FUEL PRESSURE KIT USER'S GUIDE



The Fuel Pressure Kit is designed to help diagnose driveability problems due to abnormally high or low fuel pressure.

Safety Precautions

WARNING: The following safety precautions must be carefully observed to reduce the risk of fire and personal injury.

- Read, understand, and follow safety precautions and instructions. If the operator cannot read these instructions, operating instructions and safety precautions must be read and discussed in the operator's native language.
- Operator of the 4480 Fuel Pressure Kit and bystanders must wear face shields.
- OTC 4480 is designed for use on gasoline engines ONLY. Do not use this tool for diesel applications.
- Observe normal precautions for working with flammable liquids: no smoking, open flames, electrical sparks, etc.
- Use the 4480 in well ventilated areas.
- Pressurized liquid and accumulated fumes can ignite. Keep a Class B fire extinguisher nearby when working on fuel injection systems.

- Do not modify any components of the 4480.
- Do not replace any components of the 4480 except those specified by OTC.
- Use the vehicle manufacturer's recommended procedures to service injectors. Never exceed the vehicle manufacturer's recommended pressures.
 - ☐ Release fuel system pressure before servicing fuel system components.
 - Wrap a shop towel around pressure tap fittings when connecting or disconnecting adapters to / from the vehicle and when disassembling the canister after use.
 - ☐ Tighten all connections; fuel leakage could cause a fire.
 - ☐ Do not exceed 100 psi maximum hose pressure.
 - ☐ Keep hose away from moving engine parts, hot engine components, and battery terminals.
 - ☐ Inspect the hose for damage before using the 4480. Check the inside of the hose to confirm there is no blockage. Replace the hose if needed.
 - Replace injector o-rings whenever injectors are removed.

Fuel Pressure Tester Description

1 Rubber Boot: Used to protect gauge and maintain appearance.

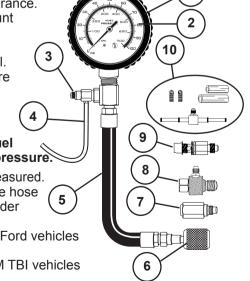
2 Dial Face: Contains measurement scales that show amount of fuel pressure present in fuel system.

3 Pressure Relief Button: Used to relieve fuel pressure in gauge hose before disconnecting gauge hose from fuel rail.

4 Bleed-Off Hose: A 6-foot hose that bleeds off fuel pressure when pressure relief button is pressed. Never use a bleed-off hose shorter than 6 foot.

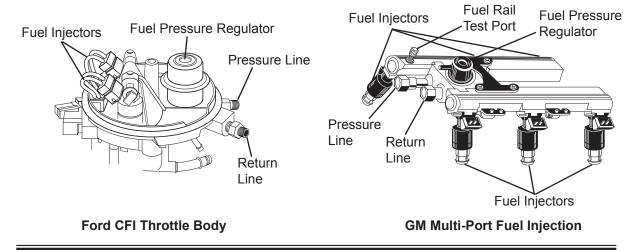
Warning: To prevent personal injury, the end of the bleed-off hose must be in an approved container for fuel at all times during testing and when bleeding off fuel pressure.

- **5 Gauge Hose:** Carries fuel to gauge, so pressure can be measured.
- **6 GM / Chrysler Test Port Adapter:** Used to connect gauge hose to GM, Chrysler, and other vehicles equipped with a Schrader valve test port on fuel rail.
- **7 Ford Test Port Adapter:** Used to connect gauge hose to Ford vehicles equipped with a Schrader valve test port on fuel rail.
- 8 GM TBI Test Adapter: Used to connect gauge hose to GM TBI vehicles NOT equipped with a Schrader valve test port.
- **9 Banjo Bolt Adapters:** Used to connect gauge hose to Asian, European, and select domestic vehicles equipped with fuel banjo bolt connections.
- **10 Dual Manifold Test Adapter:** Used to connect gauge hose to vehicles with rubber hose connections on the fuel rail, fuel line, or fuel filter.



