SERVICE BULLETIN

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Model: ASET™ AC

(Does not apply to Mack Trucks Australia)
(Supersedes SB222012 dated 01/19/07)

Installation of High-Pressure Fuel Injection Lines — ASET™ AC Engines

The ASET™ AC fuel injection system operates at pressures much higher than pressures seen on earlier engines. Because of this, it is extremely important that proper procedures be used when replacing these high-pressure injection lines, and that proper tools be used to tighten the injection line end nuts to avoid damage to the lines. To properly tighten the fuel line end nuts, a tool kit (kit No. 57GC2254) is available through the MACK Parts System. This kit contains a set of torque adapters which must be used to properly tighten the line nuts at both the cylinder head and unit pump ends of the injection lines.

NOTE

The procedures outlined and the tools mentioned in this bulletin are specific to the ASET™ AC engine. However, the techniques used to install and tighten the injection lines on ASET™ AI and AMI engines, as well as on E-Tech™ and E-Tech™ CCRS engines, are similar and can be used on those engines (with some minor changes) as well.

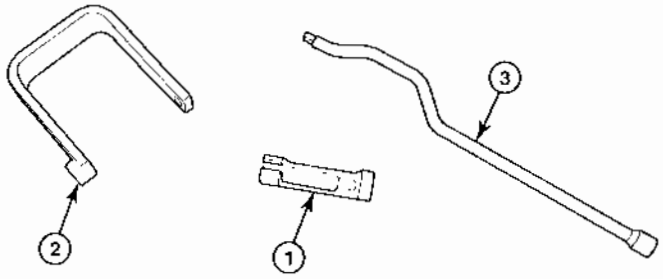

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Figure 1 — Injection Line End Nut Torque Adapter Tool Kit (Kit No. 57GC2254)

1. Fuel Line Socket (Part No. 525GC22), used to tighten the cylinder head end line nut for injection line Nos. 1, 2, 4, 5 and 6. 2. Direct-Torque Special Wrench (Part No. 525GC31), used to tighten the cylinder head end line nut for injection line No. 3 (ASET™ AC engines only).	3. Direct-Torque Extension (Part No. 2QM3114), use with a suitable flare nut crowfoot adapter such as Snap-On tool Nos. FRHM17 for 17 mm line nuts or FRHM19 for 19 mm line nuts when tightening the unit pump ends of the injection lines.

NOTE

The tools listed above are only to be used for tightening the injection lines. Use suitable open-end wrenches to loosen the line nuts when removing the lines.

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The following procedures must be used when replacing the injection lines to ensure integrity of the lines.

NOTE

DO NOT reuse injection lines. The line ends take a set with the adjoining mating surfaces. Whenever an existing injection line is removed from the engine for any reason, it must be replaced with a new line.

Preparation for Injection Line Removal and Installation

1. Secure the chassis for service, apply the parking brakes and block the wheels to prevent the vehicle from moving.
2. Open the hood.
3. Disconnect the batteries by disconnecting the negative battery cable(s) first, and then the positive cable(s). If equipped with dual battery boxes, the batteries on both sides of the vehicle must be disconnected.
4. Remove the inlet air duct. After the duct has been removed, use clean shop rags to cover the turbocharger inlet and the air compressor inlet pipe.
5. Remove the air cleaner assembly.
6. Remove the two clamps that secure the mass flow tube to the engine, and then remove the hose clamps from the coupling hoses at both ends of the tube. Remove the mass flow tube and set the tube to the side in a location where it will not interfere with the remaining procedures. This can be done without disconnecting the mass flow sensor harnesses.

