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## Introduction

### **ABOUT THIS SUPPLEMENT**

This booklet supplements your Owner Guide and is part of the owner's portfolio. It describes the operation of your natural gas vehicle (NGV) and how it differs from a standard gasoline powered vehicle. Therefore it is very important that you read this guide and thoroughly familiarize yourself and others operating the vehicle with this information.

Some of the information in this supplement replaces certain instructions in the Owner Guide. Please read this supplement carefully and completely. Refer to the Owner Guide for complete vehicle information.

### **WARNINGS**

Warnings remind you to be especially careful in those areas of the vehicle where carelessness can cause damage to your vehicle or possible personal injury to yourself, your passengers or others. Please read all warnings carefully.

### **ABOUT THE WARRANTIES**

The normal vehicle warranties will apply to your NGV. For further information, refer to your Warranty Information Booklet.

Specified maintenance procedures must be followed. Repairs must be made by trained personnel.

It is important that your NGV be properly maintained by qualified Ford trained gaseous fuel service technicians. If a problem occurs, it is important that properly trained personnel diagnose and repair the cause. If the problem relates to the fuel system, proper part replacement is imperative to keep your vehicle operating correctly. NGV fuel system components and standard gasoline fuel system components are not interchangeable. If your NGV is not maintained in accordance with approved service procedures, damage may occur and your warranty may be invalidated.

Any modification to the fuel system of your NGV voids the Ford New Vehicle Limited Warranty.

## Introduction

### COMPRESSED NATURAL GAS (CNG) FUEL SYSTEM

Your vehicle is equipped with a dedicated compressed natural gas (CNG) fuel system that is under high pressure.

Depending upon the application, the CNG fuel system is rated at a pressure of 20,700 kPa (3,000 psi) at 21°C (70°F) or 24,800 kPa (3,600 psi) at 21°C (70°F). Refer to the label on the fuel filler door to determine the fuel system pressure rating.

Use caution when servicing or maintaining any of the components of the CNG fuel system.



Service to high-pressure fuel system components must be conducted only at qualified dealerships by qualified technicians. Failure to do so may cause damage to components or cause bodily harm.

**On F-Series natural gas vehicles,** do not modify or replace the bed with any non-OEM components. Should the bed need to be removed for service or replacement, it should be done by a qualified dealership using qualified technicians. Do not sit, stand or place heavy loads on in-bed tank cover. Any bed cap added to this vehicle must be well ventilated. Failure to provide adequate ventilation could result in gas vapor build up over time potentially resulting in a combustible mixture.

## Instrumentation

### FUEL GAUGE

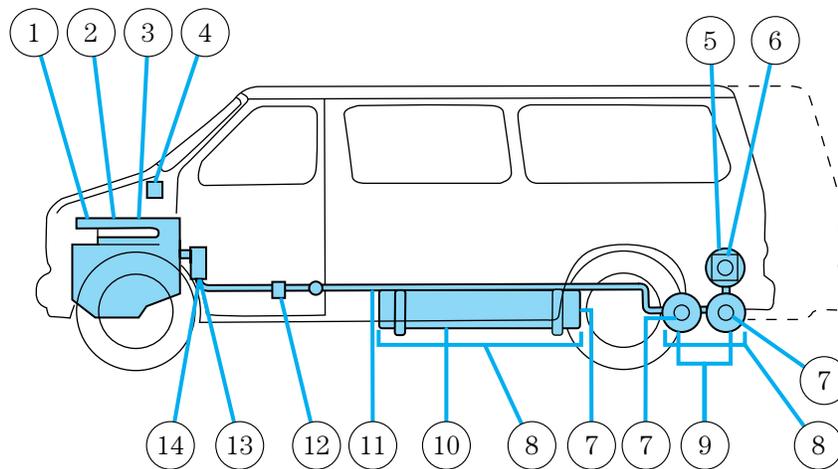
The fuel gauge in your NGV behaves similarly to a typical gasoline fuel gauge. However, the gauge operation is based on the pressure and temperature of the natural gas, not on the level of liquid gasoline. Depending upon application, a fuel gauge reading of Full will occur at a pressure of approximately 20,700 kPa (3,000 psi) or 24,800 kPa (3,600 psi), at a temperature of approximately 21°C (70°F). The NGV fuel gauge will provide a linear reading from this point down to Empty. Refer to the *Fueling* section of this supplement for more information on fuel gauge performance during the fast-fill method of fueling.

