***With Medium/Heavy Composite Vehicle Type 2***

# *TEST INFORMATION*

***FOR THE***

# *ELECTRONIC DIESEL ENGINE DIAGNOSIS SPECIALIST TEST (L2)*

- ***OVERVIEW***
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# ASE
## ELECTRONIC DIESEL ENGINE DIAGNOSIS SPECIALIST TEST
## OVERVIEW

### INTRODUCTION
The Electronic Diesel Engine Diagnosis Specialist test (L2) is the first advanced level test offered by ASE for medium and heavy vehicle technicians. It is designed to measure a technician's knowledge of the skills needed to diagnose sophisticated engine performance problems on computer-controlled diesel engines. It is an extension of the repair and diagnostic skills tested by the light vehicle, medium/heavy truck, school bus and/or transit bus Diesel Engines and Electrical/ Electronic Systems tests. *To register to take the L2 test, you must be currently certified in both Diesel Engines (A9, T2 ,S2 ,or H2) and Electrical/Electronic Systems (A6, T6, S6, or H6), and meet the two-year experience requirement*.

The L2 test (both regular and recertification) consists of 45 scored multiple choice questions, many of which are detailed and require the use of reference materials. ASE recommends that you do not register for other tests given the same night as the L2 test. This will give you plenty of time to carefully answer all the questions.

You can receive the current *Registration Booklet* by mailing the coupon contained on the back page of this booklet, or by calling the ASE Toll-Free Information Line at 1-888-ASE-TEST. Registration information is also available on the ASE website (**www.ase.com**) on the Internet. The *Registration Booklet* will give you the test dates, locations, and other important information.

### WHO WRITES THE QUESTIONS?
Each question has its roots in an “ASE question writing workshop” where service representatives from vehicle and engine manufacturers, aftermarket trainers, working technicians and vocational educators meet 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 deal with practical problems experienced by technicians in their daily work. Naturally, the failures described in the advanced level questions are more complex and challenging.

After the question writing workshop, 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 future tests; the "rejects" are sent back to the drawing board, or are discarded altogether.

### HOW DO I PREPARE FOR THE ASE L2 TEST?

To prepare for the test, we suggest the following steps be taken:

Step 1. Study the content areas of the Test Specification, noting which areas have more questions in the test.

Step 2. Carefully read the Task List, noting the areas in which your skills are strong or weak. You can do this by checking off each task that you do not perform often or do not understand completely.

Step 3. For practice, use the sample questions that follow. Although these same questions will not appear in the test, they are similar in style and difficulty to the actual test questions. Be sure to use the Medium/Heavy Composite Vehicle Reference Booklet

on the questions that refer to the Composite Vehicle.

Step 4. Use steps 1 through 3 to identify any skill areas where you need additional study or training. Then, use the Industry Training reference section to locate the training sources that are right for you.

## *WHAT IS THE "MEDIUM/HEAVY COMPOSITE VEHICLE"?*

The Composite Vehicle has an electronic unit injector diesel fuel system, **and was updated in 2005 to include new sensors, actuators, and control logic.** It contains computer circuits, sensors, and actuators used in many manufacturers' vehicles, so you should already be familiar with most of the components and how they work. It is described in detail in the enclosed *Medium/Heavy Composite Vehicle Type 2 Reference Booklet.* As you answer the questions about the Composite Vehicle, you will be simulating the real-world activities of using reference materials and diagnosing problems based on your understanding of a specific engine system.

In the test, there will be a clearly marked section of questions that specifically deal with the Composite Vehicle. To answer these questions correctly, you will need to use the information given in the question and the information contained in the *Reference* booklet, plus your own understanding of computer controls and diesel engine operation. *The Medium/Heavy Composite Vehicle Type 2 Reference Booklet should be used only with this group of questions*. Please take the time to become familiar with the Composite Vehicle operation before taking the test.

