

110 Engine Removal and Installation

GENERAL 110-1

ENGINE REMOVAL AND INSTALLATION 110-1

Engine, removing and installing
(4-cylinder engines) 110-1
Engine, removing and installing
(6-cylinder engines) 110-4

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GENERAL

Some special tools are required for removal and installation of the engine. Be sure to have the necessary equipment on hand before starting the job.

CAUTION —

- Engine removal requires disconnecting the battery. This may erase any system fault code(s) that have been stored in control unit memories. Check for fault codes prior to disconnecting the battery cables.
- If the Check Engine light is illuminated with the engine running, see **100 Engine-General** for On-Board Diagnostics (OBD) fault code information.
- If any other system faults have been detected, as indicated by an illuminated ANTI LOCK, SRS or AST warning light, see the appropriate repair group in this manual or an authorized BMW dealer for more information on fault codes.

NOTE —

It is not necessary to remove the engine hood, but it is helpful and will make engine removal and installation easier.

2. Remove transmission from car. See **230 Manual Transmission** or **240 Automatic Transmission**.
3. Remove engine hood or place hood in service position. See **410 Fenders, Engine Hood**.
4. Remove splash guard under engine, if applicable.
5. Unbolt ignition coil assembly from bracket on strut tower. Disconnect wiring to ignition coils, then place coil assembly on engine.
6. Disconnect all cables and harness connectors at throttle housing.
7. Unbolt and remove complete air cleaner housing with mass air flow sensor, disconnecting and labeling connectors, ducting and hoses as necessary. See Fig. 1.

ENGINE REMOVAL AND INSTALLATION

Engine, removing and installing (4-cylinder engines)

Cover all painted surfaces before beginning the removal procedure. As an aid to installation, label all components, wires, and hoses before removing them. Do not reuse gaskets, O-rings or seals during reassembly.

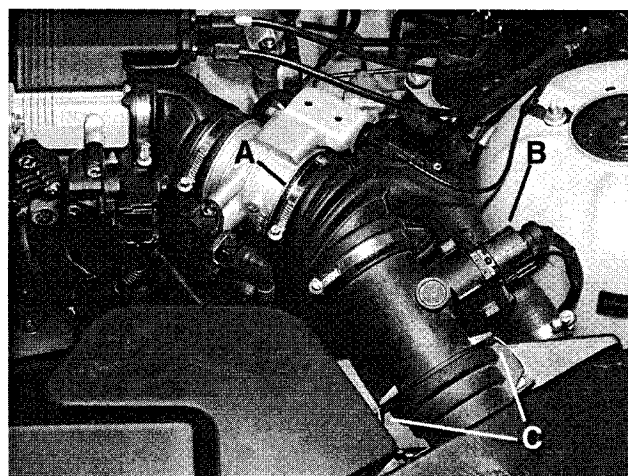
WARNING —

Due to risk of personal injury, be sure the engine is cold before beginning the removal procedure.

1. Disconnect negative (–) cable from battery in luggage compartment.

CAUTION —

Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.



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Fig. 1. Intake air duct hose clamp (A), mass air flow sensor connector (B), and air cleaner to air flow sensor clips (C) on M44 engine.

ENGINE REMOVAL AND INSTALLATION

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8. Drain engine coolant and remove coolant hoses attached to cylinder head.

- Drain radiator and engine block. See **170 Radiator and Cooling System**.
- Disconnect hoses from thermostat housing at front of cylinder head.
- Disconnect heater hoses at rear of engine. See Fig. 2.

NOTE —

- The block drain plug is located on the exhaust side towards rear of engine.
- Remove small plastic lock clip to pull radiator drain plug out completely.

