ANTI-LOCK BRAKES

- ABS, (Anti-Lock brake system)
- **ABS** allows the driver to maintain steering control of the vehicle while in hard braking situations.
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- Computerized ABS is designed to keep the wheels from locking as the brakes are applied.
- A locked wheel provides very little or no directional control.
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- The following slides show the common ABS components.
- Some components are part of both the conventional and ABS system.
Rear Backing Plate
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- When operating a vehicle with ABS never pump the brakes.
- Doing so will make the ABS system ineffective.
- Always apply firm pressure.
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- Drivers may experience a pulsation in the brake pedal, or pedal kick back during an ABS stop. This is normal and not to be confused with a conventional brake pedal pulsation.
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- Major components of the anti-lock brake system consist of a
  - Brake control module,
  - Solenoid valve assembly,
  - Speed sensor's
  - Wiring, and the amber ABS brake warning light.
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- **Brake Control Module:**
  - The brake control module is a computer that receives information from the speed sensor and compares it to the speed of other wheels.
  - When one wheel is approaching lock-up pressure can be vented allowing the wheel nearing lock-up to speed up.
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- If a wheel is to fast pressure can be increased to slow down the wheel.
- If both wheel are approximately the same speed the brake control module can enter a pressure hold mode of operation.
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- Solenoid Valve Assembly:
  - Is a pair of valves that can:
    A. Increase pressure
    B. Hold pressure steady
    C. Decrease pressure
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During pressure increase mode of operation fluid is allowed to flow through both solenoids to the brake caliper.

Solenoid 1
Pressure increase

Solenoid 2
Pressure decrease/Vent solenoid

Brake line under pressure

Brake fluid line not under pressure
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During **Pressure Hold** mode of operation both solenoids are closed and no additional fluid is allowed to flow to brake calipers.

- **Solenoid 1**
  - Pressure increase

- **Solenoid 2**
  - Pressure decrease/Vent
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During **Pressure Vent** mode the pressure increase solenoid is closed. The Vent solenoid opens allowing fluid to vent into an accumulator chamber.

*Solenoid 1*

*Pressure increase*

*Solenoid 2*

*Pressure decrease/Vent*
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- ABS system can maintain extremely high static pressure and must be disabled before attempting repairs.
- Normally pumping brake 20-30 times will release pressure.
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- ABS brake system are
  - Integrated
  - Nonintegrated
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- An integrated system has the master cylinder and control valve assembly made together.
- A nonintegrated has the master cylinder and control valve assembly made separate.
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- ABS operates using the same hydraulic principal as conventional brakes.
- ABS system only operates when wheel lock-up is emanate.
- A bussing noise and bakes pedal vibration is normal during ABS operation.
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To determine if wheel lock-up is about to occur vehicles a wheel speed sensor.
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- There are 3 ABS configurations
  - 1. channel normally RWAL (rear wheel anti-lock)
  - In a one channel RWAL system, the rear wheels are controlled together
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- ABS brakes are either
  - 1. Channel
  - 3 Channel
  - 4 Channel
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- 1 channel ABS system controls the **rear wheel together**.
- A 1 channel system only has 1 speed sensor and control valve assembly.
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- A three (3) channel ABS system control the rear wheel together and the front independently.
- Three channel ABS system have 3 speed sensor and one (1) control module
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- **Wheel Slippage**, is the wheel speed in relation to vehicle speed.
- If vehicle speed is faster than the wheel speed slippage is negative. And the wheel may become lock-up.
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- If vehicle speed is slower than wheel speed. Wheel slippage is positive.
- Positive wheel slippage occurs when a wheel is spinning.
- **NOTE:** Late model vehicles use the same ABS components with traction control. Traction control prevent a vehicle from spinning out of control.
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- The best braking action occurs at between 10-20%.
- If vehicle speed and wheel speed is the same wheel slippage is 0%
- A lock-up wheel will have a wheel slippage of 100%
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- In a diagonally split system brake system the **left front** and **right rear** brakes are controlled together.
- Diagonally split systems offer an added safety value.
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When diagnosing an ABS concern always

1. Talk with customer/ owner, to deterring if the ABS at fault or a basic brake system concern
2. Always check the basic brake system 1st.
3. Check for proper tire size
4. Check for damage sensor and reluctor rings.
5. Check brake light operation
6. Check for diagnostic trouble codes
ABS QUIZ

1. Technician A says, That ABS works only in a panic situation. Technician B says ABS works when wheel lock-up is determine. Who is correct?
   - A. Technician A only
   - B. Technician B only
   - C. Neither A nor B
   - D. Both A and B
ABS QUIZ

2. Technician A says a lock-up wheel provides no directional control. Technician B says a lock-up wheel provides a shorter stopping distance. Who is correct?

A. Technician A only  B. Technician B only  
C. Both A and B  D. Neither A nor B
ABS QUIZ

3. What component is used to determine vehicle speed?
   - A. Throttle position sensor
   - B. Mass air flow meter
   - C. Oxygen sensor
   - D. Wheel speed sensor
ABS QUIZ

4. Technician A says when operating a vehicle with ABS brakes you should pump the brake. Technician B says to hold firm when applying brakes. Who is correct?

A. Technician A only  B. Technician B only  
C. Both A and B  D. Neither A nor B
ABS QUIZ

5. What type brake fluid should never be used with an ABS system?

- A. DOT 3
- B. DOT 4
- C. DOT 5
- D. All the above can be used
ABS QUIZ

6. Best braking action occurs at what percentage of wheel slip?
   - A. 1 to 5 percent
   - B. 10-20 percent
   - C. 30-40 percent
   - D. above 40 percent
ABS QUIZ

7. A buzzing noise can be heard when the brakes are applied during a panic stop. What is likely cause.
   - A. Bad wheel bearing
   - B. Bad wheel speed sensor
   - C. Warped brake rotor
   - D. Normal operation.
ABS QUIZ

8. A signal channel ABS system operates the:
   A. Front brakes together
   B. Right front and left rear brakes together
   C. The rear together
   D. None of the above
ABS QUIZ

9. In a diagonally split brake system the right front and left rear wheels are:
   - A. Controlled separately
   - B. Controlled independently
   - C. Controlled together.
   - D. Not controlled
ABS QUIZ

10. Technician A says, when diagnosing an ABS system you should check the basic brakes system 1st. Technician B says, you should talk with customer to determine if problem is an ABS concern. Who is correct?

A. Technician A only  
B. Technician B only  
C. Both A and B  
D. Neither A nor B