

# Advanced Natural Gas Vehicle Training

## **Module 3: John Deere Computerized Engine Management System**

### **Lesson 6: Fuel Injectors**

**Lecture: 20 Minutes**

**Lab: 15 Minutes**

### **Classroom Instructional Objectives:**

Upon completion of this unit of instruction the student will be able to:

- Explain how the John Deere electronic control module (ECM) driver controls the fuel injectors.
- Explain the flow characteristics of pair 1, 2, 3, and 4 fuel injectors.
- Explain fuel injector on-time.
- Explain how to use the John Deere Operation and Diagnostic Manual.
- Explain how to perform fault code diagnostic routine.
- Explain how to perform no fault code diagnostic.
- List the fault codes specific to the John Deere fuel injectors.
- Analyze John Deere wiring diagram sections specific to the fuel injectors.
- Explain how to test the fuel injectors for opens and shorts using a lab scope.
- Explain how to test the fuel injectors for opens and shorts using a multi-meter.

### **Key Classroom Objectives:**

- Explain how ECM inputs determine fuel injector on-time.
- Explain how the ECM controls the fuel injectors.
- Explain the flow rate of pair 1, 2, 3, and 4 fuel injectors.
- Explain how to use the John Deere Operation and Diagnostic Manual.
- Explain how to perform fault code diagnostic routines.
- Explain how to perform no fault code diagnostic routines.
- List the fault codes specific to John Deere fuel injector.
- Analyze John Deere wiring diagram sections specific to fuel injectors.
- Explain how to test the fuel injectors using a lab scope and scan tool.
- Explain how to test the fuel injector on-time using a lab scope.

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## **Lab Skill Objectives:**

Upon completion of this unit of instruction the student will be able to:

- Locate the fuel injector block on the engine.
- List the difference between pair 1, 2, 3, and 4 fuel injectors.
- Use the John Deere Operation and Diagnostic Manual to diagnose driveability concerns.
- Perform fault code diagnostic routines.
- Perform no fault code diagnostic routines.
- Retrieve fault codes specific to fuel injectors.
- Use John Deere diagnostic manuals to locate specifications.
- Test fuel injectors for opens or shorts using a multi-meter.
- Test the fuel injector on-time using a lab scope.
- Read and analyze John Deere wiring diagram sections specific to fuel injectors.

## **Key Lab Points:**

- Demonstrate how to test fuel injectors for open and shorts using a lab scope.
- Demonstrate how to test fuel injector on time using a lab scope.
- Explain how to use the John Deere Operation and Diagnostic Manual.
- Demonstrate how to perform fault code diagnostic routines.
- Explain how to perform no fault code diagnostic routines.
- List the fault codes specific to fuel injectors.
- Use John Deere diagnostic manuals to locate specifications.
- Explain how to read John Deere wiring diagram section/s specific to fuel injectors.

## **Classroom Materials:**

- Attendance sheet
- Power Point presentation CD
- Lap-top
- Projector
- Instructor's guide
- White board marking pens
- Projection screen

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## Handouts:

- Power Point slide materials
- Lab activity sheet 29
- Wiring diagram

## **Instructor's notes:**

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