# THE OFFICIAL ASE STUDY GUIDE

# ASE School Bus Tests





# **ASE School Bus Tests**

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# **O**VERVIEW

### Introduction

The Official ASE Study Guide for the School Bus Tests is intended to help technicians study for the ASE certification tests. The specific material about each test, included in the booklet is a useful tool for reviewing the technical knowledge that is covered in the School Bus tests. After performing a thorough review, it should be easier to select additional reference material that will assist you with the test preparation needs.

ASE voluntary certification is a means by which technicians can prove their abilities to themselves, to their employers, and to their customers. By passing ASE tests you will earn the most valuable credential available to school bus technicians. Because the tests are tough, you'll have the satisfaction of proving to yourself that you are among the elite in your profession. What's more, these credentials are recognized throughout the nation.

Certified technicians promote customer trust and improve the image of the industry. And trust and professionalism are the first steps to a better, more prosperous business.

ASE encourages you to take the tests and to join the proven pros who wear the ASE Blue Seal of Excellence<sup>®</sup>.

### **How Do I Become Certified?**

There are currently seven tests in the School Bus Technician certification series. If you pass one or more tests, and have at least two years of hands-on working experience in school bus repair, then you will become certified as an ASE School Bus Technician. (Appropriate vocational training may be substituted for up to one year of work experience.)

If you pass tests S1 through S6, and meet the experience requirement, you will earn the certificate of Master School Bus Technician.

If you are currently certified in Diesel Engines (A9, H2, S2, or T2) and Electrical/Electronic Systems (A6, H6, S6, or T6), you are eligible to take the L2 Electronic Diesel Engine Diagnosis Specialist test.

If you fail a test, you may take it again during any scheduled test administration in which it is offered. And remember, you are the only one who will receive your tests scores; results will not be given over the phone nor will they be released to anyone without your written permission.

### School Bus Tests

ASE tests and certifies technicians in the following School Bus areas:

- Body Systems and Special Equipment (Test S1)
- Diesel Engines (Test S2)
- Drive Train (Test S3)
- Brakes (Test S4)
- Suspension and Steering (Test S5)
- Electrical/Electronic Systems (Test S6)
- Air Conditioning Systems and Controls (Test S7)

ASE also offers certification in Automobile, Medium/Heavy Truck, Truck Equipment, Collision Repair/Refinish, Transit Bus, Parts Specialist and Advanced Level specialties. Separate *Study Guides* are available for each test series.

For full information on ASE testing as well as downloadable *Study Guides*, *Registration Booklets*, and more, visit www.ase.com. You may also request *Registration Booklets* by mailing the coupon located on the back cover of this booklet or by calling ASE at 703-669-6600, ext. 400.

# Who Writes the Questions?

The questions, written by service industry experts familiar with all aspects of school bus repair, are entirely job-related. They are designed to test knowledge of the skills that you need in servicing school buses; theoretical knowledge is not covered.

Each question has its roots in an ASE "item-writing" workshop where service representatives from school bus manufacturers, aftermarket parts and equipment manufacturers, working technicians and technical educators meet in a workshop setting to share ideas and translate them into test questions. Each test question written by these experts must survive review by all members of the group. The questions are written to deal with practical problems of diagnosis and repair experienced by technicians in their day-to-day work.

From there, all questions are pre-tested and quality-checked on a national sample of technicians. Those questions that meet ASE standards of quality and accuracy are included in the scored sections of the tests; the "rejects" are sent back to the drawing board or discarded altogether.

Each certification test is made up of between 45 and 55 multiple-choice questions. The testing sessions are 4 hours and 15 minutes, allowing plenty of time to complete several tests.

*Note:* Each test could contain up to fifteen additional questions that are included for statistical research purposes only. Your answers to these questions will not affect your score, but since you do not know which ones they are, you should answer all questions in the test.

# How Do I Prepare for the ASE Tests?

Become familiar with test content and question format: The Test Specifications in this booklet contain a summary description of the content covered by each test. The Task Lists describe the actual work performed by technicians in each specialty area. Together, these form a "blueprint" for writing and assembling the ASE tests.

Please note that each question on the test is keyed, or linked, to a particular task or set of tasks in the task list. Therefore, a review of the task lists, with an eye to judging whether you know how to perform each task listed, will provide you valuable information as you prepare for the tests.

There are five types of multiple-choice questions on the tests, each of which is included in the sample questions in this booklet. Note the different instructions for some questions.

Be sure to read each question carefully, (twice, if necessary) so that you understand exactly what is being asked. *Each question tests a specific diagnostic or repair problem and has only one correct answer*.

To summarize, we suggest the following steps be taken to prepare for the tests:

- **Step 1.** Study the content list for each test you will attempt.
- Step 2. Carefully read the task list for each area.
- **Step 3.** Go over the sample questions to become familiar with each question type. This is very important.
- **Step 4.** Review steps 1 through 3 and identify the skill area(s) where you need additional study.

# Types of Knowledge Measured By the Tests

The types of knowledge and skills you will need to know to pass the tests are as follows:

• **Basic technical knowledge:** Tests your knowledge of what is in a system and how the system works, and what are the proper procedures and precautions to be followed in making repairs and adjustments.

- Service or repair knowledge and skill: Tests your understanding and ability to apply generally accepted repair procedures and precautions in assembly, disassembly, and reconditioning operations; and in making inspections and adjustments. Also tests ability to use shop manuals and precision tools of the trade.
- Testing and diagnostic knowledge and skill: Tests your ability to recognize
  problems and to use generally available measurement and testing equipment
  to make a diagnosis. Also tests your ability to trace the effects of a particular
  condition and find the cause of a particular set of symptoms.

If you are an experienced and competent technician, a careful review of this booklet, and additional brush-up on those areas in which you are weakest, is all you should need to pass the ASE tests.

### **Before The Tests**

Try to be well-rested for the test so you will be alert and efficient. If you are taking the written versions, please bring several sharpened soft-lead (#2) pencils and an eraser with you; pencils will not be furnished at the test center. If you wish to pace yourself, bring a watch; some testing rooms may not have clocks. Finally, be sure to bring along your test center admission ticket and a current photo I.D.

# At the Test Center—Some Tips

Arrive early enough to find the building and testing room. When you reach the location, wait in the assigned area until the proctor begins the test administration. He or she will instruct you in filling out the answer booklet (if taking written tests) or logging on to the computer (if taking computer-based tests).

Once testing has begun, keep track of time. Do not spend too long on any single question. Be sure to read each question carefully so that you understand exactly what is being asked. Do not mark answers in the test booklet; they must be marked on the answer booklet. Your test will not be scored if your answers are not on your answer booklet.

If a question is difficult, mark the answer that you think is correct and put a check by it in the test book. (Computer-based tests allow you to do this on screen.) Then go on to the next question. If you finish before time is up, you may go back to the questions that you checked.

It is to your advantage to answer every question. Do not leave any answers blank. Your score will be based only on the number of correct answers that you give.

### **Test Content and Sample Questions**

The following material is designed to help technicians prepare for the ASE certification tests.

Each section begins with the Test Specifications, which will list the main categories covered on that particular test and the number of test questions and percentage of the test devoted to each topic.

The Task List describes the work activities a technician should be able to perform in each technical area covered on that test. This list was developed by working technicians and technical experts from across the country and will provide a valuable check list of what to study for the test.

These task descriptions offer detailed information to technicians preparing for the test and to persons who may be instructing technicians. The task lists may also serve as guidelines for question writers, reviewers, and test assemblers.

It should also be noted that the number of questions in each content area may not equal the number of tasks listed. Some of the tasks are complex and broad in scope and may be covered by several questions. Other tasks are simple and narrow in scope and one question may cover several tasks. The main objective in listing the tasks is to describe accurately what is done on the job, not to make each task correspond to a particular test question.

Sample questions follow. Although these same questions will not appear on actual tests, they are in the same format as actual test questions. All five types of multiple-choice questions used on the ASE tests are represented here. Note the different instructions for some questions.

# School Bus Types Found on ASE Certification Tests

**The Type A** school bus is a conversion or body constructed upon a van-type or cutaway front-section vehicle with a left-side driver's door, designed for carrying more than 10 persons with a gross vehicle weight rating (GVWR) of 10,000 pounds or less.

**The Type B** school bus is a conversion or body constructed and installed upon a front-section vehicle chassis, or stripped chassis, with a gross vehicle weight rating (GVWR) of more than 10,000 pounds, designed for carrying more than 10 persons. Part of the engine is beneath and/or behind the windshield and beside the driver's seat. The entrance door is behind the front wheels.

**The Type C** school bus is a body installed upon a flat-back cowl chassis with a gross vehicle weight rating (GVWR) of more than 10,000 pounds, designed for carrying more than 10 persons. The entire engine is in front of the windshield and the entrance door is behind the front wheels.

The Type D school bus is a body installed upon a chassis, with the engine mounted in the front, midship, or rear with a gross vehicle weight rating (GVWR) of more than 10,000 pounds, and designed for carrying more than 10 persons. The engine may be behind the windshield and beside the driver's seat; it may be at the rear of the bus, behind the rear wheels. The entrance door is ahead of the front wheels. ■

# Test Specifications and Task List Body Systems and Special Equipment (Test S1)

Content Area	Questions in Test	Percentage of Test
A. Safety and Emergency Equipment Sys	tems	
Diagnosis and Repair	10	20%
B. Body and Interior Maintenance	14	28%
C. Installed Special Equipment Diagnosis		
and Repair	10	20%
D. Heating Systems Diagnosis and Repai	r 16	32%
Total	50	100%

### A. Safety and Emergency Equipment Systems Diagnosis and Repair (10 questions)

- Inspect safety equipment condition and security; service or replace as required (fire extinguisher, first aid kit, body fluid clean up kit, reflective triangles, seat belt cutter, etc.).
- Check condition and operation of seat belts/tether belts, retractor, latch and driver/ passenger restraint systems; repair or replace as required.
- 3. Inspect, adjust, lubricate, repair or replace emergency exits, doors, hatches, hold-open devices, latches, hinges, handles, decals, and seals.
- 4. Check operation of stop arm(s) and crossing gate (air-operated, vacuum, or electric) warning devices; service or replace as needed.
- 5. Inspect, test, adjust, repair or replace electrical components in the emergency exit warning systems (roof hatches, push-out windows, doors, etc.).
- 6. Inspect, test, and replace reflectors, reflective materials, and lettering.

