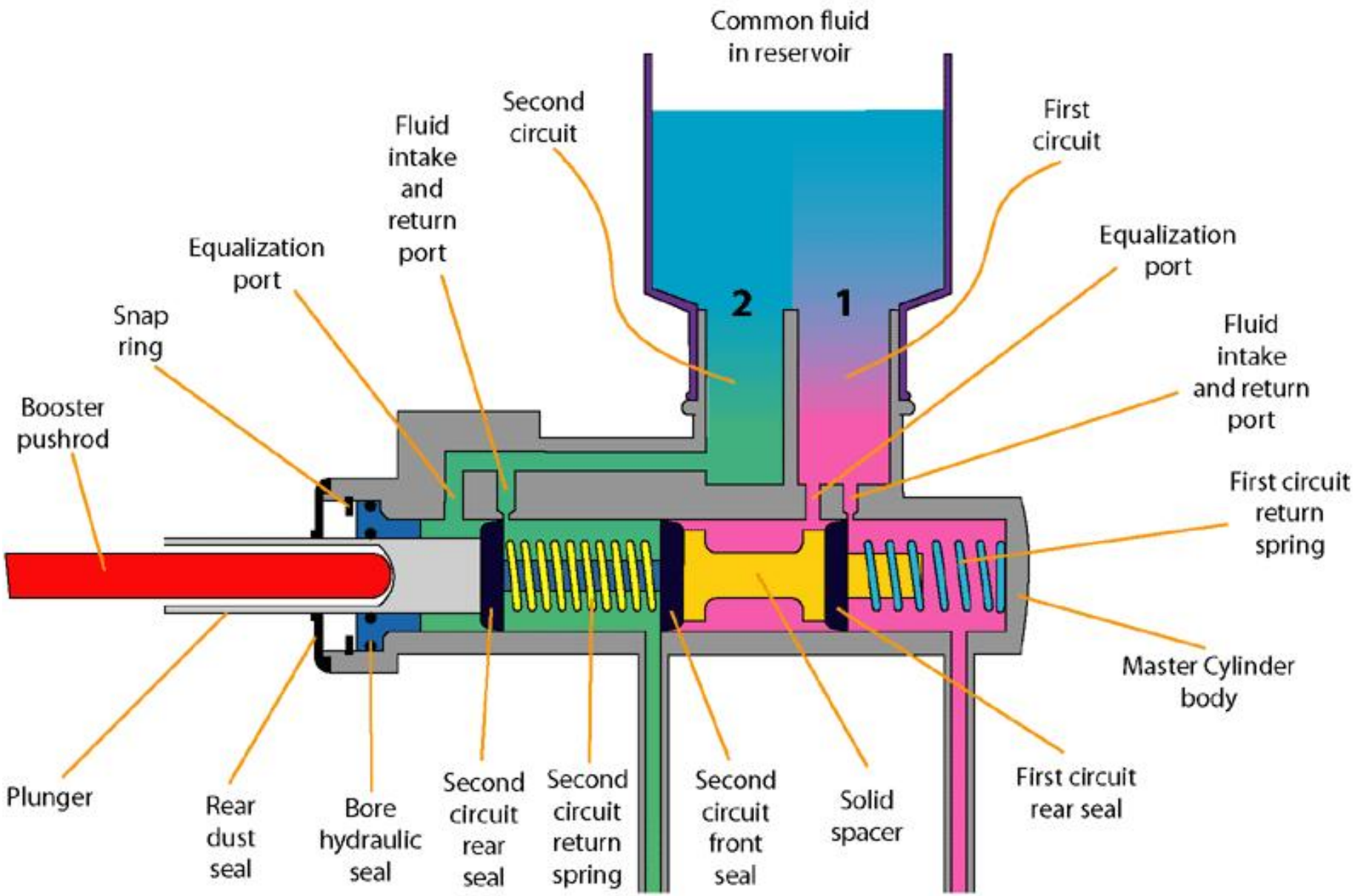


ATASA 5th Brake Systems

ATASA 5th Brake Systems



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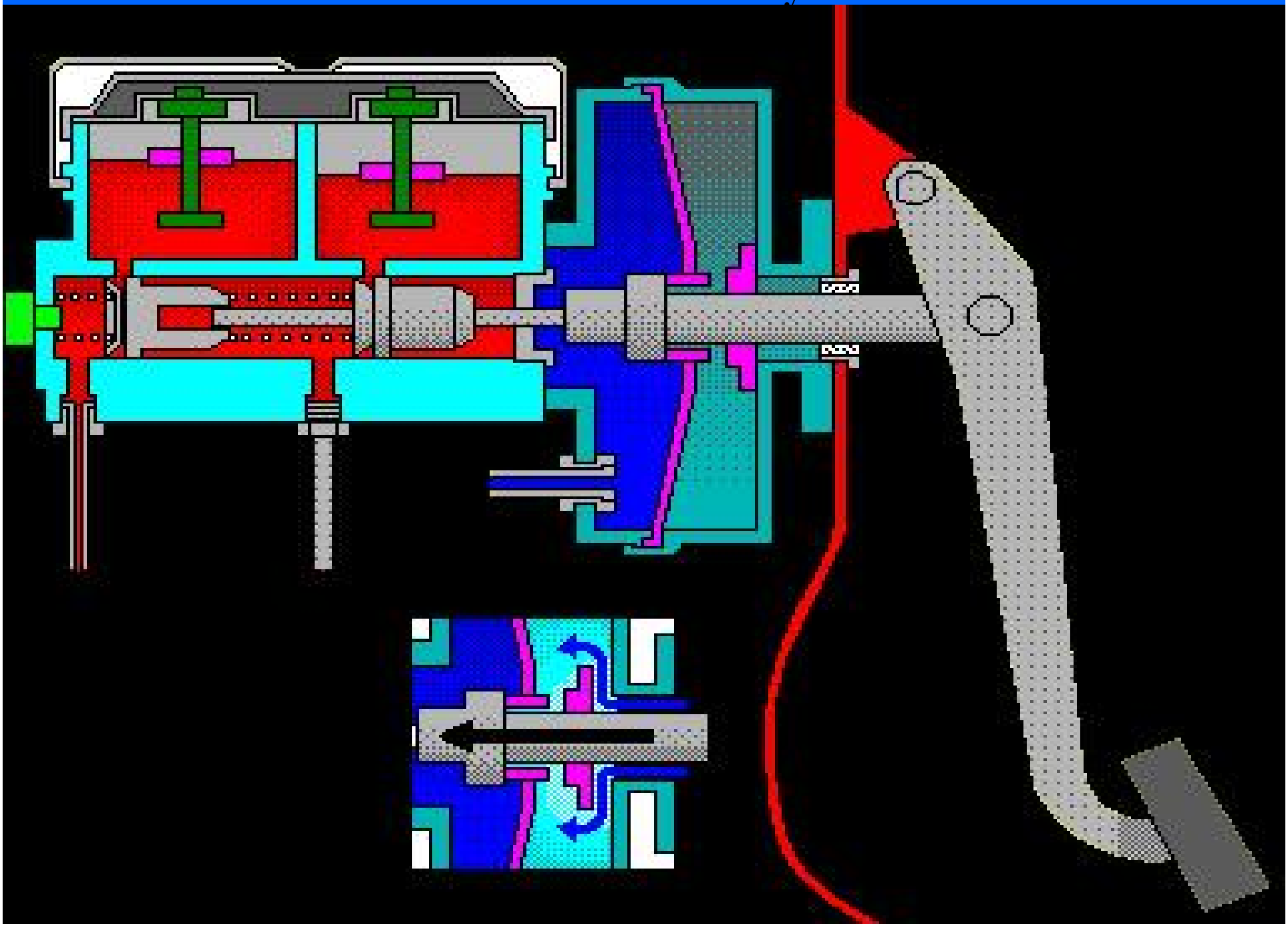
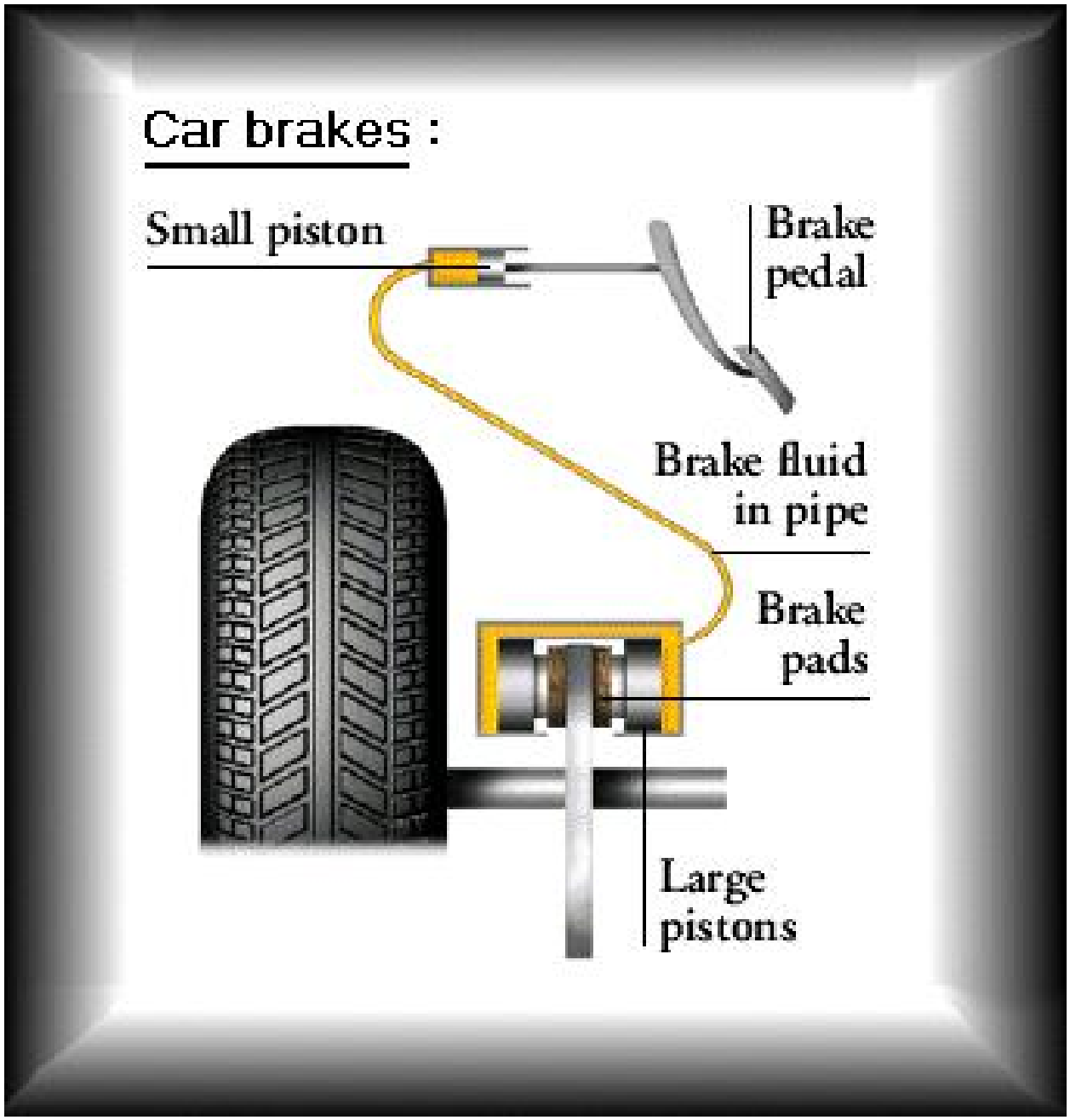
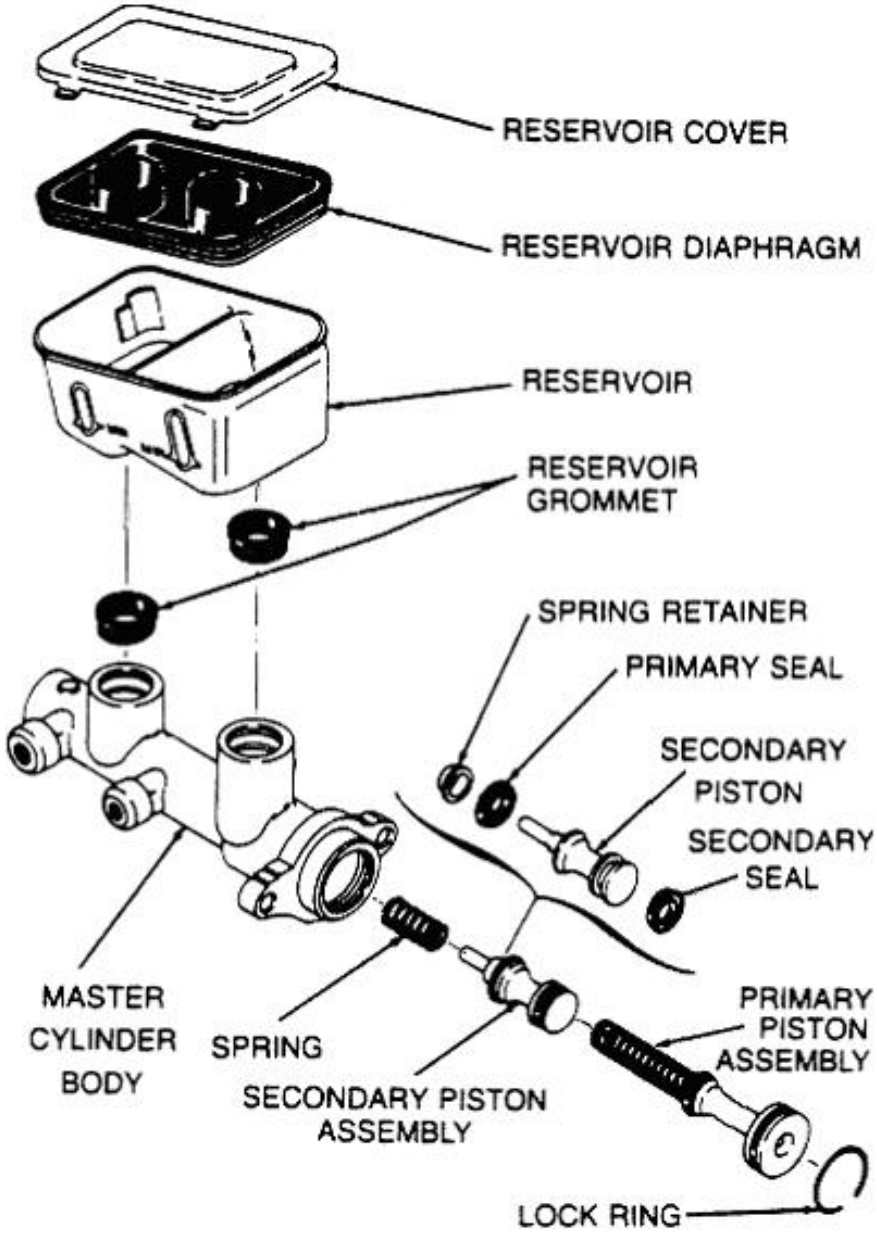


