

PRACTICE EXAM 11: ASE T4 BRAKES SIMULATION

1. The maximum hydraulic pressure typically generated by a heavy-duty disc brake caliper during firm pedal application is approximately:

- A. 200 to 400 psi
- B. 1,200 to 1,800 psi
- C. 4,000 to 5,000 psi
- D. 8,000 to 10,000 psi

2. A driver complains of a brake pedal that requires multiple pumps to develop firm pressure. The vehicle has a hydraulic brake system. The MOST likely cause is:

- A. Failed master cylinder rear seal
- B. Worn ABS modulator valves
- C. Air in the hydraulic lines requiring system bleeding
- D. Excessive caliper slide pin wear

3. The threaded fitting standard most commonly used on heavy-truck air brake lines and connections is:

- A. SAE J512 inverted flare or compression fitting
- B. NPT (National Pipe Thread) tapered seal
- C. Metric ISO O-ring face seal
- D. Flare-and-burr type with no thread sealant

4. A heavy-truck air brake system uses what type of tubing for service brake lines on most modern installations?

- A. Steel pipe with welded fittings
- B. Copper tubing with brass compression fittings
- C. Aluminum tubing with crimp-on fittings
- D. Reinforced nylon (DOT-approved) with push-to-connect fittings

5. A wheel bearing inspection reveals the bearing rollers have a uniform satin gray appearance with no pitting or discoloration. This finding indicates:

- A. Corrosion damage from water contamination
- B. Normal break-in or polishing pattern from normal service
- C. Premature failure requiring immediate replacement
- D. Manufacturing defect

6. A heavy-truck brake fluid reservoir cap should be:

- A. Always loosened to prevent vacuum lock
- B. Cracked open partially during normal driving
- C. Tightly sealed to prevent moisture ingress and contamination
- D. Removed during cold weather to prevent freezing

7. The torque specification for most heavy-truck wheel bearing adjusting nuts during the initial pre-seating step is approximately:

- A. 200 lb-ft while rotating the hub
- B. 50 lb-ft while stationary

- C. 500 lb-ft without rotation
- D. 1,500 lb-ft until rotation stops

8. A spring brake chamber's caging bolt is typically threaded into the chamber at how many TPI (threads per inch)?

- A. 8 TPI
- B. 12 TPI
- C. 16 TPI
- D. The TPI varies by manufacturer; the bolt should always be the OEM specification

9. A driver complains that the parking brake handle (yellow valve) operates with stiffness or excessive force. The MOST likely cause on a tractor is:

- A. Failed master cylinder return spring
- B. Worn or contaminated valve internals requiring replacement
- C. Excessive ABS modulator cycling
- D. Low engine vacuum

10. The DOT specification for brake hose construction is found in:

- A. FMVSS 105
- B. FMVSS 121
- C. FMVSS 106
- D. FMVSS 135

11. A heavy-truck air system fitting that uses a quick-disconnect coupling for trailer connection is the:

- A. Gladhand
- B. Schraeder valve
- C. NPT pipe coupling
- D. Compression fitting

12. A common brake line fitting torque specification on small-diameter (1/4-inch) lines using inverted flare fittings is approximately:

- A. 5 to 10 ft-lb
- B. 60 to 80 ft-lb
- C. 25 to 40 ft-lb
- D. 12 to 15 ft-lb

13. The minimum air pressure that the FMVSS 121 system must build the trailer reservoir to during initial charging is approximately:

- A. 50 psi
- B. 100 psi
- C. 120 psi
- D. 80 psi

14. A driver complains of a brake fluid leak under the master cylinder. Visual inspection shows fluid wetness at the rear of the master cylinder, near the booster face. The MOST likely cause is:

- A. A failed master cylinder rear seal allowing fluid to leak past the pushrod
- B. Cracked master cylinder reservoir

- C. Failed ABS HCU connection
- D. Loose proportioning valve

15. Brake fluid moisture content can be measured using:

- A. A multimeter set to ohms
- B. A tire pressure gauge
- C. An electronic brake fluid moisture tester (electrochemical sensor)
- D. A pH test strip