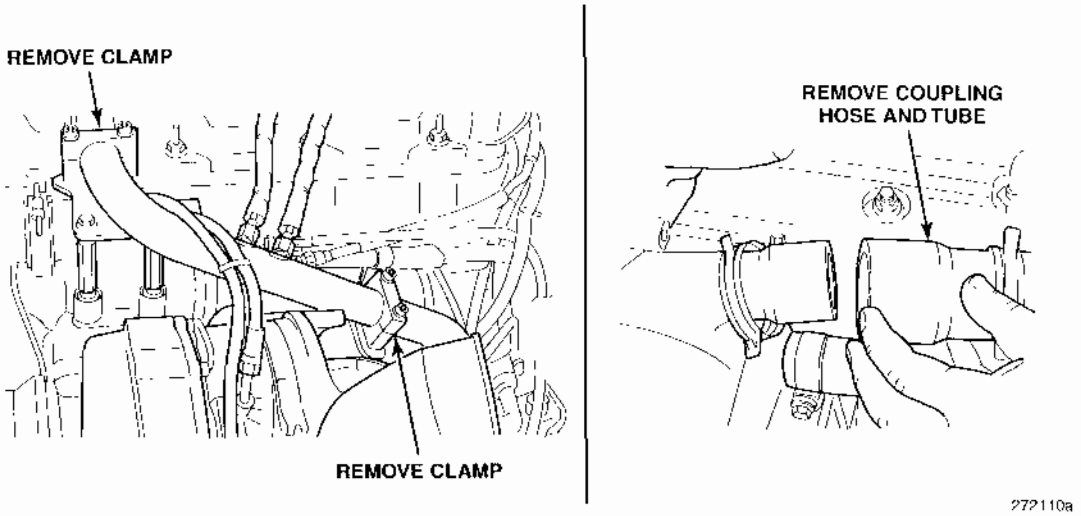

Figure 2 — Removing Mass Flow Tube

7. Disconnect both ends of the EGR valve oil line, and then remove the line from the engine.

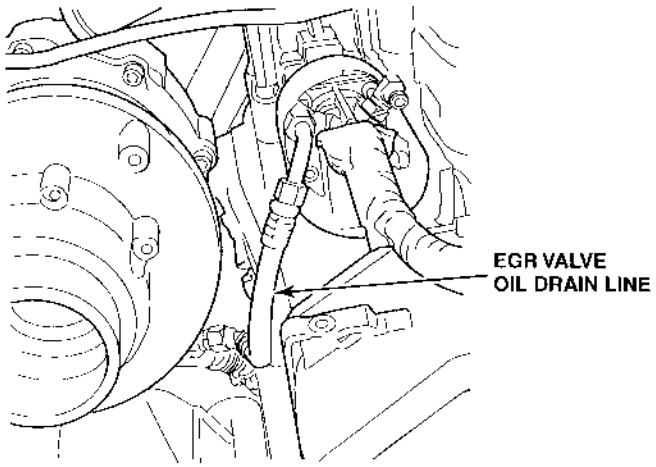

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Figure 3 — Removing EGR Oil Drain Line

8. Remove the nuts that secure the unit pump two-piece outer heat shields, and then remove the outer heat shields from the engine. Remove the rear heat shield first, as the two shields overlap each other.
9. Loosen the two bolts at each end of the intermediate heat shield. Slide the shield outward to disengage the bolts, and then place the shield on top of the inner heat shield against the cylinder block.

Removal and Installation of Injection Line

NOTE

Before removing any of the high-pressure fuel injection lines, use a suitable spray solvent such as Brakleen® to thoroughly clean the area at the cylinder head end, and then dry the area with shop air to prevent the entry of dirt and other contaminants at reassembly.

Remove and replace the fuel injection lines one line at a time.

DO NOT reuse the injection lines. The line ends take a set with the adjoining mating surfaces. Existing lines must be replaced with new lines.

1. Using suitable hand tools, completely loosen the end nuts at both the unit pump and cylinder head ends of the injection lines.

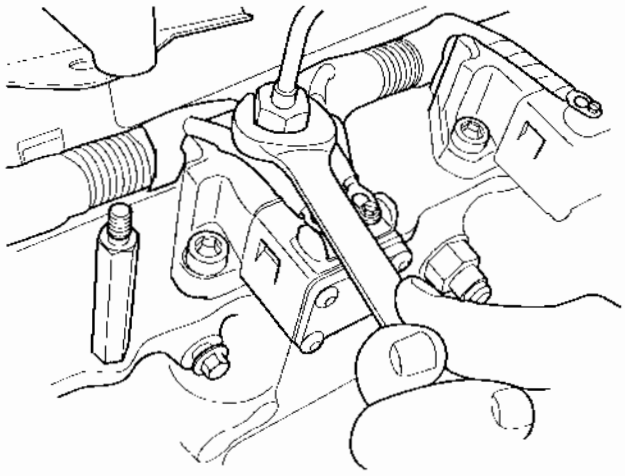

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Figure 4 — Using Standard Hand Tools to Loosen Injection Line Nuts (Unit Pump End Shown)

2. Disengage the end of the line from the unit pump, and then remove the injection line from the engine.
3. Check both ends of the new replacement line for cleanliness.
4. Apply one to two drops of clean engine oil to the line ends and the nut threads.