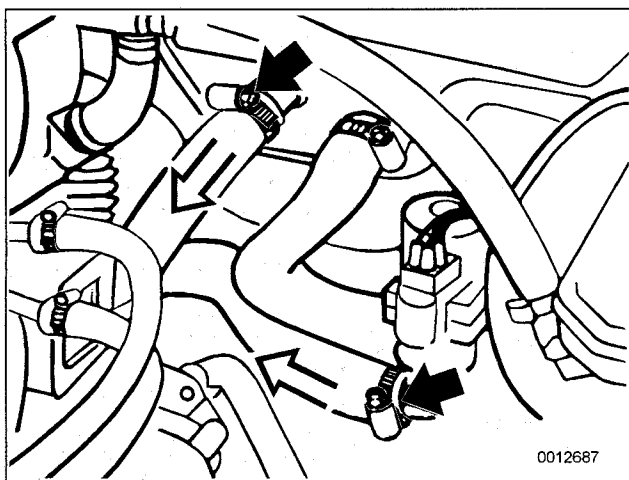


Fig. 2. Coolant hoses at heater valve and heater core to be disconnected (arrows).

9. Remove air shroud from top of radiator. See Fig. 3.

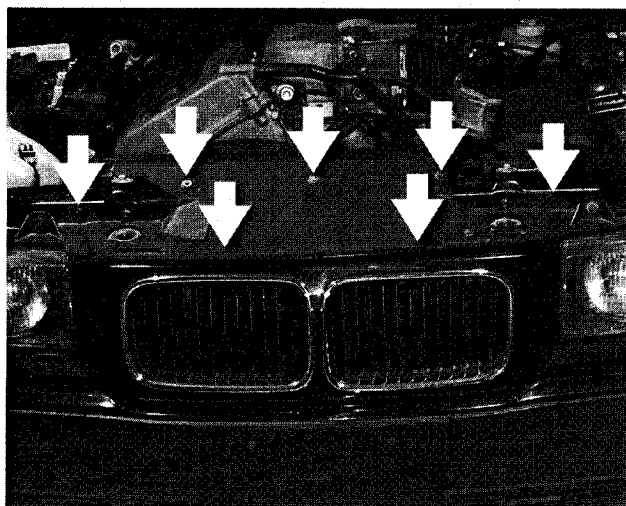


Fig. 3. Front air shroud mounting screws (arrows).

10. Remove radiator cooling fan and radiator as described in **170 Radiator and Cooling System**.

NOTE —

Some late 4-cylinder models use an electric primary cooling fan.

CAUTION —

On cars with viscous-type cooling fans, the radiator fan has left hand threads.

11. Remove upper intake manifold, unfasten cable duct from lower intake manifold, crankcase vent valve hose (M44 engine only)
12. Disconnect fuel supply and fuel return lines, main engine electrical connectors, and lower intake manifold as described in **113 Cylinder Head Removal and Installation**. See Fig. 4.

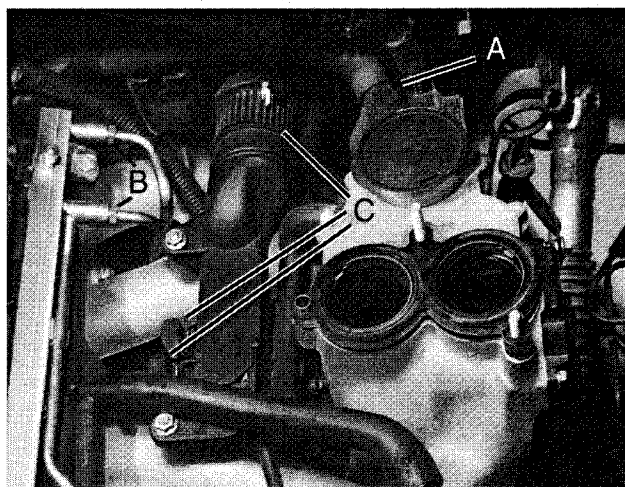


Fig. 4. Crankcase vent valve (A) on top of lower intake manifold of M44 engine. Fuel delivery and return lines shown at B. Engine harness and sensor connectors shown at C.