16. A heavy-truck air brake system uses what color coding for the parking brake control valve on the dashboard?

- A. Red octagon
- B. Yellow diamond
- C. Blue square
- D. Green circle

17. A failed wheel speed sensor will produce all of the following symptoms EXCEPT:

- A. ABS warning lamp illumination
- B. Stored DTC retrievable by scan tool
- C. Possible loss of ABS function on the affected wheel
- D. Activation of the parking brake automatically

18. The standard torque specification for brake caliper mounting bolts on a Class 6 medium-duty truck is typically:

- A. 90 to 130 ft-lb (manufacturer-specific)
- B. 25 to 35 ft-lb
- C. 200 to 250 ft-lb
- D. 500 to 600 ft-lb

19. A heavy-truck brake hose under FMVSS 106 must withstand a minimum pressure of approximately:

- A. 50 psi
- B. 200 psi
- C. 1,200 psi (general specification — verify per application)
- D. 5,000 psi

20. A brake fluid sample tested in the field shows a yellow-amber color with slight cloudiness. This indicates:

- A. New fluid that has just been bottled
- B. Moisture absorption and the fluid should be replaced
- C. Improper fluid type contamination
- D. Engine oil contamination

21. A driver complains that the tractor's brakes apply normally but the trailer brakes seem weaker than expected. After verification that air pressure at the gladhands is normal, the MOST likely cause is:

- A. Excessive driver pedal pressure
- B. Normal trailer brake variation by manufacturer

- C. Worn or contaminated friction material on the trailer
- D. Reduced effective signal pressure due to a partially failing trailer relay valve

22. A heavy-truck air dryer's purge cycle typically lasts approximately:

- A. 10 to 30 seconds
- B. 90 to 120 seconds
- C. 5 to 7 minutes
- D. The duration of an entire compressor cycle

23. A driver reports that after brake service was performed, the truck pulls slightly to the left during application. The vehicle stops correctly but the pull is consistent. The MOST likely cause is:

- A. Normal post-service variation that resolves with break-in
- B. Brake fluid contamination
- C. New shoes or pads on one side that have not yet developed full seating with the friction surface, OR mismatched friction materials between sides
- D. ABS warning lamp activation

24. The CVSA out-of-service criterion for combination vehicles applies when defective brakes reach what percentage?

- A. 10%
- B. 20%
- C. 25%
- D. 50%

25. A wheel bearing race that shows uniform discoloration to dark blue indicates:

- A. Normal coloration from manufacturing
- B. Contamination from incorrect grease
- C. Lubricant breakdown that can be cleaned
- D. The bearing has been overheated and the steel has lost hardness — replace immediately

26. A heavy-truck air brake system's safety relief valve typically opens at approximately:

- A. 150 to 175 psi
- B. 80 to 100 psi
- C. 45 to 60 psi
- D. 200 to 250 psi

27. A typical heavy-truck wheel bearing requires periodic re-greasing or oil change at approximately:

- A. Every 50,000 miles
- B. Every 1,000 miles
- C. According to manufacturer-specified service interval (often 100,000 to 250,000 miles for sealed/oil-bath designs)
- D. Every 5,000 miles

28. The brake compressor on a typical Class 8 tractor receives lubrication from:

- A. A dedicated compressor oil reservoir
- B. The engine's pressurized oil supply through an external line
- C. Splash lubrication only

D. Fuel oil mixed with the air supply

29. A driver complains that the tractor's brake system warning buzzer activates intermittently during normal operation. The dash gauge shows pressure within normal range. The MOST likely cause is:

A. The compressor producing excessive pressure

B. Excessive driver braking force

C. Normal warning buzzer operation

D. A faulty pressure switch sending intermittent low-pressure signals

30. A heavy-truck brake drum that has been heat-discolored to blue or rainbow color should be:

A. Returned to service if dimensions are within specification

B. Lightly machined and reinstalled

C. Replaced because the metal has lost its temper and structural integrity

D. Painted to mask the discoloration

31. A trailer ABS configuration designated 2S/2M means:

A. Two wheel speed sensors and two modulator channels

B. Two-axle design with two-wheel control

C. Two-channel signal with two-modulator splits

D. Two sensors with one modulator per axle pair

32. A medium-duty truck's hydraulic disc brake caliper uses what type of seal between the piston and the bore?

A. Lip seal with spring backing

- B. Single O-ring with retaining clip
- C. Cup seal with double lip
- D. Square-cut seal that provides automatic piston retraction

33. The federally standardized color and shape for the trailer supply (emergency) dash control valve is:

- A. Yellow diamond
- B. Red octagon
- C. Blue triangle
- D. Green square

34. A driver reports that after a recent road test, the brake drum on the right rear has a temperature of 380°F while the left rear measures 220°F. This is:

- A. Normal variation between sides after braking
- B. Acceptable if the truck has just been driven hard
- C. A significant brake imbalance requiring diagnosis to identify the underperforming side or overperforming side
- D. Grounds for immediate compressor replacement

35. The maximum allowable thickness variation on a heavy-truck disc brake rotor is typically:

- A. 0.001 to 0.002 inches
- B. 0.010 to 0.015 inches
- C. 0.025 to 0.050 inches
- D. 0.100 to 0.150 inches

36. A heavy-truck brake hose must be inspected for:

- A. Color matching with the tractor paint
- B. Fluid pressure rating only
- C. Length compatibility
- D. Cracks, abrasion, swelling, fluid leakage, or other physical damage

37. The brake camshaft on an S-cam foundation brake is typically:

- A. Driven by an electric motor
- B. Rotated by the slack adjuster's mechanical input from the chamber pushrod
- C. Hydraulically actuated
- D. Vacuum-driven

38. A driver complains of a "metallic squeal" from the front brakes only when the brakes are applied lightly during stops, but the sound disappears during firmer braking. The MOST likely cause is:

- A. Failed wheel bearings
- B. Worn slack adjusters
- C. Worn brake pad wear indicator contacting the rotor — pad is approaching minimum thickness
- D. ABS modulator failure

39. The brake fluid type used in a vehicle should be determined by:

- A. The reservoir cap labeling and the manufacturer's service information
- B. The technician's preference
- C. Whatever fluid is currently in stock

D. The supplier's recommendation only

40. A typical caliper piston bore diameter on a heavy-truck disc brake is approximately:

- A. 0.5 inches
- B. 5 to 6 inches
- C. 8 to 10 inches
- D. 1.5 to 3 inches

41. A heavy-truck air brake system uses what type of valve to apply the trailer brakes from the foot pedal?

- A. Trailer hand valve
- B. Treadle (foot) valve
- C. Yellow dash valve
- D. Tractor protection valve

42. The standard threading on most heavy-truck air brake fittings is:

- A. Metric ISO M-series
- B. SAE-44 specifications only
- C. NPT (National Pipe Thread) for many connections
- D. UN-style thread without seal

43. A driver reports that the brake pedal "rises" — meaning the pedal moves higher in the cab — over the course of weeks of service on a hydraulic-braked Class 6 truck. The MOST likely cause is:

- A. Drum brake self-adjusters compensating for shoe wear by automatically tightening clearance

- B. Failed master cylinder
- C. Excessive flex hose age
- D. ABS modulator stuck closed

44. The minimum pressure differential between governor cut-in and cut-out is typically:

- A. 5 psi
- B. 50 psi
- C. 100 psi
- D. 20 to 25 psi

45. A heavy-truck air brake system's primary reservoir typically holds:

- A. 150 to 200 cubic inches
- B. 1,500 to 2,500 cubic inches (varies by application)
- C. 50 to 75 cubic inches
- D. 5,000 cubic inches

