

## **EXH-01, Exhaust System Removal and Installation**

### **Tools**

- Metric Wrench Set
- Metric Socket Set
- Pry bar
- Penetrating Lubricant
- Jack Stands

### **Other Procedures Needed**

- [FUEL-09](#), Intake Manifold Removal (One-Piece Crossover Pipe Removal Only)

### **Exhaust Manifold Back Removal (Normally Aspirated)**

1. Disconnect the O<sub>2</sub> sensor near the back of the firewall and drop the sensor connector down to the exhaust pipe.
2. Remove the CO sample tube from the exhaust pipe. This pipe has been removed and capped off on many cars as it is not used and it has a tendency to rust out and cause exhaust leaks. If your car is still equipped with the sample tube, you'll find the top end of it at the back of the camshaft housing at the engine lifting ring.
3. Remove the six nuts and bolts that attach the exhaust pipe to the exhaust manifolds.
4. Support the exhaust with blocks or jack stands.
5. Remove the nuts and bolts on the hanger in front of the catalytic converter, the rear of the catalytic converter, and at the rear of the muffler.
6. Lower the exhaust system from the car.

### **Cross-Over Pipe Back Removal (Turbo)**

1. Disconnect the O<sub>2</sub> sensor near the back of the firewall and drop the sensor connector down to the exhaust pipe.
2. Remove the CO sample tube from the exhaust pipe. This pipe has been removed and capped off on many cars as it is not used and it has a tendency to rust out and cause exhaust leaks. If your car is still equipped with the sample tube, you'll find the top end of it at the back of the camshaft housing at the engine lifting ring.
3. Remove the nuts on the turbocharger discharge pipe flange (near O<sub>2</sub> sensor).
4. Remove the nuts and bolts on the triangle shaped flange on the discharge of the wastegate.
5. Support the exhaust with blocks or jack stands.
6. Remove the nuts and bolts on the hanger in front of the catalytic converter, the rear of the catalytic converter, and at the rear of the muffler.
7. Lower the exhaust system from the car.

## **Cross-Over Pipe Removal (Turbo)**

- a. Remove the intake manifold using [FUEL-09](#).
- b. Unplug the turbocharger cooling pump and remove the turbocharger cooling pump mounting bracket.
- c. Place some rags under the hose on the discharge of the turbocharger cooling pump going to the turbocharger.
- d. Loosen the hose clamp on the 90° bend cooling water supply pipe to the turbocharger.
- e. Slide the hose (still attached to the cooling pump) off of the pipe and move out of the way toward the front of the car. Some coolant will come out of the turbocharger cooling jacket. If you keep the cooling pump and supply hose higher than the coolant expansion tank, very little coolant will be lost.
- f. Using a 22 mm wrench and a 27 mm wrench, remove the 90° bend cooling water supply pipe and the threaded nipple on the jacket water supply to the turbocharger.
- g. From above, remove the two turbocharger inlet flange nuts and bolts at the top of the flange and the nut and bolt on the bottom of the flange nearest the front of the car. These require two 15 mm wrenches or a wrench and 15 mm socket.
- h. From above, disconnect the O<sub>2</sub> sensor electrical connector (round connector on the mounting bracket at the back of the intake manifold).
- i. From under the car, remove the O<sub>2</sub> sensor.
- j. Remove the turbocharger inlet flange bolt on the bottom of the flange nearest the back of the car. This requires a 15 mm wrench or socket. However, no wrench is need for the nut as it is tack welded to the flange.
- k. Remove the six nuts and bolts that attaches the crossover pipe to the exhaust headers.
- l. For models with a two-piece crossover pipe, remove the nuts and bolts on the triangle shaped flange between the crossover pipe and the wastegate.
- m. For cars with a one-piece crossover pipe it will be necessary to remove the wastegate to remove the crossover pipe.
- n. Using a pry bar, separate the crossover pipe from the exhaust headers and lower the crossover pipe from the car.

## **Exhaust Manifold Removal**

1. Remove the six nuts and bolts on the flanges between the exhaust manifolds and the exhaust pipe (crossover pipe on Turbo models).
2. Remove the two Allen head bolts that attach the coolant return pipe to the cam housing.

### **NOTE**

It may be necessary to remove the coolant return pipe completely to get the exhaust headers out. This will require partially draining the coolant system.

3. To remove the exhaust manifolds it is necessary to remove the exhaust manifold studs. To do this, loosen the exhaust nut several turns and then install a second nut onto the stud. Tighten the outside nut against the inside nut while holding the inside nut with a wrench to prevent it from turning. Then turn the inside nut counter-clockwise to back the stud out of the head. If the nuts turn on the stud, the outside nut needs to be tightened.
4. Remove the exhaust manifolds from the car.

## **Installation**

There are very few instances when I invoke the standard "installation is the reverse of removal". However, this is one of those rare cases. I do recommend using new hardware when installing the exhaust system. Also, for turbocharged cars with one piece cross-over pipes, remember to fill and vent the cooling system (COOL-02). Torque the header to exhaust flange nuts to 20 Nm (15 ft-lbs).

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