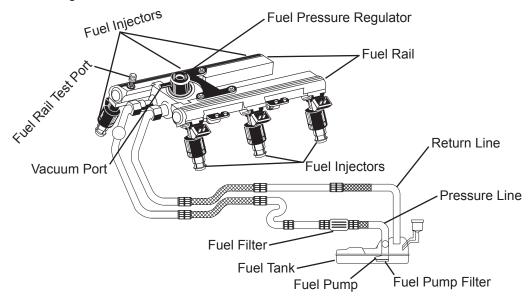
Fuel Injection System Theory

There are two basic types of fuel injection systems currently being used. The first type is called "port" or "multi-port" fuel injection. In this system, fuel injectors spray fuel directly into intake manifold behind intake valve. These systems typically have one fuel injector per cylinder. The second type is commonly called Throttle Body Injection (TBI) for GM and Chrysler vehicles or Central Fuel Injection (CFI) for Ford vehicles. These systems use one or two fuel injectors mounted on top of intake manifold. They spray fuel into throttle body similarly to a conventional carburetor.



Fuel System Components

Before doing any fuel pressure testing, it is a good idea to understand how fuel system components work and how they relate to one another. The fuel pump pumps fuel from the fuel tank to the fuel pressure regulator and fuel injectors. The fuel pressure regulator divides fuel between the pressure line and return line. The fuel in the pressure line goes to fuel injectors, while fuel is returned to fuel tank through the return line.



Fuel Tank: A large container that holds the vehicle's supply of fuel.

Fuel Pump Filter: A filter that is usually located in fuel tank. Its function is to prevent foreign particles from reaching the fuel pump. A clogged or restricted fuel pump filter can cause low fuel pressure readings. When replacing a fuel pump, it is a good idea to replace the fuel pump filter.

Fuel Pump: An electric motor that pumps fuel into the fuel system at a constant pressure. It is mounted in the fuel tank or on the frame. Some vehicles have more than one fuel pump.

Return Line: Pathway for excess fuel to return to the fuel tank.

Pressure Line: A pressurized fuel line that carries fuel from the fuel tank to the fuel injectors.

Fuel Filter: A filter that is located in-line with the pressure line. Its function is to prevent foreign particles from reaching the fuel injectors. A clogged or restricted fuel filter can also cause low fuel pressure readings. This is the only fuel system component that requires periodic replacement. Refer to vehicle owners manual for replacement interval.

Fuel Rail Test Port: A Schrader valve located on the fuel rail that allows easy connection of a fuel pressure gauge to measure fuel pressure. Do not confuse this valve with the Schrader valves that are used for recharging air conditioning systems.

Fuel Pressure Regulator: The fuel pressure regulator is connected across the pressure line and return line. It contains a spring-loaded valve assembly that opens to allow fuel to move into the return line when the pressure line fuel pressure

is exceeded. It is used to keep a constant fuel pressure drop across the fuel injectors. Some fuel pressure regulators have a vacuum port so fuel pressure can be adjusted based on engine load. These are commonly called vacuum actuated (compensated) fuel pressure regulators. A leaking fuel pressure regulator can cause low fuel pressure readings and hard starting problems.

Fuel Rail: The fuel rail assembly is bolted to the intake manifold. Its purpose is to hold the fuel injectors in place and to deliver pressurized fuel to the fuel injectors.

Fuel Injectors: A precision valve that is controlled by a solenoid. Fuel injection is controlled by the amount of fuel pressure, and the size and duration of the valve opening. Fuel injectors contain a filter used to prevent very small particles from clogging the valve. Leaking fuel injectors will cause fuel pressure to slowly decrease when the ignition key is on and engine is off.