46. The wheel speed sensor's electrical circuit typically operates at:

- A. 12 to 24 volts AC mains voltage
- B. 110 volts continuously
- C. Low-voltage DC pulse signals (typically 5V reference with sensor-induced AC output)
- D. High-frequency radio waves

47. A heavy-truck driver is performing a daily pre-trip inspection. The driver checks the brakes by listening for air leaks. The driver should listen for:

- A. Continuous hissing sounds at chamber locations or other system components
- B. Engine noise variations
- C. Tire road noise
- D. Cab interior creaking

48. A medium-duty truck's brake pedal must be adjusted to provide:

- A. No free play at all — pedal contacts the master cylinder pushrod immediately
- B. Free play that allows the master cylinder pushrod to extend 1 inch
- C. Deep travel before reaching the master cylinder
- D. A small amount of free play (typically 1/8 to 1/4 inch) before contacting the master cylinder pushrod

49. A driver complains of a brake fluid leak that drips approximately 1 drop per minute from a wheel area. The leak is small but persistent. The technician should:

- A. Continue driving the vehicle to monitor the leak progression
- B. Add more fluid to compensate
- C. Locate and repair the leak immediately, even though it appears small, to prevent reservoir depletion and pedal failure
- D. Replace the master cylinder

50. A trailer's relay emergency valve provides three simultaneous functions, including:

- A. Service relay only
- B. Service relay, reservoir charging, and emergency application during supply loss
- C. Engine RPM control
- D. ABS modulation only

PRACTICE EXAM 11 — ANSWER KEY AND EXPLANATIONS

1. B — 1,200 to 1,800 psi. Heavy-duty hydraulic disc brake calipers typically generate hydraulic pressures in the 1,200 to 1,800 psi range during firm pedal application. This pressure level produces the substantial clamping force needed to stop a loaded medium-duty truck and is well within the structural limits of properly maintained brake hoses and calipers.
2. C — Air in the hydraulic lines requiring system bleeding. A pedal that requires multiple pumps to develop firm pressure is the classic symptom of compressible air in the hydraulic circuit. Each pump compresses the air slightly, gradually building usable pressure — but the system will never feel firm until the air is purged through proper bleeding.
3. A — SAE J512 inverted flare or compression fitting. SAE J512 inverted flare fittings are the dominant standard for heavy-truck air brake line connections. The inverted flare design provides reliable sealing under pressure, vibration, and thermal cycling without thread sealants — making it ideal for safety-critical brake applications.
4. D — Reinforced nylon (DOT-approved) with push-to-connect fittings. Modern heavy-truck air brake systems use DOT-approved reinforced nylon tubing with push-to-connect fittings. This combination provides high-pressure capability, vibration resistance, and quick assembly during manufacturing and service — replacing earlier copper-and-brass installations that suffered from work hardening.
5. B — Normal break-in or polishing pattern from normal service. A uniform satin gray appearance with no pitting indicates the bearing is operating normally and developing the expected polishing pattern from regular service. This is a positive finding suggesting the bearing is healthy and the lubrication is appropriate.
6. C — Tightly sealed to prevent moisture ingress and contamination. Brake fluid is hygroscopic and absorbs atmospheric moisture rapidly when exposed. The reservoir cap must be tightly sealed to prevent moisture absorption that lowers the fluid's wet boiling point and increases brake fade risk under hard braking.
7. A — 200 lb-ft while rotating the hub. The TMC RP 618 procedure specifies approximately 200 lb-ft of torque on the adjusting nut while rotating the hub during initial pre-seating. This seats the bearings fully against their races and expels excess grease before the technician backs off and applies the final adjustment to achieve the 0.001 to 0.005 inch endplay.