WARNING —

- Fuel may be expelled under pressure. Do not smoke or work near heaters or other fire hazards. Keep a fire extinguisher handy. Before disconnecting fuel hoses, wrap a cloth around fuel hoses to absorb any leaking fuel. Plug all open fuel lines.

- Always unscrew the fuel tank cap to release pressure in the tank before working on the tank or lines.

CAUTION —

Stuff clean rags into the open intake ports to prevent any parts from falling into the engine intake.

13. Disconnect vacuum hose from brake booster on bulkhead. Cover both hole in booster and plug hose end.

14. Unbolt power steering fluid reservoir from its mounting bracket. Use stiff wire to hang reservoir to one side. Do not disconnect fluid lines.
15. Remove power steering pump drive belt and remove pump from its mounting bracket. Use stiff wire to hang pump from body.
16. On cars with automatic transmission remove front and rear brackets holding automatic transmission cooler lines to engine.
17. Remove A/C compressor from its mounting bracket without disconnecting any refrigerant lines. See Fig. 5.

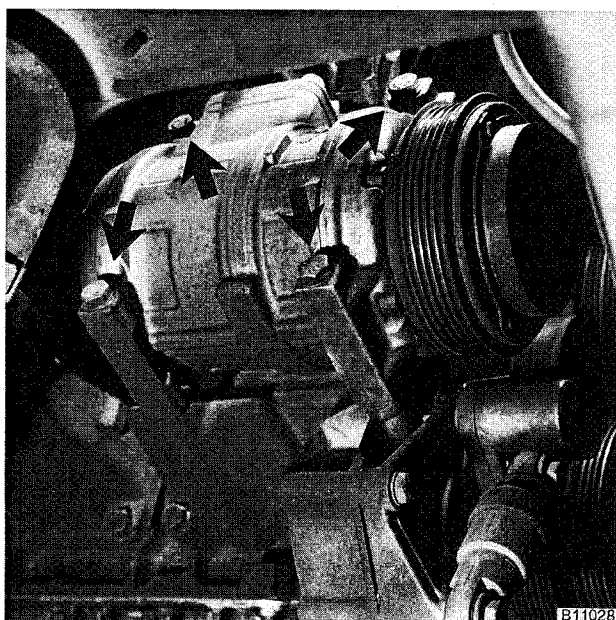


Fig. 5. A/C compressor mounting bolts (arrows).

18. Move A/C compressor out of way without distorting or damaging any lines. Support compressor by hanging it from chassis using stiff wire.
19. Disconnect wiring from starter and alternator. Move wiring harness out of way. See **121 Battery, Starter, Alternator**.
20. Remove oil dipstick guide tube. Note O-ring at base of tube when removing.
21. Remove front exhaust pipe from exhaust manifold. See Fig. 6.
22. Install an engine lifting device and raise engine until its weight is supported. Remove nuts and ground strap from left and right engine mounts.

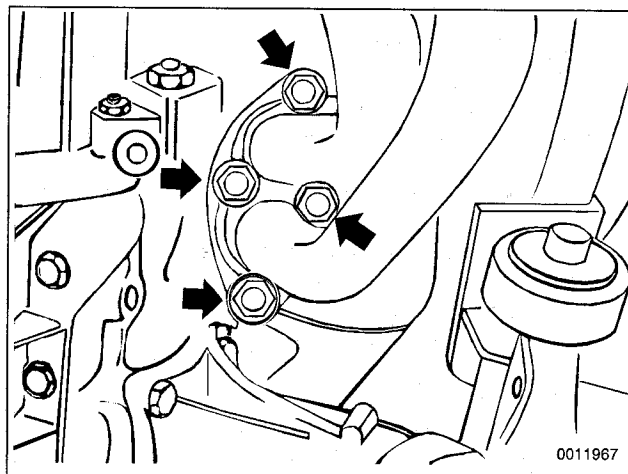


Fig. 6. Front exhaust pipe to exhaust mounting nuts (arrows), as viewed from below on 4-cylinder engine.