Pre-Testing Checks

- 1. Read Safety Precautions.
- 2. Do a thorough visual and hands-on inspection of the engine and fuel system. Look for loose or cracked electrical wiring, battery cables, ignition wires, and fuel or vacuum lines.
- 3. Verify the battery is fully charged and fuel tank has an adequate supply of fuel.
- **4.** Verify the inertia switch on certain Ford/Lincoln/ Mercury vehicles has not been tripped. (The inertia switch is usually located in the trunk.)
- 5. Verify all fuel system fuses are good.

- 6. Verify fuel vapor recovery system and gas cap are in good condition.
- 7. Verify manifold vacuum is within manufacturers specification, which is typically 18-20 inches at idle.
- 8. Look for fuel leaks and wipe up any spilled fuel immediately.
- 9. If engine will not start, check ignition system for spark. If no ignition spark is present, refer to vehicle service manual for No Start Diagnostics.
- 10. Inspect wire harnesses and electrical connectors for damaged or corroded parts.
- 11. Check other electrical systems, including ignition and car computer system.

Fuel Pressure Testing Procedures

This test procedure explains how to make fuel pressure measurements on vehicles while ignition key is on and while engine is at idle. The procedure also explains the safest way to connect and disconnect fuel pressure tester kit from vehicles. If fuel pressure readings measured in this test procedure are not within the vehicle manufacturer's specification, use the vehicle service manual along with fuel pressure tester kit to service problem. This test procedure does not contain any vehicle specific diagnostics.

- 1. Read all SAFETY PRECAUTIONS and PRE-TESTING CHECKS.
- 2. Apply a lightweight household oil to rubber o-rings on test adapters.

HOSE MUST BE

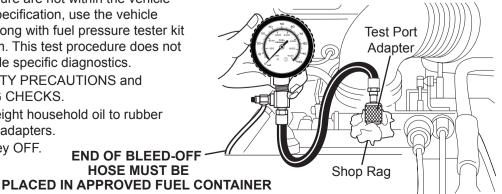
3. Turn ignition key OFF.

4. Install gauge.

For GM/Chrysler vehicles with test port... Remove test cap.

- Thread GM/Chrysler test port adapter to fuel rail test port until finger tight.

Note: Wrap a shop rag around fuel rail test port when attaching test port adapters. This is a precaution in case a small amount of fuel leaks out while attaching adapters.



For Ford/Lincoln/Mercury vehicles with test port...

- · Remove test cap.
- Thread Ford test port adapter to fuel rail test port until finger tight.
- Thread GM/Chrysler test port adapter to Ford test port adapter until finger tight.

For GM TBI vehicles without a test port ...

 Disable fuel pump(s) and relieve fuel system pressure by following instructions in vehicle service manual.

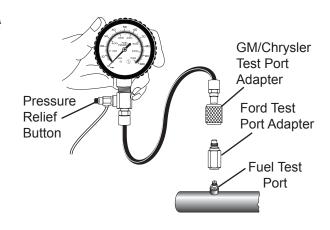
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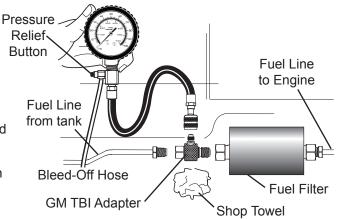
Some vehicles may have more than one fuel pump. Failure to deactivate all fuel pumps can result in spilled fuel, fire, or other hazardous conditions that could cause vehicle damage, personal injury, or death.

- Disconnect the fuel line at location described in vehicle service manual while using shop towels to catch any released fuel.
- Attach GM TBI test adapter, and then attach fuel line to adapter. Tighten all fittings finger tight, and then tighten gently 1/2 turn with wrenches.
- Attach hose and pressure gauge assembly to adapter top fitting, and tighten fitting until finger tight.

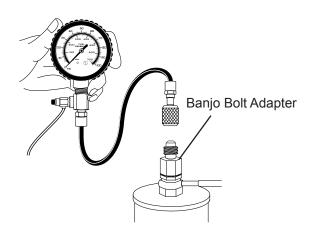
For import and some domestic vehicles with a banjo bolt connection...