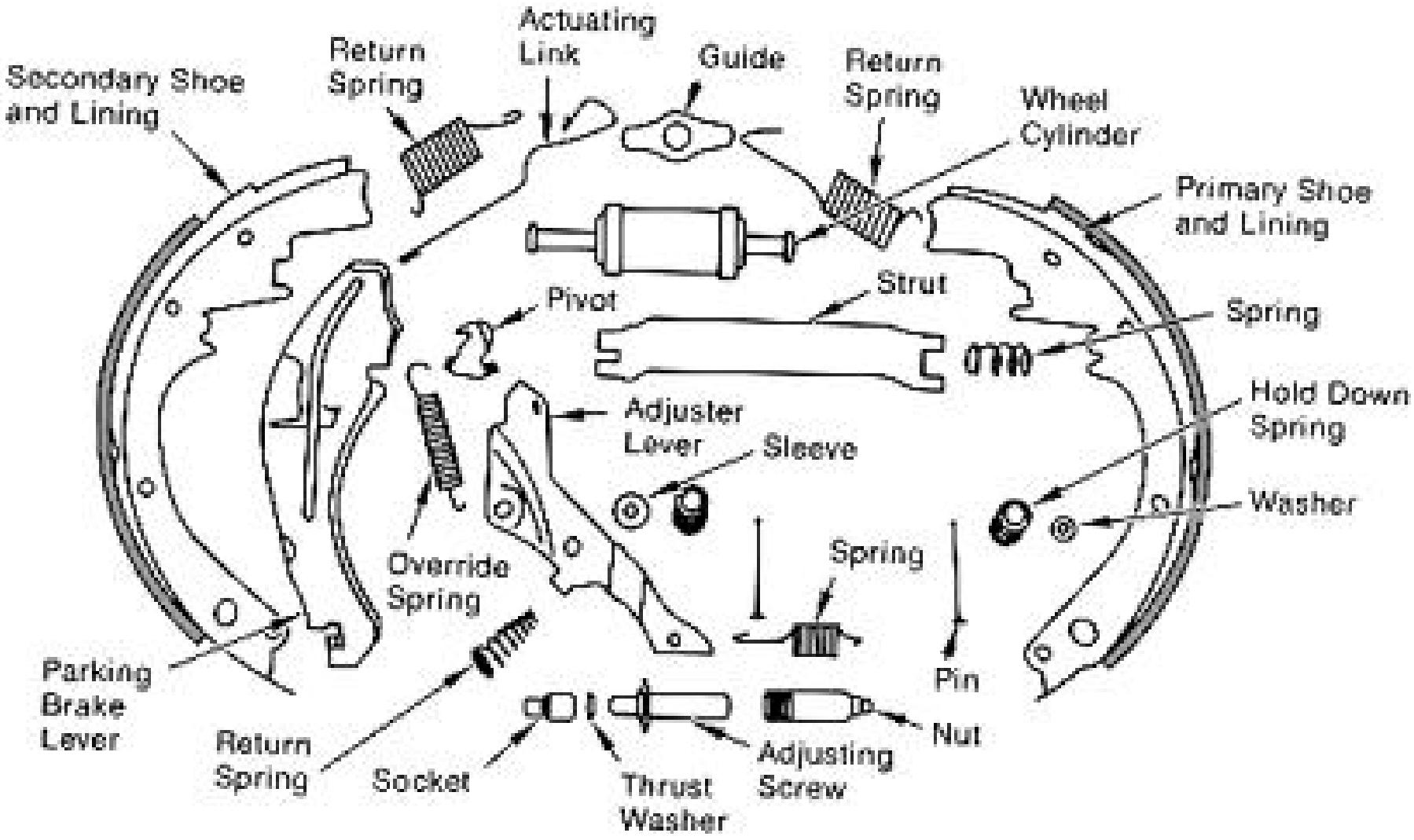
ATASA 5th Brake Systems



ATASA 5th Brake Systems



ATASA 5th Brake Systems



Typical Drum Brake Parts

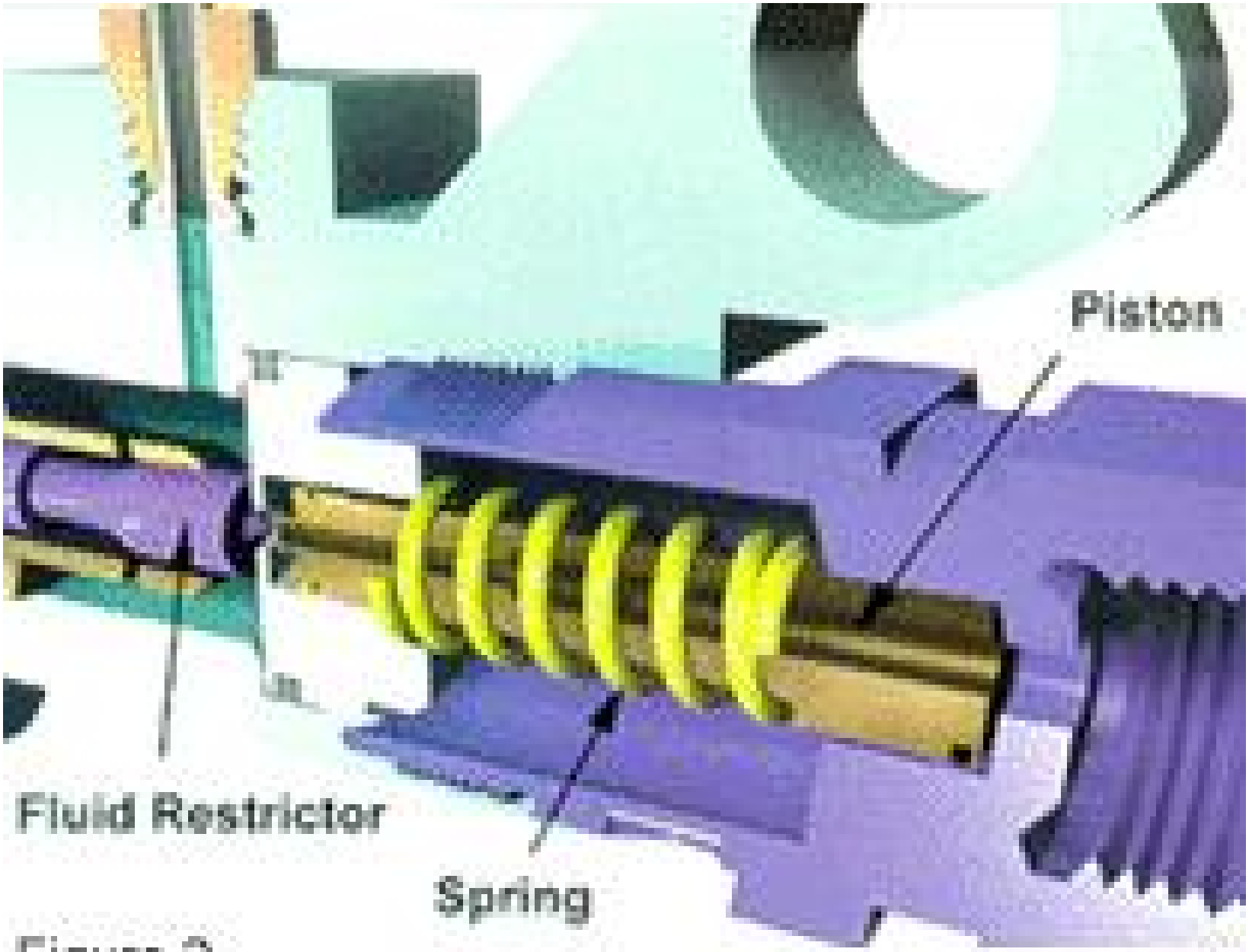


Figure 2

ATASA 5th Brake Systems

Anti-Squeal Spray

Brake Pad Lining Thickness Sensors

ATASA 5th Brake Systems

Anti-Squeal Paste