### **B. Body and Interior Maintenance (14 questions)**

- 1. Inspect upholstery, foam, seat frame, and mounting hardware of passenger seats (including track, flip, child seats, etc.); repair or replace as required.
- 2. Inspect, diagnose, test, adjust, repair or replace upholstery, foam, seat frame (air and manual, etc.) and mounting hardware for driver's seat.
- Inspect floor, floor covering, step well, wheel house, and moldings; repair or replace as needed.
- 4. Inspect, adjust, repair or replace entry doors, lift doors, and hand rails.
- Check mirrors for clarity, mounting security, and condition; repair or replace as required.
- 6. Inspect, adjust, repair or replace body mounting bolts, clips (tie downs), outriggers, shear bolts, crossmembers (floor sills), cowl mounts, and accessory compartments (battery, luggage) in accordance with manufacturers' recommended procedures.

### S1 TASK LIST (CONTINUED)

- Inspect chassis frame for cracks, breaks, distortion, looseness, and damage; determine needed repairs.
- Check alignment and security of engine cover and seals; adjust, service, repair or replace as required.
- Inspect, test, adjust, repair or replace manual, electric, or air-operated entry door controls including the emergency release systems.
- Inspect windshield, window glass, frame, sash and latches; repair or replace as necessary.

### C. Installed Special Equipment Diagnosis and Repair (10 questions)

- 1. Check operation of wheel chair lift systems controls (electrical, hydraulic, or mechanical) and backup systems; adjust, repair or replace as needed.
- 2. Inspect structural integrity of wheelchair lift platform, mounting devices, hand rails, and safety barriers; repair or replace according to manufacturers' recommendations.
- Inspect condition and security of wheelchair track and tie downs, and wheelchair passenger seat belt (restraint) systems.

### D. Heating Systems Diagnosis and Repair (16 questions)

- 1. Diagnose the cause of temperature control problems in the heating/ventilating/defrosting system; determine needed repairs.
- 2. Diagnose window fogging problems; determine needed repairs.
- 3. Perform cooling system tests, including freeze protection; determine needed repairs.
- Inspect, test, and replace heater coolant control valve (manual, vacuum, and electrical types).
- 5. Inspect, flush, and replace heater core, hoses, clamps, and covers; bleed the system.
- Perform heating system tests to include correct flow, booster pump operation, and restrictors.
- Check condition of heater filters and exterior of heater core; clean or replace according to manufacturer's recommendations.
- 8. Inspect, diagnose, test, repair, and replace heater/defroster blowers and defogger fans, resistors, switches, relay/modules, sensors, wiring, connectors, and protection devices
- 9. Inspect, diagnose, test, service, or replace heating, ventilating, and defrosting control panel assemblies, cables, and linkages.
- Inspect, diagnose, test, and replace heating, ventilating, and defrosting system vacuum control switches and hoses, diaphragms, vacuum pumps, vacuum reservoir, check valves, and drive belts.
- Inspect, test, adjust, repair, or replace heating/ventilating/defrosting ducts, doors, hoses, and outlets. ■

# Sample Questions Body Systems and Special Equipment (Test S1)

### QUESTIONS:

- 1. An air-operated stop arm will not fully extend. Which of these is the most likely cause?
  - \* (A) Low air pressure
    - (B) Binding hinge pivots
    - (C) A sticking solenoid valve
    - (D) A broken return spring pivot
- 2. A replacement student window side glass should:
  - (A) be tempered.
  - \* (B) meet FMVSS requirements.
    - (C) be laminated.
    - (D) be replaced by a glass company.
- 3. Which of these is the best location for a school bus first aid kit?
  - (A) The floor by the stepwell
  - (B) On the rear emergency door
  - (C) In the tool box
  - \* (D) In the driver's area
- 4. Technician A says that the pH level should be checked during a coolant test. Technician B says that the freeze point should be checked during a coolant test. Who is right?
  - (A) A only

\* (C) Both A and B

(B) B only

- (D) Neither A nor B
- 5. After a broken heater hose is repaired, the right side of the windshield will not defrost. The most likely cause is:
  - (A) the system was overfilled.
  - \* (B) air is trapped in the system.
    - (C) the replacement coolant was improperly mixed.
    - (D) the heater filter was installed backwards.

### **S1 SAMPLE QUESTIONS (CONTINUED)**

- 6. On a type C school bus, the defroster blower works on low and medium speed, but not on the high speed. The most likely cause is a:
  - (A) bad circuit breaker.
  - \* (B) bad control switch.
    - (C) loose ground.
    - (D) clogged heater filter.

### Question 7 is not like the ones above.

It has the word **EXCEPT**. For this question, look for the choice that could **NOT** cause the described situation. Read the entire question carefully before choosing your answer.

- A wheelchair lift has a drifting/leakdown problem. All of these could be the cause EXCEPT:
  - (A) an open manual valve.
  - \* (B) low fluid level.
    - (C) a bad seal.
    - (D) a bad hydraulic pump.

# Test Specifications and Task List Diesel Engines (Test S2)

Content Area	Questions in Test	Percentage of Test
A. General Engine Diagnosis	15	27%
B. In-Chassis Engine Inspection and Repa	ıir 6	11%
<ul><li>C. Lubrication and Cooling Systems</li><li>Diagnosis and Repair</li></ul>	7	13%
<ul> <li>D. Air Induction and Exhaust Systems</li> <li>Diagnosis and Repair</li> </ul>	9	16%
E. Fuel System Diagnosis and Repair	15	27%
F. Starting System Diagnosis and Repair	3	6%
Total	55	100%

### A. General Engine Diagnosis (15 questions)

- Verify the complaint, and road test vehicle; review past maintenance documents (if available); check for technical service bulletins (TSBs), determine further diagnosis.
- Inspect engine assembly and compartment for fuel, oil, coolant, and other leaks; determine needed repairs.
- 3. Isolate and diagnose engine noises; determine needed repairs.
- Check engine exhaust odor, smoke color, density (opacity) and quantity; determine needed repairs.
- Perform fuel system tests (fuel pressure, volume, fuel level, quality, contamination); determine needed repairs.
- 6. Perform air intake system restriction and leakage test; determine needed repairs.
- 7. Perform intake manifold boost pressure test; determine needed repairs.
- 8. Perform exhaust back pressure tests; determine needed repairs.
- 9. Perform crankcase pressure test; determine needed repairs.
- 10. Diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed repairs.
- 11. Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and engine shutoff problems; determine needed repairs.
- 12. Isolate and diagnose engine related vibration problems; determine needed repairs.
- 13. Check cooling system for coolant type, freeze point, boiling point, contamination, coolant level, temperature, pressure, conditioner concentration (supplemental coolant additive), filtration, and fan operation; determine needed repairs.

### **S2** TASK LIST (CONTINUED)

- 14. Check lubrication system for contamination, oil level, temperature, pressure, filtration, and oil consumption; determine needed repairs. Change oil and filters.
- 15. Connect diagnostic tool to vehicle/engine and verify software to check, record, and clear active and inactive diagnostic trouble codes (DTCs); monitor electronic engine data.

### B. In-Chassis Engine Inspection and Repair (6 questions)

- 1. Remove, clean, inspect, and reinstall cylinder head(s) assembly.
- 2. Inspect cylinder head threaded holes, studs, and bolts for service-ability; service/replace as needed.
- Measure cylinder head deck-to-deck thickness and mating surface areas for warpage; inspect for cracks/damage; check condition of passages; inspect core and gallery plugs; service as needed.
- Inspect and replace injector sleeves and seals/0-rings where specified by manufacturer.
- Inspect valve springs, retainers, and/or rotaters, locks and seals, determine needed repairs.
- Inspect pushrods, rocker arms, rocker arm shafts, and brackets for wear, bending, cracks, looseness, and blocked oil passages; repair/replace as needed.
- 7. Inspect, replace cam followers.
- 8. Inspect, measure and replace camshaft; measure/adjust endplay; measure lobe for lift.
- 9. Inspect, replace, and time the engine gear train (includes checking gear wear and backlash of camshaft, auxiliary, and idler gears).
- 10. Adjust valve clearance and injector settings.
- 11. Inspect, service, and install pans, covers, vents, engine driven accessories, mounts and supports, gaskets, seals, and wear rings.
- 12. Clean and inspect engine block assembly for cracks, and mating surface areas for damage or warpage; check condition of passages, core, and gallery plugs; inspect threaded holes, studs, dowel pins and bolts for serviceability; service/replace as needed.
- 13. Measure liner height (protrusion) and counterbore depth; determine needed repairs.
- 14. Inspect, measure, service/replace crankshaft vibration damper and flywheel.
- Inspect cylinder walls or liners, pistons and rings for wear and damage; determine needed service.

### C. Lubrication and Cooling Systems Diagnosis and Repair (7 questions)

- Verify engine oil pressure and check pressure gauge, sending unit, and warning devices.
- 2. Inspect, measure, repair/replace oil pump, drives, inlet pipes, and screens.
- 3. Inspect, repair/replace oil pressure regulator valve(s), bypass valve(s), and filters.
- 4. Inspect, clean, test, reinstall/replace, oil cooler; test, reinstall/replace bypass valve and oil thermostat valve; inspect and repair/replace lines and hoses.
- 5. Inspect and clean turbocharger lubrication system; replace as needed.
- Inspect, reinstall/replace, drive belts, pulleys, idler pulleys, and automatic tensioners; check alignment and adjust drive belts.
- Verify coolant temperature and check temperature gauge, sending unit, and warning devices.