⚠ WARNING

DO NOT BEND A FUEL LINE. Fuel injection lines are subjected to high hydraulic pressures in operation. Even slight bends can weaken the line and result in an increased risk of fuel line split or breakage.

When installing the new injection line, avoid contacting the ends of the lines with other surfaces, as this may damage the sealing surfaces or pick up debris.

5. Install the injection line by inserting the cylinder head end of the line into the port in the cylinder head, and then engaging the opposite end of the line with the unit pump seat. Hand-tighten the end nuts at both the cylinder head and unit pump ends.

When installing the No. 3 injection line, caution must be used to avoid bending the line. The No. 3 injection line should be installed as follows:

a. Slide the end nut and sleeve against the bend in the line.

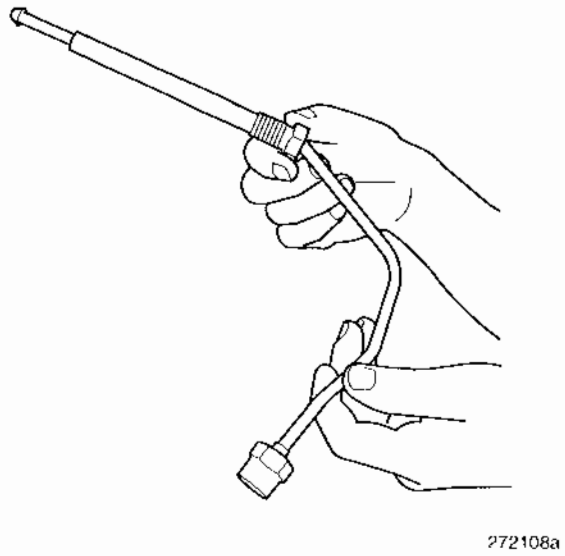

Figure 5 — Slide Nut and Sleeve Against Bend in Line

b. Holding the line with the ends facing the rear of the engine and the upper nut and sleeve against the bend in the line, guide the line between the turbocharger housings and down behind the EGR cooler.

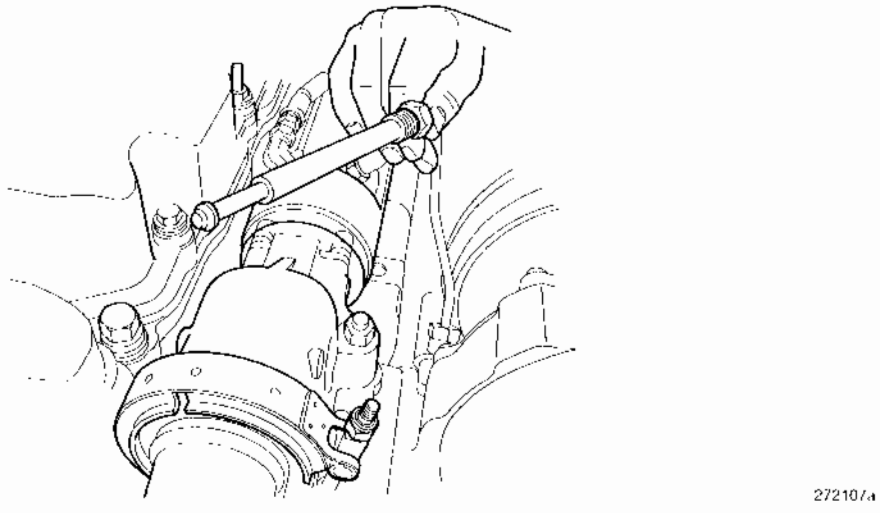

Figure 6 — Guiding Line Between Turbocharger Housings

c. When the line is down far enough so that the upper end is below the EGR valve, rotate the line slightly and begin moving the line upward while guiding the end of the line toward the cylinder head port. Keep the unit pump end of the line facing the rear of the engine.

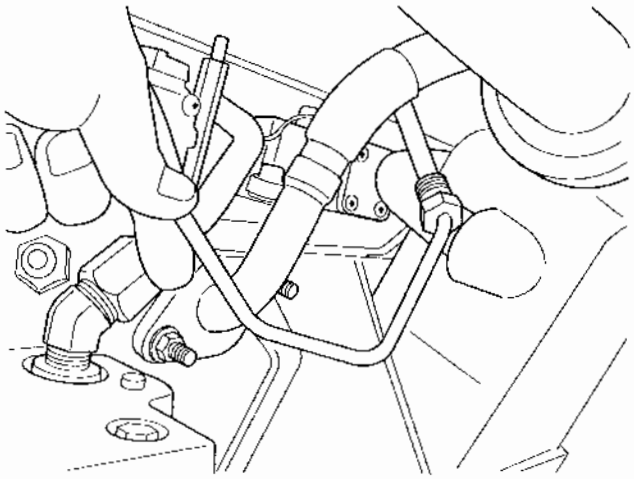

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Figure 7 — Guiding End of Line Toward Cylinder Head Port

d. Insert the line into the cylinder head port. Push the line fully into the port while rotating the unit pump end of the line until the end nut aligns with the unit pump seat. Hand-tighten both end nuts.