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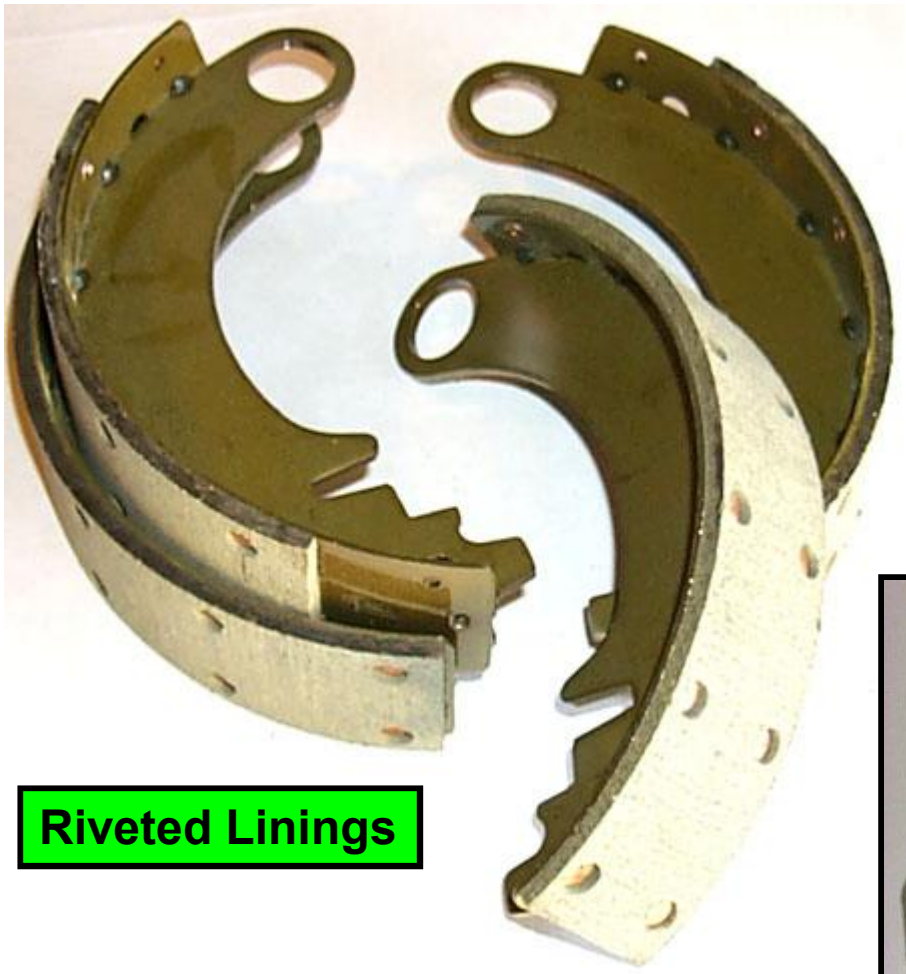

Riveted Linings

Bonded Linings

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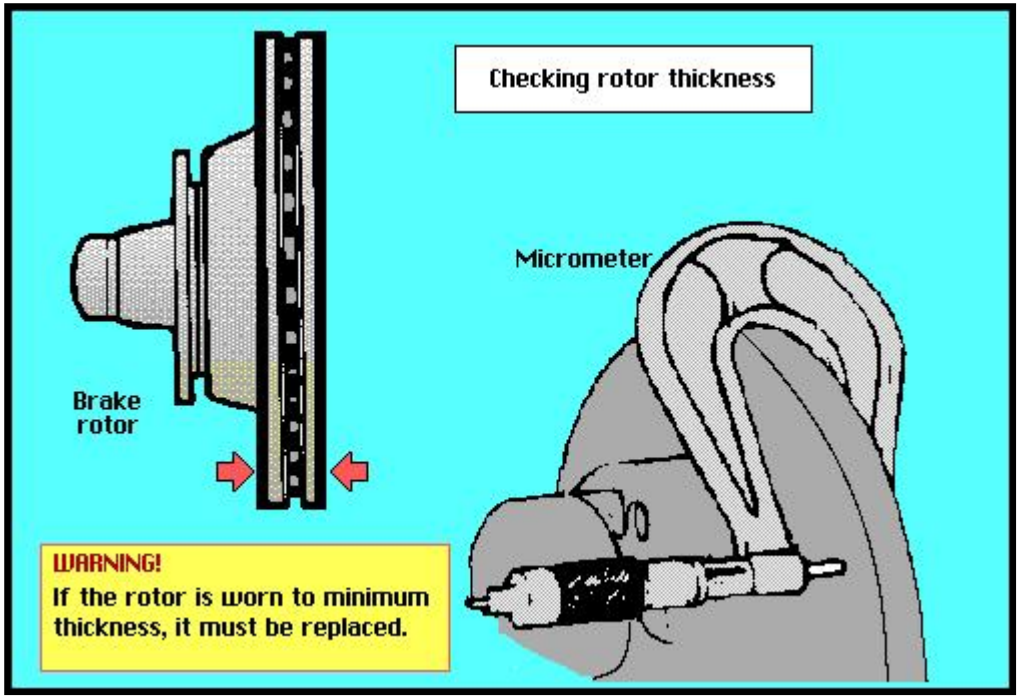
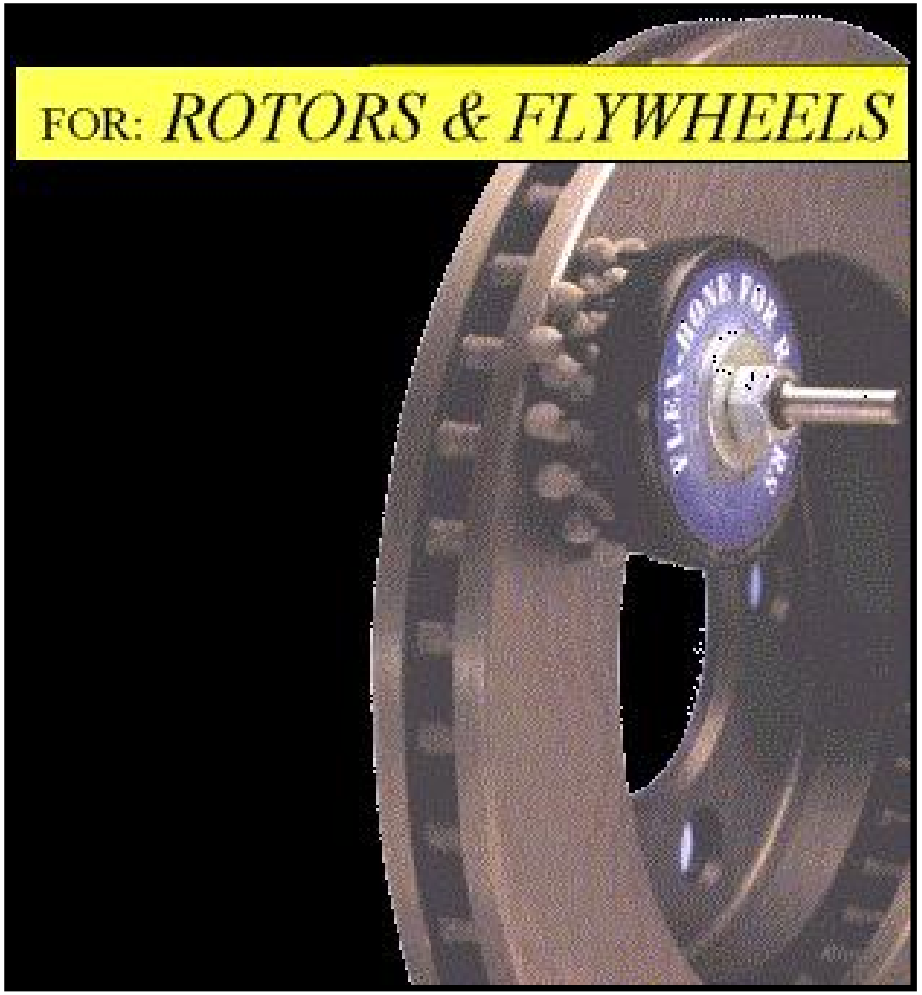
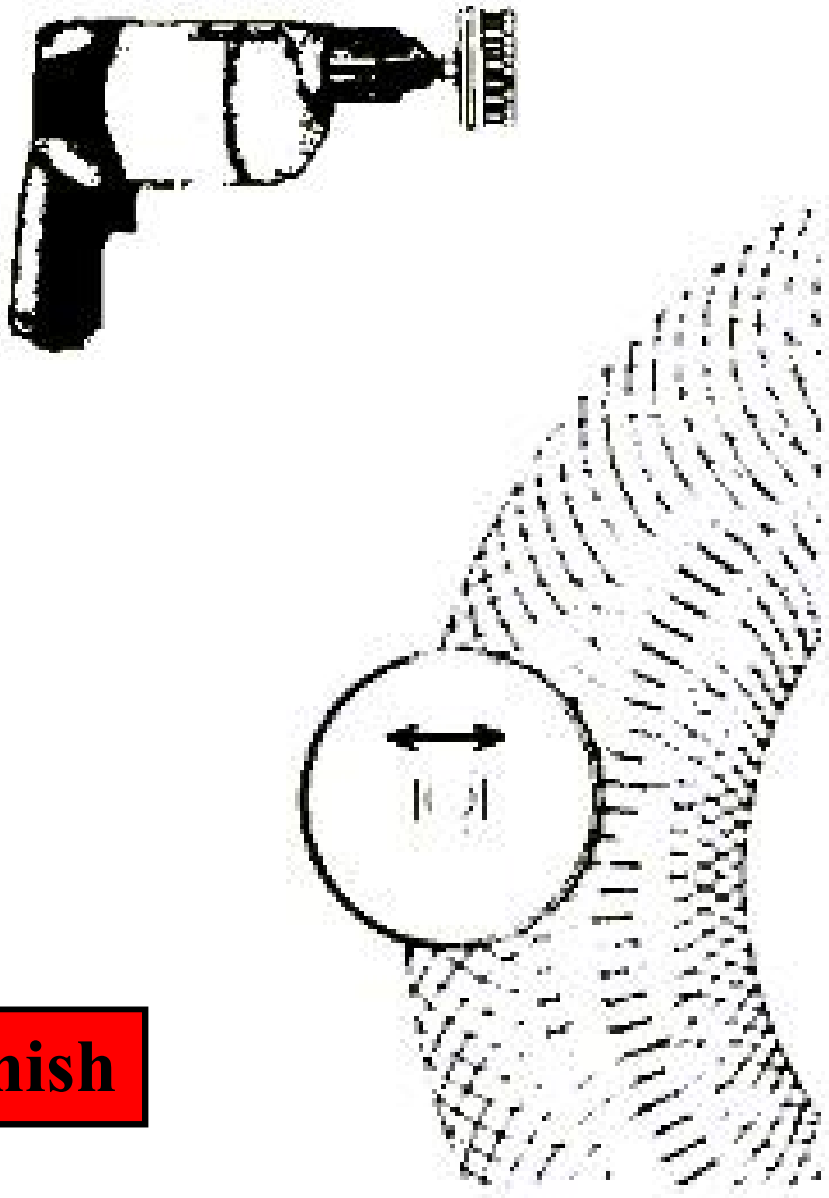
ATASA 5th Brake Systems