23. Carefully raise engine out of car, checking for any wiring harnesses, fuel lines, or mechanical parts that might become snagged as engine is removed.
24. Installation is reverse of removal, noting the following:
 - Replace all gaskets, O-rings and seals.
 - Change engine oil and filter and check all other fluid levels. See **020 Maintenance Program**.
 - Refill and bleed cooling system. See **170 Radiator and Cooling System**.
 - Install the front exhaust pipes using new gaskets and self-locking nuts. Use copper paste on threads. See **180 Exhaust System**.

Tightening Torques

- Coolant drain plug to cylinder block . 25 Nm (18 ft-lb)
- Engine mount to subframe
 - M8 22 Nm (17 ft-lb)
 - M10 45 Nm (33 ft-lb)
- Intake manifold to cylinder head
 - M7 15 Nm (11 ft-lb)
 - M8 22 Nm (16 ft-lb)
- Radiator cooling fan to coolant pump 40 Nm (30 ft-lb)
- Radiator drain screw to radiator . . . 2.5 Nm (22 in-lb)
- Wiring to alternator (M8 nut). 12 Nm (9 ft-lb)
- Wiring to starter
 - M6 nut 5 Nm (44 in-lb)
 - M8 nut 12 Nm (9 ft-lb)

110-4 ENGINE REMOVAL AND INSTALLATION

Engine, removing and installing (6-cylinder engines)

Engine removal procedures for the various 6-cylinder engines are covered in this section. Most steps in the procedures are similar or the same for all engines. Specific differences that apply are noted at the beginning of each step.

Be sure to cover all painted surfaces before beginning the removal procedure. As an aid to installation, label all components, wires, and hoses before removing them. Do not reuse gaskets, O-rings or seals during reassembly.

WARNING —

Due to risk of personal injury, be sure the engine is cold before beginning the removal procedure.

1. Disconnect negative (–) battery cable in luggage compartment.

CAUTION —

Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.

2. Remove engine hood or place hood in service position. See **410 Fenders, Engine Hood**.

NOTE —

It is not necessary to remove the engine hood, but it is helpful and will make engine removal and installation easier.

3. Remove splash guard under engine, if applicable.
4. Remove transmission from car. See **230 Manual Transmission** or **240 Automatic Transmission**.
5. Remove vacuum hose from brake booster on bulkhead. Cover hole in booster and plug hose end.
6. Remove intake air plenum panel in rear of engine compartment. See **640 Heating and Air Conditioning**.
7. Remove ground strap from timing case cover, if applicable.
8. Remove top engine covers and disconnect ignition coil harness connectors. Working at fuel injectors, pry open small wire clips at each injector. Remove main harness hold-down nuts and lift complete harness away. See Fig. 7.
9. Unbolt and remove complete air cleaner housing with mass air flow sensor, disconnecting and labeling connectors, ducting and hoses as necessary. See Fig. 8.

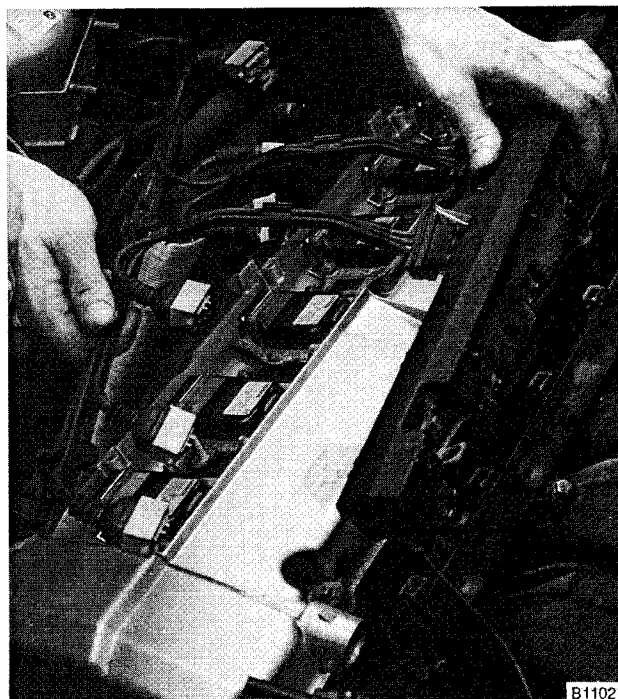


Fig. 7. Remove main harness from top engine and place at base of windshield.

