

Chapter 2 Part A V6 engine

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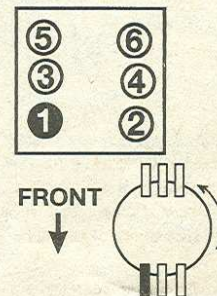
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Specifications

Cylinder arrangement	V6
Displacement	2,960 cc (180.62 cu in)
Bore and stroke	87 x 83 mm (3.43 x 3.27 in)
Firing order	1-2-3-4-5-6
Compression ratio	
non-turbo	9.0
turbo	7.8
Cylinder numbers (see illustration 3.3a on page 68)	
right bank	1-3-5
left bank	2-4-6
Valve timing	
intake opens	20-degrees BTDC
intake closes	52-degrees ABDC
intake duration	252-degrees
exhaust opens	62-degrees BBDC
exhaust closes	10-degrees ATDC
exhaust duration	252-degrees

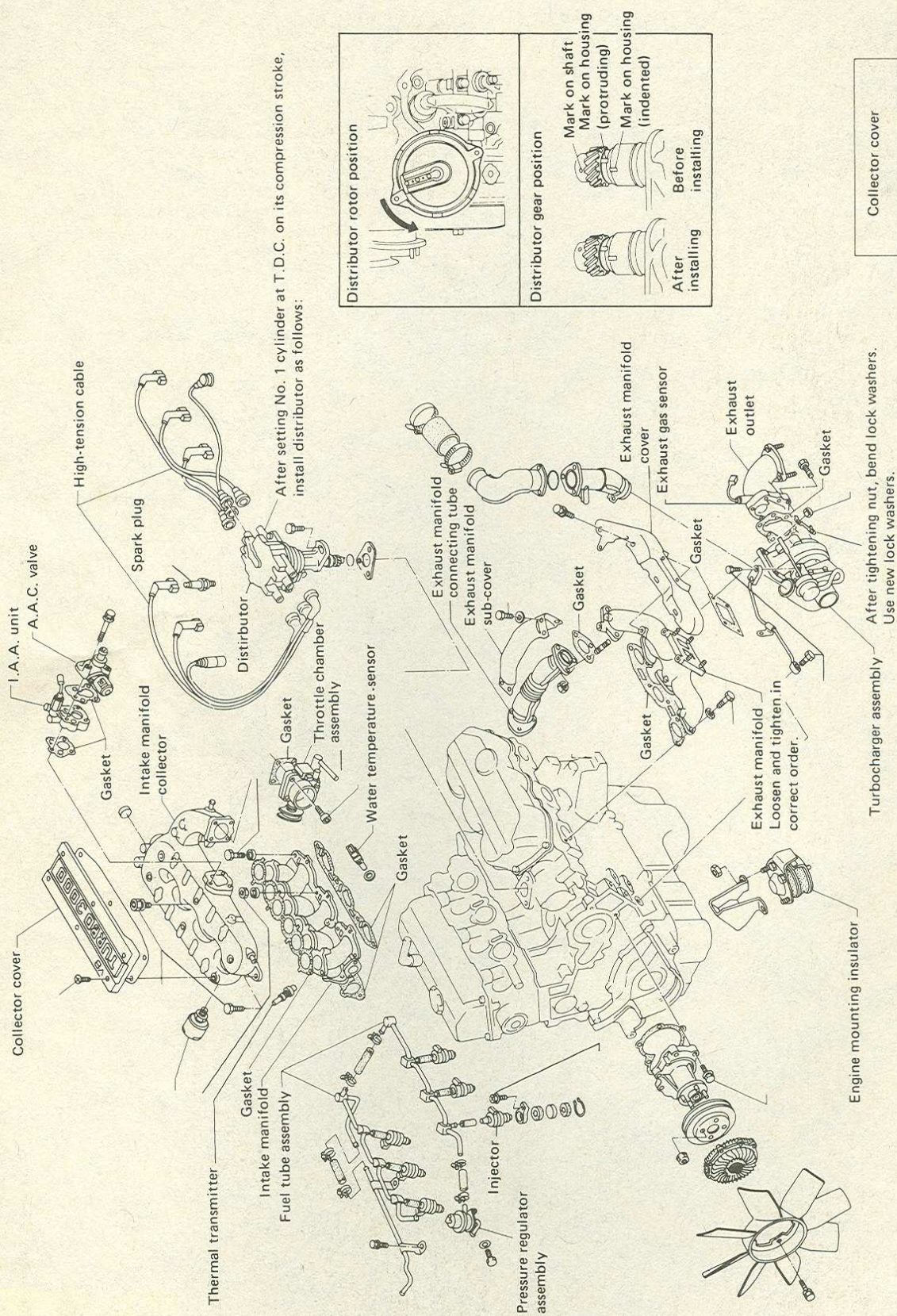
Torque specifications

	Kg-m	Ft-lbs
Collector cover	0.6 to 0.8	4.3 to 5.8
Collector	1.8 to 2.2	13 to 16
Throttle chamber	1.8 to 2.2	13 to 16
EGR control valve	1.8 to 2.3	13 to 17
Intake relief valve	3.0 to 4.0	22 to 29
Injector holder	0.25 to 0.33	1.8 to 2.4
Cylinder head temperature sensor	1.2 to 1.6	9 to 12
Thermal transmitter	1.5 to 2.0	11 to 14
Exhaust manifold	1.8 to 2.2	13 to 16
Exhaust manifold stay	2.2 to 2.8	16 to 20
Exhaust outlet	2.5 to 3.0	18 to 22
EGR tube	3.5 to 4.5	25 to 33
Exhaust connecting tube	2.2 to 2.8	16 to 20
Exhaust gas sensor		
1984 thru 1986/1987 and later non-turbo	4.1 to 5.1	30 to 37
1987 and later turbo	1.8 to 2.4	13 to 17
Crankshaft pulley	12.5 to 13.5	90 to 98
Water inlet	1.6 to 2.1	12 to 15
Detonation sensor	2.5 to 3.5	18 to 25
PCV valve	3.0 to 4.0	22 to 29
Distributor bolt	0.5 to 0.63	3.6 to 4.6
Alternator adjusting bar bolt	1.4 to 1.7	10 to 12
Air regulator	0.5 to 0.63	3.6 to 4.6
Rocker cover	0.1 to 0.3	0.7 to 2.2
Tensioner nut	4.4 to 5.9	32 to 43
Belt cover	0.3 to 0.5	2.2 to 3.6
Rocker shaft	1.8 to 2.2	13 to 16
Camshaft pulley	8.0 to 9.0	58 to 65
Camshaft plate	8.0 to 9.0	58 to 65
Water pump	1.6 to 2.1	12 to 15
Drain plug	3.0 to 4.0	22 to 29
Flywheel	10 to 11	72 to 80
Water drain connector	3.5 to 4.5	25 to 33
Water drain plug	2.2 to 2.8	16 to 20
Spark plug	2.0 to 3.0	14 to 22



The blackened terminal shown on the distributor cap indicates the Number One spark plug wire position

Cylinder location and distributor rotation



1.1a Exploded view of the VG30ET (turbo) engine

Torque specifications**Turbo related parts (1984 thru 1987)**

	Kg-m	Ft-lbs
oil feed tube	1.5 to 2.0	11 to 14
oil return tube	1.0 to 1.2	7 to 9
water inlet and outlet tubes	3.2 to 4.2	23 to 30
turbocharger unit	4.5 to 5.5	33 to 40

Turbo related parts (1988 on)

oil feed tube	1.6 to 2.4	12 to 17
oil return tube	1.3 to 1.6	9 to 12
water inlet and outlet tubes	2.0 to 3.2	14 to 23
exhaust outlet	2.2 to 3.0	16 to 22
turbocharger unit	2.2 to 3.0	16 to 22