Tightening the Fuel Line End Nuts

Torque specifications for the injection line end nuts are as follows:

- **Unit Pump End Nut** — 41 N•m (30 lb-ft)
- **Cylinder Head End Nut** — 48 N•m (35 lb-ft)

To properly tighten the fuel line end nuts, the special torque adapter kit (tool No. 57GC2254) is required. This kit contains the following torque adapters which must be used to tighten the specific end nuts as specified:

- **525GC22, Fuel Line Socket** — Use this tool to tighten the cylinder head end line nuts for line Nos. 1, 2, 4, 5 and 6.
- **525GC31, Direct-Torque Adapter** — Use this tool to tighten the cylinder head end line nut for line No. 3 (ASET™ AC engines only).
- **2QM3114, Direct-Torque Extension** — Use this tool along with a suitable flare nut crowfoot adapter (such as Snap-On tool Nos. FRHM17 for 17 mm end nuts or FRHM19 for 19 mm end nuts) to tighten all the unit pump end line nuts.

NOTE

To ensure a proper connection, the end nuts (both the cylinder head and unit pump ends) must be tightened to specifications, immediately backed off one nut flat and retightened to specifications. This critical "joint conditioning" procedure is necessary to ensure a proper leak-free connection.

Tighten the fuel line end nuts as follows:

1. Tighten the line nut at the cylinder head end first. For line Nos. 1, 2, 4, 5 and 6, use the special injection line socket (tool No. 525GC22) and an accurately calibrated 3/8" drive click-type torque wrench. Tighten the nut to 48 N•m (35 lb-ft), immediately back off the nut slightly (approximately one nut flat) and then retighten the nut to 48 N•m (35 lb-ft). This critical "joint conditioning" procedure is necessary to ensure a proper leak-free connection.

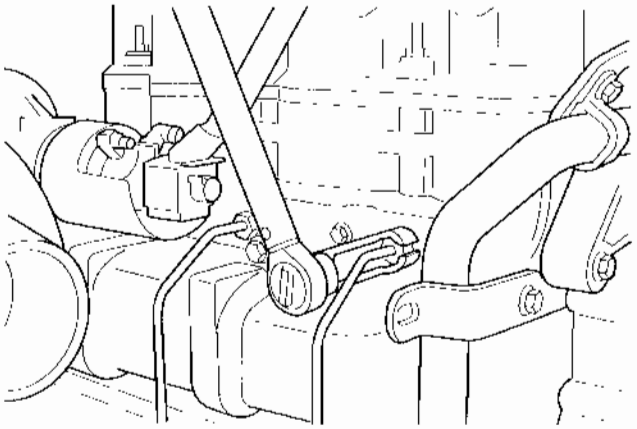

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Figure 8 — Using the Injection Line Socket (Tool No. 525GC22)

To tighten the cylinder head end line nut for line No. 3, use the special direct-torque adapter tool (tool No. 525GC31) and an accurately calibrated 3/8" drive click-type torque wrench. Place the tool over the EGR valve and install the socket on the line nut. Install the torque wrench and then tighten the nut to 48 N•m (35 lb-ft), immediately back off the nut slightly (approximately one nut flat) and retighten to 48 N•m (35 lb-ft).

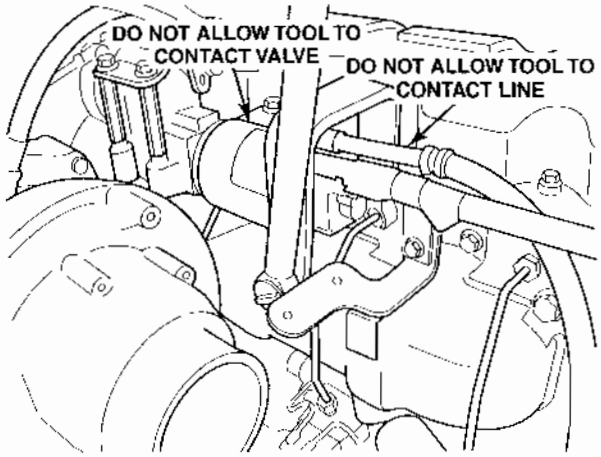

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Figure 9 — Using the Direct-Torque Adapter (Tool No. 525GC31)

NOTE

Use care when tightening the end nut with the direct-torque adapter so that the tool does not contact the EGR valve or any of the oil lines surrounding the valve. Doing so will result in a false torque reading and an under-torque condition.