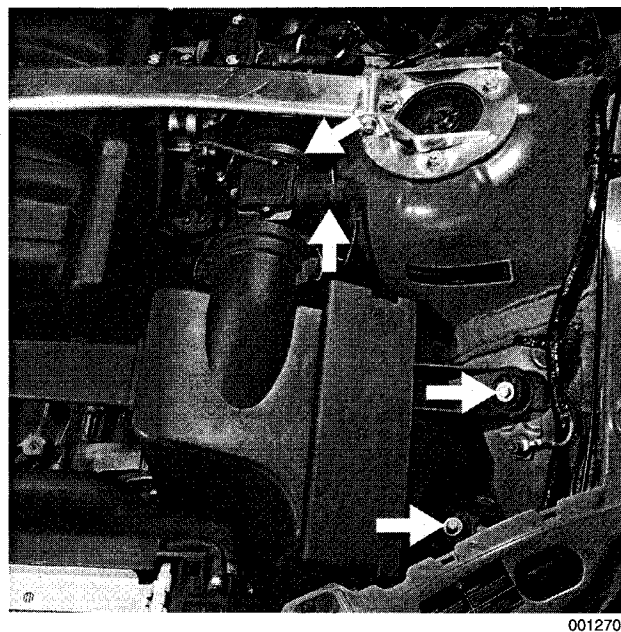


Fig. 8. Mass air flow sensor connector, air duct hose clamp, and air cleaner housing mounting bolts (arrows).

10. On cars with automatic transmission, remove front and rear brackets holding transmission cooler lines to side of engine.

ENGINE REMOVAL AND INSTALLATION

11. Drain engine coolant and remove coolant hoses attached to cylinder head.

- Drain engine block by removing block drain.
- Disconnect hoses from thermostat housing in front of cylinder head.
- Disconnect heater hoses at rear of engine. See Fig. 9.
- Drain radiator by removing threaded plastic plug from lower left corner.

NOTE —

- The block drain plug is located on the exhaust side towards rear of engine.
- Remove small plastic lock clip to pull radiator drain plug out completely.

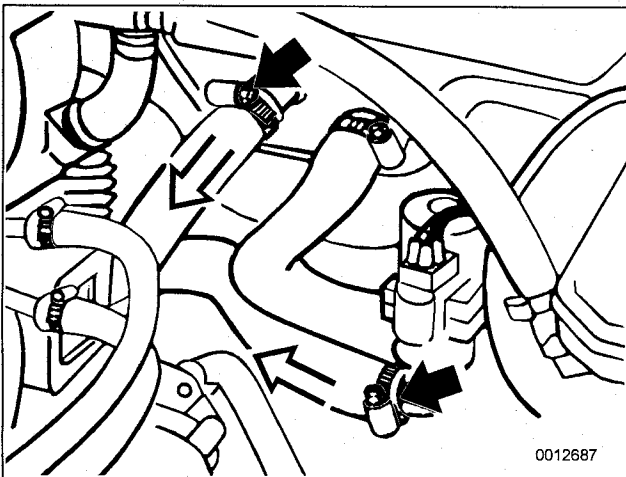


Fig. 9. Coolant hoses at heater valve and heater core to be disconnected (arrows).

12. Remove radiator cooling fan and radiator as described in **170 Radiator and Cooling System**.

CAUTION —

Radiator fan has left hand threads.

13. Label and disconnect coolant hoses, cables, and harness connectors from throttle housing. See Fig. 10.
14. Working at rear of intake manifold, label and then remove fuel supply and fuel return lines. Disconnect fuel lines from support bracket on manifold. See Fig. 11.