# **\$2** TASK LIST (CONTINUED)

- 8. Inspect and replace coolant thermostat(s), bypasses, housing(s), and seals.
- 9. Flush and refill cooling system with correct coolant type; bleed air from system.
- 10. Inspect, repair/replace coolant conditioner (supplemental coolant additive) filter, check valves, lines, and fittings.
- 11. Inspect, repair/replace water pump and hoses.
- 12. Inspect and clean radiator, pressure cap, and tank(s); determine needed service.
- 13. Inspect, repair/replace fan hub, fan, fan clutch, fan controls, fan thermostat, and fan shroud.
- 14. Inspect, repair/replace radiator coverings, (including shutter assembly, controls, and winter fronts).
- 15. Inspect, test, repair/replace components of engine block heater systems.

### D. Air Induction and Exhaust Systems Diagnosis and Repair (9 questions)

- 1. Inspect, service/replace air induction piping, air cleaner, and element; check for air restriction; check operation of air restriction indicator and housing drain valve.
- Inspect, test, and repair/replace turbocharger(s) (including variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators; inspect, test, and replace wastegate and wastegate controls.
- Inspect, repair/replace intake manifold, gaskets, temperature and pressure sensors, and connections.
- 4. Inspect, test, clean, replace charge air cooler and piping system.
- Inspect, repair/replace exhaust manifold, gaskets, piping, mufflers, exhaust aftertreatment devices, (including three-way and oxidation catalyst and diesel particulate filters DPF) and mounting hardware.
- Inspect, test, and repair/replace preheater/inlet air heater, or glow plug system and controls.
- 7. Inspect, test, and replace exhaust aftertreatment regeneration system and controls.
- 8. Inspect, test, service, and replace EGR system components; including EGR valve, cooler, piping, filter, sensors, controls, and wiring.

### E. Fuel System Diagnosis and Repair (15 questions)

- 1. Inspect, repair/replace fuel tank, vent, cap, mounts, tank protection (cages), valves, screen, supply lines, return lines, fittings, and seals.
- 2. Inspect, clean, test, repair/replace fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, and associated mounting hardware.
- 3. Check fuel system for air; determine needed repairs.
- 4. Prime and bleed fuel system; check, repair/replace primer hand pump.
- 5. Inspect, adjust, repair/replace throttle control linkage.
- Perform on-engine inspections, tests, adjustments, and time, or replace rotary-type and inline injection pumps.
- 7. Perform on-engine inspections, tests, and adjustments, or replace fuel injectors.
- 8. Inspect and test air/fuel ratio controls and timing advance mechanisms; determine needed repairs.
- 9. Inspect, reinstall/replace high-pressure injection lines, fittings, and seals.
- 10. Inspect, test, adjust, repair/replace engine fuel shutoff devices and controls.
- 11. Use a scan tool, digital multimeter (DMM), and/or PC-based diagnostic tool to inspect or test electronic engine control system sensors, actuators, circuits, harnesses, and electronic control module (ECM); determine needed repairs.

### **S2** TASK LIST (CONTINUED)

- 12. Inspect, adjust, repair/replace electronic throttle controls.
- 13. Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system controls (common rail or rail pressure control) and electronic unit injection system controls.
- 14. Diagnose engine low power problems caused by related electronic transmission and traction control systems.
- Inspect, test, and replace electrical connector terminals, pins, harnesses, deals, and locks.

### F. Starting System Diagnosis and Repair (3 questions)

- Perform battery state-of-charge test, charge battery(s) as needed, load test; determine needed service.
- 2. Start vehicle using jumper cables, booster battery, or auxiliary power supply.
- 3. Inspect, clean battery cables and terminals; perform battery cable voltage drop test.
- Inspect, test, and reinstall/replace starter relays, safety switch(s), vandal lock system, and solenoids.
- 5. Perform starter current draw test; determine needed repairs.
- 6. Perform starter circuit voltage drop tests; determine needed repairs.
- 7. Remove and replace starter. ■

# Sample Questions Diesel Engines (Test S2)

### QUESTIONS:

- 1. A driver complains that a Type C school bus has excessive black smoke when started in the morning. Which of these could be the cause?
  - \* (A) A bad fuel injection nozzle
    - (B) A restricted fuel filter
    - (C) A blocked fuel tank vent
    - (D) A leaking fuel return line
- The driver complains that the school bus will not crank. The most likely cause is:
  - (A) Loose starter bolts
  - \* (B) An open vandal lock circuit
    - (C) A shorted starter ground cable
    - (D) The gear selector left in neutral
- 3. A school bus engine repeatedly throws off the engine accessory drive belts. Which of these is the most likely cause?
  - (A) Worn pulley groves
  - (B) An over-tightened drive belt
  - (C) Loose driveline yokes
  - \* (D) An out-of-balance crankshaft vibration damper
- 4. An in-line six cylinder diesel engine has a blown head gasket.

  Technician A says that the cylinder head should be checked for cracks.

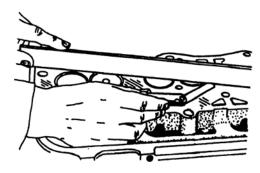
Technician B says that cylinder liner protrusion should be checked.

Who is right?

- (A) A only
- (B) B only
- \* (C) Both A and B
  - (D) Neither A nor B

## **S2 SAMPLE QUESTIONS (CONTINUED)**

- 5. During a cold weather start-up, the oil filter ruptures, causing an oil leak. This could be caused by:
  - \* (A) A stuck-closed oil filter bypass valve
    - (B) A stuck-open oil pressure regulator valve
    - (C) Use of a high-viscosity motor oil
    - (D) Excessive engine rpm's at start-up



- 6. What is the technician checking in the illustration shown above?
  - (A) Valve protrusion
  - (B) Valve recession
  - (C) Coolant nozzle recession
  - \* (D) Cylinder head warpage
- During a diesel engine overhaul, the cylinder liners are found to have excessive external cavitation erosion.

Technician A says that improperly treated coolant could be the cause.

Technician B says that an improper antifreeze to water mix (ratio) could be the cause.

Who is right?

(A) A only

\* (C) Both A and B

(B) B only

(D) Neither A nor B

- 8. A HEUI engine runs poorly and misfires. While performing an engine running injector test, a fault code is set for poor #3 cylinder contribution. Technician A says that a bad injector on cylinder #3 could be the cause. Technician B says that a bent push rod on cylinder #3 could be the cause. Who is right?
  - (A) A only

\* (C) Both A and B

(B) B only

(D) Neither A nor B

### **S2 Sample Questions (CONTINUED)**

9. The cause of a logged fault code in an electronic diesel engine has just been repaired.

Technician A says that the codes should be cleared before releasing the vehicle. Technician B says that the customer's password should be reset before releasing the vehicle.

Who is right?

\* (A) A only

- (C) Both A and B
- (B) B only (D) Neither A nor B

### Question 10 is not like the ones above.

It has the word **EXCEPT**. For this question, look for the choice that could **NOT** cause the described situation. Read the entire question carefully before choosing your answer.

- 10. A Type D school bus has excessive engine oil consumption and an oil film on the back of the bus. All of these could be the cause **EXCEPT**:
  - (A) bad turbocharger seals.
  - \* (B) a cracked cylinder liner.
    - (C) worn piston rings.
    - (D) worn valve guide seals.

# Test Specifications and Task List Drive Train Test (Test S3)

Content Area	Questions in Test	Percentage of Test	
A. Clutch Diagnosis and Repair	4	9%	
B. Manual Transmission Diagnosis		00/	
and Repair	4	9%	
<ul> <li>C. Automatic Transmission Diagnosis and Repair</li> </ul>	25	55%	
D. Drive Shaft and Universal Joint Diagno	osis		
and Repair	5	11%	
E. Drive Axle Diagnosis and Repair	7	16%	
Total	45	100%	_

### A. Clutch Diagnosis and Repair (4 questions)

- 1. Diagnose clutch noise, binding, slippage, pulsation, grabbing, hard shifting, and chatter problems; determine needed repairs.
- Inspect, adjust, repair, or replace clutch linkage, cables, levers, brackets, bushings, pivots, and springs (includes push and pull-type assemblies).
- 3. Inspect, adjust, repair, or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.
- Inspect release (throw-out) bearing clearance, sleeve, bushing, springs, levers, shafts, and seals; determine needed repairs.
- 5. Inspect, or replace clutch pressure plate and disc assembly.
- 6. Inspect and replace pilot bearing; check pilot bearing bore for condition.
- 7. Inspect flywheel mounting area on crankshaft; determine needed repairs.
- 8. Inspect, service, or replace flywheel and starter ring gear.
- 9. Measure flywheel face runout; determine needed repairs.
- Inspect engine block, flywheel housing, and transmission housing mating surfaces; determine needed repairs.
- Measure flywheel housing bore runout and flywheel housing face runout; repair as necessary.

### B. Manual Transmission Diagnosis and Repair (4 questions)

- 1. Diagnose transmission noise, hard shifting, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed repairs.
- Remove and replace transmission; inspect and replace transmission mounts, insulators, and mounting bolts.
- Inspect for leakage; replace transmission cover plates, gaskets, cap bolts, and seals; inspect seal surfaces.

### S3 TASK LIST (CONTINUED)

- 4. Check transmission fluid level, type, and condition; determine needed service and add proper type of lubricant.
- 5. Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts.
- Inspect and replace speedometer drive gear ratio adapters, driven gear, cable, and retainers.
- 7. Inspect, test, or replace speedometer speed sensor.
- 8. Inspect and test backup light and warning device circuit switches.