Cylinder head – tighten in five stages

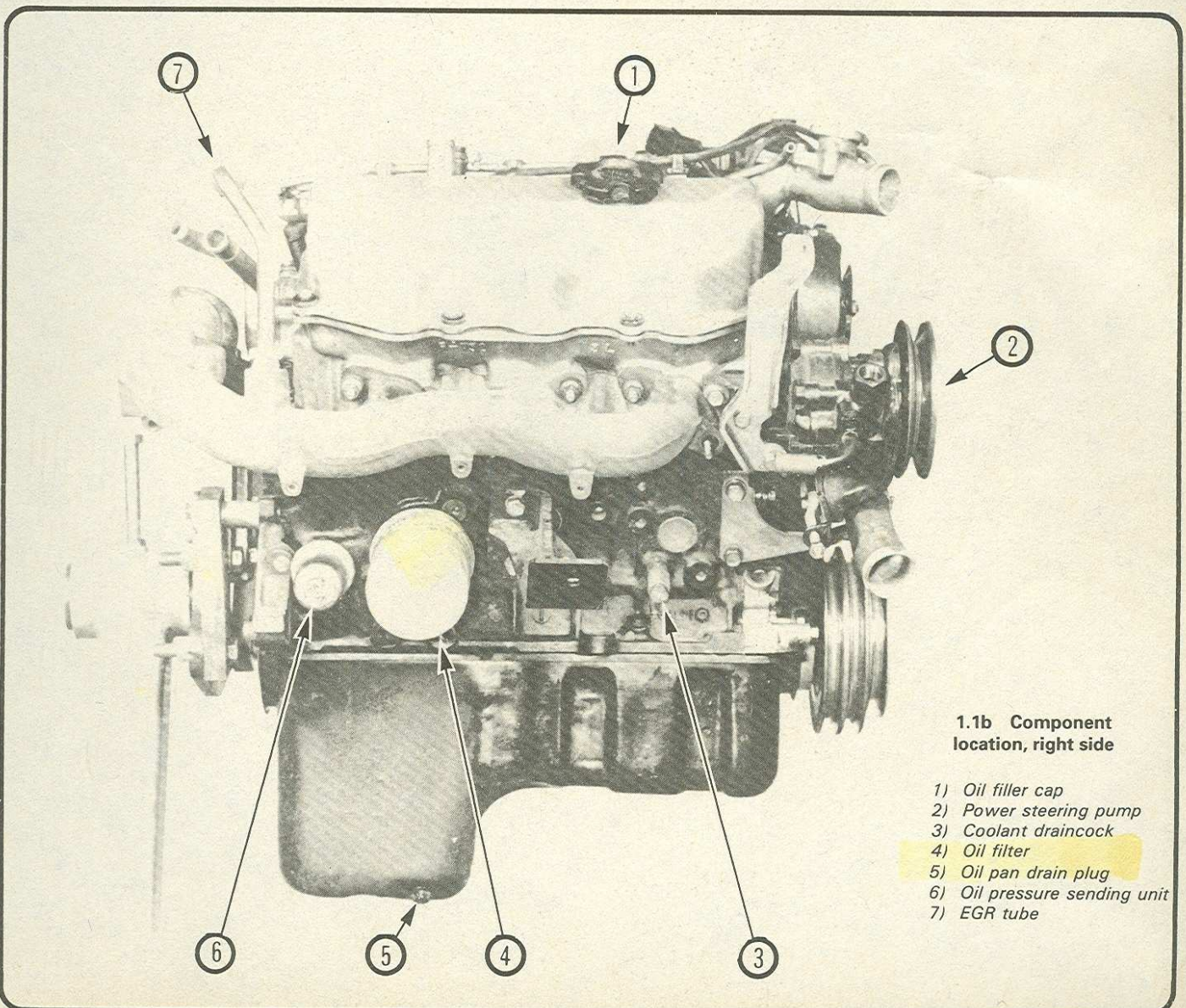
1st stage	3.0	22
2nd stage	6.0	43
3rd stage	Loosen all bolts	
4th stage	3.0	22
5th stage	5.5 to 6.5	40 to 47

Intake manifold bolt – tighten in two stages

1st stage	0.3 to 0.5	2.2 to 3.6
2nd stage	1.6 to 2.0	12 to 14

Intake manifold nut – tighten in two stages

1st stage	0.3 to 0.5	2.2 to 3.6
2nd stage	2.35 to 2.76	17 to 20



1 General information

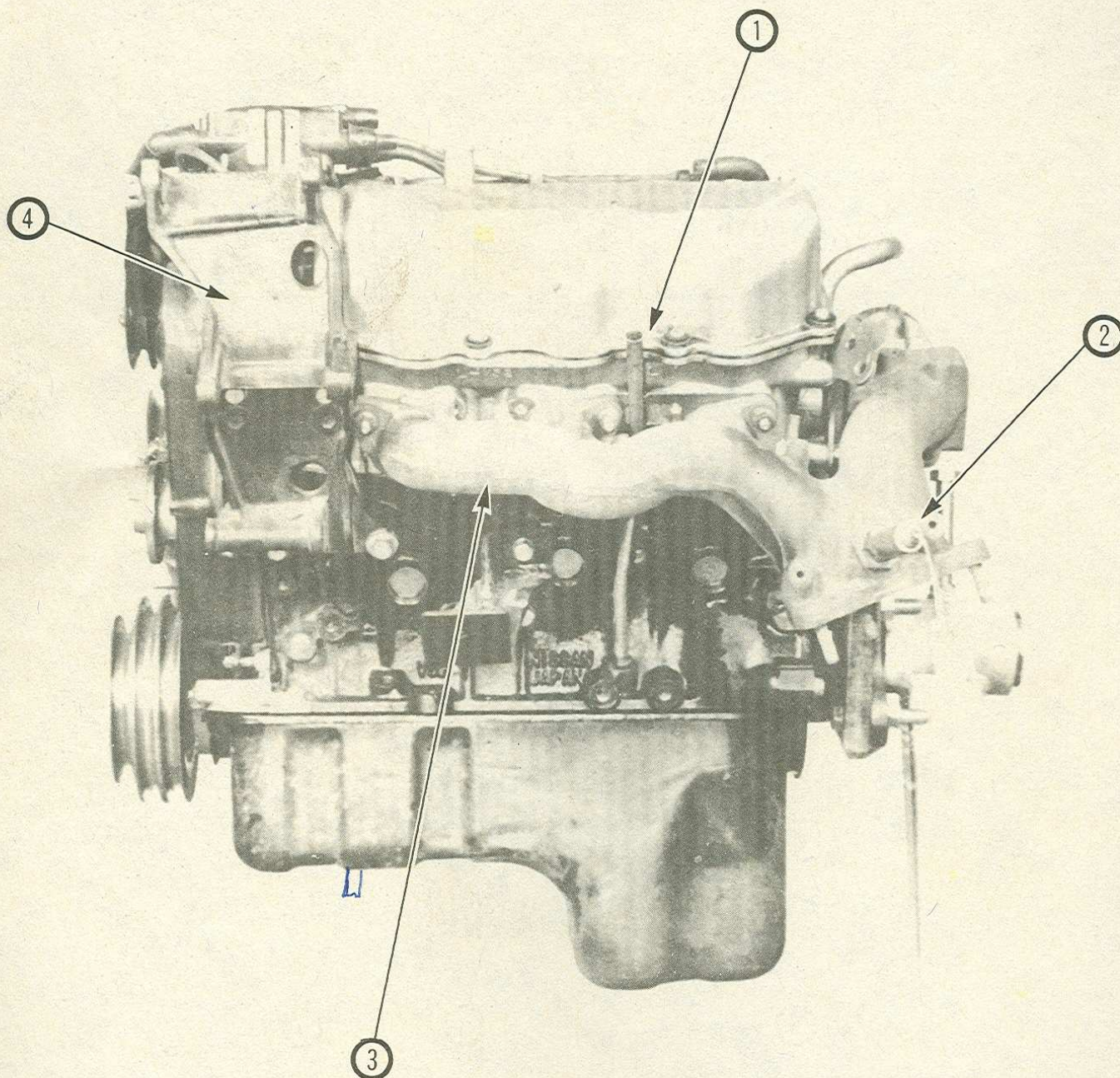
Refer to illustrations 1.1a, 1.1b, 1.1c and 1.1d

Your Nissan 300ZX is powered by a fuel injected SOHC V6 engine with a bore and stroke of 87 X 83 mm (3.43 X 3.27 inches). The 2960cc (181 cu in) engine is available in two versions: a 160 horsepower normally aspirated model (VG30E) or an optional 200 hp turbocharged version (VG30ET). Aside from a knock sensor circuit to

ward off detonation and a lower compression ratio for the turbo version, the engines are virtually identical.

The 60-degree V6 has a cast iron block and aluminum crossflow heads with a camshaft in each head. The block has thin walled sections for light weight. A "cradle frame" main bearing casting — the main bearing caps are cast as a unit, with a bridge, or truss, connecting them — supports the cast ductile iron crankshaft.