ATASA 5th Brake Systems





Non-Directional Rotor Finish

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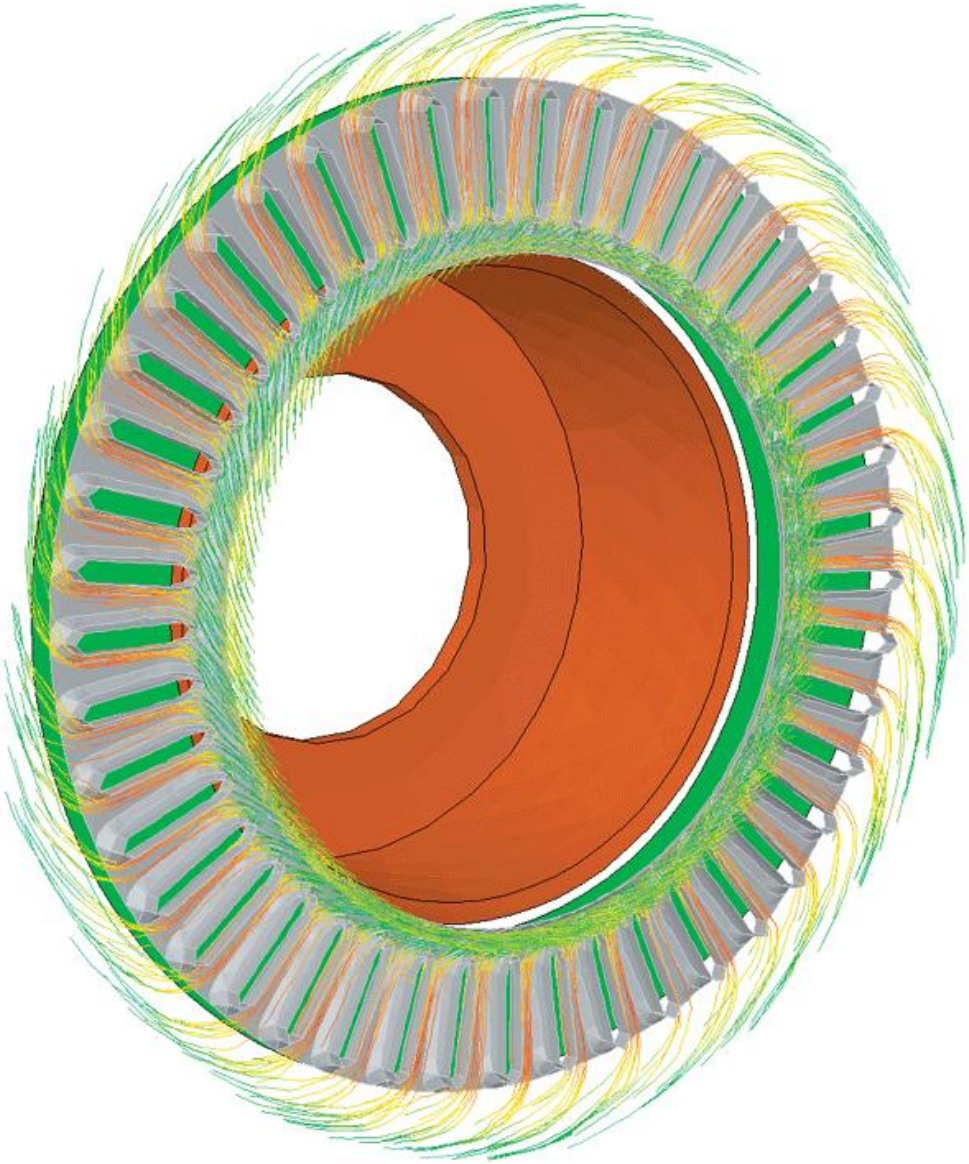
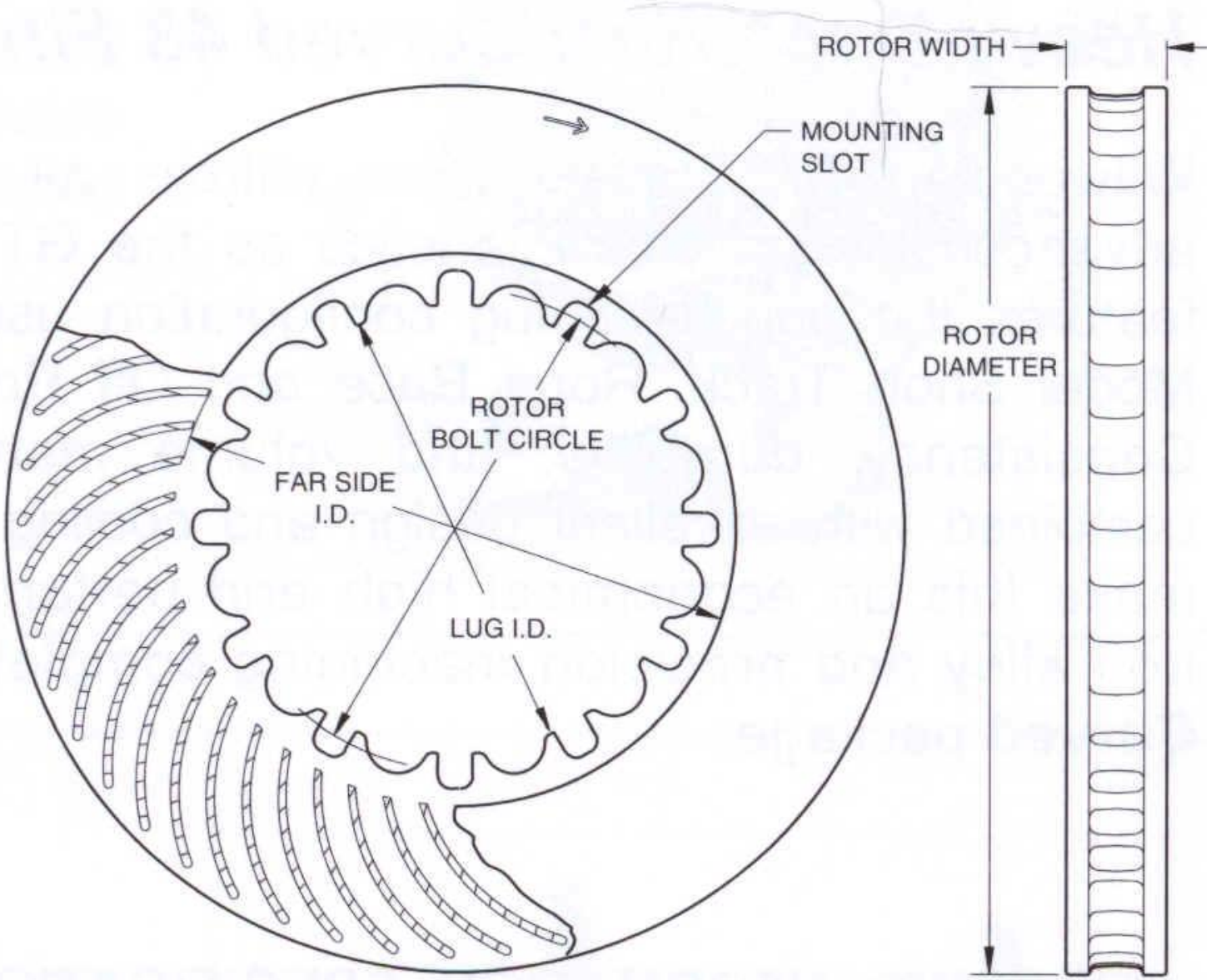


ATASA 5th Brake Systems



Rotor Fully Floats on Hub

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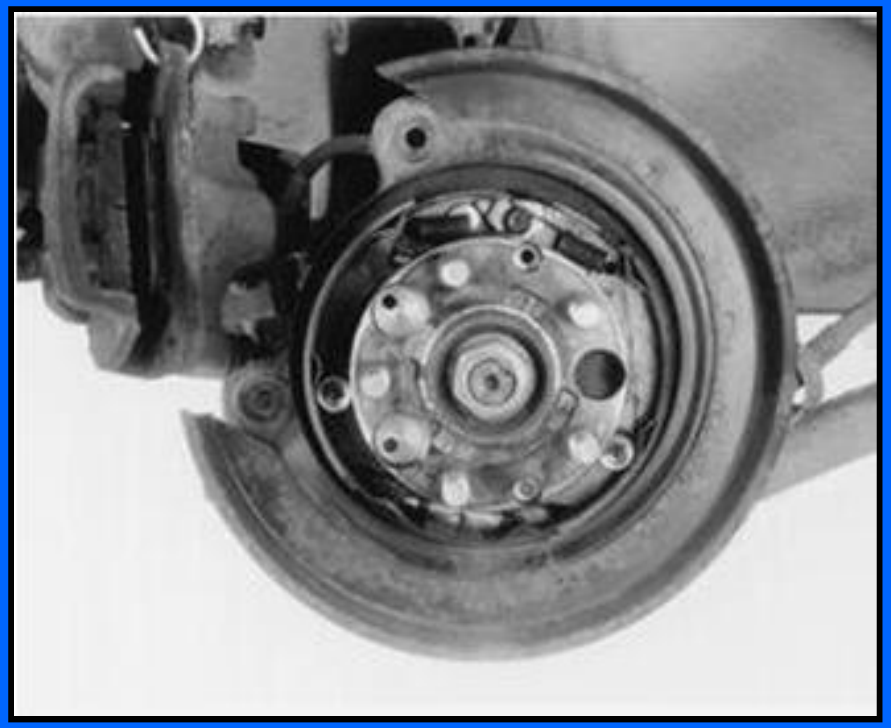