- Relieve fuel system pressure by following instructions in vehicle service manual.
- Remove the vehicle's fuel bolt at location described in service manual. Use shop towels to catch any released fuel.
- Install banjo bolt test adapter in place of fuel bolt. Position banjo bolt gaskets on either side of banjo. Banjo with fuel supply line attached should be sandwiched between banjo bolt gaskets.
- Tighten banjo bolt test adapter finger tight, then gently snug with wrench.
- Connect hose and pressure gauge assembly to banjo bolt test adapter fitting. Tighten gauge hose fitting finger tight.



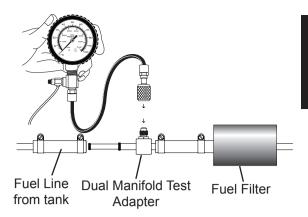


END OF BLEED-OFF HOSE MUST BE PLACED IN AN APPROVED FUEL CONTAINER



For import and domestic vehicles with rubber hose connections...

- Relieve fuel system pressure by following instructions in vehicle service manual.
- Disconnect the vehicle's rubber fuel line hose at location described in service manual. Use shop towels to catch any released fuel. Leave rubber hose attached to fuel line.
- Install matching sized adapter hose and hose clamps on dual manifold test adapter.
- Connect test adapter hose at location where vehicle's fuel line was disconnected.
- Connect vehicle's fuel line to other side of dual manifold adapter. Use vehicle's hose clamps on rubber hose.
- Tighten all hose clamps securely.
- Connect hose and pressure gauge assembly to dual manifold test fitting. Tighten gauge hose fitting finger tight.
- **5.** Place end of 6-foot bleed-off hose in an approved container for fuel. Bleed-off hose must remain in container until testing is complete.
- **6.** Turn all accessories OFF (radio, A/C, blower fan, headlights, windshield wipers...).
- **7.** Re-activate fuel pump and turn ignition key ON. Do the following checks:
 - Listen for fuel pump. Pump should run for approximately 2 seconds.
 - Pressurize fuel system by cycling ignition ON and OFF every ten seconds until fuel pressure is at manufacturers specifications. (Check vehicle service manual for your particular application.)
 - Check fuel system for leaks. If leaks are found, turn ignition key OFF and wipe up fuel immediately!
 - Read fuel pressure from dial face. Pressure should rise to manufacturer's specification and hold steady.
 - If fuel pressure is not within manufacturer's specification, cycle ignition key 2 or 3 more times.
 If fuel pressure is still not within manufacturer's specifications, service vehicle according to vehicle service manual, then re-test.
 - When key-on-engine-off fuel pressure is within manufacturers specification, proceed to Step 8.
 - To safely disconnect Fuel Pressure Test Kit, proceed to Step 9.
- 8. Start engine Let idle.
 - If vehicle's fuel system uses a vacuumactuated (compensated) fuel pressure regulator, fuel pressure should drop about 3-10 psi, depending on manifold vacuum.
 - If vehicle's fuel system uses a fuel pressure regulator without a vacuum port, fuel pressure should remain constant during both key-onengine-off and idle.



- Read fuel pressure from dial face.
- If fuel pressure is not within manufacturer's specification, service vehicle according to vehicle service manual.
- When repair is completed and idle fuel pressure is now within manufacturer's specification, proceed to Step 9.
- 9. Turn ignition key OFF.
- **10.**Verify 6-ft. bleed-off hose is still in an approved container for fuel.
- **11.**Fully DEPRESS and HOLD pressure relief button until dial face pointer is resting on stop pin.
- **12.**Shake bleed-off hose to make sure all fuel went into approved container.
- 13. Remove gauge hose.

For GM/Chrysler Vehicles with test port...

- Wrap a shop rag around fuel rail test port in case a small amount of fuel drips out while unscrewing test port adapters.
- Unscrew GM/Chrysler test port adapter from fuel rail test port and reinstall test cap.
- Wrap a shop rag around GM/Chrysler test port adapter so any fuel dripping from gauge hose is absorbed.
- Remove bleed-off hose from approved fuel container, and hold gauge hose over container so remaining fuel will drip into container.