## Servicing your vehicle

### CNG FUEL SYSTEM COMPONENT IDENTIFICATION

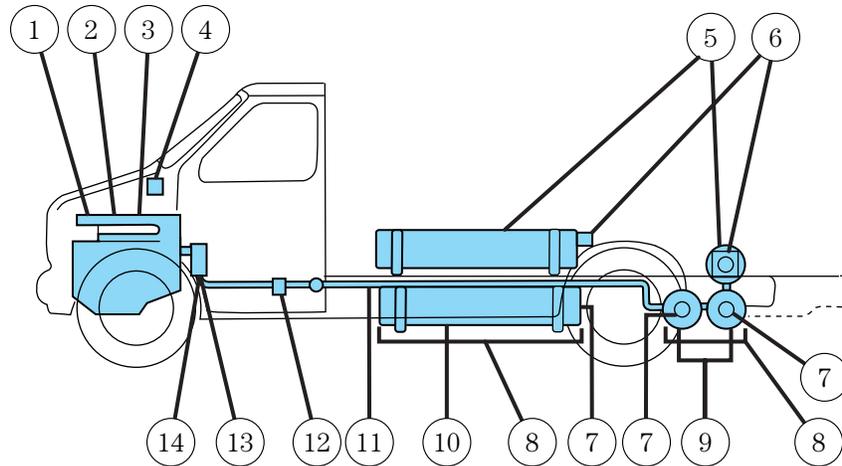
The following illustrations depict the major unique components of the CNG fuel system. All of these unique components are constructed of special materials that withstand the effects of CNG. **NEVER** replace a unique CNG fuel system component with a standard gasoline fuel system component or any aftermarket component.

#### E-Series Van



## Servicing your vehicle

### *E-450 Cutaway*

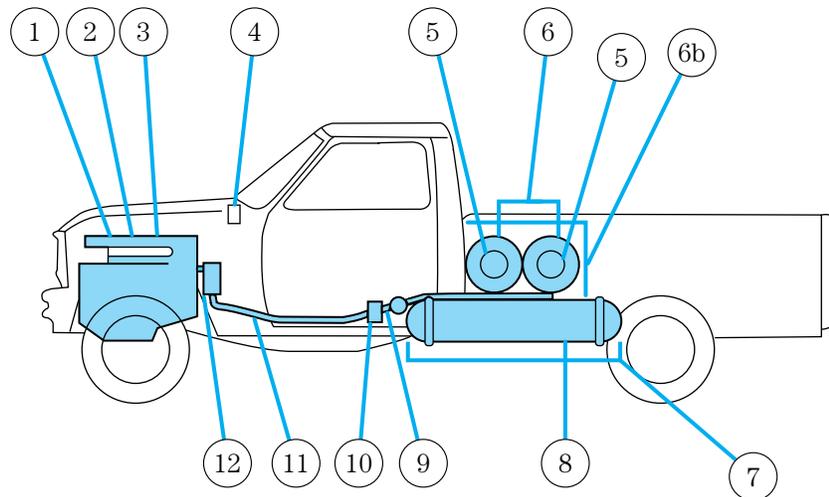


- 1. Fuel rail sensors**-An injection pressure sensor and an engine fuel temperature sensor provide engine fuel information to the powertrain control module.
- 2. Isolation solenoid valve**-Blocks fuel flow from supply line to injection manifold when the engine is off.
- 3. Engine**-A modified 5.4L gasoline engine with Sequential Electronic Fuel Injection (SEFI), an improved valvetrain and a high compression ratio.
- 4. Powertrain control module**-Uniquely calibrated for NGV application.
- 5. Extended range fuel tank**-An optional steel fuel tank located in the cargo area.
- 6. Sealed vent box**-Dispenses natural gas vapor to atmosphere if vapor becomes present.
- 7. Internal tank valve**-One electronically actuated, normally closed solenoid valve is located in each fuel tank. The valve is wired into the vehicle's inertia switch. If the engine cranks but does not start after a collision, the fuel solenoid valve inertia switch may have been activated. The inertia switch is a device intended to close the fuel solenoid valve when your vehicle has been involved in a substantial jolt.
- 8. Stone shield(s)**-Protective shield(s) to prevent damage to the fuel tank(s) caused by road debris or other road hazards.