Both camshafts are driven off the front of the crankshaft by a cog



1.1c Component location, left side

- | | |
|-----------------------|--|
| 1) Oil dipstick tube | 4) Air conditioning compressor bracket |
| 2) Exhaust gas sensor | |
| 3) Exhaust manifold | |

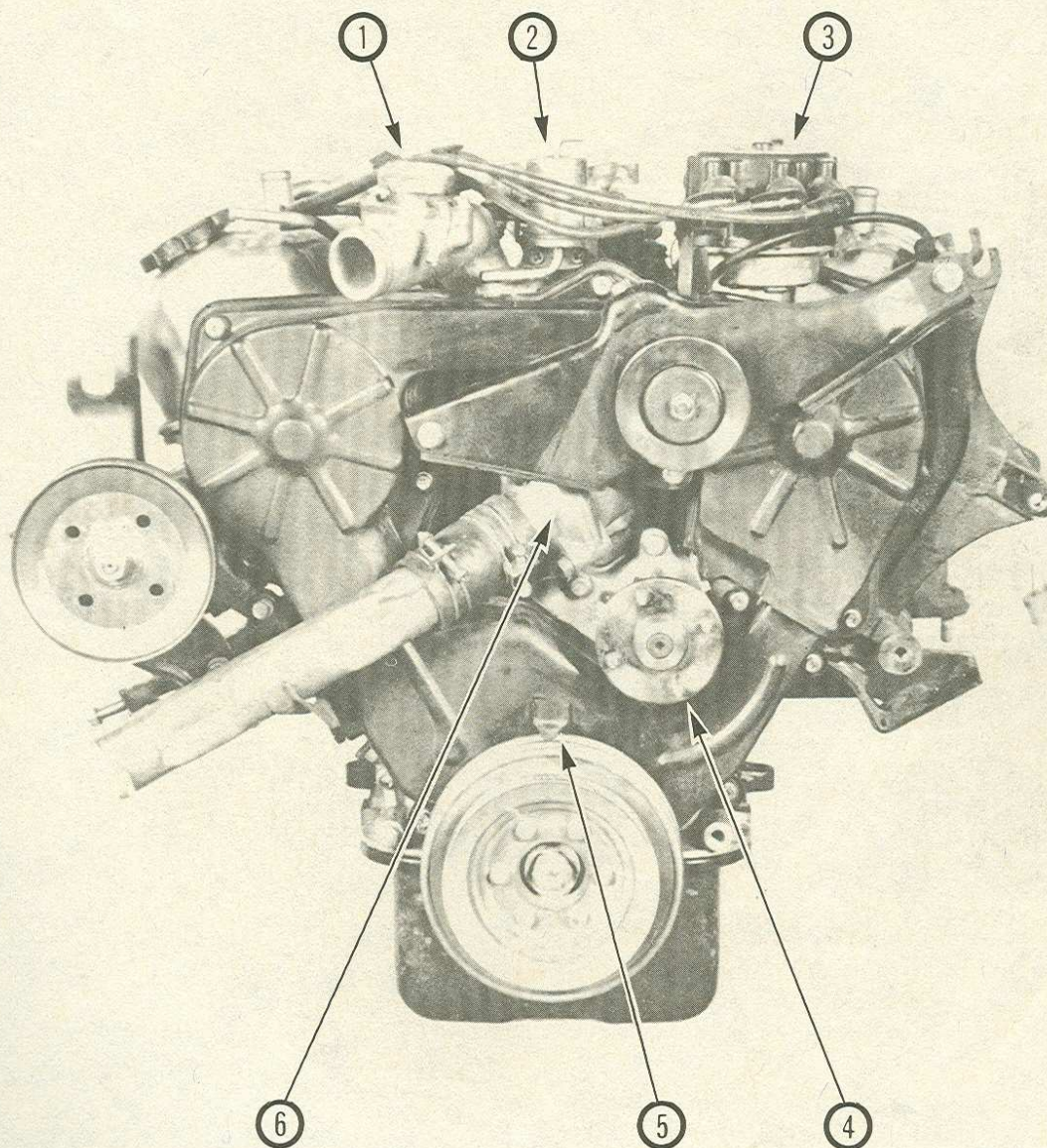
belt. A spring loaded tensioner, adjusted by an eccentric type locknut, maintains belt tension. Each camshaft actuates two valves per cylinder through hydraulic tappets and shaft-mounted forged aluminum rockers.

Each cast aluminum three-ring piston has two compression rings and a three-piece oil control ring. The piston pins are pressed into forged steel connecting rods. The normally aspirated engine's flat topped pistons deliver a 9.0:1 compression ratio; the turbo's dished pistons produce 7.8:1.

The distributor, which is mounted on the front of the left cylinder head, is driven by a helical gear on the front of the left camshaft. The

water pump, which is bolted to the front of the block, is driven by the crankshaft by a drivebelt and pulley. The gear type oil pump is mounted on the front of the crankshaft.

From the oil pump, lubrication travels through the oil filter to the main oil gallery, from which it is routed either directly to the main bearings, crankshaft, connecting rod bearings and piston and cylinder walls or to the cylinder head. Turbocharged engines have an additional circuit for lubricating the turbo bearings. Turbo models equipped with automatic transmissions route the oil through an oil cooler situated between the oil filter and the main oil gallery.



1.1d Component location, front

- | | |
|----------------------------|--------------------------|
| 1) Coolant filler cap | 4) Water pump |
| 2) Fuel pressure regulator | 5) Timing mark indicator |
| 3) Distributor cap | 6) Thermostat housing |

2 Repair operations possible with engine in vehicle

The following engine repair operations can be performed with the engine installed in the vehicle:

- Removal of the intake collector
- Removal of the rocker arm cover
- Removal of the rocker arm components
- Removal of the lifters
- Removal of the intake manifold
- Removal of the exhaust manifolds
- Removal of the vibration damper
- Removal of the engine front oil seals
- Removal of the timing belt
- Removal of the cylinder heads
- Removal of the rear main oil seal
- Removal of the engine mounts

Whenever engine work is required, there are some basic steps which the home mechanic should perform before any work is begun. The following preliminary steps will help prevent delays during the operation:

- a) Read through the appropriate Sections in this manual to get an understanding of the procedures involved, the tools that are necessary and the replacement parts which will be needed.
- b) Contact your local dealer or auto parts store to check on the availability and cost of replacement parts. You will often have to decide whether to overhaul, or simply remove and replace, a faulty part. It is generally a good policy to know where to get new or rebuilt components before you start.
- c) If it is necessary to disassemble the A/C system in order to perform one of the procedures outlined in this Chapter, it is essential that a qualified specialist depressurize the system. **Warning:** Never disconnect an air conditioning system hose while it is still pressurized. Performed improperly, depressurization can cause serious personal injury and damage to the air conditioning system.

3 Top Dead Center (TDC) positioning

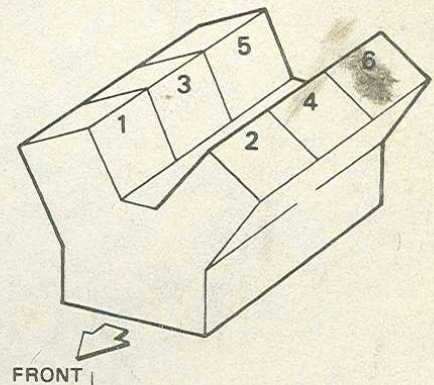
Refer to illustrations 3.3a and 3.3b

1 Top Dead Center (TDC) refers to the uppermost position of a piston in its travel up and down the cylinder on the firing stroke. Positioning the piston at TDC is an essential part of many procedures, such as ignition timing, valve timing and the removal and installation of the distributor and oil pump.

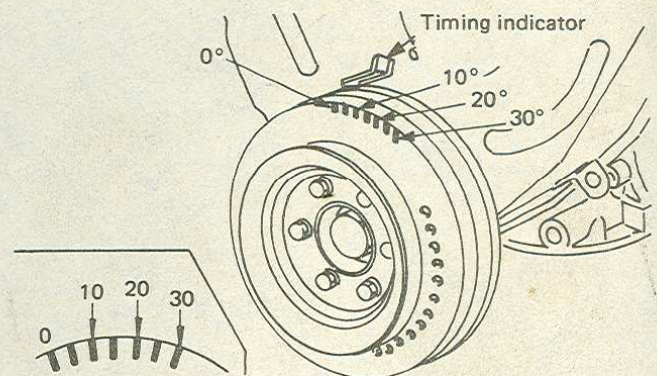
2 In order to bring a piston to its TDC position, the crankshaft must be rotated. Below, you will find several ways to do this. **Warning:** Before you use any of these methods, put the transmission in the Neutral position and unplug the ignition coil wire from the distributor cap and ground it on the engine to prevent the ignition system from firing.