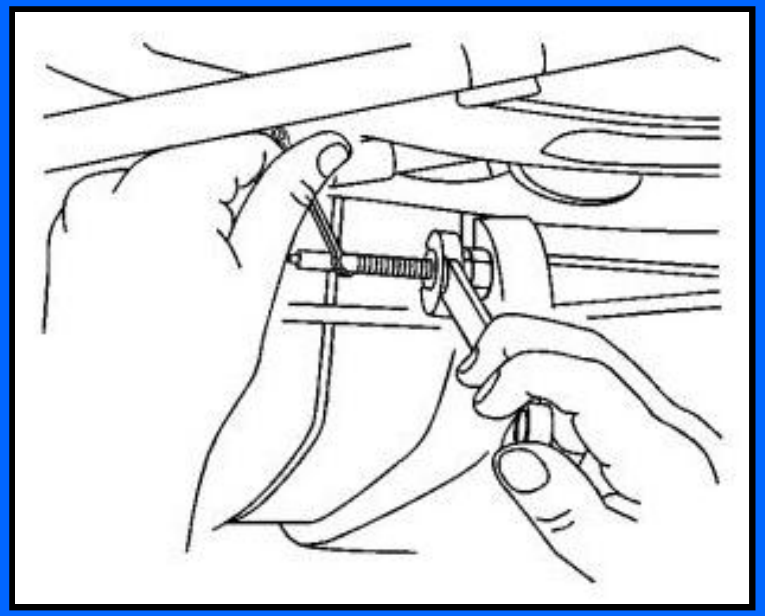
ATASA 5th Brake Systems

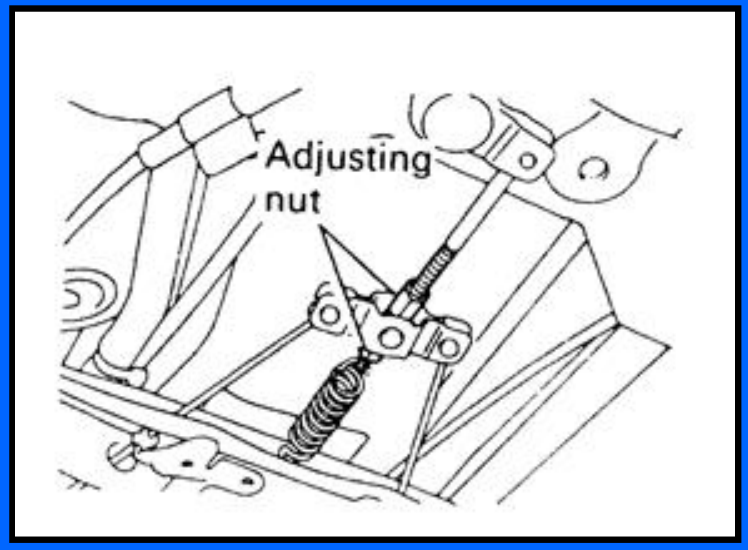
Single-Shoe, Full-Circle Rear Parking Brake with Mechanical Adjuster

ATASA 5th Brake Systems

Single-Shoe, Full-Circle Rear Parking Brake with Mechanical Adjuster

ATASA 5th Brake Systems





ATASA 5th Brake Systems

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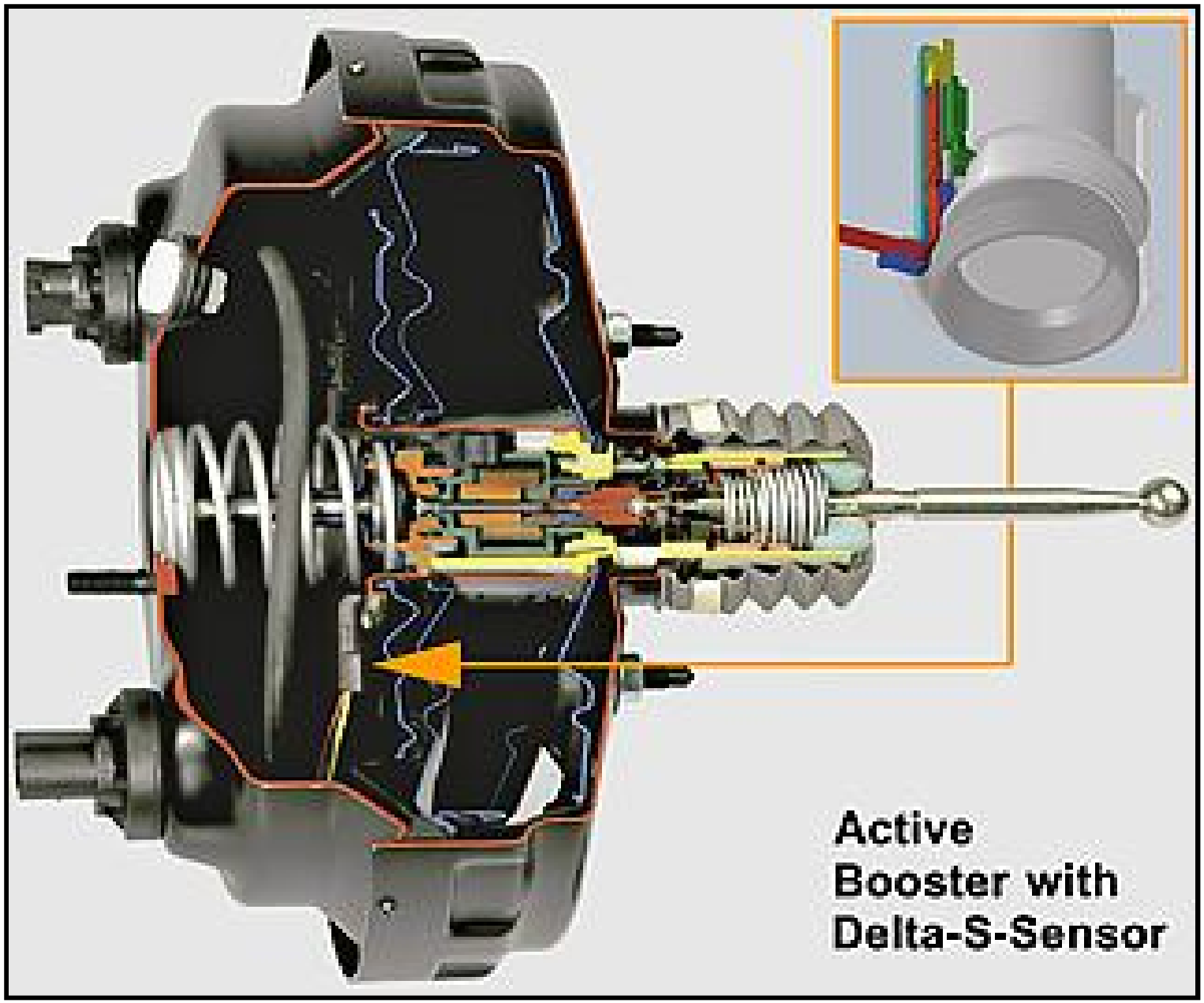

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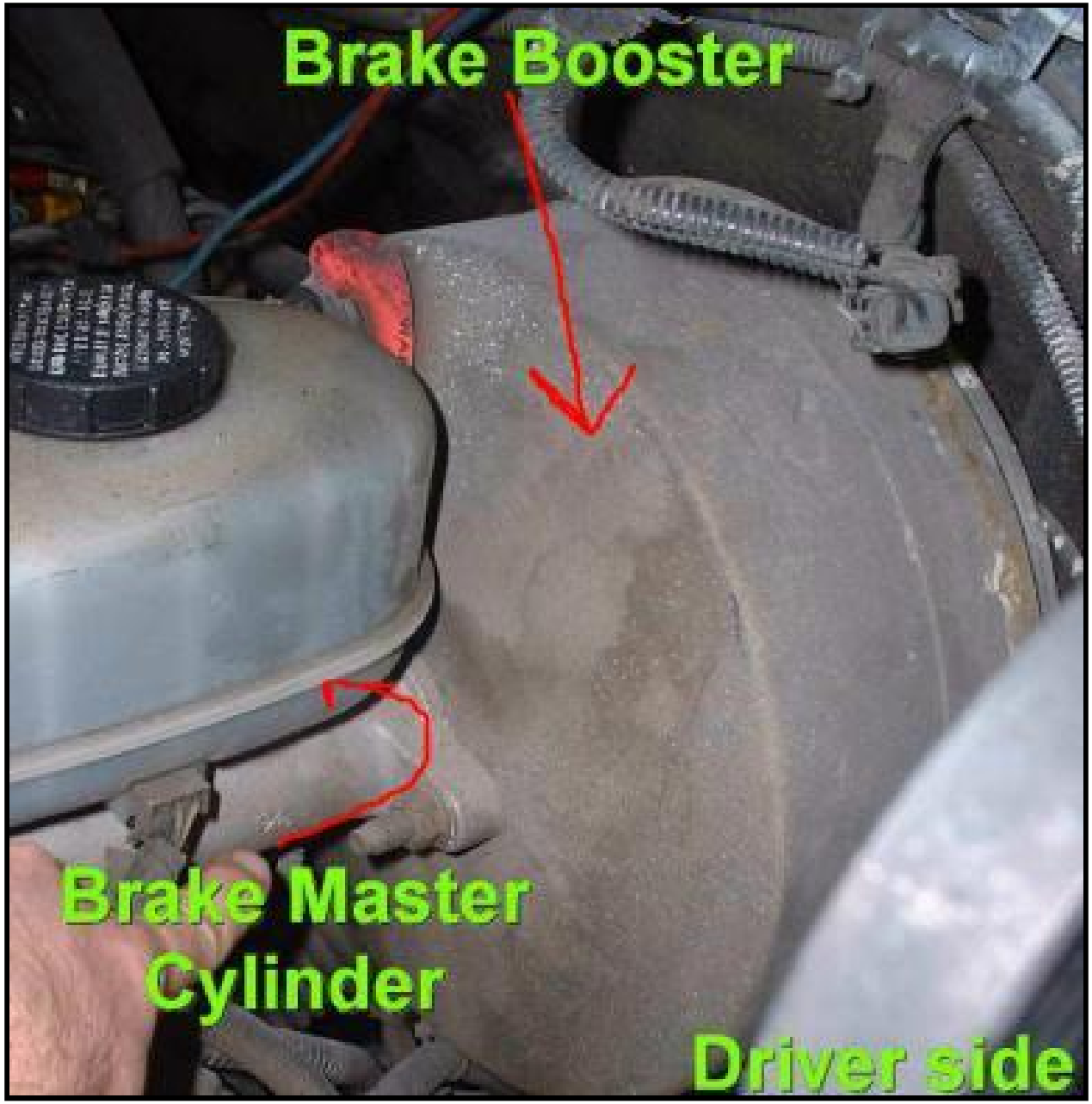
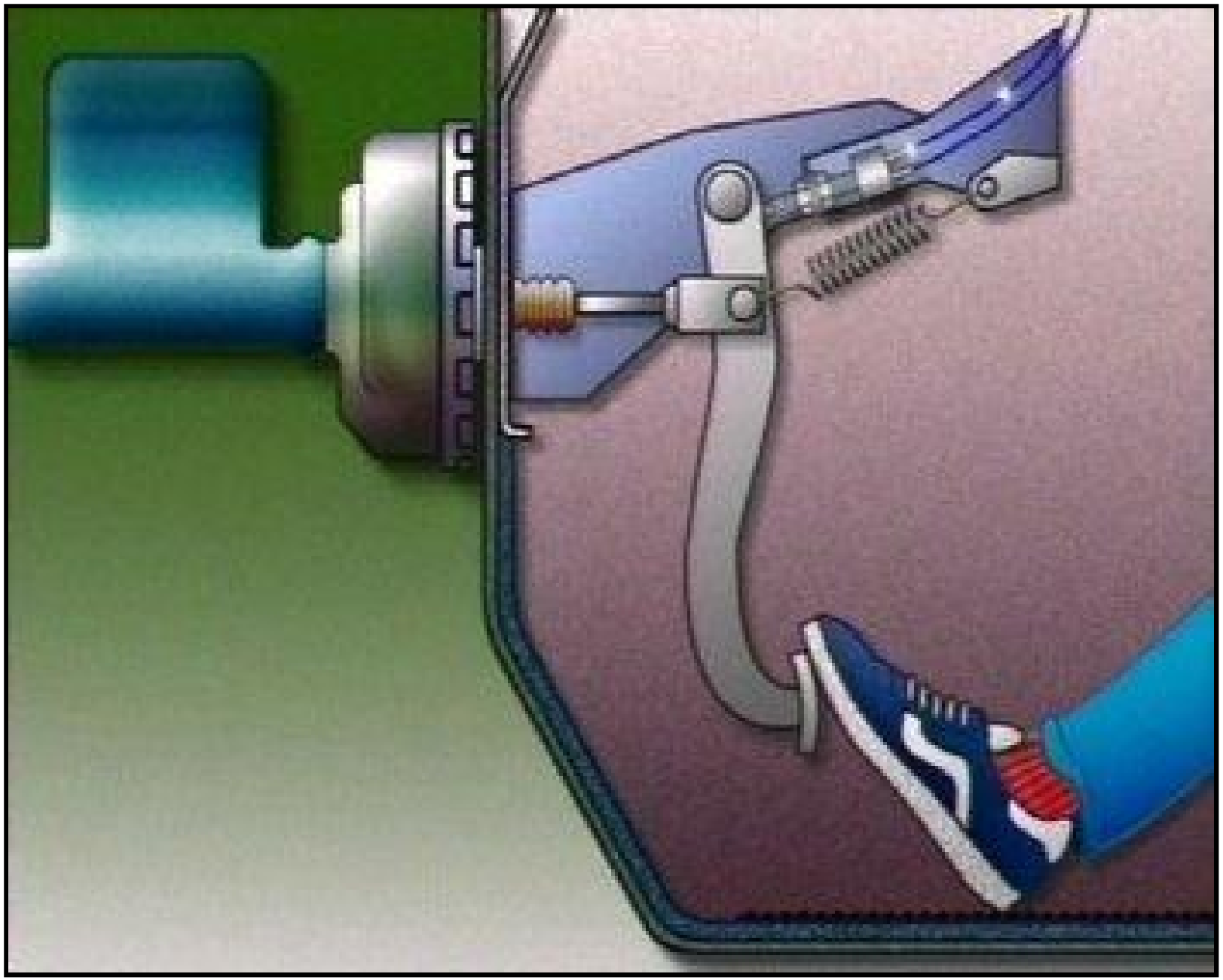