## Servicing your vehicle

9. **Aft axle fuel tanks**-Two steel fuel tanks located behind the rear axle.
10. **Midship fuel tank**-A steel fuel tank located underbody.
11. **High pressure fuel lines**-Delivers high pressure fuel to the fuel tanks and fuel pressure regulator.
12. **Fuel pressure regulator/Coalescent fuel filter**-Reduces fuel pressure to 95 psi and removes impurities from the gas.
13. **Low pressure fuel line**-Supplies 95 psi of natural gas to the injectors.
14. **NGV module**-Contains the unique powertrain electronics that are required for an NGV.

### F-Series Pick-up



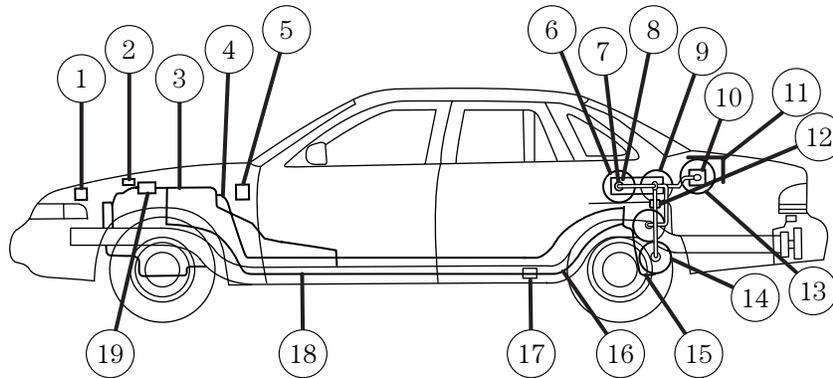
1. **Fuel rail sensors**-An injection pressure sensor and an engine fuel temperature sensor provide engine fuel information to the powertrain control module.
2. **Isolation solenoid valve**-Blocks flow from supply line to injection manifold when the engine is off.
3. **Engine**-A modified 5.4L gasoline engine with Sequential Electronic Fuel Injection (SEFI), an improved valvetrain and a high compression ratio.

## Servicing your vehicle

4. **Powertrain control module**-Uniquely calibrated for NGV application.
5. **Internal tank valve**-One electronically actuated, normally closed solenoid valve is located in each fuel tank. The valve is wired into the vehicle's inertia switch. If the engine cranks but does not start after a collision, the fuel solenoid valve inertia switch may have been activated. The inertia switch is a device intended to close the fuel solenoid valve when your vehicle has been involved in a substantial jolt.
6. **Standard fuel tanks**-Two steel fuel tanks located in the bed of the truck.
  - 6b. **In-bed tank cover**-Cover to prevent damage to the fuel tanks. Protective shield to prevent damage to the fuel tank caused by road debris or other road hazards. **Do not sit, stand or place heavy loads on the fuel tank cover.**
7. **Stone shield**-Protective shield to prevent damage to the fuel tank caused by road debris or other road hazards.
8. **Underbody fuel tank**-A steel fuel tank located underbody.
9. **High pressure fuel lines**-Delivers high pressure fuel to the fuel tanks and fuel pressure regulator.
10. **Fuel pressure regulator/Coalescent fuel filter**-Reduces fuel pressure to 95 psi and removes impurities from the gas.
11. **Low pressure fuel line**-Supplies 95 psi of natural gas to the injectors.
12. **NGV module**-Contains the unique powertrain electronics that are required for an NGV.

## Servicing your vehicle

### Crown Victoria



1. **NGV module**-Provides power for the fuel injectors. Also, drives the fuel gauge using fuel tank pressure and temperature sensors.
2. **Isolation solenoid valve**-Blocks flow from the injection manifold when the engine is off.
3. **Engine**-Is a modified 4.6L engine with Sequential Electronic Fuel Injection (SEFI) and increased compression ratio.
4. **Engine coolant lines**-Provide required heat to high pressure regulator.
5. **Powertrain control module**-Required for NGV application.
6. **Sealed vent box**-Vented to underbody. Dispenses natural gas vapor to atmosphere if vapor becomes present.
7. **Tank pressure sensor**-Fuel tank pressure sensor located in this tank's solenoid valve is used for fuel indication.
8. **Solenoid tank valves**-One solenoid per tank. Internal valves with shut-off solenoids wired into inertia circuit for crash protection.
9. **Two fuel tanks**-Located in the trunk. On taxi or police vehicles, an extended range fuel system is available which includes two additional NGV fuel tanks mounted in the trunk (total of three).
10. **Fueling point**-Fueling receptacle is conveniently located with the fuel door. Same location as gasoline fueled vehicles.
11. **Tank shield**- Protective shield able to prevent damage to the fuel tanks caused by trunk cargo.