- a) The most accurate method is to turn the crankshaft by hand with a wrench on the crankshaft pulley bolt at the front of the engine. When you're facing the engine, crankshaft rotation is in a clockwise direction.
 - b) A remote self-starter switch hooked up to the starter motor is a quicker method. Once the piston is close to TDC, use a wrench to set it precisely.
 - c) If you have an assistant who can turn the ignition key in short bursts, you can get the piston close to TDC without a remote starter switch. Again, use a wrench to position the piston exactly at TDC.
- 3 Various methods can be used to determine that the piston is at the TDC position.
- a) To bring the number 1 or 6 piston (see illustration) to TDC, the simplest checking method is to align the timing marks on the crankshaft pulley with the stationary timing indicator on the front of the timing belt cover (see illustration). When the "0" notch in the pulley aligns with the pointer on the timing plate, both the number 1 and 6 are at TDC. To determine which one is on its compression stroke, refer to Step B below.
 - b) To verify that a piston is on its compression stroke, number each spark plug wire, then remove all the spark plugs from the engine. Locate the number 1 cylinder spark plug wire and

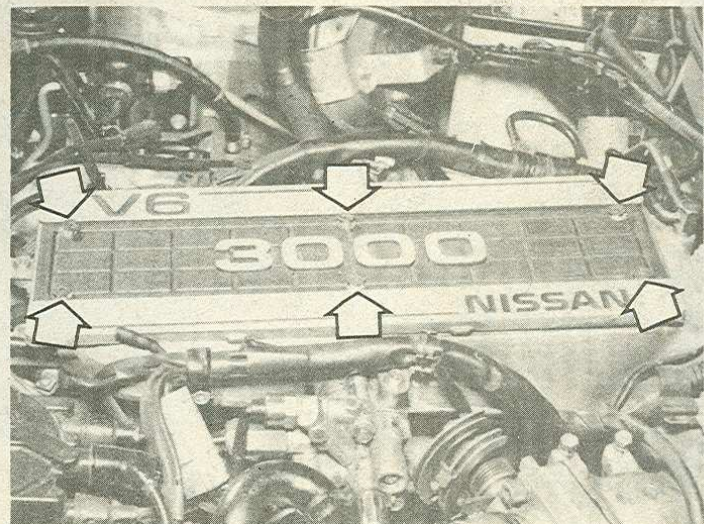
trace it back to the distributor. Write a number 1 on the distributor body directly below the terminal where the number one spark plug wire attaches to the distributor cap. Repeat this procedure for each of the remaining five cylinders — using numbers 2, 3, 4, etc. — and remove the distributor cap. Each time you establish TDC for a piston, look at the numbers you have written on the distributor body. For example, if you are trying to verify that the number 1 or 6 piston is at TDC when the 0 notch on the crank pulley is aligned with the pointer on the timing belt cover, the distributor rotor should be pointing directly at the number 1 you made on the distributor body. If it isn't, turn the crankshaft one more complete revolution (360°) in a clockwise direction. If the rotor is now pointing at the 1 on the distributor body, then the number 1 piston is at TDC on the compression stroke. This procedure applies to the other cylinders as well.



3.3a Cylinder numbering



3.3b Timing marks on the crankshaft pulley



4.3 Remove the six retaining screws on the intake manifold collector cover

4 Intake collector — removal and installation

Refer to illustrations 4.3, 4.4, 4.5, 4.7a, 4.7b, 4.9, 4.16, 4.19 and 4.20

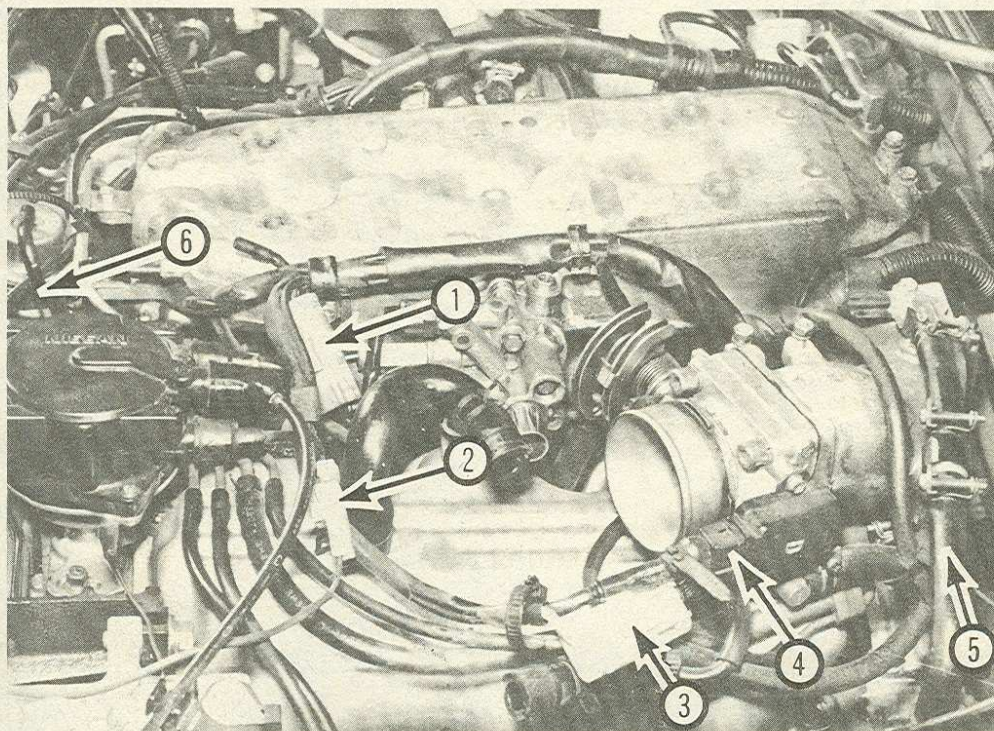
- 1 Release the fuel pressure (Chapter 1).
- 2 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally contact the negative terminal.

- 3 Remove the six attaching screws holding the intake collector cover to the collector (see illustration).

- 4 Disconnect the electrical connectors on the left side of the engine (see illustration).

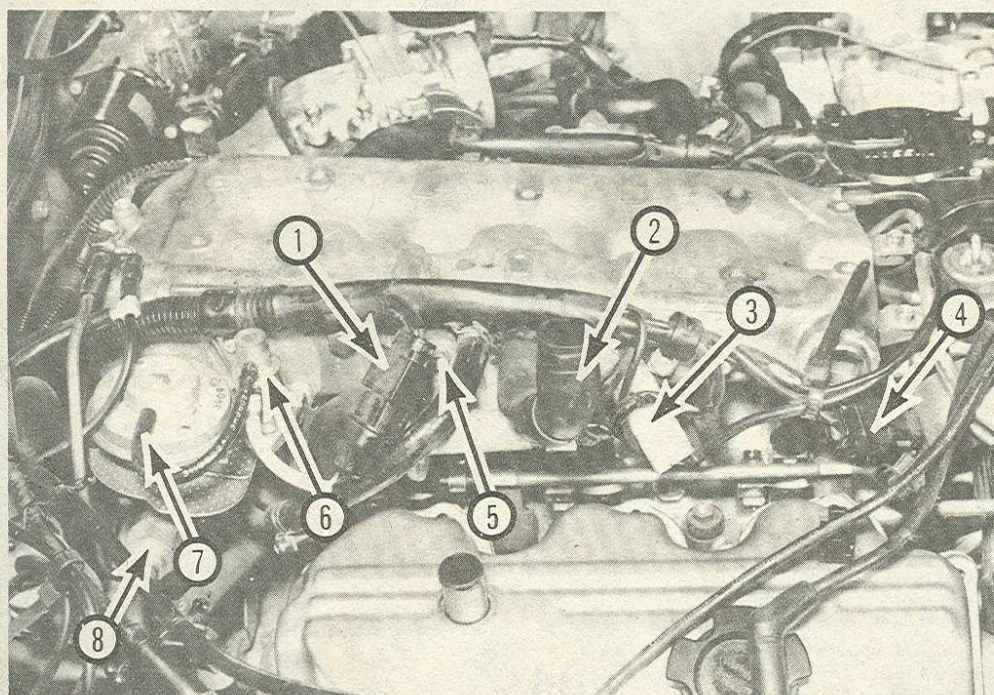
- 5 Disconnect the electrical connectors on the right side of the engine (see illustration).