NOTE —

On M52 and S52US engines, special fittings are used to retain the fuel lines to the fuel rail. Use BMW special tool no. 16 1 050 to compress the locking clip inside the end of the fuel line fittings to release the line.

15. Unbolt power steering fluid reservoir from its mounting bracket. Use stiff wire to hang reservoir to one side. Do not disconnect fluid lines.

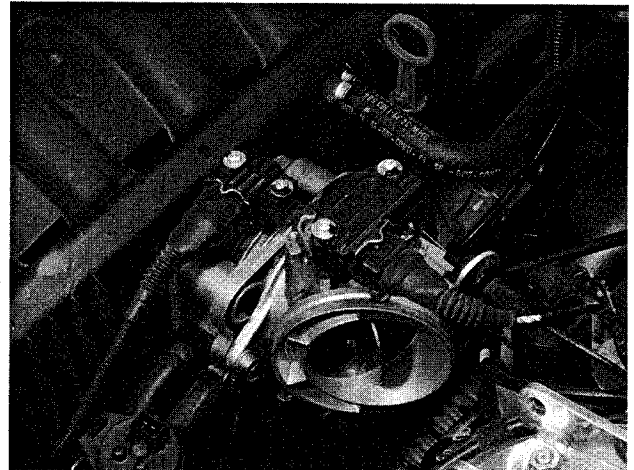


Fig. 10. Throttle housing assembly on M52 engine. Disconnect hoses, cables and harness connectors at and around housing.

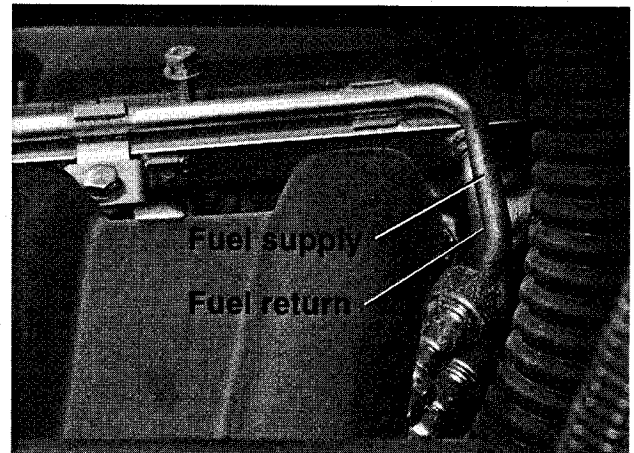


Fig. 11. Special fuel line fitting at fuel rail on M52/S52US engine. Use BMW special tool 16 1 050 to release locking fittings at ends of fuel lines.

WARNING —

- Fuel may be expelled under pressure. Do not smoke or work near heaters or other fire hazards. Keep a fire extinguisher handy. Before disconnecting fuel hoses, wrap a cloth around fuel hoses to absorb any leaking fuel. Plug all open fuel lines.

- Always unscrew the fuel tank cap to release pressure in the tank before working on the tank or lines.

16. Remove intake manifold from engine by removing seven mounting nuts from above and two mounting bracket bolts from below. See Fig. 12.

CAUTION —

Stuff clean rags into the open intake ports to prevent any parts from falling into the engine intake.

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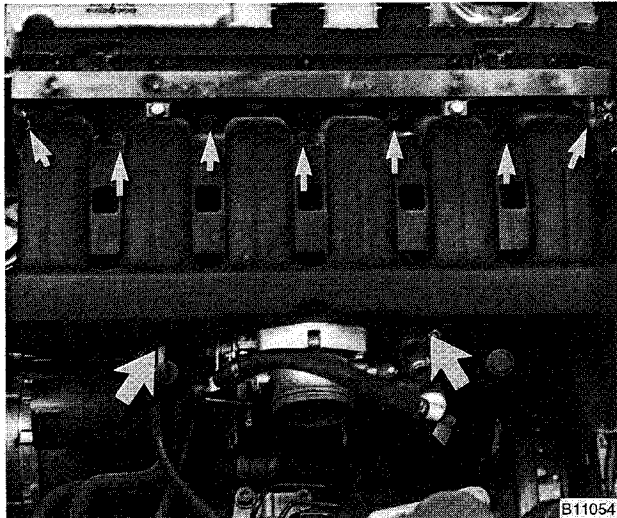


Fig. 12. Intake manifold mounting nuts on 6-cylinder engine. Also remove two bolts from support brackets (**arrows**).