## Servicing your vehicle

12. **Tank temperature sensors**-One each in set of tanks (solenoid valves) used for fuel indication.
13. **Optional fuel tank**- A fiber-wrapped steel fuel tank (total of three tanks in the trunk). Also has a sealed vent box which vents to the underbody. Dispenses natural gas vapor to the atmosphere if vapor is present.
14. **Two fuel tanks**-Located underbody to facilitate fuel system design.
15. **Stone and heat shield**-Protective shield able to prevent damage to the fuel tanks caused by road debris or other road hazards.
16. **High pressure fuel lines**-Delivers high pressure fuel to the pressure regulator.
17. **Pressure regulator and coalescent fuel filter assembly**-Reduces the fuel pressure to the fuel injection pressure of 125 psi.
18. **Low pressure fuel lines**-Supplies 125 psi of natural gas to the engine.
19. **Fuel rail sensors**-One injection pressure sensor and one engine fuel temperature sensor provide engine fuel information to the PCM.

### ADAPTERS

**DO NOT** use fuel receptacle adapters when refueling your vehicle.

The profiles of both the natural gas vehicle receptacle and the fuel station nozzles are specified by ANSI/AGA NGV1-1994, CGA NGV1-M94. These profiles are specified for compressed natural gas vehicles and fuel stations for safety purposes. Three separate adapter profiles are available. P24, P30 and P36 respectively, are specified for the three different service pressures of 16,500 kPa (2,400 psi), 20,700 kPa (3,000 psi) and 24,800 kPa (3,600 psi).

Your vehicle's service pressure may be 20,700 kPa (3,000 psi) or 24,800 kPa (3,600 psi), depending upon application. Refer to the label on the fuel filler door:

- If your vehicle's fuel system is rated at 20,700 kPa (3,000 psi), it can be refueled using a P30 or P24 nozzle. However, use of a P24 nozzle will result in an incomplete fill.
- If your vehicle's fuel system is rated at 24,800 kPa (3,600 psi), it is refueled using a P36 nozzle only.



**DO NOT** over pressurize the CNG fuel system or damage to the fuel system and possible personal injury may occur.

## Servicing your vehicle

### NATURAL GAS DISPENSING

Most dispensers have a digital indicator displaying the cost and amount of fuel delivered to your vehicle. Fuel delivery to the vehicle is stopped when the pressure of fuel stored on the vehicle equalizes with the temperature compensated pressure of fuel stored at the station. As the pressure between the station and vehicle equalizes, the cost and quantity meters slow to a near stop. When this occurs, refueling is complete.

Certain noises can be expected during the refueling process and may vary depending on the type of fuel station and your proximity to the fuel compression and storage equipment. At the beginning of refueling you might hear the rushing noise of gas entering the vehicle through the station hose and tubing. At the end of refueling, the fuel receptacle on the vehicle may make a high pitch noise or chatter. This is another indication that refueling is nearly complete. Also, the station compression equipment may turn on at any time during the refueling process.

### FUEL QUALITY

Use only a CNG fuel that meets the specification of NFPA-52 and SAE J1616 in your NGV. Specifications NFPA-52 and SAE J1616 place limits on particulate contamination and moisture content to ensure a quality CNG fuel.

The use of a CNG fuel that does not meet specifications NFPA-52 and SAE J1616 is **not recommended** and may cause engine damage.

Use of poor quality CNG fuel may result in:

- component failure.
- leakage from the fueling point.
- poor vehicle operation.

Use of poor quality fuel may also result in your warranty being invalidated.

### SERVICING YOUR NATURAL GAS VEHICLE



Service to the CNG fuel system should be conducted at a qualified dealership by a trained NGV technician only. Failure to do so may cause damage to components or cause bodily harm.

## Servicing your vehicle

### FUELING

Do not fuel your vehicle with the ignition on the ON position. Failure to do so may cause component damage.

Fueling a NGV, with a few exceptions, is very similar to fueling a gasoline vehicle. The same care and cautions used when fueling a gasoline vehicle should be exercised when fueling a NGV. In particular, for safety reasons, an engine **must** always be turned off when refueling is occurring. Always use the recommended fill nozzle to refuel your vehicle.

