

## **FUEL-09, Intake Manifold Removal and Installation**

### **Tools**

- 10 mm socket/ratchet
- 12 mm socket
- 10 mm open end wrench
- Long 6 mm Allen head socket / Long 6 mm hex key
- Flat tip screwdriver

### **Other Procedures Needed**

- [FUEL-02](#), Fuel Injector and Fuel Rail Removal and Installation
- [BOLT-01](#), Allen Head and Cheesehead Bolt Removal

### **Intake Removal**

1. Disconnect the battery negative lead.
2. Disconnect spark plug wires from spark plugs and move out of the way.
3. Using [FUEL-02](#), remove the fuel rail and injectors.
4. On normally aspirated cars, remove the air intake hose from between the air flow sensor and the throttle body.
5. On turbocharged cars, remove the pipe between the intercooler outlet and the throttle body.
6. Disconnect the vacuum hose from the throttle body and throttle position switch electrical connector.
7. Remove the oil dipstick tube to intake manifold mounting bolt.
8. On turbocharged cars, remove the oil air separator bracket to intake manifold bolts (near oil filler tube)(2 - M6 Allen head bolts).
9. Disconnect all hoses from the intake manifold.

### **NOTE**

On normally aspirated cars, there are hoses underneath the intake manifold which can not be disconnected from the intake until it is lifted.

10. At the back of the intake manifold, disconnect the speed and reference sensor electrical connector mounting bracket from the intake manifold by loosening the retaining bolt and sliding the bracket off.
11. Loosen the intake manifold brace bolt. On normally aspirated cars the bolt needs to be removed. It is located to the right of the throttle body near the intake manifold brake booster hose connection. On turbocharged cars, the bolt only needs to be loosened and is located to the left of the throttle body under the front edge of the intake manifold.
12. Disconnect the throttle cable.

13. If equipped, disconnect the cruise control cable from the servo unit (mounted on firewall near battery tray). Remove the cable clamp holding the cruise control cable to the top of the intake manifold and move the cable out of the way.
14. Remove the intake manifold retaining bolts (8 - M8 Allen head bolts) using a 6 mm Allen head socket or 6 mm hex key. A long (6") 6 mm Allen head socket works well for this application.

### **NOTE**

The intake manifold bolts tend to bond themselves to the cylinder head making it very easy to strip the heads on the bolts. To avoid stripping the heads refer to [BOLT-01](#) for "waking up" the bolts.

15. If the intake manifold does not lift off the head easily, strike the intake with a rubber mallet to break it free.
16. On normally aspirated cars, lift up the intake manifold and disconnect the vacuum lines on the bottom of the manifold.
17. Remove the intake manifold from the car.
18. If other work is to be performed while the intake manifold is removed, cover the cylinder head intake ports (stuff clean rags into the ports or cover them with duct tape).

### **Intake Installation**

1. Remove the old intake manifold gaskets from the cylinder head and intake manifold using a scraper. Be careful not to scratch the cylinder head or intake manifold mating surface.
2. Apply a small amount of grease to the intake manifold gaskets to hold them in place and install the gaskets on to the cylinder head.

### **NOTE**

Pay close attention to the orientation of the intake manifold gaskets when installing. On some cars, the gaskets are shaped identically but, must be oriented differently during installation. For example, on turbocharged cars, the #1 cylinder gasket orientation is not the same as the #2, #3, and #4 cylinders. While the gasket can be installed in the same orientation as the other cylinders and still fit, if done so, the gasket will partially block the injector flow path affecting the injector spray pattern.

3. Set the manifold into position on the cylinder head. On normally aspirated cars, attach the vacuum hoses to the bottom of the intake manifold as it is lowered into place.

4. Ensure the intake manifold lines up with the intake manifold brace. On turbocharged cars, the intake manifold is installed with the bolt already on the intake manifold. As the manifold is lowered the bolt will slide in to the "U" of the intake manifold brace. Torque the brace bolt (M8) to 20 Nm (15 ft-lbs).
  5. Install the intake manifold retaining bolts (8 - M8 Allen head) and torque to 20 Nm (15 ft-lbs).
  6. Connect the fuel supply and return lines.
  7. Connect the vacuum line connections to the fuel damper and fuel pressure regulator.
  8. If equipped, connect the cruise control cable to the cruise control servo.
  9. Connect the throttle cable to the throttle body.
  10. Connect the vacuum line to the throttle body and the electrical connector to the throttle position switch.
  11. Connect the speed and reference sensor mounting bracket to the back of the intake manifold.
  12. Connect all vacuum hoses to the intake manifold.
  13. Install the oil dipstick tube to intake manifold mounting bolt.
  14. On turbocharged cars, install the pipe between the intercooler outlet and the throttle body.
  15. On normally aspirated cars, install the air intake hose between the air flow sensor and the throttle body.
  16. Using [FUEL-02](#), install the fuel rail and injectors. Route and connect the spark plug wires as the fuel rail is being installed. Check for leaks as described in [FUEL-02](#).
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