8. D — The TPI varies by manufacturer; the bolt should always be the OEM specification. Caging bolt thread specifications vary by chamber manufacturer, and using the wrong bolt can damage the chamber or fail under load. Always use the manufacturer-specified caging bolt for the specific chamber being serviced — this is a safety-critical detail.
9. B — Worn or contaminated valve internals requiring replacement. Stiffness or excessive force at the dash control valve typically indicates internal valve wear, contamination, or seal degradation. The fix is to replace the valve as a unit — internal repair is not typically supported, and continued use of a worn valve can produce inconsistent or failed parking brake operation.
10. C — FMVSS 106. FMVSS 106 specifies the construction, marking, and performance requirements for brake hoses used on motor vehicles. This standard defines pressure ratings, burst strength, dimensional tolerances, and identification markings that must appear on all DOT-compliant brake hoses.
11. A — Gladhand. The gladhand is the quick-disconnect coupling used to connect the tractor's air brake supply and service lines to the trailer. The two gladhands (red for supply, blue for service) provide a reliable seal under pressure while allowing rapid coupling and uncoupling during normal operations.
12. D — 12 to 15 ft-lb. Standard torque specifications for inverted flare fittings on small-diameter (1/4-inch) brake lines are typically in the 12 to 15 ft-lb range. Over-torquing damages the flare and the seat surface, while under-torquing produces leaks. Always follow the manufacturer's specific torque values.
13. B — 100 psi. The trailer reservoir must be initially charged to approximately 100 psi during system buildup. This pressure level is sufficient for trailer brake operation while ensuring full pressure equalization between tractor and trailer reservoirs after initial charging.
14. A — A failed master cylinder rear seal allowing fluid to leak past the pushrod. Fluid wetness at the rear of the master cylinder near the booster face is the diagnostic fingerprint of a failed master cylinder rear seal. The seal allows fluid to leak past the pushrod into the booster area, producing the characteristic external symptom.
15. C — An electronic brake fluid moisture tester (electrochemical sensor). Modern brake fluid moisture testers use electrochemical sensors to measure water content directly. These provide accurate, repeatable readings that guide the technician's decision on fluid replacement timing — typically when moisture exceeds 3%.
16. B — Yellow diamond. Federal standardization specifies the yellow diamond shape for the parking brake control valve on heavy-truck dashboards. This shape can be identified by touch alone in low-light conditions, allowing the driver to operate the parking brake without visual reference.
17. D — Activation of the parking brake automatically. A failed wheel speed sensor produces ABS warning lamp illumination, stored DTCs, and possible loss of ABS function — but does not

automatically activate the parking brake. Parking brake activation requires driver-initiated input through the dash valve.

18. A — 90 to 130 ft-lb (manufacturer-specific). Caliper mounting bolts on Class 6 trucks typically require torque in the 90 to 130 ft-lb range, though specific values vary by manufacturer and application. Always verify the torque specification in the service information for the specific vehicle being serviced.
19. C — 1,200 psi (general specification — verify per application). FMVSS 106 establishes minimum pressure ratings for brake hoses, with general specifications around 1,200 psi for hydraulic hoses (specifications vary by hose type and application). The hose markings on the hose itself confirm compliance with the applicable specification.
20. B — Moisture absorption and the fluid should be replaced. Yellow-amber color with cloudiness in brake fluid is a visual indicator of moisture contamination. Confirmation with a moisture tester is recommended, but visual indicators alone often justify fluid replacement to maintain proper boiling point and brake performance.
21. D — Reduced effective signal pressure due to a partially failing trailer relay valve. With air pressure confirmed normal at the gladhands but trailer brakes weak, the most likely remaining cause is a partially failing trailer relay valve that delivers lower-than-commanded pressure to the chambers. The relay valve's amplification function is degrading, producing weaker brake response.
22. A — 10 to 30 seconds. The air dryer's purge cycle typically lasts 10 to 30 seconds, allowing accumulated moisture and oil to be expelled while the desiccant is regenerated by stored dry air. Longer cycles indicate the dryer is consuming excessive air, while shorter cycles may indicate inadequate regeneration.
23. C — New shoes or pads on one side that have not yet developed full seating with the friction surface, OR mismatched friction materials between sides. Post-service brake pull is most often caused by uneven friction surface conditions between sides — either due to incomplete break-in of new friction material or actual mismatched friction materials. The pull should resolve as the brake material seats with the friction surface.
24. B — 20%. CVSA out-of-service criteria specify that 20% or more of total brakes defective triggers OOS status. On a combination vehicle with 10 brakes total, 2 or more out-of-adjustment brakes meet this threshold, and the vehicle cannot be moved until corrected.
25. D — The bearing has been overheated and the steel has lost hardness — replace immediately. Uniform dark blue discoloration on bearing races indicates the steel has exceeded its tempering temperature, permanently reducing hardness. The bearing is structurally weakened regardless of apparent surface condition and must be replaced — continued use will result in rapid failure.
26. A — 150 to 175 psi. Heavy-truck air brake safety relief valves are typically set to open at approximately 150 to 175 psi. This pressure threshold is well above normal operating ranges (120-