Two methods for filling the fuel tanks are available to NGV owners. The fast-fill method, described below, is available at many of the commercial and privately owned filling stations. The slow-fill method, also described below, is available for purchase or lease from a number of commercial or natural gas utility companies.

#### Fast fill procedure

“Fast-filling” a NGV involves rapidly (typical fill time: 3–5 minutes) raising the pressure in the vehicle’s tanks by “fast-fill” refueling station. “Fast-filling” a vehicle provides the greatest convenience to the driver in terms of time spent refueling. However, present “fast-fill” refueling technology does not presently allow a NGV to be completely refueled to its maximum rated capacity. Therefore, “fast-filling” results in a reduced driving range and an initial fuel gauge reading of Full. However, within approximately 10 minutes, the fuel gauge of a NGV that has been “fast-filled” will drop about 1/8th of a tank lower to reflect the reduced amount of fuel that was actually added.

#### Slow fill procedure

“Slow-filling” a NGV involves slowly raising the pressure in the vehicle’s fuel tank(s) by a slow fill station (typical fill rate: 6-8 hours). “Slow-filling” usually is done overnight and allows the greatest amount of fuel to be added to a NGV. A properly functioning “slow-fill” refueling station will fill the NGV’s fuel tank(s) to a fuel gauge reading of “full” at a temperature of 21°C (70°F).

The fueling point, or fuel receptacle is located near the driver’s side.

When refueling, the engine **must** be shut off.



Use caution when fueling your vehicle. Make sure the engine is turned off and all flammable material is extinguished. Observe all Dispensing Equipment Safety Standards and Operating Procedures.

## Servicing your vehicle

The procedure is the same for both fast-fill and slow-fill fueling.

1. Open fuel door and determine the pressure rating of your vehicle's fuel system.
2. Remove protective cap from the vehicle's fuel receptacle. Remove any debris that may be present.
3. Follow the natural gas fueling procedures provided by the natural gas dealer and dispense the CNG until the fuel tanks are full or until the flow stops.
4. When refueling is complete, follow the natural gas dispensing equipment's operating procedures to shut the natural gas flow off.
5. Remove the dispensing connector and put protective cap on the vehicle's fuel receptacle. Close the fuel door.

### ***Refill capacities — BTU equivalent to gasoline***

<b>E-Series (3 000 psi)</b>			
<b>Fueling method</b>	<b>Standard tank</b>	<b>With extended range tank</b>	
Slow-fill	60.9L (16.1 gallons)	92.7L (24.5 gallons)	
Fast-fill	51.8L (13.7 gallons)	78.7L (20.8 gallons)	

<b>E-Series (3 600 psi)</b>			
<b>Fueling method</b>	<b>Standard tank</b>	<b>With extended range tank</b>	
Slow-fill	70.0L (18.5 gallons)	106.0L (28.0 gallons)	
Fast-fill	59.4L (15.7 gallons)	90.1L (23.8 gallons)	

<b>E-Series Cutaway 158" Wheelbase (3 000 psi)</b>			
<b>Fueling method</b>	<b>Standard tanks</b>	<b>With Extended Range - One In-body Tank</b>	<b>With Extended Range - Two In-body Tanks</b>
Slow-fill	55.3L (14.6 gallons)	84.0L (22.2 gallons)	112.4L (29.7 gallons)
Fast-fill	46.9L (12.4 gallons)	71.2L (18.8 gallons)	95.8L (25.3 gallons)

## Servicing your vehicle

<b>E-Series Cutaway 158" Wheelbase (3 600 psi)</b>			
<b>Fueling method</b>	<b>Standard tanks</b>	<b>With Extended Range - One In-body Tank</b>	<b>With Extended Range - Two In-body Tanks</b>
Slow-fill	63.2L (16.7 gallons)	96.1L (25.4 gallons)	128.7 (34.0 gallons)
Fast-fill	53.8L (14.2 gallons)	81.8L (21.6 gallons)	109.4L (28.9 gallons)

<b>E-Series Cutaway 176" Wheelbase (3 000 psi)</b>			
<b>Fueling method</b>	<b>Standard tanks</b>	<b>With Extended Range - One In-body Tank</b>	<b>With Extended Range - Two In-body Tanks</b>
Slow-fill	60.9L (16.1 gallons)	89.7L (23.7 gallons)	118.1L (31.2 gallons)
Fast-fill	51.8L (13.7 gallons)	76.1L (20.1 gallons)	100.7L (26.6 gallons)