### C. Automatic Transmission Diagnosis and Repair (25 questions)

- 1. Diagnose noise, vibration, and shifting problems; determine needed repairs.
- 2. Check transmission fluid level; diagnose fluid usage and condition; determine needed service and add proper type of lubricant.
- 3. Perform pressure tests; determine needed repairs.
- 4. Perform stall tests; determine needed repairs.
- 5. Perform lock-up converter system tests; determine needed repairs.
- 6. Diagnose mechanical and vacuum control systems; determine needed repairs.
- 7. Inspect, adjust, and replace manual valve shift linkage and cables.
- 8. Inspect, adjust, and replace cables, linkages or lines for throttle valve (modulator), kickdown, and accelerator pedal.
- 9. Replace fluid and filter(s).
- 10. Check dipstick calibration.
- 11. Inspect, test and/or replace governor, governor cover, and gasket.
- 12. Inspect and replace external seals and gaskets.
- 13. Inspect, test, flush, and replace cooler, lines, filters and fittings.
- Inspect and replace speedometer cable drive gear, driven gear, ratio adapters, and retainers.
- 15. Inspect, test, or replace speedometer speed sensor (pulse generator).
- Inspect and test transmission temperature gauge circuit for accuracy; determine needed repairs.
- 17. Inspect, test operation, adjust, repair, or replace electronic shift controls, indicators, speed sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, warning devices, and wiring harnesses.
- 18. Inspect, test operation, repair, or replace electronic shift selectors (driver controls), switches, displays, indicators, and wiring harnesses.
- 19. Use appropriate diagnostic tools and software, procedures, and service information/ flow charts to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, interpret digital multimeter (DMM) readings, determine needed repairs.
- Diagnose automatic transmission problems caused by data link/bus interfaces with related electronic control systems.
- 21. Inspect, replace, and align transmission mounts.
- 22. Remove and replace transmission; inspect flex plate.
- 23. Remove, inspect, and replace torque converter.
- 24. Inspect engine block, flywheel housing, transmission mating surfaces, and engine-to-transmission mounting adapters; determine needed repairs.
- 25. Diagnose transmission brake problems; determine needed repairs.

# S3 TASK LIST (CONTINUED)

### D. Drive Shaft and Universal Joint Diagnosis and Repair (5 questions)

- Diagnose drive shaft and universal joint noise and vibration problems; determine needed repairs.
- 2. Inspect, service, or replace drive shaft, slip joints, yokes, drive flanges, universal joints, vibration dampers; determine drive shaft phasing.
- 3. Inspect, repair, and replace drive shaft center support bearings and mounts.
- 4. Measure loaded and unloaded driveline angles; determine needed repairs.
- 5. Inspect, adjust, repair, or replace driveline parking brake system components.
- 6. Diagnose driveline retarder problems; determine needed repairs.

### E. Drive Axle Diagnosis and Repair (7 questions)

- Diagnose rear axle drive unit noise and overheating problems; determine needed repairs.
- Check and repair fluid leaks; inspect and replace rear axle drive unit cover plates, gaskets, vents, magnetic plugs, and pinion seals.
- 3. Check rear axle drive unit fluid level and condition; determine needed service and add proper type of lubricant.
- 4. Remove, inspect, and replace differential carrier assembly.
- 5. Inspect rear axle housing mating surfaces; determine needed repairs.
- 6. Remove, inspect, and replace axle shafts.
- 7. Remove, inspect, and replace rear wheel hub assembly; determine needed repairs.
- 8. Diagnose wheel bearing noises and damage; determine needed repairs.
- Clean, inspect, lubricate, and replace wheel bearing cones and races; clean and inspect locking plates and nuts, replace seals, wear rings, and axle flange gasket; adjust rear wheel bearings.
- 10. Inspect or replace extended service (sealed, close-tolerance, and unitized) bearing assemblies; perform initial installation adjustment procedures.
- 11. Check, adjust, and replace wheel speed sensor(s).

# Sample Questions Drive Train (Test S3)

### QUESTIONS:

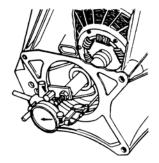
- A Type A school bus with an overdrive transmission and a computer-controlled lock-up converter has shifts that are early and very soft. The most likely cause is:
  - \* (A) An improperly adjusted throttle valve (TV) cable.
    - (B) A slipping converter clutch.
    - (C) A worn governor gear.
    - (D) A shorted converter clutch solenoid.
- Technician A says that a vibration in the driveline could be caused by excessive universal joint movement.

Technician B says that a vibration in the driveline could be caused by an incorrect universal joint operating angle.

Who is right?

- (A) A only
- (B) B only
- \* (C) Both A and B
  - (D) Neither A nor B
- 3. The automatic transmission fluid of a school bus is discolored and has an unusual odor. The most likely cause is:
  - (A) Overrunning the engine governor.
  - \* (B) Overheating the transmission.
    - (C) A dragging spring (parking) brake.
    - (D) Improper gear selection.
- 4. The fluid level in a school bus automatic transmission should be checked with the:
  - (A) Engine shut off at normal operating temperatures.
  - (B) Engine shut off and the transmission in NEUTRAL.
  - (C) Engine running and the transmission in DRIVE, at normal operating temperatures.
  - \* (D) Engine running and the transmission in PARK, at normal operating temperatures.

### S3 SAMPLE QUESTIONS (CONTINUED)



- 5. Which of these is being checked in the setup shown above?
  - \* (A) Clutch housing runout
    - (B) Clutch disc runout
    - (C) Pilot bearing wear
    - (D) Clutch disc spline wear
- 6. The rear axle in a Type C school bus is noisy on deceleration. Which of these is the most likely cause?
  - (A) A worn ring and pinion
  - (B) A worn carrier bearing
  - \* (C) A bad front pinion bearing
    - (D) A bad rear pinion bearing
- 7. A computer-controlled transmission starts off in high gear. Which of these could be the cause?
  - \* (A) A bad transmission control module
    - (B) A bad coolant temperature sensor
    - (C) A low transmission fluid level
    - (D) A stuck one-way clutch

### Question 8 is not like the ones above.

It has the word **EXCEPT**. For this question, look for the choice that could **NOT** cause the described situation. Read the entire question carefully before choosing your answer.

- 8. A school bus driver reports that the clutch slips when the bus is accelerated. All of these could be the cause **EXCEPT**:
  - (A) No clutch pedal freeplay.
- (C) Worn pressure plate springs.

(B) A worn clutch disc.

\* (D) Excessive flywheel runout.

# Test Specifications and Task List Brakes (Test S4)

Content Area	Questions in Test	Percentage of Test
<ul> <li>A. Air Brakes Diagnosis and Repair</li> <li>1. Air Supply and Service Systems (15)</li> <li>2. Mechanical/Foundation (9)</li> <li>3. Parking Brakes (4)</li> </ul>	28	56%
<ul><li>B. Hydraulic Brakes Diagnosis and Repair</li><li>1. Hydraulic System (9)</li><li>2. Mechanical System (6)</li><li>3. Power Assist Units and Misc. (3)</li></ul>	r 18	36%
C. Wheel Bearings Diagnosis and Repair	4	8%
Total	50	100%

### A. Air Brakes Diagnosis and Repair (28 questions)

### 1. Air Supply and Service Systems (15 questions)

- 1. Diagnose poor stopping, air leaks, pulling, grabbing, or dragging complaints caused by supply and service system problems; determine needed repairs.
- 2. Check air system build-up and recovery time; determine needed repairs.
- Drain air reservoir tanks; check for oil, water, and foreign material; determine needed repairs.
- Inspect, adjust, align, or replace air compressor drive belts, pulleys, tensioners, drive gears, and couplings.
- 5. Inspect, repair, or replace air compressor, air cleaner, oil and water lines and fittings.
- 6. Inspect, test, adjust, or replace system pressure controls (governor/relief valve), unloader assembly valves, pressure protection valves, and filters.
- 7. Inspect, repair, or replace air system lines, hoses, fittings, and couplings.
- 8. Inspect, test, clean, or replace air tank relief (pop-off) valves, one-way check valves, drain cocks, automatic drain (spitter) valves, heaters, wiring, and connectors.
- Inspect, clean, repair, or replace air drier systems, filters, valves, heaters, wiring, and connectors.
- 10. Inspect, test, adjust, repair, or replace brake application (foot/treadle) valve, fittings, and mounts; check and adjust brake pedal free play.
- Inspect, test, clean, or replace two-way (double) check valves and anti-compounding valves.
- Inspect, test, repair, or replace stop and parking brake light circuit switches, wiring, and connectors.
- 13. Inspect, test, repair, or replace brake relay valve, quick-release valves, and limiting quick-release valves.

### **S4 TASK LIST (CONTINUED)**

- 14. Inspect, test, and replace inversion and emergency (spring) brake control valve(s).
- 15. Inspect, test, repair, or replace low pressure warning devices.
- 16. Inspect, test, and replace air pressure gauges, lines, and fittings.
- 17. Perform antilock brake system (ABS) warning lamp start-up test; determine needed repairs; diagnose hard fault codes/diagnostic trouble codes (DTCs) using scan tool, PC computer, or LEDs; determine needed repairs.
- Diagnose poor stopping and lockup problems on antilock brake systems (ABS); determine needed repairs.
- 19. Test, adjust, or replace antilock brake system (ABS) wheel speed sensors and tone/exciter rings.
- 20. Test and replace antilock brake system (ABS) electronic control units (ECU) and modulator valves; test, repair, and replace wiring and connectors.

### 2. Mechanical/Foundation (9 questions)

- Diagnose poor stopping, brake noise, pulling, grabbing, or dragging problems caused by foundation brake, slack adjuster, and brake chamber problems; determine needed repairs.
- Inspect, test, adjust, repair, or replace service brake chambers, diaphragm, clamp, spring, pushrod, clevis/pins, and mounting brackets.
- 3. Inspect, test, adjust, repair, or replace manual and automatic slack adjusters.
- 4. Inspect or replace S-cams brake rollers, camshafts, bushings, seals, spacers, retainers, brake spiders, shields, anchor springs, and springs.
- 5. Inspect, clean, rebuild or replace, and adjust air disc brake caliper assemblies.
- 6. Inspect and replace brake shoes, or pads.
- 7. Inspect, resurface, or replace brake drums or rotors.

### 3. Parking Brakes (4 questions)

- 1. Inspect and test parking (spring) brake chamber operation; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.
- 2. Inspect, test, or replace parking (spring) brake valves, lines, hoses, and fittings.
- 3. Manually release and (cage) reset (uncage) parking (spring) brakes.
- Inspect, test, or replace parking brake interlock valve, module, wiring, and connectors.