- 6 Disconnect the idle-up solenoid valve connector.



4.4 Label each connector clearly to facilitate installation, then disconnect the components listed for the left side of the engine

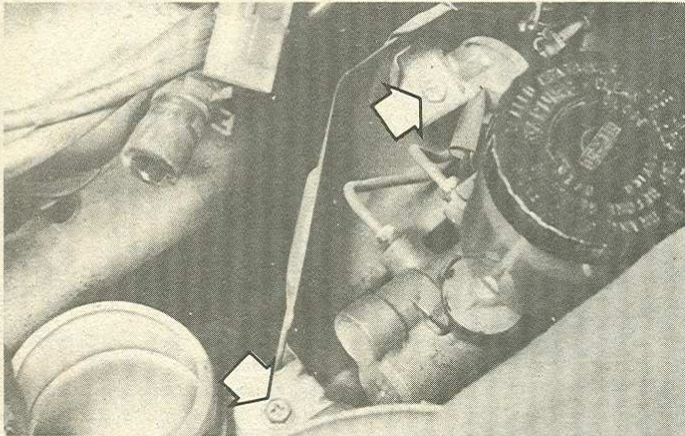
- 1) FICD/idle up
- 2) Air conditioner
- 3) Full throttle indicator
- 4) TVS switch
- 5) Power brake vacuum line
- 6) Fuel regulator



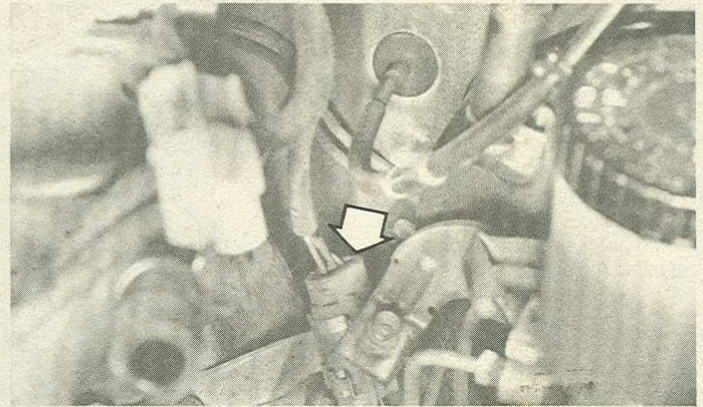
4.5 Label each connector clearly to facilitate installation, then disconnect the components listed for the right side of the engine

- 1) EGR solenoid
- 2) AIR regulator
- 3) Distributor TDC sensor
- 4) Cylinder head temperature sender
- 5) Air regulator
- 6) EGR solenoid
- 7) EGR valve
- 8) EGR tube

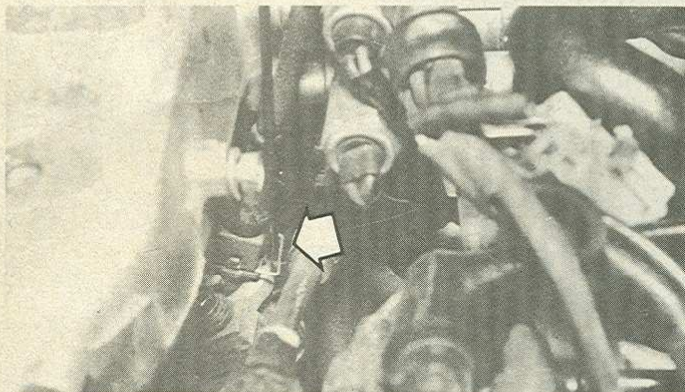
- 7 Remove the two heat shield retaining bolts (see illustration), then disconnect the exhaust gas sensor electrical connector (see illustration).
- 8 Remove the five wiring harness hold-downs — three on the left and two on the right — from the intake collector.
- 9 To remove the injector electrical connectors, insert a screwdriver behind the metal retaining clip, pry it away from the connector and pull the connector off the injector. Repeat this step for each injector (see illustration).



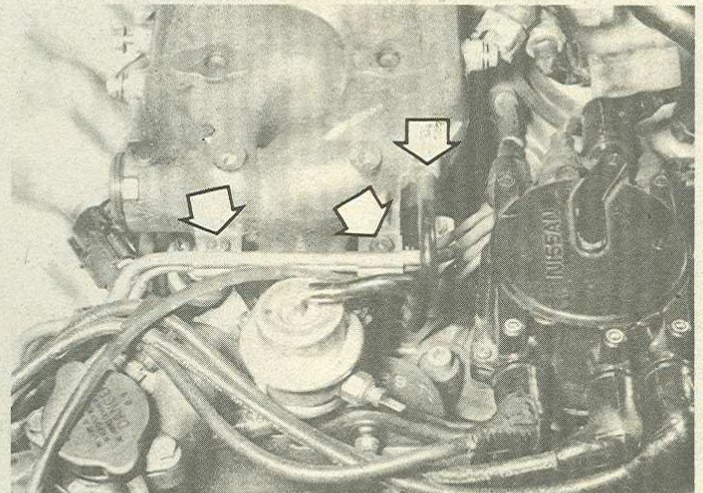
4.7a To gain access to the oxygen sensor, first remove the two heat shield retaining screws



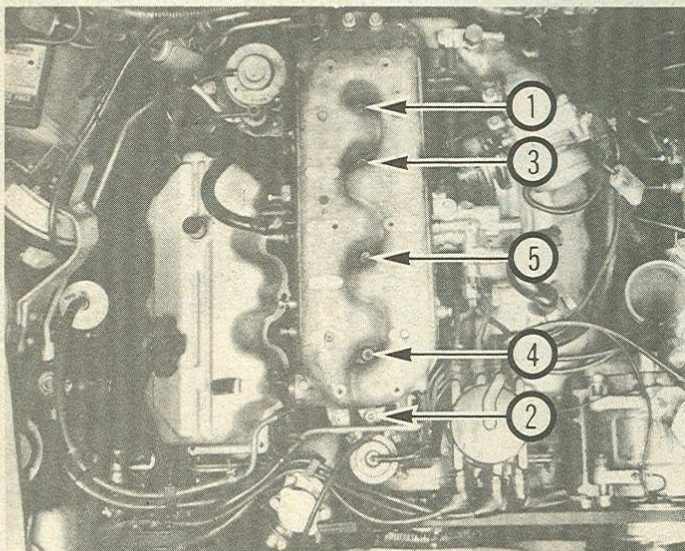
4.7b After the heat shield has been removed, unplug the oxygen sensor connector



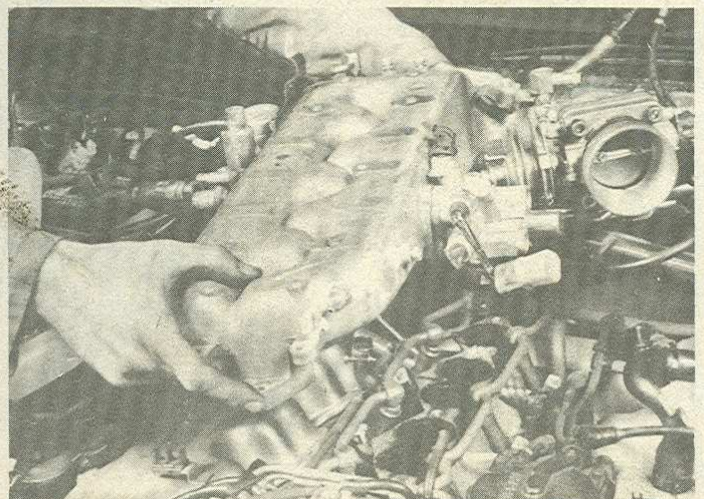
4.9 Disconnect the electrical plug from each fuel injector by inserting a screwdriver between the metal clip and the connector and prying it outward



4.16 Remove the vacuum line retaining screws and the vacuum hose connected to the front of the collector (arrows)



4.19 Remove and install the allen head bolts in the order shown



4.20 Carefully lift the collector and throttle chamber from the intake manifold

- 10 Disconnect the fuel pressure regulator electrical connector.
- 11 Disconnect the distributor TDC sensor electrical connector.
- 12 Disconnect the air regulator retaining bolts and remove the air regulator from the collector.
- 13 Disconnect the EGR tube from the EGR valve attached to the collector.
- 14 Disconnect the remaining hoses attached to the left side of the intake collector.

