


Light Vehicle Diesel Engines
First Edition

Light Vehicle Diesel Engines



Chapter 16
Service Procedures

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ALWAYS LEARNING

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LEARNING OBJECTIVES (1 of 2)

16.1 Prepare for the ASE Light Vehicle Diesel Engine (A9) ASE certification test content area “D” (Lubrication and Cooling Systems Diagnosis and Repair).

16.2 Perform the maintenance pre-check on a modern diesel equipped light-duty vehicle.

16.3 Discuss the need to service the intake air system.

16.4 Identify the correct oil and filter for the engine being serviced.

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LEARNING OBJECTIVES (2 of 2)

16.5 Discuss the need for servicing the cooling system.

16.6 Explain how to service the fuel system on a modern diesel engine.

16.7 Discuss how to service the diesel exhaust fluid system on an equipped vehicle.

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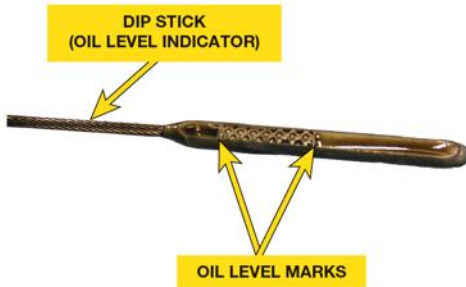
OVERVIEW (1 of 4)

- Importance of Routine Service: Page 176
- Pre-Maintenance Check Page 176

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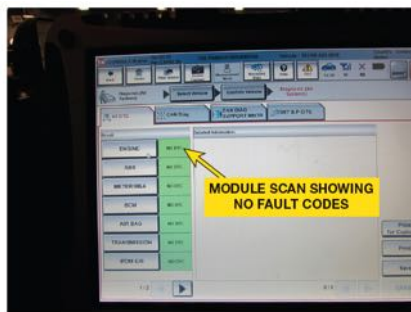
FIGURE 16-1 over-full oil dipstick is an indication that system was over-filled on a previous service or something is leaking into crankcase. It is not uncommon for fuel to get past piston rings and contaminate oil. If technician finds this condition, further diagnosis will be necessary.



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FIGURE 16-2 presence of DTC may provide insight into how the vehicle is being operated or maintained. The technician can use this data to investigate further or to make specific recommendations about needed service.



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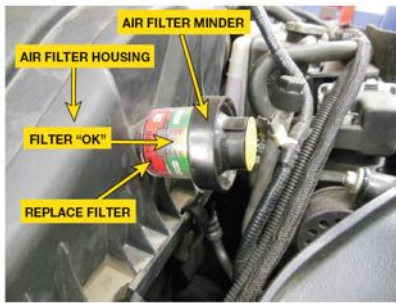
INTAKE AIR SYSTEM MAINTENANCE

- **Airflow Restriction Gauge**
 - Designed to measure a pressure
 - < Atmospheric so will sense a restriction
 - When air filter needs to be replaced

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FIGURE 16-3 air intake restriction gauge allows technician to determine condition of air filter element without opening air filter housing. This will eliminate the possibility of misdiagnosing a dirty element and missinstallation of filter element after it is inspected.



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Use Air Filter Gauge as a Guide



TECH TIP

An engine air filter operates most efficiently when it is slightly dirty. Do not change the filter unless the restriction gauge indicates it is near failure. This will increase system efficiency and reduce maintenance costs.

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ENGINE OIL SERVICE

• Need For Oil Change: Page: 178 – API & SAE Ratings

- OEM specify type, grade, and viscosity of oil
- All equipped with DPF must use oil
- API service rating of CJ-4,
 - FIGURE 16-4.
- Since 2018, a new API service rating of CK-4
- For vehicles AFTER 2018. • SEE FIGURE 16-5.
- Historically, diesel engines use SAE 15W-40
- Newer models use SAE 10W-30



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FIGURE 16-4 proper oil must be used when servicing any diesel engine. Engine oil with a rating of CJ-4 meets the service requirements for most late model light-duty diesel engines.



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FIGURE 16-5 Diesel engines manufactured for use after January 1, 2017, may require the use of diesel motor oil that has a rating of CK-4.



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COOLING SYSTEM SERVICE (1 of 2)

Importance of Servicing Cooling System

- Prior To Servicing Cooling System, Page 178
 - Determine type of coolant
 - know ABOUT cavitation erosion
 - PREMIX: coolant ready to use out of a container
 - Use only deionized water
 - tap water may contain a high mineral content
 - Use service information determine MIX
 - KNOW SERVICE INTERVAL
 - Know bleeding procedure
 - Check for TSBs
 - Check for Secondary Cooling System



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Color of the Coolant



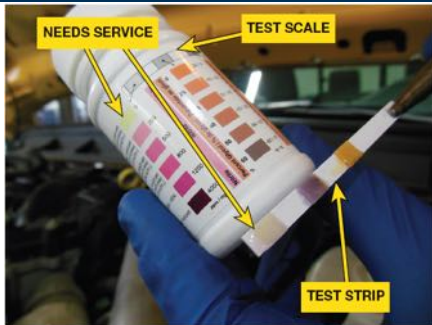
TECH TIP

Many will attempt to identify correct coolant by color. This practice is not recommended as there is not standardization of colors in coolant industry. Always check service information to determine what coolant should be used in vehicle being serviced.