#### B. Hydraulic Brakes Diagnosis and Repair (18 questions)

### 1. Hydraulic System (9 questions)

- 1. Diagnose poor stopping, pulling, dragging, or brake feel complaints caused by hydraulic system problems; determine needed repairs.
- 2. Inspect hydraulic system for leaks.
- 3. Check and adjust brake pedal free play.
- 4. Inspect, test, or replace master cylinder.
- 5. Inspect, test, or replace brake lines, flexible hoses, and fittings.
- 6. Inspect, test, and replace metering (hold-off), proportioning, and combination valves.
- 7. Inspect, test, or replace brake pressure differential valve and warning light circuit switch, bulbs, wiring, and connectors.
- 8. Inspect, and replace wheel cylinders.

### S4 TASK LIST (CONTINUED)

- 9. Remove, inspect, clean, and replace disc brake caliper assemblies.
- 10. Inspect/test brake fluid; bleed and/or flush hydraulic system.
- 11. Perform antilock brake system (ABS) warning lamp start-up test; determine needed repairs; diagnose hard fault codes/diagnostic trouble codes (DTCs) using scan tool, PC computer, or LEDs; determine needed repairs.
- Diagnose poor stopping and lockup problems on antilock brake systems (ABS); determine needed repairs.
- 13. Test, adjust, or replace antilock brake system (ABS) wheel speed sensors and tone/exciter rings.
- 14. Test and replace antilock brake system (ABS), electronic control units (ECU) and modulator valves; test, repair, and replace wiring and connectors.
- 15. Inspect, test, and replace parking bake interlock valves, modules, wiring, and connectors.

### 2. Mechanical System (6 questions)

- Diagnose poor stopping, noise, pulling, grabbing, dragging, or pedal pulsation complaints caused by drum and disc brake mechanical assembly problems; determine needed repairs.
- 2. Inspect, resurface, or replace brake drums or rotors.
- 3. Inspect, adjust, or replace drum brake shoes, mounting hardware, adjuster mechanisms, and backing plates.
- 4. Inspect, or replace disc brake pads and mounting hardware; inspect or replace anchor plate and mounting hardware.
- Inspect, adjust, and repair or replace in-wheel mechanical and hydraulic parking brake systems.
- Inspect, adjust, or replace driveline parking brake drums, rotors, bands, shoes, mounting hardware and adjusters.
- 7. Inspect, adjust, or replace driveline parking brake application system pedal, actuators, cables, linkage, levers, pivots, springs, bearings, and seals.

### 3. Power Assist Units and Miscellaneous (3 questions)

- Diagnose poor stopping complaints caused by power brake booster problems; determine needed repairs.
- 2. Inspect, test, repair, or replace power brake booster hoses and control valves.
- 3. Test, adjust, and replace brake stop light switch, bulbs, wiring, connectors, and warning devices.

### C. Wheel Bearings Diagnosis and Repair (4 questions)

- 1. Remove and replace axle hub and wheel assembly.
- 2. Clean, inspect, lubricate, or replace wheel bearing assemblies; replace seals and wear rings (if applicable).
- 3. Adjust axle wheel bearings in accordance with manufacturers' procedures and specifications (includes standard and unitized).

# Sample Questions Brakes (Test S4)

### QUESTIONS:

 The parking brakes fail to apply on a school bus with air brakes.
 Technician A says that low air pressure in the spring brake chamber could be the cause.

Technician B says that a ruptured spring brake diaphragm could be the cause. Who is right?

(A) A only

(C) Both A and B

(B) B only

\* (D) Neither A nor B

- A school bus has an uneven braking problem. Which of these could be the cause?
  - (A) A binding treadle (foot) valve

\* (C) A bad brake drum

(B) Low brake line air pressure

(D) A bad governor

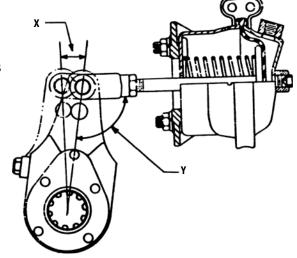
3. The slack adjuster shown is being adjusted.

Technician A says that travel X should be as short as possible without causing the brakes to drag.

Technician B says that angle Y should be less than 90° when the brakes are applied.

Who is right?

- \* (A) A only
  - (B) B only
  - (C) Both A and B
  - (D) Neither A nor B



## **S4 SAMPLE QUESTIONS (CONTINUED)**

- 4. All the brakes drag on a school bus with hydraulic brakes. This is most likely caused by:
  - (A) Air in the hydraulic system.
  - (B) Excessive vacuum supply to the power brake booster.
  - (C) A leaking secondary cup in the master cylinder.
  - \* (D) No brake pedal free travel.
- 5. Technician A says that the low air pressure warning system must provide a signal that the driver can hear.

Technician B says that the low air pressure warning system must provide a signal that the driver can see.

Who is right?

(A) A only

\* (C) Both A and B

(B) B only

- (D) Neither A nor B
- 6. The most likely cause for no air pressure in the secondary air reservoir tank is:
  - (A) An improperly adjusted air governor.
  - \* (B) A plugged one-way check valve.
    - (C) A weak pressure relief valve.
    - (D) A restricted compressor main discharge line.

### Questions 7 and 8 are not like the ones above.

Each of these has the word **EXCEPT**. For each question, look for the choice that could **NOT** cause the described situation. Read the entire question carefully before choosing your answer

- 7. The driver of a school bus with air brakes says that it has poor stopping power. All of these could be the cause **EXCEPT**:
  - \* (A) The quick-release valve exhaust port is plugged.
    - (B) The air pressure is too low.
    - (C) The application line is restricted.
    - (D) The brakes are adjusted wrong.
- 8. The low air pressure indicator stays on when the air pressure gauge shows 100 psi. All of these could be the cause **EXCEPT**:
  - (A) Burned contact points in the pressure switch.
  - \* (B) Low battery voltage at the pressure switch.
    - (C) A plugged air inlet to the pressure switch.
    - (D) A blown diaphragm in the pressure switch.

# TEST SPECIFICATIONS AND TASK LIST SUSPENSION AND STEERING (TEST S5)

Content Area	Questions in Test	Percentage of Test
A. Steering System Diagnosis and Repair	18	36%
B. Suspension Systems Diagnosis and Re	epair 18	36%
<ol> <li>Independent Front Suspensions (5)</li> <li>Straight/I-Beam Axle Diagnosis and Repair (6)</li> <li>Rear Suspensions (7)</li> </ol>		
C. Wheel Alignment Diagnosis,		
Adjustment, and Repair	8	16%
D. Wheels and Tires Diagnosis and Repair	ir 6	12%
Total	50	100%

### A. Steering System Diagnosis and Repair (18 questions)

- Diagnose steering column (tilt and fixed) shaft noise, looseness, and binding problems; determine needed repairs.
- Inspect and replace steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft U-joints.
- Diagnose power steering system noises, steering binding, uneven turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed repairs.
- 4. Inspect power steering fluid level and condition; determine needed service and fluid type.
- 5. Purge air from the power steering system.
- 6. Perform power steering system pressure and flow tests; determine needed repairs.
- Inspect, service, or replace power steering reservoir including hoses, filter, seals, and gaskets.
- Inspect, adjust, align, or replace power steering pump belt(s), pulley(s), and tensioners.
- 9. Inspect power steering pump drive gear and coupling; replace as required.
- 10. Inspect, adjust, repair, or replace power steering pump, mountings, and brackets.
- Inspect, test, or replace power steering pump internal/external pressure regulator valve(s).
- 12. Inspect and replace power steering system lines, hoses, cooler, and fittings.
- 13. Inspect, adjust, or replace integral-type power steering gear.
- 14. Inspect and replace pitman arm.

### **S5 TASK LIST (CONTINUED)**

- 15. Inspect, adjust, or replace drag link/center link, tie rods, and ends; position adjusting sleeves, clamps, and retainers.
- 16. Inspect and/or replace idler arm(s).
- 17. Inspect and replace steering and Ackerman (tie rod) arms.
- 18. Check and adjust steering linkage or wheel stops (axle stops).
- 19. Check and adjust steering gear poppets/relief valves.

### **B. Suspension Systems Diagnosis and Repair (18 questions)**

### 1. Independent Front Suspensions (5 questions)

- Diagnose front suspension system noises, looseness, body sway, and rough ride; determine needed repairs.
- Inspect and replace upper and lower control arms, strut rods/radius arms, bushings, shafts, and rebound/jounce bumpers on short and long arm (SLA) suspension systems.
- 3. Inspect and replace upper and lower ball joints and/or kingpins.
- 4. Inspect and replace steering knuckle/spindle assemblies.
- 5. Measure and correct ride height as required.
- 6. Inspect and replace front suspension system coil springs and spring insulators (silencers); measure ride height.
- 7. Inspect and replace stabilizer bar (sway bar) bushings, brackets, and links.
- 8. Inspect and replace shock absorbers, bushings, brackets, and mounts.

### 2. Straight/I-Beam Axle Diagnosis and Repair (6 questions)

- Diagnose front suspension system noises, looseness, body sway, and rough ride; determine needed repairs.
- 2. Inspect and replace front axle, U-bolts, and nuts.
- Inspect, service or replace kingpin, steering knuckle bushings, locks, bearings, shims, seals, and covers.
- 4. Inspect and replace shock absorbers, bushings, brackets, and mounts.
- 5. Inspect, repair, or replace leaf springs, shims/wedges, center bolts, clips, fasteners, bushings, shackles, pins, insulators, brackets, and mounts.
- 6. Measure vehicle ride height; determine needed adjustments or repairs.

### 3. Rear Suspensions (7 questions)

- 1. Diagnose suspension system noises, looseness, rough ride, and body sway problems; determine needed repairs.
- 2. Inspect and replace rear axle housing, U-bolts, and nuts.
- 3. Inspect and replace shock absorbers, bushings, brackets, and mounts.
- 4. Measure vehicle ride height; determine needed adjustments or repairs.
- 5. Inspect and replace leaf springs, center bolts, clips, fasteners, bushings, shackles, pins, insulators, brackets, shims/wedges, and mounts (pads and saddles).
- 6. Inspect and replace torque arms (rods), pins, bolts, bushings, and mounts.
- 7. Inspect, test, adjust, repair, or replace air suspension pressure regulator, pressure protection valve(s), height control valve(s), links, lines, hoses, and fittings.
- 8. Inspect, test, repair, or replace air bags, springs, shims, mounting plates, suspension arms, bushings, pins and bolts.