2. Bleed the injection line(s) as follows:

> **NOTE**
>
> If all six injection lines have been replaced, snug the line nut(s) at the unit pump end(s) with an open-end wrench, and then begin the bleed procedure at cylinder No. 6. Continue with cylinder Nos. 5, 4, 3, 2 and then 1.

a. Using a standard open-end wrench, snug the unit pump line nut, and then back the line nut off one turn.

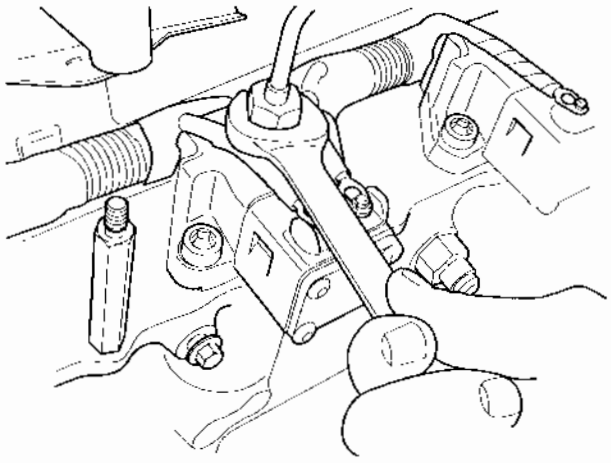

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Figure 10 — Loosening Unit Pump Line Nut with a Standard Open-End Wrench

b. Gently lift the injection line to unseat it from the unit pump.

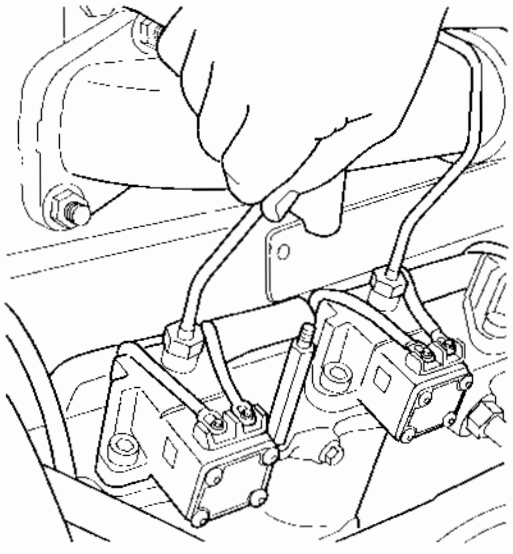

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Figure 11 — Unseating Injection Line at Unit Pump

c. Purge the air from the line by pumping the hand primer until a steady stream of fuel is seen coming from the unit pump connection with each stroke of the hand pump.

d. When a steady stream of fuel is seen at the unit pump connection, use a standard open-end wrench to snug the unit pump line nut.

e. Repeat the above steps for the remaining injection lines that have been replaced.

3. Once the air has been purged from the line and the line nut snugged with the open-end wrench, use the special direct-torque extension (tool No. 2QM3114), the appropriate flare nut crowfoot adapter (such as Snap-On tool Nos. FRHM17 for 17 mm end nuts or FRHM19 for 19 mm end nuts) and an accurately calibrated 3/8" drive click-type torque wrench to tighten the unit pump line nuts. Tighten the line nut to 41 N•m (30 lb-ft), immediately back off the nut slightly (approximately one nut flat) and then retighten to 41 N•m (30 lb-ft).