17. Working below intake manifold, disconnect harness connectors. Cut wire ties holding engine harness to bulkhead and disconnect main engine harness connector at rear of engine compartment. See Fig. 13.

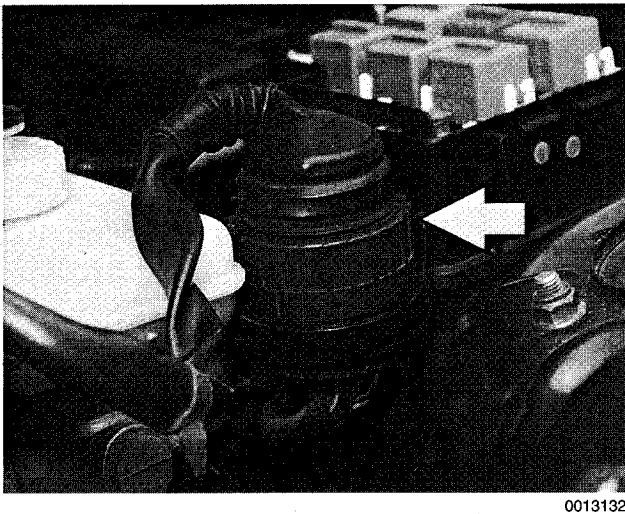


Fig. 13. Main engine harness connectors in rear of engine compartment (**arrow**).

18. Remove poly-ribbed drive belt(s).
19. Remove engine drive belt. See **020 Maintenance Program**.
20. Remove power steering pump from its mounting bracket. See Fig. 14. Use stiff wire to hang pump from body.

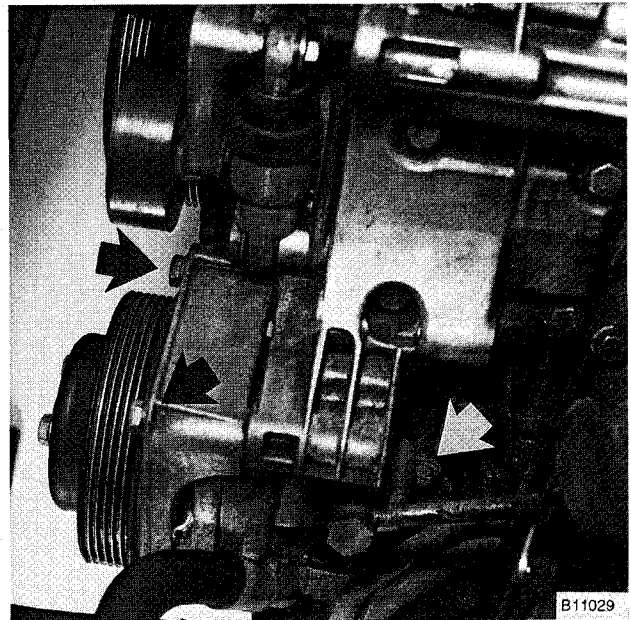


Fig. 14. Power steering pump mounting bolts (**arrows**). M52 engine shown.