For Ford/Lincoln/Mercury vehicles with test port...

- Wrap a shop rag around fuel rail test port in case a small amount of fuel drips out while unscrewing test port adapters.
- Unscrew GM/Chrysler test port adapter from Ford test port adapter.
- Wrap a shop rag around GM/Chrysler test port adapter so any fuel dripping from gauge hose is absorbed.
- Remove bleed-off hose from approved fuel container, and hold gauge hose over container so any remaining fuel will drip into container.
- Unscrew Ford test port adapter from fuel rail test port and reinstall the test cap.

For GM TBI vehicles without a test port ...

- Place shop rag under GM TBI adapter in case a small amount of fuel drips out while unscrewing.
- Disconnect gauge hose and wrap a shop rag around it so any fuel dripping from hose is absorbed.
- Disconnect fuel lines from GM TBI adapter and wrap with shop rag so any fuel dripping from adapter is absorbed.
- Reconnect fuel lines as described in vehicle service manual.

For import and some domestic vehicles with a banjo bolt connection...

- Wrap a shop towel around banjo bolt connection while removing bolt.
- Disconnect hose and pressure gauge assembly from banjo bolt test adapter.
- Wrap a shop towel around end of gauge hose. Hold end of gauge hose over approved container to catch any remaining fuel.
- Loosen banjo bolt test adapter and remove adapter and gaskets.
- Re-install vehicle's fuel bolt with new gaskets on either side of banjo. Install fuel bolt finger tight, then wrench-tighten to specifications given in service manual.
- · Check for leaks.

For import and domestic vehicles with rubber hose connections...

- Place a shop towel under dual manifold test adapter.
- Disconnect hose and pressure gauge assembly from dual manifold adapter.
- Wrap a shop towel around end of gauge hose.
 Hold end of gauge hose over approved container to catch any remaining fuel.
- Loosen hose clamp securing vehicle's rubber fuel line to dual manifold adapter. Disconnect fuel line from adapter.
- Loosen hose clamp securing dual manifold adapter hose to vehicle. Disconnect adapter from vehicle.
- Reconnect vehicle's rubber fuel line to original location.
- Securely tighten hose clamps on vehicle's fuel line.
- · Check for leaks.
- 14. Store shop rags in an approved container so they cannot cause personal injury or a hazardous situation.
- **15**. Store Fuel Pressure Tester in a well ventilated area where it cannot cause personal injury or a hazardous situation.

General Fuel Pressure Diagnostics

Fuel pressure checking is an essential part of fuel injection system troubleshooting. High fuel pressure will make an engine run rich; low fuel pressure will make an engine run lean or not at all. Fuel pressure readings that are higher than manufacturer's specifications are generally caused by a problem in the fuel return line components. Conversely, fuel pressure readings that are lower than manufacturer's specifications are generally caused by a problem in the fuel pressure line components. If fuel pressure readings are not within manufacturer's specifications, refer to a vehicle service manual for step-by-step diagnostic procedures that will pinpoint the faulty component for a specific vehicle.

Possible causes of high fuel pressure readings are:

- Faulty fuel pressure regulator
- · Restriction in return line
- Faulty fuel line couplings at fuel tank
- Sticking or "sluggish" fuel injectors

Possible causes of low fuel pressure readings are:

- · Clogged or restricted fuel filter
- Restriction in pressure line
- Faulty fuel pump
- Faulty fuel pump relay
- Blown fuel pump fuse
- Faulty fuel pump wiring
- Clogged or restricted fuel pump filter
- Faulty fuel pressure regulator
- Leaking fuel injectors
- Faulty fuel line couplings at fuel tank.

Care and Maintenance

Apply a lightweight household oil to the rubber o-rings inside adapters before each use.