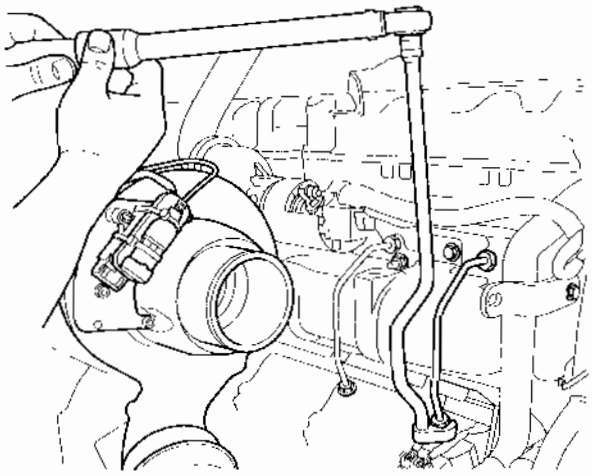

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Figure 12 — Using Direct-Torque Extension (Tool No. 2QM3114) and Flare Nut Crowfoot Adapter

4. After the line nuts at both the cylinder head and unit pump ends have been tightened and conditioned, use a suitable spray solvent such as Brakleen® or equivalent and shop air to clean any residual fuel that may be present on the engine or the unit pumps.

Reassembly

Reinstall all the components that had been removed previously. When reinstalling the unit pump heat shields, ensure that the intermediate shield is installed fully inboard and centered so that it does not contact the unit pump line nuts. When reinstalling the inlet air duct, remove the cover from the turbocharger inlet and check and remove debris that may have found its way inside the compressor housing. Ensure that the duct clamps are properly oriented so as to not cause any damage to the hood when it is closed. Torque specifications for the various fasteners are as follows:

- Unit pump heat shield — 20 N•m (15 lb-ft)
- Intermediate heat shield — 8 N•m (72 lb-in)
- Mass flow tube clamps — 10.8 N•m (96 lb-in)
- Inlet air duct clamps — 9 N•m (80 lb-in)
- EGR valve oil line end fittings — 27 N•m (20 lb-ft)

Reconnect the batteries by connecting the positive battery cable(s) first, and then the negative cable(s).

Start the engine and allow it to idle for approximately 5 minutes. Stop the engine and check for fuel leakage at both ends of the injection lines. Also check for oil leakage at both ends of the EGR valve oil line. If no leakage is seen, close the hood and perform a short road test. Return to the service facility and recheck for fuel or oil leakage to ensure that the fuel injection lines and the EGR valve oil line have been properly installed.

NOTE

When starting the engine, it is important to crank continuously for up to 30 seconds. Continuous cranking is required because the fuel delivery rate increases with increased cranking time. This will help to purge any remaining air in the fuel injection lines.

There should be a fuel injection warning label (part No. 4MR21141M) affixed to the inlet air duct, just above the turbocharger inlet. If a label is not present, one must be applied. Be sure to clean the area of the duct where the label is to be applied with a suitable cleaning fluid (such as alcohol or some other type of solvent) that will dry or evaporate quickly, not leave a residue or damage the air duct. The label adhesive allows it to be quickly lifted off the duct immediately after application, and then reapplied, should alignment of the label not be correct at the first application.

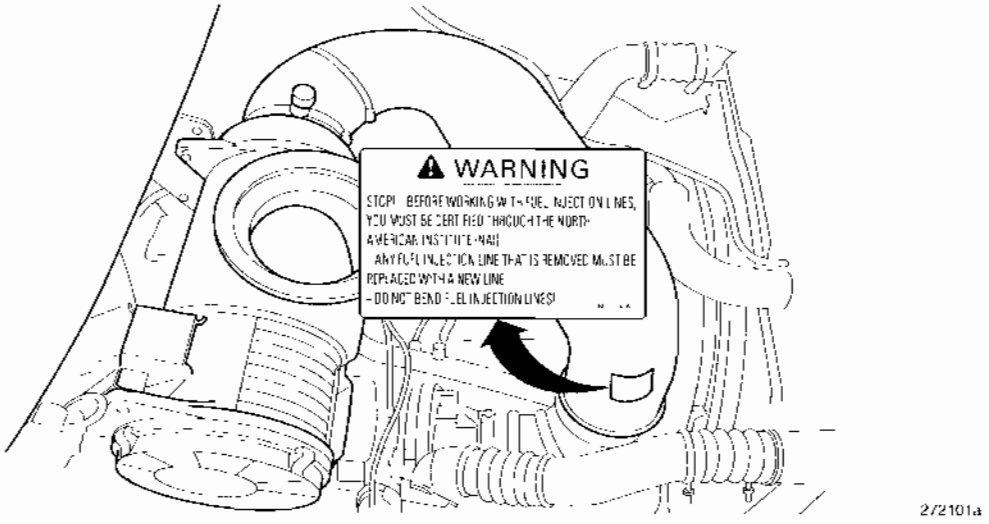

Figure 13 — Fuel Line Warning Label (Part No. 4MR21141M)