## *BEFORE THE TEST*

Try to be well rested for the test so you will be alert and efficient. Bring several sharpened #2 pencils with you; pencils usually are not available at the test center. To keep track of the time, bring a watch. Finally, be sure to bring along your admission ticket and some form of current (unexpired) photo identification, like a driver's license. *Do not bring your Medium/Heavy Composite Vehicle Type 2 Reference Booklet with you. Another copy is included in the test booklet, and will be collected when you finish your test.*

## *AT THE TEST CENTER*

Once the test begins, be sure to read each question carefully, (twice, if necessary) so that you understand exactly what is being asked. There are no "trick" questions. *Each question tests a specific diagnostic skill and has a single best answer*.

If you are unsure of an answer, don't get stuck. Mark the answer that you think is correct and put a check by the question in the test book. Then go on to the next question. If you finish before the allotted time is up, you can 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 is based on the total number of correct answers that you give.*

## *TEST SPECIFICATIONS*
## *FOR THE MEDIUM/HEAVY VEHICLE*
## *ELECTRONIC DIESEL ENGINE DIAGNOSIS SPECIALIST TEST (L2)*

| | Content Area | Questions in Test | Percentage of Test |
|---|---|---|---|
| A. | General Diesel Engine Diagnosis | 4 | 9% |
| B. | Electronic Diesel Engine Controls Diagnosis | 25 | 56% |
| C. | Diesel Engine Air Induction and Exhaust Diagnosis | 5 | 11% |
| D. | Diesel Fuel Systems Diagnosis | 4 | 9% |
| E. | Specific Fuel Systems Diagnosis | 7 | 16% |
| | 1. Electronic Unit Injector (2) | | |
| | 2. Pump Line Nozzle - Electronic (1) | | |
| | 3. Hydraulic Electronic Unit Injector (3) | | |
| | 4. Common Rail (1) | | |
| | Total | **45*** | **100%** |

**Note:* The test could contain up to fifteen 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.

The L2 Recertification Test and the regular L2 test both cover the same content areas, and have the same number of scored questions.

## *ELECTRONIC DIESEL ENGINE DIAGNOSIS SPECIALIST TASK LIST*

### *A. GENERAL DIESEL ENGINE DIAGNOSIS (4 QUESTIONS)*

1. Locate and utilize relevant service information, vehicle information, and diagnostic tools.
2. Verify operational complaint.
3. Determine if problem is electrical/electronic or engine mechanical.
4. Evaluate engine mechanical condition based on visual inspection of exhaust output.
5. Diagnose performance complaints caused by cooling system problems.
6. Diagnose performance complaints caused by engine lubrication system problems.
7. Evaluate integrity of air induction system.
8. Evaluate integrity of exhaust system.
9. Diagnose performance complaints caused by problems or modifications to the transmission, drive axle ratio, or by incorrect tire specifications.
10. Diagnose performance complaints caused by vehicle operation and configuration.
11. Determine root cause of current, multiple, and repeated failures.

### *B. ELECTRONIC DIESEL ENGINE CONTROLS DIAGNOSIS (25 QUESTIONS)*

1. Inspect and test for missing, modified, or damaged, engine control components and programmed parameters (factory and customer).
2. Interpret diagnostic scan tool data to determine program parameters (factory and customer) and engine control system condition.
3. Establish relative importance and accuracy of displayed data.
4. Determine if the control system problem is electrical/electronic or mechanical.
5. Determine appropriate electronic engine control diagnostic procedures based on vehicle data, operational complaint, and utilize relevant service information and diagnostic tools.
6. Perform digital multimeter tests on circuits.
7. Test input sensors/circuits using displayed data.
8. Test output actuators/circuits using displayed data.
9. Test and confirm operation of electrical/electronic circuits not displayed on diagnostic tools.
10. Diagnose performance complaints caused by non-engine electronic control system problems.
11. Determine root cause of current, multiple, and repeated failures.

## C. Diesel Engine Air Induction and Exhaust Diagnosis (5 questions)

1. Inspect and test for missing, modified, or damaged components.
2. Determine appropriate air induction and exhaust system diagnostic procedures based on vehicle data, operational complaint, and utilize relevant service information and diagnostic tools.
3. Establish relative importance and accuracy of displayed data.
4. Diagnose performance complaints caused by air induction system problems.
5. Diagnose performance complaints caused by exhaust system problems.
6. Diagnose performance complaints caused by engine brakes, exhaust brakes, backpressure devices, and mechanically and electronically actuated wastegates.
7. Determine root cause of current, multiple, and repeated failures.