<b>E-Series Cutaway 176" Wheelbase (3 600 psi)</b>			
<b>Fueling method</b>	<b>Standard tanks</b>	<b>With Extended Range - One In-body Tank</b>	<b>With Extended Range - Two In-body Tanks</b>
Slow-fill	70.0L (18.5 gallons)	102.6L (27.1 gallons)	135.5 (35.8 gallons)
Fast-fill	59.4L (15.7 gallons)	87.1L (23.0 gallons)	115.1L (30.4 gallons)

<b>F-Series (3 000 psi)</b>	
<b>Fueling method</b>	<b>Standard tanks</b>
Slow-fill	71.9L (19.0 gallons)
Fast-fill	60.9L (16.1 gallons)

## Servicing your vehicle

<b>F-Series (3 600 psi)</b>		
<b>Fueling method</b>	<b>Standard tanks</b>	
Slow-fill	82.1L (21.7 gallons)	
Fast-fill	70.0L (18.5 gallons)	

<b>Crown Victoria (3 600 psi)</b>		
<b>Fueling method</b>	<b>Standard tanks</b>	<b>With extended range system <sup>1</sup></b>
Slow-fill	48.5L (12.8 gallons)	61.3L (16.2 gallons)
Fast-fill	41.6L (11.0 gallons)	52.6L (13.9 gallons)

<sup>1</sup>Police and Taxi vehicles.

### **Extended range fuel system**

Crown Victoria Police and Taxi vehicles with the extended range fuel system have a 5-passenger seating configuration with one additional CNG fuel tank mounted in the luggage compartment.

E-Series vehicles with the extended range fuel system have one additional CNG fuel tank mounted in the cargo area behind the rear seat.

### **TRAILER TOWING**

On F-Series models, your NGV has the capability for towing up to 2,267 kg (5,000 lbs.) using the factory installed step-bumper. It is recommended that the vehicle **NOT** be modified for towing (i.e.-any frame-mounted hitches).

Crown Victoria and E-Series Van/Wagon and Cutaway models are not equipped with a trailer towing option. It is recommended that the vehicle **NOT** be modified for towing.

### **TOWING YOUR CNG VEHICLE**

Refer to your Owner's Guide for towing procedure except E-Series vehicles with the optional tank package which **MUST** be flat-bed towed.

### **NGV REFUELING STATIONS**

To obtain a directory of all the refueling stations in the United States, contact the American Gas Association (AGA) at (703) 841-8400. In Canada, contact Union Gas at 1-800-265-5277.

### **SERVICING YOUR VEHICLE**

The following is a brief description of unique maintenance items for your NGV. For a complete list of maintenance items and intervals, refer to your *Service Guide*.

## **Servicing your vehicle**

### **Tank inspection and replacement**

For your protection, the CNG fuel tanks require visual inspection every three years or 58,000 kilometers (36,000 miles) whichever comes first. The purpose of the inspection is to check for exterior damage to the tank which would shorten its usable life span. This inspection should only be done by qualified NGV Ford service technicians.

The expiration date for the tank replacement is stated on each tank label. See instructions on fuel container for inspection and service life.

### **Coalescent fuel filter assembly**

Your vehicle is equipped with a coalescent fuel filter assembly. Its primary function is to remove contaminants; oil and water carryover moisture from the fuel and trap it in the filter bowl.

The coalescent filter bowl should be drained every 48,000 kilometers (30,000 miles). Perform fuel system depressurization procedure (outlined in Service Manual) before disassembling the filter to avoid fuel pressure regulator damage. The filter element (FG-985 on E-Series and F-Series models; FG-976 on Crown Victoria models) and housing O-ring seal should also be replaced every 48,000 km (30,000 miles).

### **Inspect and clean fuel fill valve filter**



On Crown Victoria and F-Series models, the fuel fill valve filter is located in the high-pressure fuel line. Inspection and cleaning should only be done by a qualified technician.

The fuel fill valve filter should be inspected and cleaned annually. Fuel fill valve filter replacement is only required when damage to the filter is visible.

### **Spark plugs**

Replace spark plugs every 96,000 kilometers (60,000 miles) on E-Series and F-series models and every 60,000 km (36,000 miles) on Crown Victoria models. Use recommended nickel-plated platinum spark plugs with the Motorcraft part number AWSF-22FM1 (or equivalent) on E-Series and F-series models and spark plugs with the Motorcraft part number AWSF-22FM (or equivalent) on Crown Victoria models.