135 psi cut-out) but below the failure threshold of system components, providing safety protection without normal operational interference.

27. C — According to manufacturer-specified service interval (often 100,000 to 250,000 miles for sealed/oil-bath designs). Wheel bearing service intervals vary significantly based on hub design (oil-bath vs. grease) and operating conditions. Always follow the manufacturer's specified interval rather than generic intervals — modern sealed designs often go 100,000+ miles between services.
28. B — The engine's pressurized oil supply through an external line. Heavy-truck air compressors share the engine's pressurized oil supply through an external oil line. This integration ensures consistent lubrication during operation and eliminates the need for a separate compressor lubrication system — but also means a compressor oil leak indicates a brake-system fault that must be addressed.
29. D — A faulty pressure switch sending intermittent low-pressure signals. Intermittent warning buzzer activation with normal gauge readings indicates the pressure switch is faulty — sending intermittent low-pressure signals to the warning circuit. The switch must be diagnosed and replaced to eliminate the false warning.
30. C — Replaced because the metal has lost its temper and structural integrity. Heat discoloration on a brake drum to blue or rainbow color indicates the metal has been heated beyond tempering temperature, permanently reducing hardness and structural integrity. The drum must be replaced — machining, painting, or further use is not acceptable.
31. A — Two wheel speed sensors and two modulator channels. The 2S/2M designation specifies two wheel speed sensors and two independent modulator channels. This configuration typically monitors and controls the two rear wheels independently, providing better control than 2S/1M designs but less than 4S/4M.
32. D — Square-cut seal that provides automatic piston retraction. Hydraulic disc brake calipers use a square-cut seal between the piston and the bore. The seal's elastic deformation under pressure and elastic return after release provides automatic piston retraction, eliminating the need for separate adjustment mechanisms.
33. B — Red octagon. Federal standardization specifies the red octagon shape for the trailer supply (emergency) dash control valve. The shape is intentionally distinct from the yellow diamond parking brake valve, allowing identification by touch and preventing confusion in emergency situations.
34. C — A significant brake imbalance requiring diagnosis to identify the underperforming side or overperforming side. A 160°F temperature differential between sides indicates significant brake imbalance well outside normal variation. The imbalance must be diagnosed to identify whether the hot side is overperforming (e.g., dragging) or whether the cool side is underperforming (e.g., contaminated linings).