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FIGURE 16-6 Cooling system test strips that are used on diesel engines need to test the level of nitrates, as well as determine the freeze point and the alkalinity of the coolant.



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COOLING SYSTEM SERVICE (2 of 2)

- Coolant Leak Check Page 179
- Freezing Point Check Page 179
- Nitrate Level Check Page 179
- PREMIX Page 179
- SERVICE INTERVAL Page 179

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FUEL SYSTEM SERVICE (1 of 2)

- Diesel Fuel Rating
 - Diesel fuel Quality critical to performance & life
 - Meets ASTM standards for either 100% diesel
 - Standards for biodiesel blends

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FUEL SYSTEM SERVICE (2 of 2)

- Diesel Filters
 - Equipped with one or two fuel filters
 - Water separator with a drain valve
 - Water-in-fuel sensor (WIF)
 - Water drain must be opened
 - Replaced at specific intervals



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FIGURE 16-7 Many manufacturers recommend that the water be drained every 30 days. When all the water is drained, only diesel fuel will be coming out of the drain.



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DIESEL EXHAUST FLUID SERVICE

- DEF critical to keeping emission compliant
 - DEF mixture of 32.5% laboratory grade ammonia
 - 67.5% deionized water
 - Fluid gets low, reminder light illuminated
 - Fail to refill system, **MIL ON, DTC SET**
 - **Reduced Power Mode/Won't Run At All Mode**

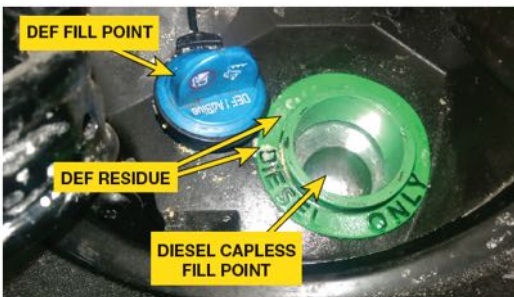
CAUTION: Do not put DEF in fuel tank. DEF will cause damage to fuel system components & may have an effect on warranty.



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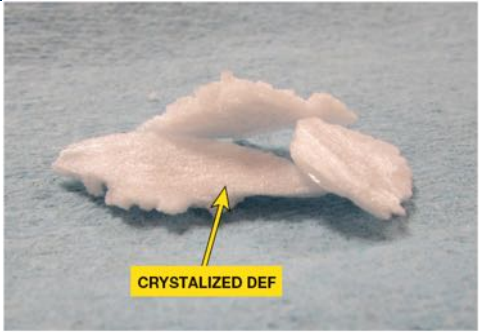
FIGURE 16-8 operator must ensure that only diesel exhaust fluid (DEF) gets into DEF system, and only diesel fuel gets into fuel tank. The presence of DEF in fuel tank or presence of diesel fuel in DEF reservoir can lead to expensive repairs.



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FIGURE 16-9 C rystalized diesel exhaust fluid (DEF) can cause harm to the vehicle and needs to be discarded.



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QUESTION 1

- Why must a “CJ-4” rated oil be used on a 2007 or newer vehicle equipped with a diesel engine?

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ANSWER 1

- All late model light-duty diesel vehicles that are equipped with diesel particulate filters (DPF) must use oil that meets American Petroleum Institute (API) service rating of CJ-4.

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Summary (1 of 2)

- Routine maintenance is the key to an engine that operates clean and efficiently.
- For every gallon of diesel fuel that is used by a diesel engine, 10,000 gallons of air flows through the air intake system.
- Most recent diesel engine intake air systems are equipped with an intake air restriction gauge.
- The length of time between oil services will depend on time, mileage, or driving habits. Idle time is one of most overlooked criteria for an oil service on current modern diesel engines.

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Summary (2 of 2)

- All late model light-duty diesel vehicles that are equipped with diesel particulate filters (DPF) must use oil that meets American Petroleum Institute (API) service rating of CJ-4.
- As a part of routine service, it is very important to check coolant for proper level, the freeze protection, acidity, and the level of nitrates.
- The water separator contains a water-in-fuel sensor (WIF) that is used to illuminate an indicator on instrument panel when service is needed.
- The maintenance of the diesel exhaust fluid (DEF) system is critical to keeping many modern diesel vehicles within emissions compliance. DEF is a mixture of 32.5% laboratory grade ammonia and 67.5% deionized water.

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