21. Remove A/C compressor from its mounting bracket without disconnecting any refrigerant lines. See Fig. 15.

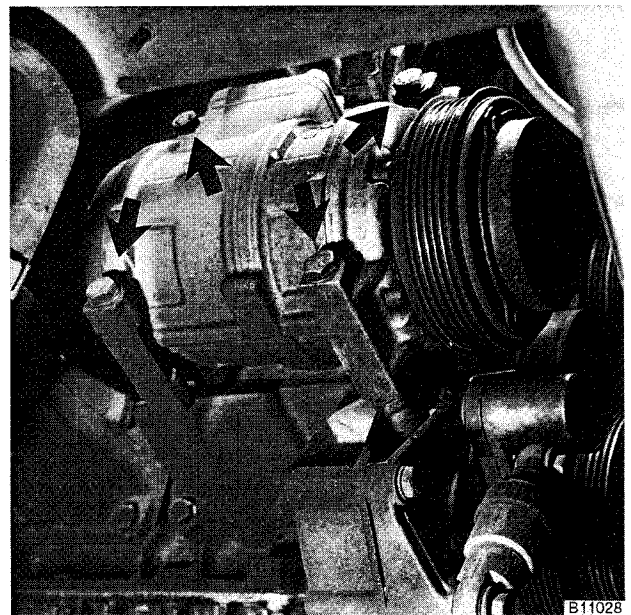


Fig. 15. A/C compressor mounting bolts (**arrows**).

ENGINE REMOVAL AND INSTALLATION

22. Move A/C compressor out of the way without distorting or damaging any lines. Support compressor by hanging it from chassis using stiff wire.
23. Disconnect wiring from starter and alternator. Move wiring harness out of the way. See **121 Battery, Starter, Alternator**.
24. Remove front exhaust pipe from exhaust manifold. See Fig. 16.

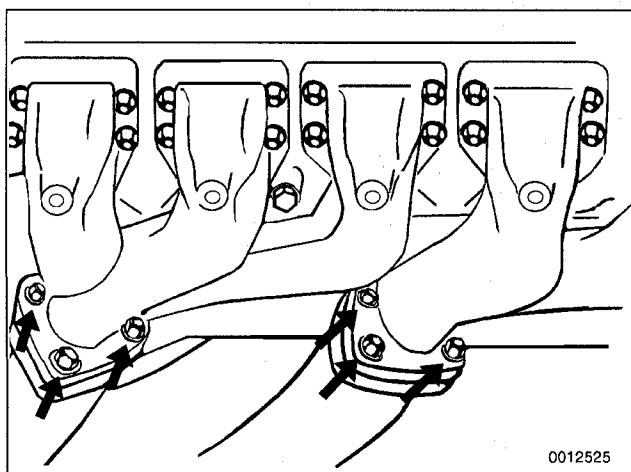


Fig. 16. Front exhaust pipe to exhaust manifold mounting nuts on 6-cylinder engine (arrows).

25. Install an engine lifting device and raise engine until its weight is supported. Remove nuts and ground strap from left and right engine mounts.

26. Carefully raise engine out of car, checking for any wiring, fuel lines, or mechanical parts that might become snagged as engine is removed.
27. Installation is reverse of removal, noting the following:
 - Replace all gaskets, O-rings and seals.
 - Change engine oil and filter and check all other fluid levels. See **020 Maintenance Program**.
 - Refill and bleed cooling system. See **170 Radiator and Cooling System**.
 - Check that engine drive belts properly engage the pulley grooves.
 - Install the front exhaust pipes using new gaskets and self-locking nuts. Use copper paste on threads. See **180 Exhaust System**.

Tightening Torques

- Coolant drain plug to cylinder block . 25 Nm (18 ft-lb)
- Engine mount to subframe
 - M10 45 Nm (33 ft-lb)
 - M8 22 Nm (16 ft-lb)
- Intake manifold to cylinder head
 - M7 15 Nm (11 ft-lb)
 - M8 22 Nm (16 ft-lb)
- Radiator cooling fan to coolant pump 40 Nm (30 ft-lb)
- Radiator drain screw to radiator . . . 2.5 Nm (22 in-lb)
- Wiring to alternator (M8 nut). 12 Nm (9 ft-lb)
- Wiring to starter
 - M6 nut 5 Nm (44 in-lb)
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