## D. Diesel Fuel Systems Diagnosis (4 questions)

1. Inspect and test for missing, modified, or damaged components.
2. Determine appropriate fuel system diagnostic procedures based on available vehicle data, operational complaint and utilize relevant service information and diagnostic tools.
3. Establish relative importance and accuracy of displayed data.
4. Determine if the fuel system problem is electrical/electronic or mechanical.
5. Diagnose performance complaints caused by fuel system problems.
6. Test and/or analyze fuel, fuel system pressure, temperature, and delivery rates.
7. Determine the need for fuel injector performance testing.
8. Determine root cause of current, multiple, and repeated failures.

## E. Specific Fuel Systems Diagnosis (7 questions)

*Note: Each task in this section applies to the following types of fuel injection systems: E1-Electronic Unit Injector (EUI), E2- Pump Line Nozzle - Electronic (PLN-E), and E3- Hydraulic Electronic Unit Injector (HEUI), E4-Common Rail (CR).*

1. Inspect and test for missing, modified, or damaged engine control components and programmed parameters.
2. Determine if the fuel control system problem is electrical/electronic or mechanical.
3. Research system operation, and determine appropriate electronic engine control/fuel system control diagnostic procedures based on vehicle data, operational complaint, and service information.
4. Test input sensors/circuits using displayed data.
5. Test fuel control system operation.
6. Test output actuators/circuits using displayed data.
7. Test and confirm operation of electrical/electronic circuits not displayed on diagnostic tools.
8. Diagnose performance complaints caused by non-engine electronic control system problems.
9. Test and/or analyze fuel, fuel system pressure, fuel supply, fuel return, temperature, and delivery rates to diagnose performance complaints.
10. Determine the need for fuel injector performance testing.
11. Determine root cause of current, multiple, and repeated component failures.■

## *ELECTRONIC DIESEL ENGINE DIAGNOSIS SPECIALIST TEST*
## *SAMPLE QUESTIONS*

Questions 1 and 2 are to be answered without using the Medium/Heavy Composite Vehicle Type 2 Reference Booklet.

1. An engine cranks, but will not start, and no exhaust smoke is present. During diagnosis, the ECM will not communicate with the diagnostic tool. Which of these is the most likely cause?

   (A) A failed data link connector
   (B) A failed engine speed/timing sensor
   (C) Low ECM supply voltage
   (D) Incorrect diagnostic tool software

Question #1 Explanation:

Option (A) is wrong. While a failed data link connector could cause the diagnostic tool to be unable to communicate with the ECM, it would not result in a no-start condition.
Option (B) is wrong. A failed engine speed sensor or timing sensor could cause the ECM to not operate the injectors, resulting in a no-start problem. However, the loss of the speed/timing signal would not cause a diagnostic tool communication problem.
Option (C) is correct. A low supply voltage could result in the ECM shutting down. In this case, the ECM would not operate the injectors or communicate with the diagnostic tool.
Option (D) is wrong. If the diagnostic tool software did not match the ECM being diagnosed, it would result in a loss of communications only.

2. A driver complains of lack of power. Technician A says that a leaking intake manifold gasket could be the cause. Technician B says that a bad boost pressure sensor could be the cause. Who is right?

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

Questions 3, 4, and 5 require the use of the Medium/Heavy Composite Vehicle Type 2 Reference Booklet. This booklet describes the engine control system and diagnostic parameters referred to in questions 3, 4, and 5. You need to use this information to correctly answer these questions. Take time to review the content of the booklet before you continue, and then use it as a reference as you answer these questions.

3. A composite vehicle will start, but will not go above idle when the throttle is depressed. The most likely cause could be an open circuit at:

   (A) ECM pin 75.
   (B) ECM pin 76.
   (C) ECM pin 78.
   (D) ECM pin 80.