15 Disconnect the remaining hoses connected to the right side of the collector and the bolt attaching the EGR solenoid valve bracket to the collector.

16 At the front of the engine, remove the metal vacuum hose by removing the two retaining bolts attached to the intake collector. Disconnect the rubber vacuum hose attached to the front of the collector next to the metal hose bracket (see illustration).

17 Disconnect both vacuum lines and both fuel lines connected to the throttle chamber.

18 Disconnect the power brake vacuum line and the manifold vacuum line below it. Remove the air hose bracket attached to the intake collector.

19 Remove the five allen head attaching bolts that secure the collector to the intake manifold. **Note:** Loosen the bolts in the numerical order shown and tighten in reverse order of removal (see illustration).

20 Carefully lift the collector and throttle chamber as an assembly from the intake manifold (see illustration). Do not let anything fall into the intake ports.

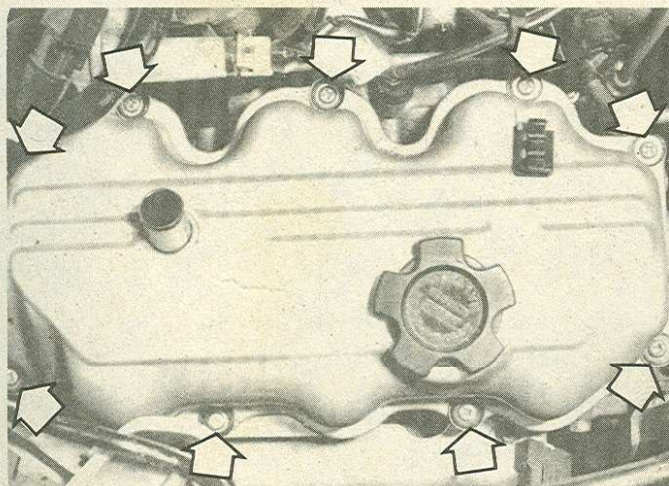
21 Cover the intake ports with a clean shop rag to prevent dirt or gasket particles from falling into the intake.

22 Remove all of the old gasket material from the intake and engine block mating surfaces with a gasket scraper.

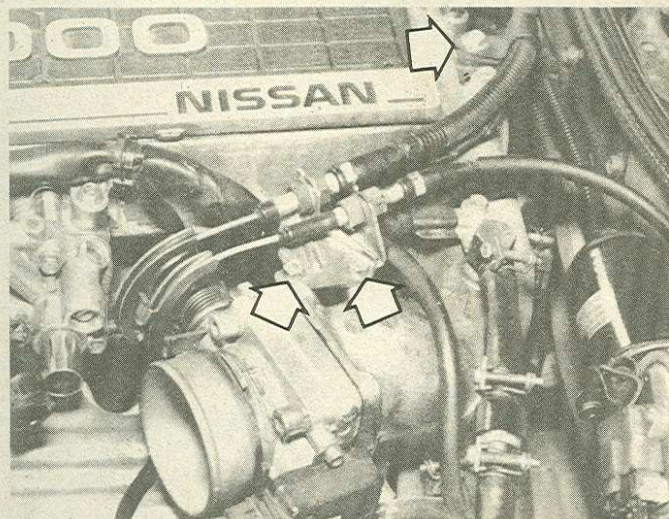
23 Lay a new gasket on the engine block, remove the shop rag and install the intake manifold.

24 Tighten the intake mounting bolts to the specified torque.

25 Installation of all fasteners and connectors is the reverse of removal.



5.5 After removing the plug wires and PCV hose, remove all nine retaining screws



5.8 Remove the throttle cable and cruise control cable hold-down bracket screws and the screw holding the cruise control cable to the intake collector (arrows)

5 Rocker arm cover — removal and installation

Refer to illustrations 5.5, 5.8, and 5.13

1 Relieve the fuel pressure (Chapter 1).

2 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally come in contact with the negative terminal of the battery.

Right side

3 Remove the PCV hose by sliding the hose clamp back and pulling the hose off the nipple on the rocker arm cover.

4 Remove the number 1, 3 and 5 spark plug wires from the spark plugs. Mark them clearly with either numbers or colored electrical tape to prevent confusion during installation.

5 Remove the nine rocker arm cover screws and washers (see illustration).

6 Lift off the rocker arm cover. **Caution:** If you find it necessary to pry the cover loose, do so with extreme care. A bent rocker arm cover will not seal properly.

Left side

7 Remove the throttle chamber air intake tube.

8 Remove both the throttle cable and cruise control cable hold-down bracket screws and the screw holding the cruise control cable to the intake collector (see illustration). Slide the cable ends out of the throttle actuator and set the cable assembly aside.

9 Remove the throttle chamber and intake collector assembly as a unit.

10 Cover the intake ports with a shop rag to prevent dirt from entering the engine.

11 Remove the two distributor cap retaining screws and lift off the distributor cap.

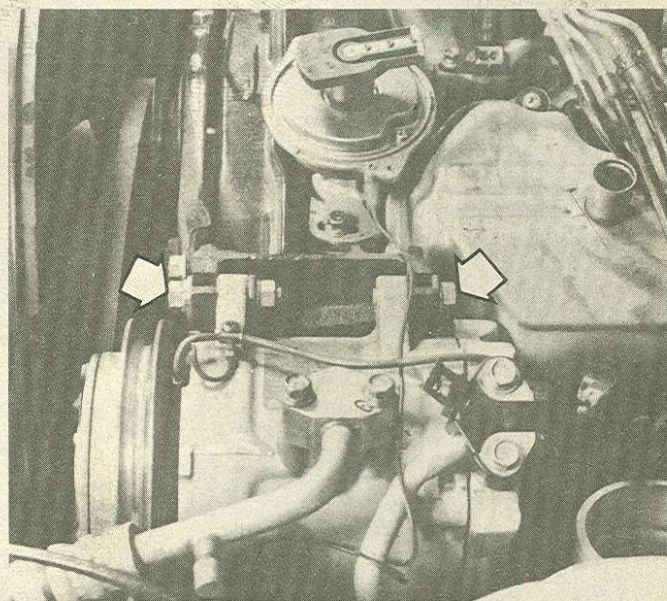
12 Remove the air conditioning compressor drivebelt (Chapter 1).

13 Remove the top two air conditioning compressor bolts (see illustration) and pivot the compressor back to gain access to the rocker arm cover screw.

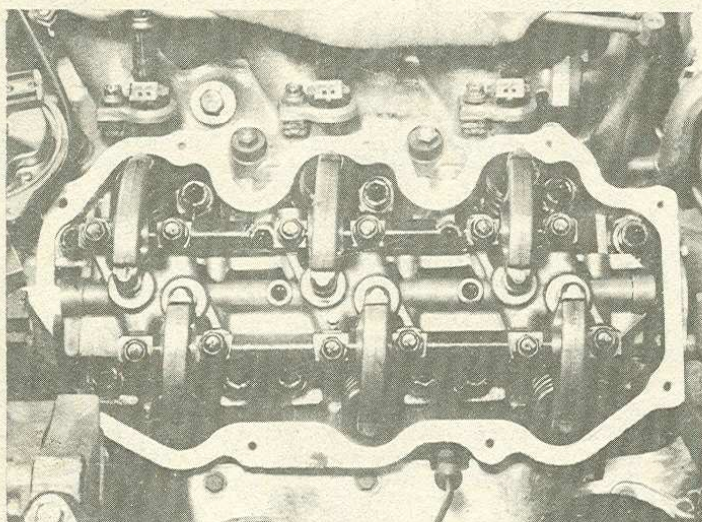
14 Remove the nine rocker arm cover screws and lift off the rocker arm cover.

16 It is not necessary to use sealant with rubber rocker arm cover gaskets. Place the gasket in the recessed groove in the rocker arm cover and install the cover onto the head.

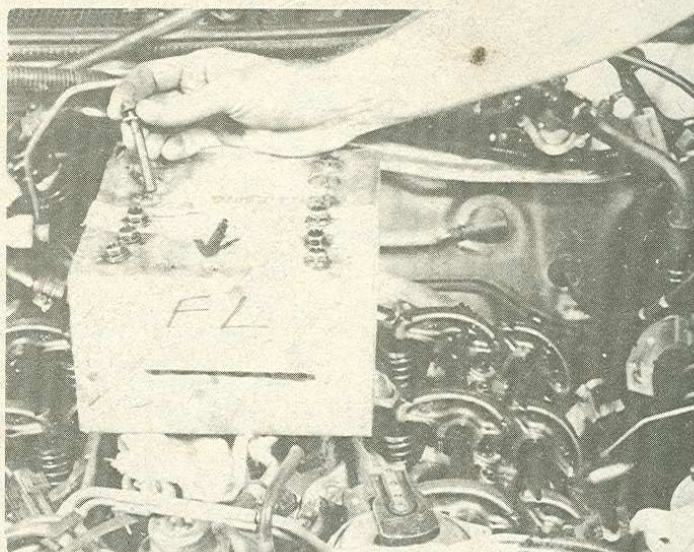
17 Installation of the covers, components, connectors and cables you disconnected or removed is the reverse of removal.