ATASA 5th Brake Systems



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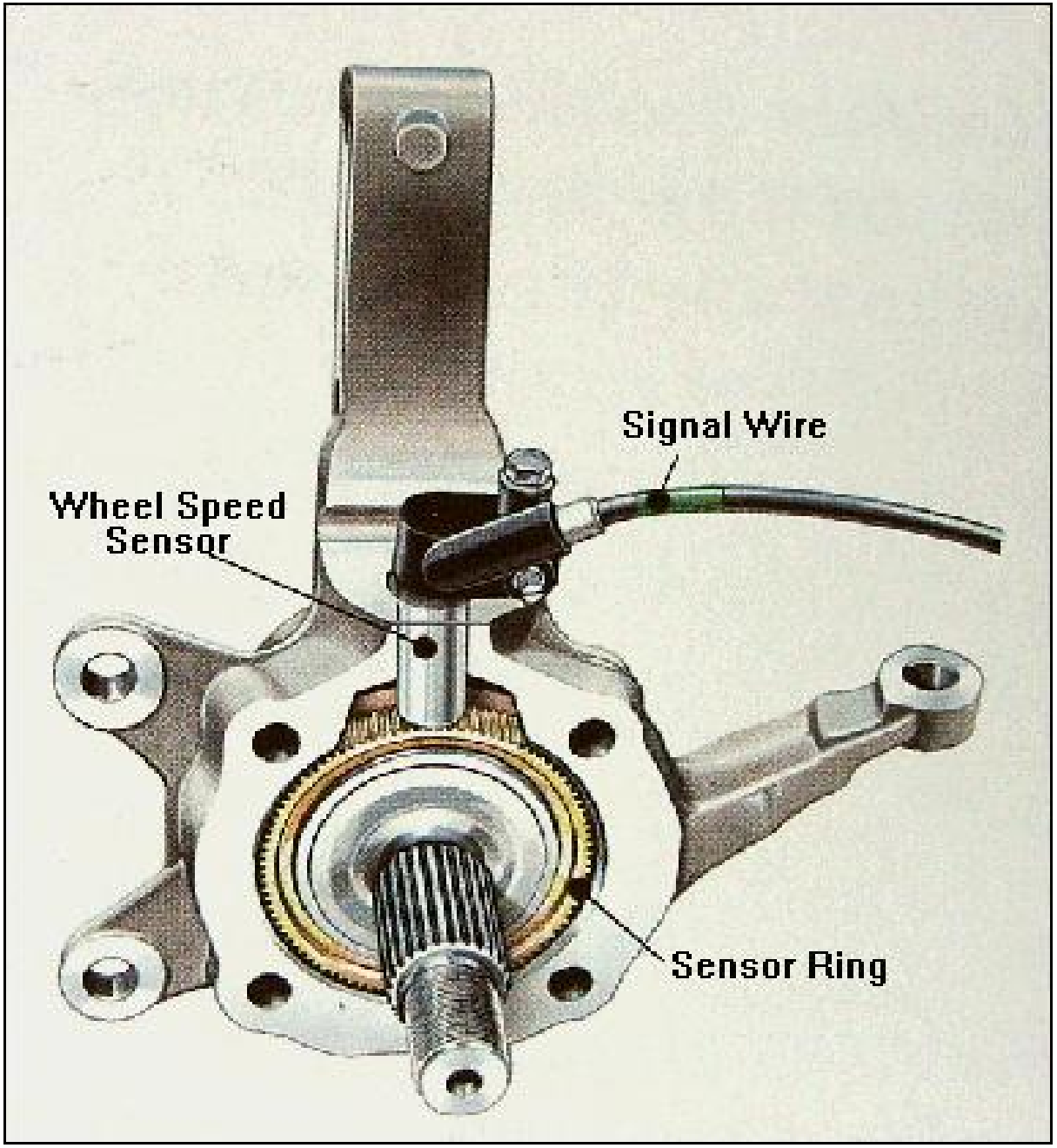

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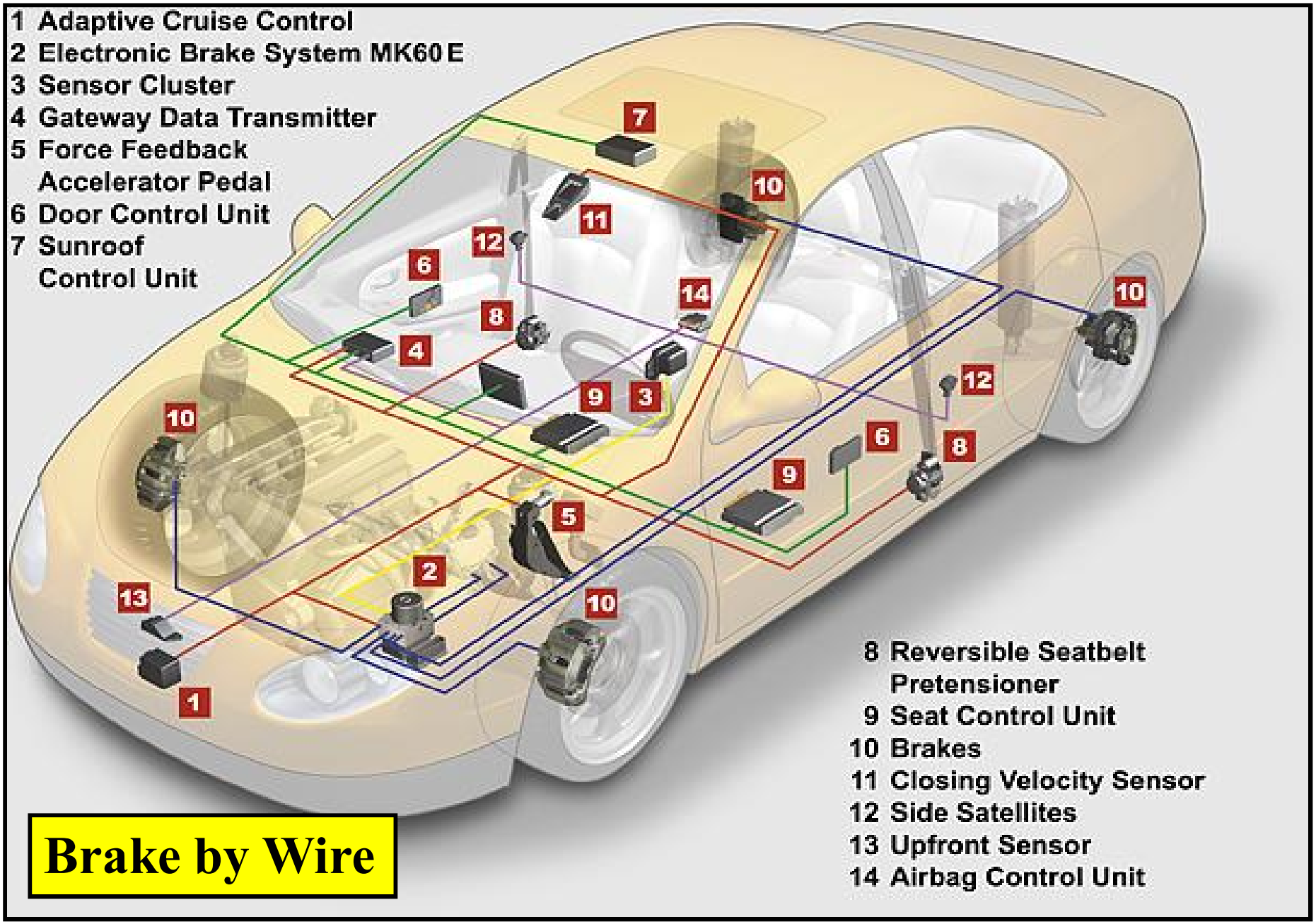