## DISPLAYED DATA

| | |
|---|---|
| Engine Coolant Temperature (**ECT**) | 112°F |
| Intake Manifold Temperature (**IMT**) | 118°F |
| Engine Oil Temperature (**EOT**) | 195°F |
| Fuel Temperature (**FT**) | 80°F |
| Engine Oil Pressure (**EOP**) | 30 psi |
| Boost Pressure (**BP**) | 0 psi |
| Barometric Pressure (**BARO**) | 26.8 In.Hg |
| Throttle Position (**TPS**) | 3% |
| Idle Validation Switch (**IVS**) | On |
| Engine Position (**EPS**) | 700 rpm |
| Vehicle Speed (**VSS**) | 0 mph |
| Battery Voltage (**B+**) | 13.9 Volts |
| Coolant Level (**CL**) | Normal |
| Inlet Air Temperature (**IAT**) | 75°F |
| Engine Cooling Fan Command | Off |
| Wastegate Solenoid 1 Command | On |
| Wastegate Solenoid 2 Command | Off |

| | |
|---|---|
| Cruise Control Set Speed | mph |
| Cruise Control Switch | Off |
| Cruise Control Set/Coast Switch | Off |
| Cruise Control Resume/Accel Switch | Off |
| PTO Switch | Off |
| Remote PTO Switch | Off |
| Engine Cooling Fan Switch | Off |
| A/C High Pressure Switch | Closed |
| Clutch Switch | Released |
| Service Brake Switch | Released |
| Engine Brake Switch | On |
| Engine Brake Selector | Medium |
| Protection Override Switch | Off |
| Diagnostic Lamp - Yellow | Off |
| - Red | Off |

**Diagnostic Trouble Codes**

Active:
Inactive:

4. The readings above were taken after engine warm up, while diagnosing an exhaust smoke and rough idle complaint. The most likely cause is a failed:

   (A) boost pressure sensor.
   (B) engine coolant temperature sensor.
   (C) barometric pressure sensor.
   (D) intake manifold temperature sensor.

5. A composite vehicle has an intermittent S5 FMI 5 diagnostic trouble code. Which of these is the most likely cause?

   (A) Loose wires at injector #5
   (B) Loose wires at injector #6
   (C) An open circuit at connector A pin 3
   (D) An open circuit at connector A pin 5

Question 6 is not like the other questions. It contains 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.

6. A HEUI engine stumbles and lacks power on acceleration. Any of these could be the cause EXCEPT a:

   (A) leaking charge air cooler.
   (B) plugged air cleaner element.
   (C) faulty injection pressure regulator.
   (D) faulty camshaft position sensor.

Answer Key : 1. **C** 2. **C** 3. **A** 4. **B** 5. **A** 6. **D**

## *ELECTRONIC DIESEL ENGINE DIAGNOSIS SPECIALIST TEST INDUSTRY TRAINING*

The training sources listed in this guide are designed to help you sharpen your technical skills in diesel engine fuel systems and driveability diagnostics. Since the L2 test reflects these skills - the more you learn, the better your chances of passing this test.

Please call or write the listed organizations for availability, schedules, and prices. You may wish to check with truck and engine manufacturers, community colleges, tool and equipment suppliers, and technical training organizations for the latest training information. Training resources can also be found on ASE's home page (**http://www.ase.com**), or the iATN Technician's Network (**http://www.i-atn.com**).

**Caterpillar, Inc.**

Caterpillar, Inc., Engine Div., Service Training, Bldg. JJ, 600 W. Washington St., East Peoria, IL 61630; Attn: Supervisor, Service Training.

Many Caterpillar dealers have on-site training. A fee is charged. For further info, contact the training department of your local Caterpillar dealer.

**Cummins**

Courses conducted at Cummins Distributor Training Centers in the U.S. and Canada.

For details on course locations, schedules, and costs, contact nearest Cummins Distributor Training Center, or write: Cummins Engine Co., Inc., Box 3005, Columbus, IN 47202-3005, Attn.: Service Training MC91300.