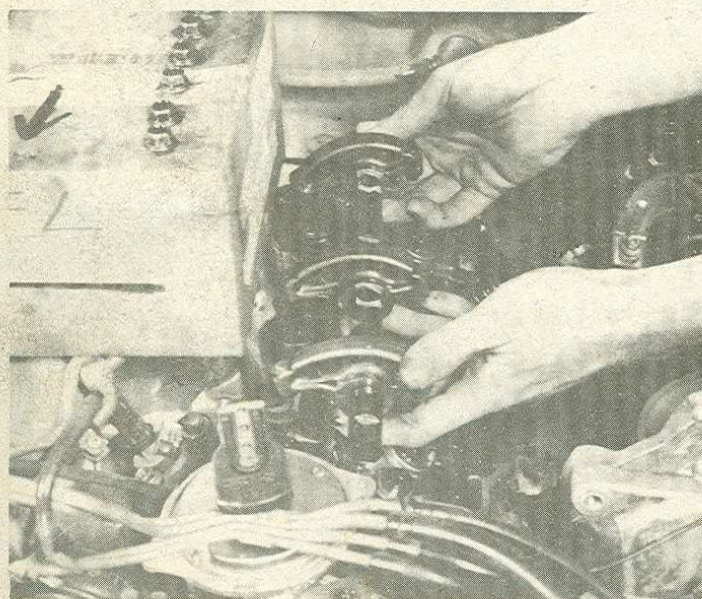
5.13 Remove the two upper air conditioning mounting bolts (arrows), then swing the compressor out of the way to gain access to the front rocker arm cover retaining screw



6.2 To remove the rocker arm assemblies, back off the retaining bolts in two or three stages to avoid bending a shaft



6.3 The rocker arm shaft retaining bolts, which are different lengths, must be installed in the same hole from which they were removed. A small box with holes in it will keep the bolts in order

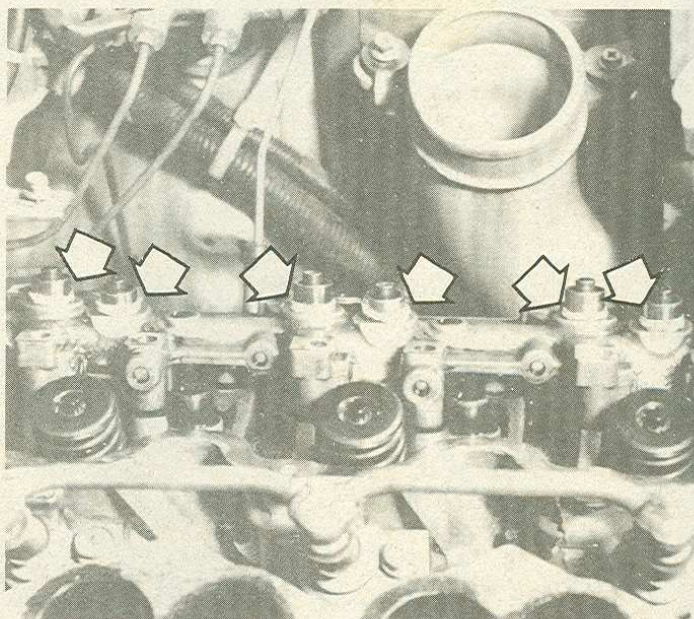


6.4 Lift off the rocker arm shaft and rocker arm assembly

6 Rocker arm components — removal and installation

Refer to illustrations 6.2, 6.3 and 6.4

- 1 Remove the rocker arm cover (Section 5).
- 2 Back off the rocker arm shaft retaining bolts (see illustration) in two or three stages, working your way from the ends toward the middle of the shafts (see illustration). **Caution:** Because some of the valves will be open when you back out the rocker arm shaft retaining bolts, the rocker arm shafts will be under a certain amount of valve spring pressure. Therefore, it is imperative that the bolts are loosened gradually. Loosening a bolt all at once near a rocker arm under spring pressure could bend a rocker arm shaft.
- 3 Remove the rocker arm shaft retaining bolts and set them aside. The bolts must be kept in the order in which they were removed so that they can be installed in their original location. A cardboard box with 12 holes punched in the top can be used to store the bolts in order. Be sure to label the front, left and right sides of the cardboard box (see illustration).
- 4 Lift off the rocker arm shaft and rocker assemblies one at a time and set them aside (see illustration). Lay them down on a nearby workbench in the same relation to one another that they have when



7.2 Wrap each lifter with a rubber band so the lifters cannot fall from the lifter guides

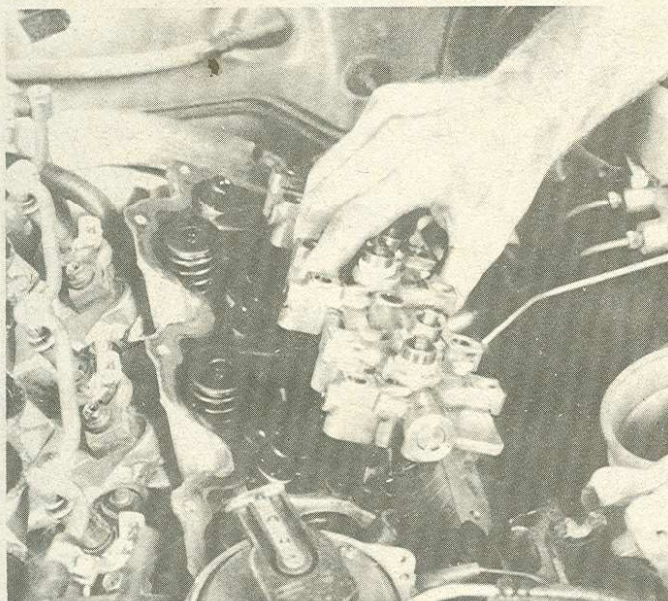
installed. They must be installed on the same cylinder head from which they were removed.

- 5 Installation is the reverse of the removal procedure. Tighten the rocker arm shaft retaining bolts to the specified torque in a gradual sequence similar to removal. Work from the ends of the shafts toward the middle.

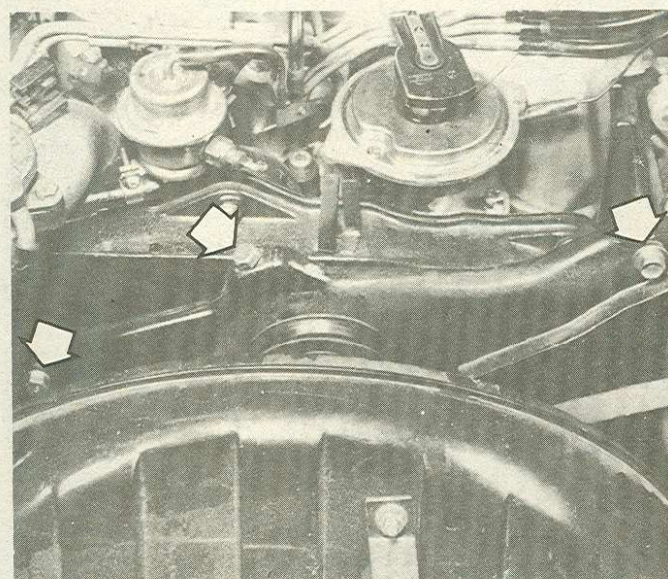
7 Lifters — removal and installation

Refer to illustrations 7.2, 7.3 and 7.5

- 1 Remove the rocker arm cover (Section 5) and the rocker arm shaft assemblies (Section 6).
- 2 Secure the lifters by raising them slightly and wrapping a rubber band around each one to prevent them from falling out of their respective guides (see illustration). **Note:** If a lifter should fall out of the guide, immediately restore it to its original guide position.