# S5 TASK LIST (CONTINUED)

### C. Wheel Alignment Diagnosis, Adjustment, and Repair (8 questions)

- 1. Diagnose vehicle wandering, pulling, shimmy, darting, and steering effort problems; determine needed adjustments or repairs.
- 2. Check and adjust camber and caster; determine needed repairs.
- Check SAI (steering axis inclination)/KPI (kingpin inclination) and included angle; determine needed repairs.
- 4. Check and adjust toe.
- 5. Diagnose toe-out-on-turn (Ackerman angle) problems; determine needed repairs.
- 6. Check rear axle alignment (thrustline/centerline) and tracking; adjust or determine needed repairs.
- 7. Check and adjust steering and/or drive axle wheel bearings.

### D. Wheels and Tires Diagnosis and Repair (6 questions)

- 1. Diagnose tire wear patterns; determine needed repairs.
- 2. Inspect, repair, or replace tires; check air pressure; valve stems, and caps.
- Diagnose wheel/tire vibration, wheel hop, and shimmy problems; determine needed repairs.
- 4. Inspect and replace wheels/rims, wheel spacers, clamps, studs, and nuts.
- 5. Measure wheel and tire radial and lateral runout; determine needed repairs.
- 6. Balance wheel and tire assembly.
- 7. Measure tire diameter and/or circumference; match tires and rims.

# Sample Questions Suspension and Steering (Test S5)

### QUESTIONS:

1.	Which of these could cause the front	tires of a school bus to show a feathered
	edge wear pattern?	
	* (A) A wrong toe setting	(C) A wrong caster setting
	(B) A wrong camber setting	(D) Wrong tire pressures

- 2. Excessive steering wheel freeplay may be an indication of:
  - (A) A loose power steering pump drive belt.
  - (B) Improperly adjusted axle stops.
  - (C) Contaminated power steering fluid.
  - \* (D) Loose steering sector-to-frame mounting bolts.
- 3. A school bus has a history of springs breaking at the center bolt holes. Technician A says that loose u-bolts could be the cause. Technician B says that loose spring shackles could be the cause. Who is right?
  - \* (A) A only

(C) Both A and B

(B) B only

- (D) Neither A nor B
- 4. A school bus has a greater turning radius in one direction than in the other. This could be caused by:
  - (A) Over-tightened wheel bearing adjustment.
  - (B) Air in the hydraulic system.
  - (C) Incorrect power steering fluid.
  - \* (D) Incorrect axle stop adjustment.
- 5. A technician finds low pump pressure during a power steering pressure test.

Which of these could be the cause?

- (A) Excessive hose back-pressure
- (B) A worn steering gear
- (C) A high fluid level
- \* (D) A worn power steering pump

### **S5 SAMPLE QUESTIONS (CONTINUED)**

- 6. A school bus driver reports that the front end starts to shimmy at 40 mph (64kph) and stops at 45 mph (72 kph). This could be caused by a:
  - \* (A) missing wheel weight.
    - (B) worn sway bar bushing.
    - (C) broken spring leaf.
    - (D) dry kingpin bushing.
- 7. A school bus leans to one side. The most likely cause is:
  - (A) A loose spring U-bolt.
  - \* (B) A broken leaf spring.
    - (C) Bad shock absorbers
    - (D) Loose spring shackles.

### Question 8 is not like the ones above.

It has the word **EXCEPT**. For this question, look for the choice that could **NOT** cause the described situation. Read the question carefully before choosing your answer.

- 8. All of these must be checked before aligning the front wheels on a school bus **EXCEPT**:
  - (A) tire pressure.
  - (B) trim height.
  - (C) wheel bearing adjustment.
  - \* (D) tire balance.

# Test Specifications and Task Lists Electrical/Electronic Systems (Test S6)

Content Area	Questions in Test	Percentage of Test
A. General Electrical Diagnosis	4	9%
B. Battery Diagnosis and Service	3	6%
C. Starting System Diagnosis and Repair	7	16%
D. Charging System Diagnosis and Repair	7	16%
E. Lighting Systems Diagnosis and Repair	15	33%
<ol> <li>Headlights, Daytime Running Lights, Fog Lights, Parking, Clearance, Tail Lights, Dome, Stepwell, Strobe, and Dash Lights (7)</li> </ol>		
<ol> <li>Stoplights, Turn Signals, Hazard Ligh Back-up Lights/Alarms, and 4-Lamp and 8-Lamp Warning Systems (8)</li> </ol>	its,	
<ul> <li>F. Gauges and Instrument Warning Device Diagnosis and Repair</li> </ul>	e 4	9%
G. Miscellaneous	5	11%
Total	45	100%

### A. General Electrical System Diagnosis (4 questions)

- 1. Check continuity in electrical/electronic circuits using appropriate test equipment.
- Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using a digital multimeter (DMM).
- 3. Check current flow in electrical/electronic circuits and components using an ammeter.
- 4. Check resistance in electrical/electronic circuits and components using an ohmmeter.
- 5. Locate open, shorted, and grounded circuits in electrical/electronic systems.
- 6. Diagnose key-off battery drain problems.
- 7. Inspect, test, and replace fusible links, circuit breakers, and fuses.
- 8. Inspect, test, and replace spike suppression capacitors, resistors and diodes.

#### **B. Battery Diagnosis and Service (3 questions)**

- 1. Perform battery capacity (load, high rate discharge) test; determine needed service.
- Determine battery state-of-charge by measuring terminal post voltage using a digital multimeter (DMM).
- 3. Inspect, clean, service, or replace batteries.

### S6 TASK LIST (CONTINUED)

- 4. Inspect, clean, repair, and replace battery boxes, mounts, and hold downs.
- 5. Charge battery using slow or fast charge method as appropriate.6. Inspect, clean, repair, and replace battery cables and connectors.
- 7. Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply.

### C. Starting System Diagnosis and Repair (7 questions)

- 1. Perform starter current draw test; determine needed repairs.
- 2. Perform starter circuit voltage drop tests; determine needed repairs.
- 3. Inspect, test, and replace components and wiring in the starter control/interrupt circuit.
- 4. Inspect, remove, and replace starter.
- 5. Inspect, test, and replace starter relays and solenoids/switches.

### D. Charging System Diagnosis and Repair (7 questions)

- 1. Diagnose dash-mounted charge meters and/or indicator lights that show a no charge, low charge, or overcharge condition; determine needed repair.
- 2. Diagnose the cause of a no charge, low charge, or overcharge condition; determine needed repair.
- 3. Inspect, adjust, and replace alternator drive belts, pulleys, fans, and mounting brackets.
- 4. Perform charging system output test; determine needed repairs.
- 5. Perform charging circuit voltage drop tests; determine needed repairs.
- 6. Inspect, remove and replace alternator.
- 7. Inspect, repair, or replace connectors and wiring in the charging circuit.

### E. Lighting Systems Diagnosis and Repair (15 questions)

# 1. Headlights, Daytime Running Lights, Fog Lights, Parking, Clearance, Tail Lights, Dome, Stepwell, Strobe, and Dash Lights (7 questions)

- 1. Diagnose the cause of brighter-than-normal, intermittent, dim, or no headlight operation.
- 2. Inspect, test, aim, and replace headlights.
- 3. Inspect, test, repair, or replace headlight and dimmer switches, relays, control modules, solenoids, wiring, connectors, and sockets.
- 4. Inspect, test, repair, or replace switches, relays, solenoids, bulbs, LEDs, sockets, connectors, and wiring of fog light, parking, clearance, stepwell, strobe light, and tail light circuits.
- 5. Inspect, test, repair, or replace dash light circuit switches, bulbs, LEDs, sockets, connectors, wiring, printed circuits, and instrument panel warning lights.
- 6. Inspect, test, repair, or replace dome light circuit switches, relays, bulbs, LEDs, sockets, connectors, and wiring.

### 2. Stoplights, Turn Signals, Hazard Lights, Back-up Lights/Alarms, and 4-Lamp and 8-Lamp Warning Systems (8 questions)

1. Inspect, test, adjust, repair, or replace stoplight circuit switches, relays, bulbs, LEDs, sockets, connectors, and wiring.

### **S6 TASK LIST (CONTINUED)**

- Diagnose the cause of no turn signal and hazard flasher lights and indicators, or lights with no flash on one or both sides.
- 3. Inspect, test, repair, or replace turn signal and hazard circuit flasher, switches, bulbs, LEDs, sockets, connectors, and wiring.
- 4. Inspect, test, adjust, repair, or replace back-up lights/alarms and warning device circuit switches, relays, solenoids, bulbs, LEDs, sockets, horns, buzzers, connectors, and wiring.
- 5. Inspect, test, repair or replace 4-lamp and 8-lamp warning systems (motor-driven, sequential and non-sequential), stop arm lights, switches, relays, diodes, control/flasher units, and actuators.
- Inspect, test, repair or replace 4-lamp and 8-lamp warning systems (electronic, sequential and non-sequential), stop arm lights, switches, relays, diodes, control/ flasher units, and actuators.
- 7. Inspect, test and repair override circuits for 4-lamp and 8-lamp warning light systems.
- 8. Inspect, test, adjust and repair electronically-controlled stop arms and crossing gates.

### F. Gauges and Instrument Warning Devices Diagnosis and Repair (4 questions)

- 1. Diagnose intermittent, high, low, or no gauge readings; determine needed repairs. (Does not include charge indicators.)
- Inspect, test, adjust, repair, or replace gauge circuit sending units, gauges, connectors, and wiring.
- 3. Inspect, test, repair, or replace instrument warning light circuit sending units, bulbs, sockets, connectors, wiring, diodes, and printed circuits.
- 4. Inspect, test, repair, or replace audible alarm circuit sending units, buzzers, switches, relays, connectors, wiring, and printed circuits.
- 5. Inspect, test, replace and calibrate electronic speedometer, odometer, tachometer systems, and hour meters.