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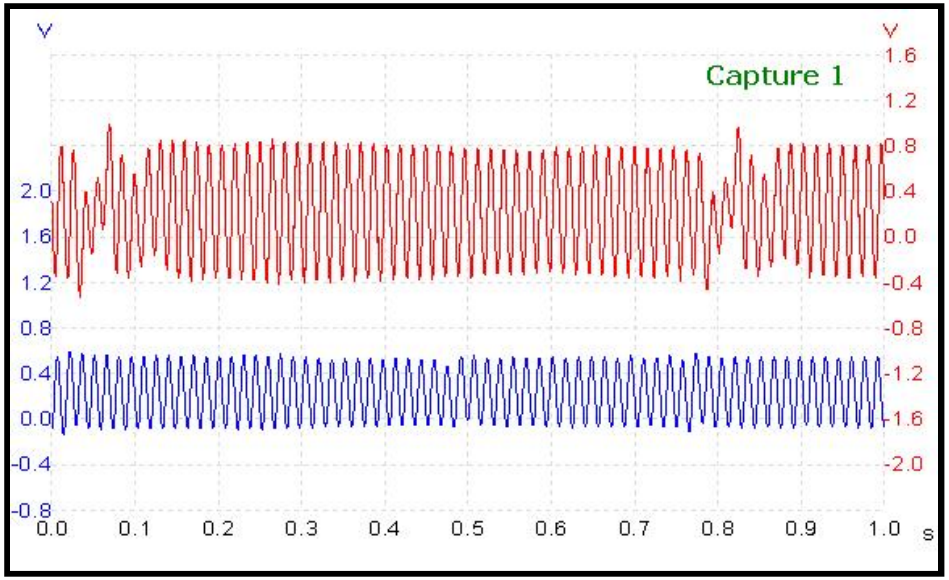

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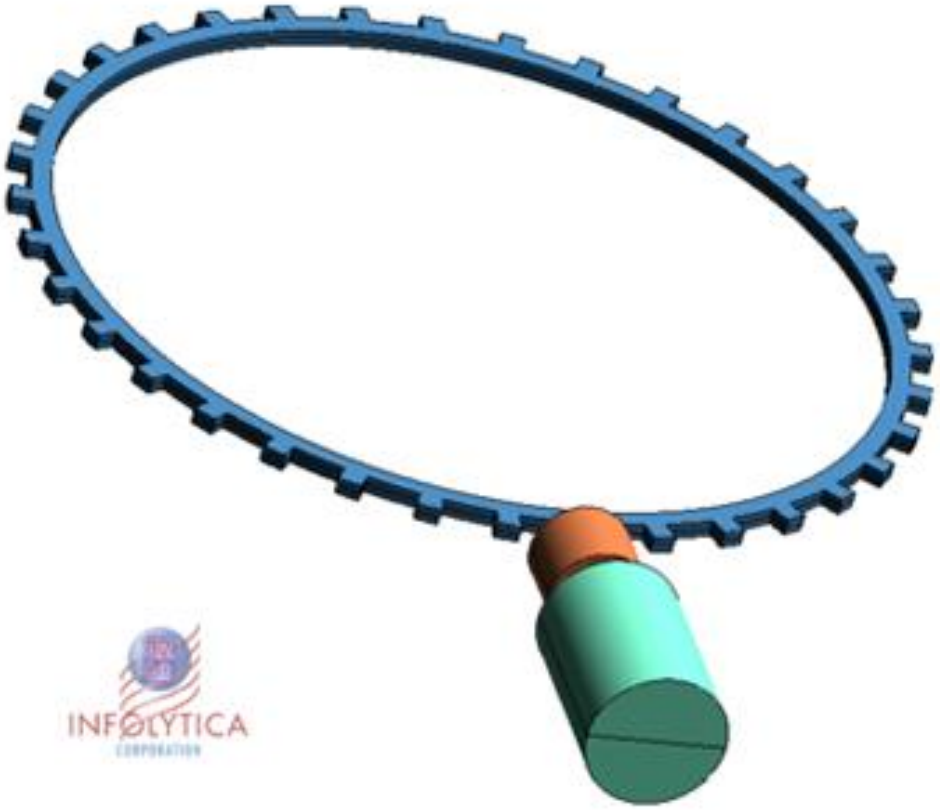
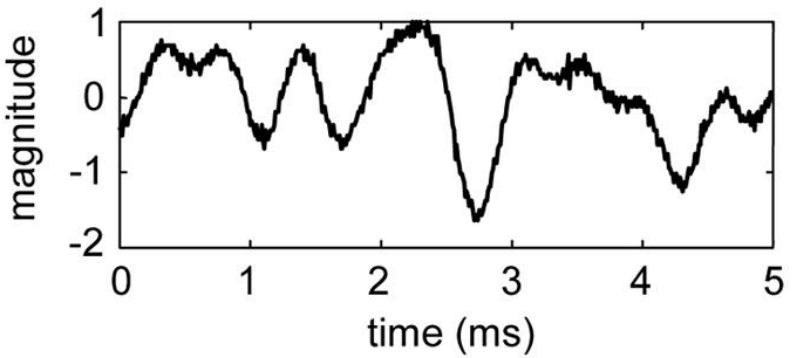
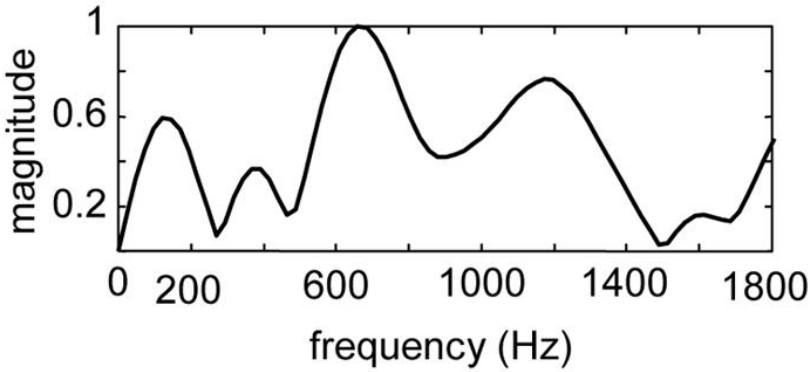




(a) time dependence



(b) frequency dependence

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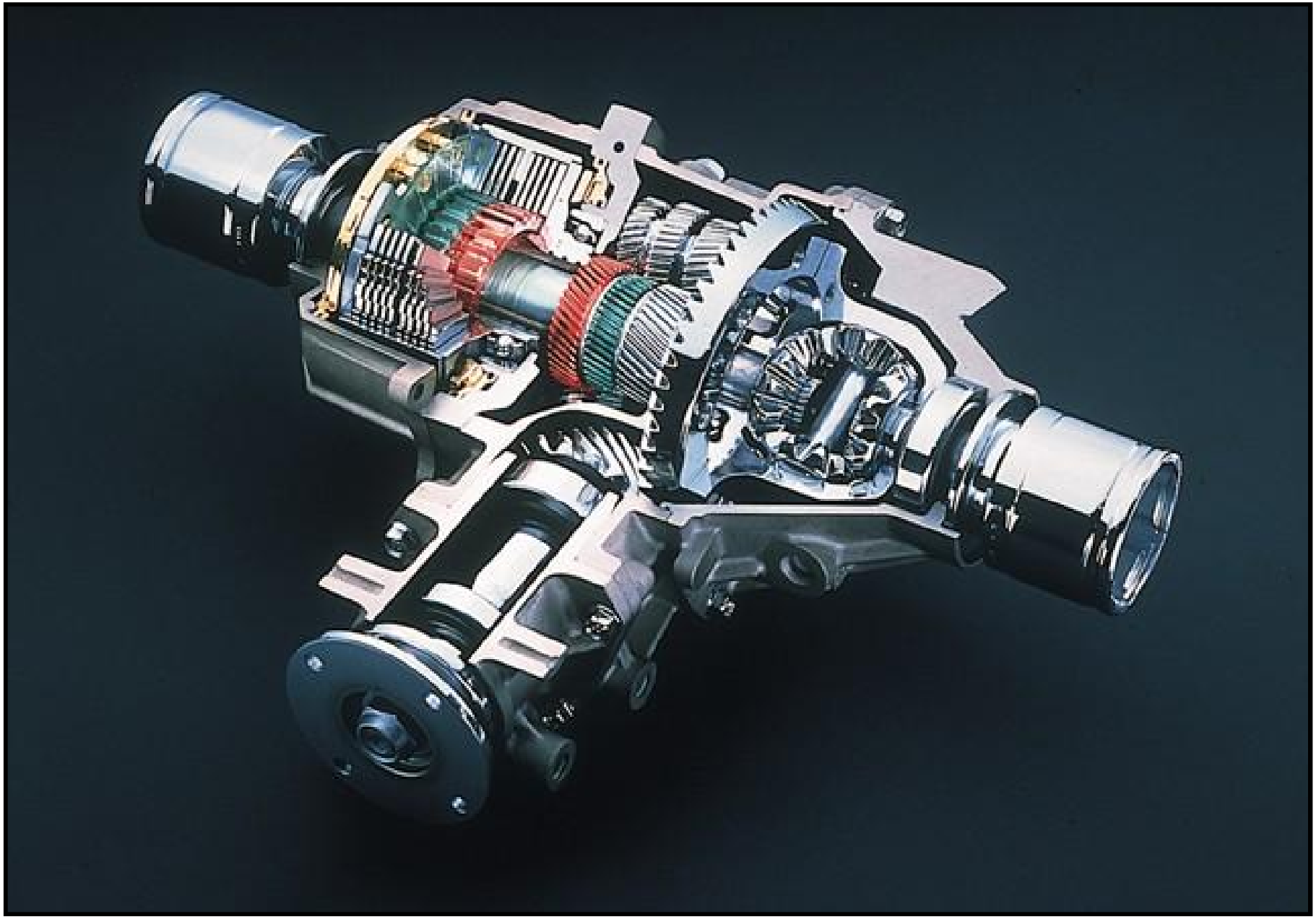
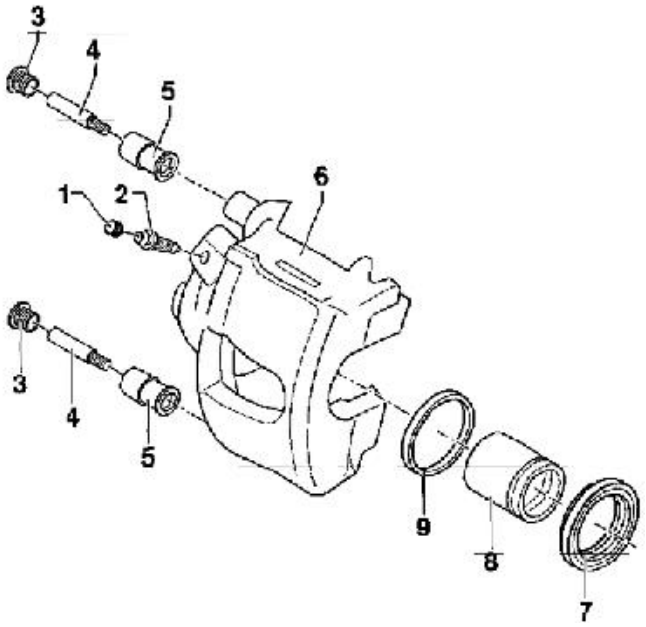
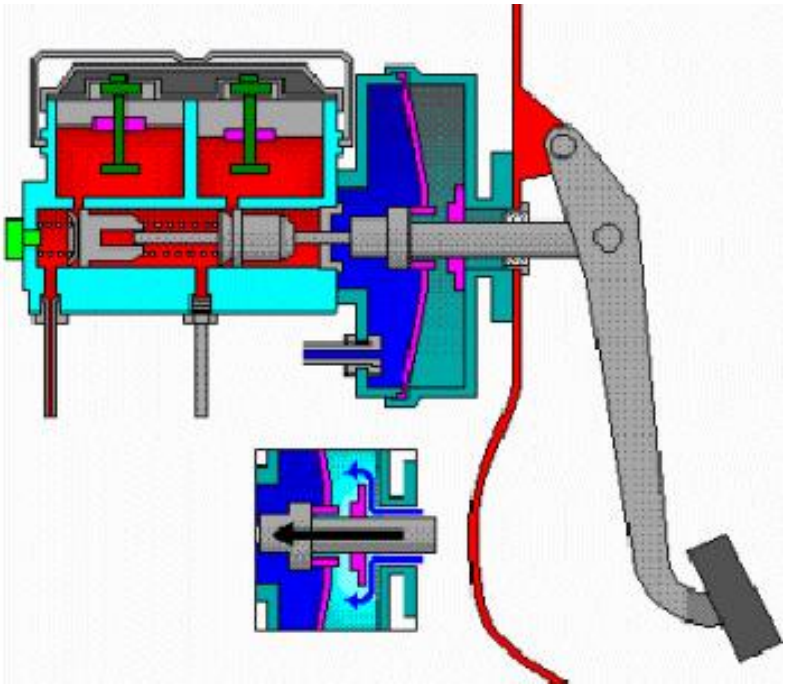
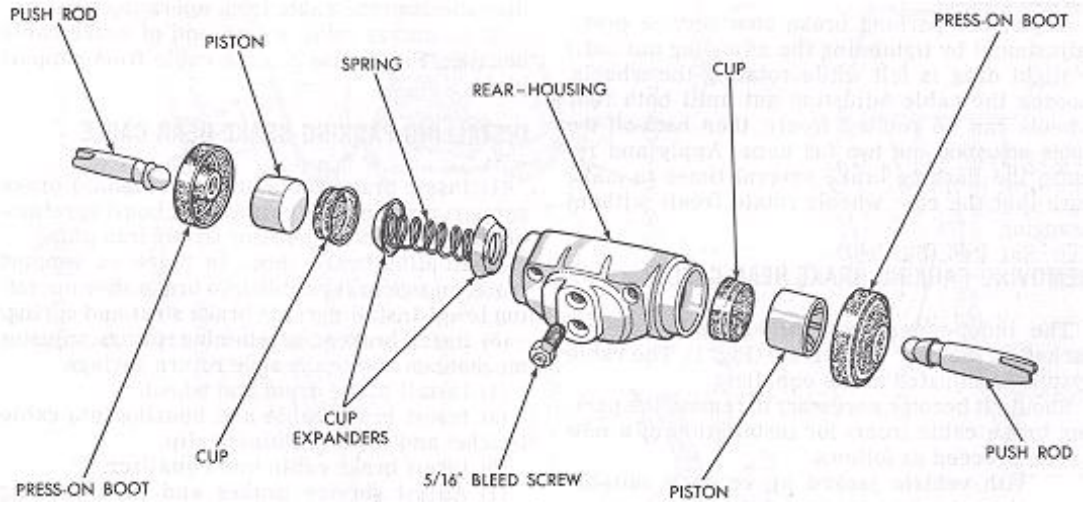