35. A — 0.001 to 0.002 inches. Maximum allowable thickness variation on a heavy-truck disc brake rotor is typically 0.001 to 0.002 inches. Variation exceeding this specification produces the characteristic pedal pulsation symptom and requires the rotor to be machined (if thickness allows) or replaced.
36. D — Cracks, abrasion, swelling, fluid leakage, or other physical damage. Brake hose inspection focuses on physical condition: cracks, abrasion from contact with chassis or suspension components, swelling that indicates internal pressure damage, and fluid leakage at fittings. Color matching, length compatibility, and pressure rating are not field inspection criteria.
37. B — Rotated by the slack adjuster's mechanical input from the chamber pushrod. The brake camshaft on an S-cam foundation brake is rotated mechanically by the slack adjuster, which transfers force from the chamber pushrod into rotational motion. As the camshaft rotates, the cam-follower rollers on the brake shoes ride up the cam profile, forcing the shoes outward against the drum.
38. C — Worn brake pad wear indicator contacting the rotor — pad is approaching minimum thickness. The metallic squeal during light braking that disappears under firm pressure is the distinctive signature of a brake pad wear indicator contacting the rotor. The indicator is designed to alert the driver that pad replacement is needed before metal-to-rotor contact occurs.
39. A — The reservoir cap labeling and the manufacturer's service information. Brake fluid type is determined by the vehicle manufacturer's specifications — the reservoir cap is marked with the required type, and the service information confirms it. Mixing fluid types or using the wrong specification can damage seals and components throughout the system.
40. D — 1.5 to 3 inches. Heavy-truck disc brake calipers typically use piston bore diameters in the 1.5 to 3 inch range, depending on application. Larger bores produce greater clamping force from the same hydraulic pressure, but require more brake fluid volume to actuate.
41. B — Treadle (foot) valve. The treadle valve is the driver's primary input to the air brake system. Pedal application opens the valve, sending controlled air pressure to the chambers (through relay valves) — both tractor service brakes and trailer brakes apply simultaneously through the dual-circuit treadle.
42. C — NPT (National Pipe Thread) for many connections. NPT (National Pipe Thread) is widely used for heavy-truck air brake fittings. The tapered design self-seals when threaded together properly, though thread sealant or PTFE tape is often applied for additional seal integrity. Proper torque is critical — over-torquing can split the female fitting.
43. A — Drum brake self-adjusters compensating for shoe wear by automatically tightening clearance. Drum brake self-adjusters automatically compensate for lining wear by tightening shoe-to-drum clearance over time. As linings wear, the adjuster engages slightly, causing the pedal to rise as the shoes are positioned closer to the drums. This is a normal operational pattern.

44. D — 20 to 25 psi. The standard differential between governor cut-in and cut-out is 20 to 25 psi. This range balances compressor duty cycle (avoiding excessive cycling) with adequate reserve pressure for service demands. Differentials outside this range typically indicate governor adjustment is needed.
45. B — 1,500 to 2,500 cubic inches (varies by application). Heavy-truck primary reservoir volumes typically range from 1,500 to 2,500 cubic inches, varying based on vehicle application and chamber size. Larger applications require larger reservoirs to meet FMVSS 121's 12× chamber displacement requirement.
46. C — Low-voltage DC pulse signals (typically 5V reference with sensor-induced AC output). Wheel speed sensors produce low-voltage AC pulse signals as the tone ring teeth pass the sensor tip. The ECU provides a low-voltage DC reference to power the sensor, and the sensor-induced AC output is converted to digital wheel speed data by the ECU's electronics.
47. A — Continuous hissing sounds at chamber locations or other system components. During pre-trip inspection, the driver listens for continuous hissing sounds that indicate air leaks at chambers, valves, gladhands, or fittings. A small leak detected during pre-trip is far easier to repair than a major failure that occurs during operation.
48. D — A small amount of free play (typically 1/8 to 1/4 inch) before contacting the master cylinder pushrod. Brake pedal free play of approximately 1/8 to 1/4 inch is required to ensure the master cylinder pushrod can fully retract and clear the compensation port between applications. Without this clearance, the system can develop residual pressure that causes brake drag.
49. C — Locate and repair the leak immediately, even though it appears small, to prevent reservoir depletion and pedal failure. Even small persistent fluid leaks indicate ongoing fluid loss. Over time, the reservoir will deplete, leading to pedal failure during a critical brake application. The leak must be located and repaired immediately, regardless of how small it appears.
50. B — Service relay, reservoir charging, and emergency application during supply loss. The trailer relay emergency valve performs three simultaneous functions: amplifying the service signal from the tractor for fast trailer brake response, charging the trailer reservoir from supply air, and automatically applying the trailer brakes from reservoir air during supply pressure loss. This multifunction design is the backbone of trailer air brake safety.