### **G. Miscellaneous (5 questions)**

- 1. Diagnose, inspect, test, repair, or replace horn circuit relays, horns, switches, connectors, and wiring.
- 2. Diagnose, inspect, test, repair, or replace wiper motor, intermittent (delay) module, transmission linkage, resistors, park switch, relays, switches, connectors, and wiring.
- 3. Inspect, test, repair, or replace windshield washer motor, pump/relay assembly, switches, connectors, and wiring.
- 4. Inspect, test, repair, or replace mirror heater circuit grids, relays, timer circuits, switches, connectors, and wiring.
- 5. Inspect, test, repair or replace motorized sideview mirror relays, motors, switches, connectors, and wiring.
- 6. Inspect, test, repair, or replace heater electrical components including blower motors, booster pumps, resistors, relays, switches, connectors, and wiring.
- Inspect, test, repair, or replace accessory power outlets, integral fuses, connectors, and wiring.
- 8. Diagnose, inspect, test, adjust, repair or replace vandal lock/starter interlock system switches, actuators, relays, alarms, connectors, and wiring.
- 9. Inspect, test, adjust and repair electrically-controlled door opening devices.

# Sample Questions Electrical/Electronic Systems (Test S6)

### QUESTIONS:

- If a charging system check shows a fully charged battery and a high charging rate, the technician should test the:
  - (A) Alternator diodes.
  - (B) Stator windings.
  - \* (C) Voltage regulator.
    - (D) Field current draw.
- Both headlights on a school bus are dim on high beam, and normal on low beam.

Technician A says that a poor headlight ground could be the cause. Technician B says that a shorted headlight switch could be the cause.

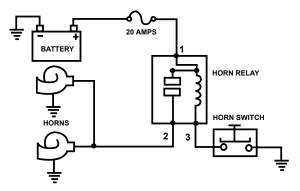
Who is right?

(A) A only

(C) Both A and B

(B) B only

\* (D) Neither A nor B



3. The horns in the circuit shown above only blow when a jumper wire is connected between terminals #1 and #2 of the horn relay.

Technician A says that a bad horn relay could be the cause.

Technician B says that a ground in the circuit between the horn relay and the horn switch could be the cause.

Who is right?

\* (A) A only

(C) Both A and B

(B) B only

(D) Neither A nor B

# **S6 Sample Questions (continued)**

4. When the door is opened and the amber lights cancel, the red lights do not illuminate on a school bus with an electronic 8-lamp warning system.

Technician A says that a bad relay could be the cause.

Technician B says that a bad master switch could be the cause.

Who is right?

\* (A) A only

(C) Both A and B

(B) B only

(D) Neither A nor B

- 5. The windshield wipers on a school bus will not park. Which of these is the most likely cause?
  - (A) The worm gear is out-of-adjustment
  - \* (B) A bad parking switch assembly
    - (C) A binding wiper transmission
    - (D) A poor ground at the wiper motor
- 6. Which of these could cause the driver's heater blower motor to operate at low speed only?

(A) An open ground

(C) A binding blower cage

\* (B) A bad heater switch

(D) A wiring short to the heater

### Questions 7 and 8 are not like the ones above.

Each of these has the word **EXCEPT**. For each question, look for the choice that could **NOT** cause the described situation. Read the entire question carefully before choosing your answer.

- 7. All of these could cause high starter current draw **EXCEPT**:
  - (A) Worn starter bushings
  - \* (B) A bad starter relay
    - (C) Grounded field coils
    - (D) A grounded armature
- School buses which are **not** operated during the summer for more than 30 days should have all of these done to the batteries **EXCEPT**:
  - (A) Removed and stored
  - (B) Periodically tested and charged
  - (C) Disconnect the negative cable
  - \* (D) Replace the electrolyte

# TEST SPECIFICATIONS AND TASK LIST AIR CONDITIONING SYSTEMS AND CONTROLS (TEST S7)

Content Area	Questions in Test	Percentage of Test	
A. A/C System Diagnosis and Repair	16	36%	
<ul> <li>B. A/C System Component Diagnosis and Repair</li> </ul>	14	31%	
<ol> <li>Compressor and Clutch (6)</li> <li>Evaporator, Condenser, and Related Components (8)</li> </ol>			
<ul> <li>C. Operating Systems and Related Contro Diagnosis and Repair</li> </ul>	ls 12	27%	
<ul> <li>D. Refrigerant Recovery, Recycling, and Handling</li> </ul>	3	6%	
Total	45	100%	

# A. A/C System Diagnosis and Repair (16 questions)

- Diagnose the cause of unusual operating noises of the A/C system; determine needed repairs.
- Identify system type and conduct performance test on the A/C system; determine needed repairs.
- 3. Diagnose A/C system problems indicated by refrigerant flow past the sight glass (for systems using a sight glass); determine needed repairs.
- Diagnose A/C system problems indicated by pressure gauge readings; determine needed repairs.
- Diagnose A/C system problems indicated by visual and touch procedures; determine needed repairs.
- 6. Leak test A/C system; determine needed repairs.
- 7. Determine type of refrigerant; perform A/C system recovery procedure.
- 8. Evacuate A/C system.
- 9. Internally clean A/C system components and hoses.
- 10. Charge A/C system with refrigerant (liquid or vapor).

### B. A/C System Component Diagnosis and Repair (14 questions)

### 1. Compressor and Clutch (6 questions)

- 1. Diagnose A/C system problems that cause the pressure protection devices to interrupt system operation; determine needed repairs.
- 2. Test and replace A/C system pressure protection devices.

# **S7 TASK LIST (CONTINUED)**

- Inspect, adjust, and replace A/C compressor drive belts and pulleys; check operation
  of automatic tensioner(s); check pulley alignment.
- 4. Inspect, test, service, and replace A/C compressor clutch components or assembly.
- 5. Determine oil type; inspect and correct oil level in A/C compressor.
- 6. Inspect, test, and replace A/C compressor.
- 7. Inspect, repair or replace A/C compressor mountings.

### 2. Evaporator, Condenser, and Related Components (8 questions)

- Inspect, repair or replace A/C system mufflers, hoses, lines, in-line filters, fittings, and seals.
- 2. Inspect A/C condenser for air flow restrictions; clean and straighten fins.
- 3. Inspect, repair or replace A/C system condenser coil, condenser chassis, and mountings.
- 4. Remove and replace receiver/drier.
- 5. Remove and replace accumulator/drier.
- 6. Inspect, test, and replace expansion valve.
- 7. Inspect, test, and replace orifice tube.
- 8. Inspect, clean, or replace evaporator and inlet air filter.
- 9. Inspect, clean, and repair evaporator housing and water drain.
- 10. Identify, inspect, and replace A/C system service ports (gauge connections).

### C. Operating Systems and Related Controls Diagnosis and Repair (12 questions)

- 1. Diagnose failures in the control system of heating, ventilating, and A/C systems; determine needed repairs.
- Inspect, test, repair, or replace evaporator blower motors, resistors, switches, relay/modules, wiring, and protection devices; check operation of electricallyoperated mode/blend doors.
- 3. Inspect, test, repair, or replace A/C compressor clutch coil, relay/modules, wiring, sensors, switches, diodes and protection devices.
- 4. Diagnose A/C problems related to engine idle speed control systems.
- 5. Inspect, test, repair, or replace condenser fan motors, relays/modules, switches, sensors, wiring, and protection devices.
- Inspect, test, adjust, and repair or replace evaporator temperature switches, sensors, and wiring.
- 7. Inspect, test, adjust, and repair or replace electrical charging system components.
- 8. Inspect, test, adjust, repair, or replace heating, ventilating, and A/C ducts, doors, hoses, and outlets.
- Inspect, test, and replace mechanical heater-control valves and manual shut-off valves

### D. Refrigerant Recovery, Recycling, and Handling (3 questions)

Tasks 1 through 5 should be accomplished in accordance with current EPA regulations and SAE standards for motor vehicle refrigerants.

- 1. Maintain and verify correct operation of certified equipment.
- 2. Identify and recover A/C system refrigerant and containers.
- 3. Recycle label and store, properly dispose of refrigerant, test for non-condensables and contamination.

# Sample Questions Air Conditioning Systems and Controls (Test S7)

### **QUESTIONS:**

- The A/C system on a Type A school bus is blowing cool, but not cold, air from the dash ducts. The system has the correct charge and the pressure gauge readings are normal. Which of these is the most likely cause?
  - (A) The air recirculation door is stuck closed.
  - (B) The heater valve is stuck closed.
  - (C) The source of vacuum has been lost.
  - \* (D) The blend door is out of adjustment.
- 2. A high pitched noise comes from one of the evaporators while the A/C system is running.

Technician A says that the noise could be caused by the A/C system equalizing. Technician B says that the noise could be caused by a partially restricted expansion valve.

Who is right?	
(A) A only	(C) Both A and B
* (B) B only	(D) Neither A nor B

- 3. An A/C system has a low discharge pressure. Which of these could be the cause?
  - \* (A) A bad internal compressor seal
    - (B) A restricted refrigerant flow in the condenser
    - (C) A restricted air flow over the condenser
    - (D) A compressor clutch that will not disengage
- 4. The high-side pressure reaches 300 psi within 15 seconds when the compressor on an A/C system is engaged.

Technician A says that a bad compressor could be the cause.

Technician B says that a restriction in the evaporator could be the cause.

Who is right?
(A) A only

(C) Noth A and B

(B) A only

\* (D) Neither A nor B

# S7 SAMPLE QUESTIONS (CONTINUED)

- 5. Which of these components should be replaced when an A/C system is found to have excessive moisture?
  - (A) Compressor
  - (B) Thermostat
  - \* (C) Receiver/drier
    - (D) Evaporator
- 6. The accumulator/drier is warm on an A/C system that has been operating (compressor engaged) for 20 minutes. Which of these could be the cause?
  - (A) Too little clutch air gap
  - \* (B) A refrigerant undercharge
    - (C) A refrigerant overcharge
    - (D) An open in the pressure switch
- 7. An A/C system with a new compressor and receiver/drier is not cooling properly and the compressor is cold and sweating.

Technician A says that a stuck-open expansion valve could be the cause. Technician B says that an overcharged system could be the cause.

Who is right?