ATASA 5th Brake Systems







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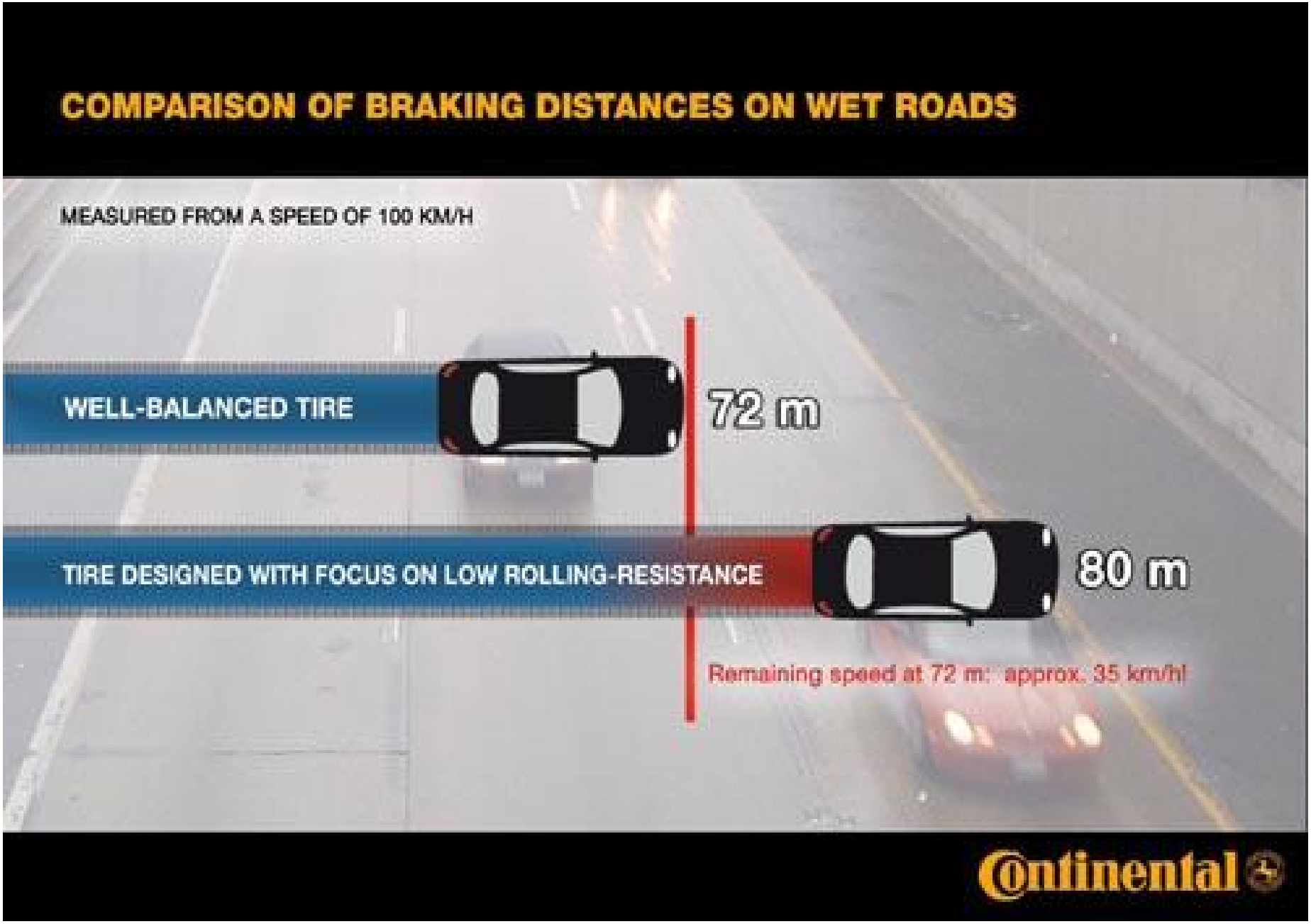

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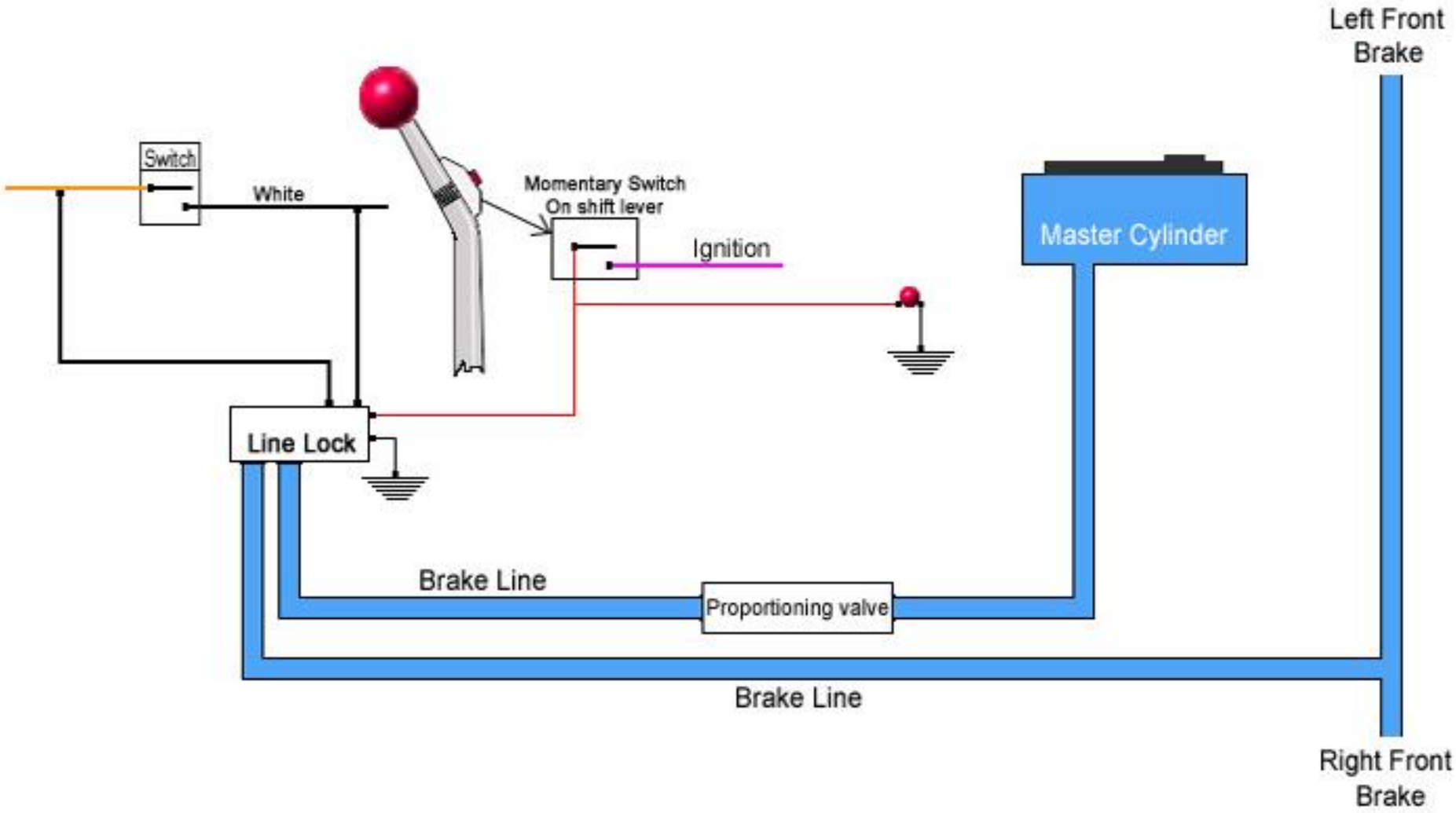

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