**Delmar Publishers**

Delmar offers training textbooks for medium/ heavy truck repair; including electronic diesel engines and technician certification test preparation. For a free catalog, write: Delmar Publishers, P.O. Box 15015, Albany, NY 12212, or call 800-347-7707. Internet: www.trainingbay.com

**Detroit Diesel**

Detroit Diesel provides training at the corporate training center and at distributors world wide. Training is provided to distributors, dealers, and customers in the areas of overhaul, engine electronic controls, maintenance, marine service, failure analysis, parts, sales, and application.

For detailed information, contact: Detroit Diesel Corp., 13400 W. Outer Drive, Detroit, MI 48239. Ph: 313-592-7437.

**Freightliner Corp.**

Training Courses: Freightliner offers courses for technicians sponsored or employed by authorized Freightliner dealers. Courses cover vehicle service and maintenance, air conditioning, electrical troubleshooting, electronic engine systems, cab repair and rebuilding, and medium truck engine rebuilding. Courses are taught at training centers in Atlanta, GA; Bridgeport, NJ; Chicago, IL, Cleveland, NC; and Portland, OR.

Training Materials: Self-Paced and Video Training programs are available to Freightliner dealer and customer technicians through authorized Freightliner dealers.

For info about courses and materials contact: Freightliner Corp., Service Training Dept. (CII-SDF), 5169 N. Lagoon Ave., Portland, OR 97217, or call 503-745-7725.

**GMC Truck**

For catalogs or course information, contact local GM Training Ctr. or Branch Office, or contact: General Motors Technical College, 1650 Research Drive, Suite 200, Troy, MI 48083, or call 1-888-748-2687. Internet: www.gmstc.com

**International Trucks**

Training Classes: International Truck and Engine Corp. conducts one- two- and three-day classes on diagnosis/overhaul of International diesel engines, brakes, steering, and H-D air conditioning systems.

Self-directed service training materials for home study are also available.

For scheduling info and registration forms, write to International Truck and Engine Corp., International Training Enrollment Ctr., 455 N. Cityfront Plaza Dr., Chicago, IL 60611 or call 1-800-365-0088.

**Mack Trucks, Inc.**

Training Classes: Mack offers classes for their technicians at various Mack Truck locations. Classes vary in length from two to five days. Emphasis is on maintenance, repair, and troubleshooting of various Mack Truck components. Courses offered in diesel engines, transmissions, carriers and drive lines, V-MAC, steering and suspension systems, brakes, electrical systems and air conditioning.

For course availability and scheduling, write: Mack Trucks, Inc., Service Training Dept., P.O. Box 1782, Allentown, PA 18105 or call 610-709-2695.

**Motor Age Training Library**

Test preparation materials.

For information contact: Motor Age, P.O. Box 6310, Duluth, MN 55806-6130 or call 1-800-240-1968. Internet: www.motorage.com

**Robert Bosch Corp.**

Robert Bosch Corp. provides a comprehensive selection of training aids and reference material for gasoline and diesel fuel injection systems, starting and charging systems, and antilock braking systems on automotive and heavy-duty applications.

Technical instruction booklets, troubleshooting guides, large and small wall charts are also available.

To receive a training materials catalogue, price list and order form, write to: Robert Bosch Corp., Training Materials, 2740 W. 79th St., Chicago, IL 60652, or call 1-800-937-2672.

**Volvo Trucks North America, Inc.**

Training Classes: VTNA offers advanced parts and service training classes for their dealers and customers at their five North American training centers. Advanced classes are conducted in parts systems, engine rebuilding, transmission rebuilding, electrical systems, air conditioning, vehicle electronics, and warranty administration.

For course availability and scheduling, contact nearest VTNA Dealer or write: Volvo Trucks North America, Inc., Parts and Service Education and Development, P.O. Box 26115, Greensboro, NC 27402-6115 or call 336-393-2430.

To obtain copies of the current **Registration Booklet**, complete the form below. Please print clearly as the form will become your mailing label. Clip and mail this form to:

**ASE Registration Booklets**
**101 Blue Seal Dr. S.E., Suite 101**
**Leesburg, VA 20175**

You can also get registration materials from the ASE Fax-Back System (1-888-273-8378, option 7) or at www.ase.com.

L2P

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