(A) A only

\* (C) Both A and B

(B) B only

- (D) Neither A nor B
- 8. After replacing a condenser and charging a school bus A/C system, there is a loss of refrigerant. This could be caused by:
  - (A) bent condenser fins.
  - \* (B) damaged O-rings.
    - (C) excessive refrigerant oil.
    - (D) a low refrigerant charge.

### Question 9 is not like the ones above.

It has the word EXCEPT. For this question, look for the choice that could NOT cause the described situation. Read the entire question carefully before choosing your answer.

- 9. The driver of a Type D school bus complains that there is no hot air when the blend valve control is moved from COLD to HOT. All of these could be the cause EXCEPT the:
  - \* (A) Manual shutoff valves are open.

(C) Heater core filters are clogged.

(B) Coolant level is low.

(D) Control cable is misadjusted.

# **INDUSTRY TRAINING**

The following sources of information provide comprehensive listings of training resources available to working technicians:

### **Delmar Cengage Learning**

P.O. Box 6904 Florence, KY 41022 1-800-487-8488 www.autoed.cengage.com www.cengage.com/delmar

### **Motor Age Training for Certification**

131 West First Street Duluth, MN 55802 800-240-1968 www.motorage.com

In Canada

### **Thomson Learning Nelson Canada**

1120 Birchmount Road Scarborough, Ontario M1K 5G4 1-800-268-222

E-mail: inquire@nelson.com

#### Spanish Language Training Resources

For a listing of training providers who offer training, or training materials in Spanish go to *www.ase.com*; once there, enter the "Service Professionals" area and click on "Spanish Language Training Resources."

#### **MD Publications**

Undercar Digest, July Issue Transmission Digest, September Issue P.O. Box 2210 Springfield, MO 65801 1-800-274-7890

### **Motor Source Guide**

Hearst Business Publishing, Inc. 645 Stewart Ave. Garden City, NY 11530 www.motor.com

### Fleet Equipment, April Issue

P.O. Box 7605 Mt. Prospect, IL 60056-7605 www.truklink.com

#### Recursos de Educación en Español

Para obtener acceso a la lista de proveedores de educación, ó materiales educativos en Español diríjase a www.ase.com; una ves allí, entre en la sección "Español" y prosiga al área "Lista de Educadores y Materiales Didácticos."

# CASE: ASE Certification for Training Providers of Continuing Automotive Service Education. Visit www.natef.org/case/case\_certified.cfm for periodic updates to this list.

The National Institute for Automotive Service Excellence (ASE) and its educational foundation, the National Automotive Technicians Education Foundation (NATEF), offer a voluntary certification program for institutions and organizations providing continuing automotive service education. ASE seeks to improve the quality of continuing automotive education and help automotive technicians identify appropriate training sources and activities by evaluating and certifying providers of continuing automotive service education against CASE Standards.

The CASE program differs from ASE's existing entry-level training program certification in that it addresses the training provider's process of developing and delivering training as opposed to prescribing specific program content. Elements of organization, structure and methods which appear to contribute significantly to the development and delivery of high quality automotive service education, have been identified and incorporated into the CASE Standards.

The following training providers have achieved CASE certification. Please note that \* indicates a proprietary program unavailable to all technicians.

# **INDUSTRY TRAINING (CONTINUED)**

### 3M Industrial and Transportation Business Services Training and Development

3M Center Building 225-1N-01 St. Paul, MN 55144 651-737-0141 www.3m.com/automotive

### **ACDelco Service Training**

6200 Grand Point Dr., MC#2-316 Grand Blanc, MI 48439 800-825-5886 prompt 1 www.acdelcotechconnect.com

### **Affinia Under Vehicle Group**

Technical Services Department 4400 Prime Parkway McHenry, IL 60050 815- 363-9000 – ask for technical www.raybestos.com

### AKZO NOBEL Coatings Inc., Car Refinishes

5555 Spalding Dr. Norcross, GA 30092 770-242-5760 www.akzonobelcarrefinishes.net

### **American Automobile Association, Inc.**

1000 AAA Dr.
Heathrow, FL 32746
407-444-7169 or 407-444-8041
Allan Stanley, astanley@national.aaa.com
Len Johannes, ljohannes@national.aaa.com
www.aaa.com

### \*American Honda Automobile Service Training

1919 Torrance Blvd. Torrance, CA 90501 310-783-3557 www.honda.com

# Automotive Spray Equipment Technologies (ASET)

3703 West Parkway Blvd. Salt Lake City, UT 84120 801-964-6646 www.asetusa.com

### **ATech Training, Inc**

12290 Chandler Dr. PO Box 297 Walton, KY 41094 859-485-7229 ext. 109 www.atechtraining.com

### **BASF Automotive Refinish Division**

26701 Telegraph Rd. Southfield, MI 48034 248-304-5200 www.basfrefinish.com

### **BP Global Fuels Technology**

150 W. Warrenville Rd. 800 Building Naperville, IL 60563 312-729-4212 www.fuelcertification.com

### **Chief Automotive Systems**

996 Industrial Dr. Madison, IN 47250 800-445-9262 www.chiefautomotive.com

#### **CAROUEST Technical Institute**

4401 Atlantic Ave. Raliegh, NC 27604 919-573-3000 www.CARQUEST.com/CTI

# **Collision Management Services Inc.** 2040R Lord Baltimore Dr.

Baltimore, MD 21244 410-944-3383 www.ineedcms.com/Training.html

# **Delphi Integrated Service Solutions**

5820 Delphi Dr. Troy, MI 48098 800-545-2220 Customer Support www.delphi-iss.com

### **DuPont Performance Coatings**

500 Eagleview Blvd. Exton, PA 19341 610-458-6323 www.pc.dupont.com

# **INDUSTRY TRAINING (CONTINUED)**

### **EAST Training Inc.**

4404 Sylon Blvd. Hainesport, NJ 08036 609-267-2223 www.easttraining.com

# Federal Mogul Technical Education Centers

6565 Wells Ave. St. Louis, MO 63133 314-977-0684 www.federal-mogul.com

### **Fox Valley Technical College**

1825 N. Bluemound Dr. Appleton, WI 54912 920-993-5163 www.fvtc.edu/public

# \*General Motors Service Technical College

30501 Van Dyke Ave., M/C 480-204-100 Warren, MI 48090 586-947-9704 www.gmstc.com

# **Hunter Engineering**

11250 Hunter Dr. Bridgeton, MO 63044 314-731-0000 www.hunter.com

# I-CAR (Inter-Industry Conference on Auto Collision Repair)

5125 Trillium Blvd. Hoffman Estates, IL 60192 800-422-7872 www.i-car.com

#### **Iwata Medea**

3703 West Parkway Blvd. West Valley City, UT 87120 801-964-6646 www.asetusa.com

### **Jiffy Lube International**

700 Milam, Room 24038PNT Houston, TX 77002 713-546-3957 www.jiffylube.com

#### **Kent Automotive**

6200 Oak Tree Blvd., #350 Independence, OH 44131 216-642-5973 www.kent-automotive.com

### **Lawson State Community College**

1100 9th Ave., SW Bessemer, AL 35022 205-929-3521 www.lawsonstate.edu

### Lew Kinney & Associates On-site Welding Training and Certifications

PO Box 511, 184 State Route 314 Centerburg, OH 43011 740-625-6342

### \*Lexus, A Division of Toyota Motor Sales, Inc., U.S.A.

19001 S. Western Ave. Torrance, CA 90509 Technical Training 310-468-4958 www.lexus.com

### **Martin Senour Automotive Finishes**

7019 Highgrove Rd. Burr Ridge, IL 60527 630-887-7516 www.martinsenour-autopaint.com

# **Megatech Corporation**

525 Woburn St., Suite 3 Tewksbury, MA 01876 800-767-6342 (US) 978-937-9600 (Int'1) www.megatechcorp.com

### Melior, Inc.

200 Cahaba Park Circle West, Suite 250 Birmingham, AL 35242 205-298-8300 www.melioronline.com

# National Automotive Parts Association (NAPA)

2999 Circle 75 Pkwy. Atlanta, GA 30339 800-292-NIAT (6428) www.niat-training.com

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### **National Appraisal Institute**

10150 Canoga Ave Chatsworth, CA 91311 818-775-1370 www.nainstitute.com

### **Nationwide Training Organization**

9243 Columbus Pike Lewis Center, OH 43035 614-840-7169 www.nationwide.com

### \*Navistar, Inc.

3033 Wayne Terrace Fort Wayne, IN 46806 260-461-1951 www.navistar.com

### \*Nissan North America, Inc. Customer Loyalty and Training

P.O. Box 685001 Franklin, TN 37068 615- 725-8319 www.nissantechinfo.com

### \*Penske Truck Leasing

Route 10 Pheasant Rd., PO Box 563 Reading, PA 19607 610-775-6479 www.gopenske.com

#### **PPG Industries**

19699 Progress Dr. Strongsville, OH 44149 440-572-6784 www.ppg.com

## **Raytheon Professional Services L.L.C.**

1919 Technology Dr. Troy, MI 48083 248-837-6777 www.rps.com

#### **Saint Gobain Abrasives**

1 New Bond St.
Worcester, MA 01606
508-795-2774
www.nortonautomotive.com
www.aa.carborundumabrasives.com

### **SEM Products, Inc.**

1685 Overview Dr. Rock Hill, SC 29730 803-207-8231 www.semproducts.com

# Sherwin-Williams Automotive Finishes Corp.

7019 Highgrove Rd. Burr Ridge, IL 60527 630-887-7516 www.sherwin-automotive.com

### Solera, Inc.

P.O. Box 151376 Altamonte Springs, FL 32715 858-724-1600 www.training.audatex.us

### **Specialty Products Company**

4045 Specialty Place Longmont, CO 80504 303-772-2103 www.spcalignment.com

### **Technical Training, Inc. (TTi)**

2750 Product Dr. Rochester Hills, MI 48309 248-853-5550 or 800-837-5222 www.ttinao.com

### \*Toyota Motor Sales, USA, Inc.

19001 S. Western Ave. Torrance, CA 90509-2991 310-468-7171 www.toyota.com

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