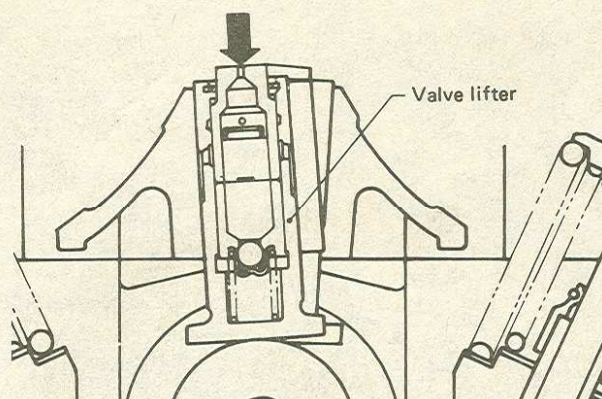


7.3 With the lifters retained by rubber bands, the lifter guide assembly can be removed

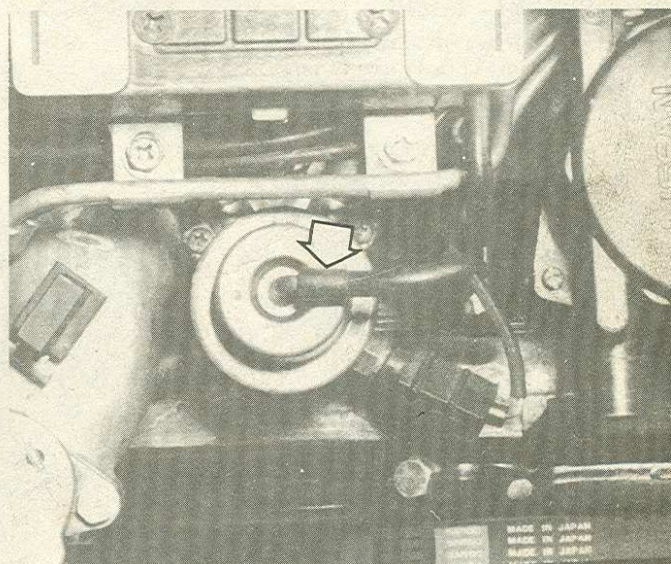


8.9 Remove the air conditioner idler pulley by removing three bolts

- 3 Remove the hydraulic lifter guide assembly (see illustration).
- 4 Remove the lifters one at a time from their bores. Keep them in order. Each lifter must be reinstalled in its original bore. **Caution:** Try to avoid turning lifters upside down. If you turn a lifter upside down, air can become trapped inside and the lifter will have to be bled.
- 5 With the lifter in its bore, push down on the lifter (see illustration). If it moves more than 1mm (0.04 in), air may be trapped inside the lifter.
- 6 If you think air is trapped inside a valve lifter, re-install the rocker arm and rocker arm cover.
- 7 Bleed air from the lifter by running the engine at 1,000 rpm under no load for about 10 minutes.
- 8 Remove the rocker arm cover and rocker arm again. Repeat the procedure in Step 5 once more. If there is still air in the lifter, replace it.
- 9 While the lifters are removed inspect them for wear. Refer to Chapter 2B for inspection procedures.
- 10 Upon completion of lifter inspection, place the lifters in their respective bores, install the rocker arm shaft assemblies (Section 6) and the rocker arm covers (Section 5).



7.5 Depress the valve lifter plunger with your finger to see if it moves

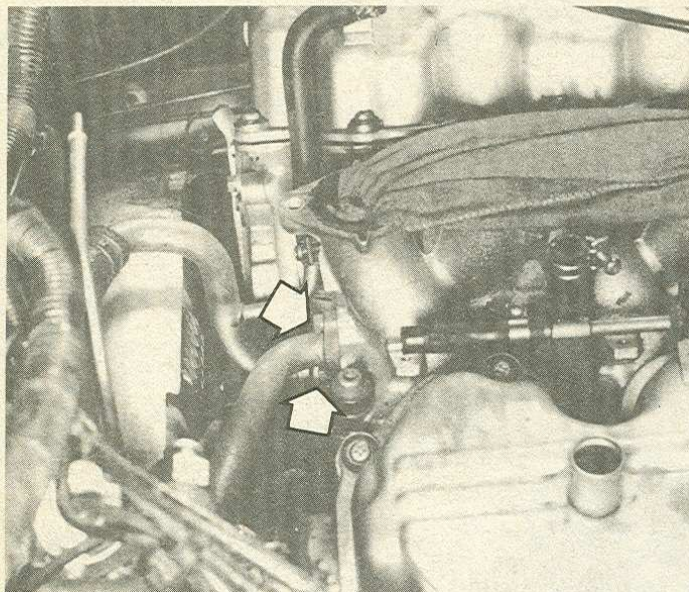


8.13 Disconnect the vacuum hose on top of the fuel pressure regulator

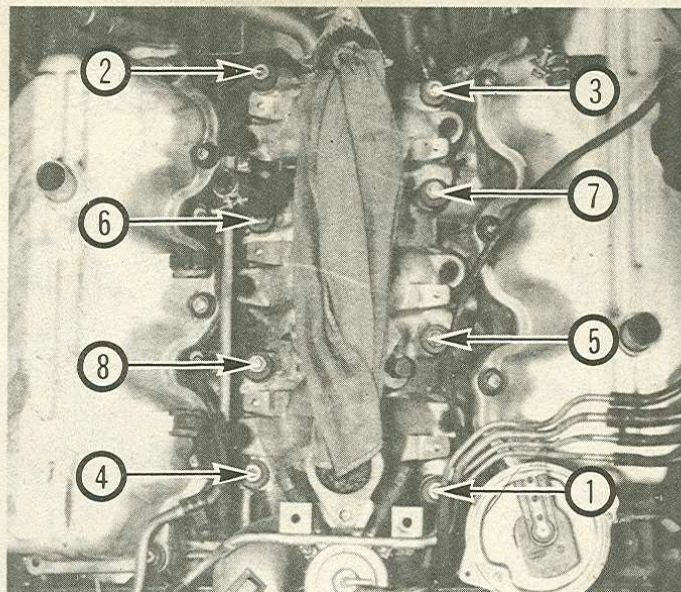
8 Intake manifold — removal and installation

Refer to illustrations 8.9, 8.10, 8.13, 8.15, 8.16 and 8.17

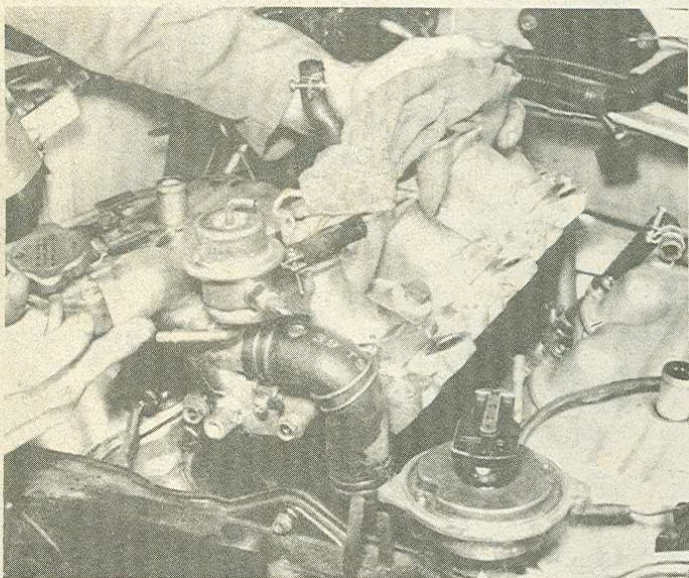
- 1 Release the fuel pressure (Chapter 1).
- 2 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally contact the negative terminal.
- 3 Drain the cooling system (Chapter 1).
- 4 Remove the throttle chamber intake air pipe.
- 5 Remove the intake collector with the throttle chamber attached (Section 4).
- 6 Remove the spark plug wires and distributor cap. Be sure to mark the spark plug wires for proper re-installation.
- 7 Remove the injector assembly (Chapter 4).
- 8 Remove the air conditioning compressor drivebelt (Chapter 1).
- 9 Remove the bolts securing the air conditioning idler pulley bracket (see illustration) and remove the bracket.
- 10 Loosen the bypass hose clamp and pry the hose from the thermostat housing.
- 11 Remove the bolt securing the timing belt cover to the thermostat housing.
- 12 Remove the upper radiator hose from the inlet pipe.
- 13 Disconnect the vacuum hose on top of the fuel pressure regulator (see illustration).
- 14 Loosen the screw securing the fuel return hose to the fuel regulator and pry off the hose.



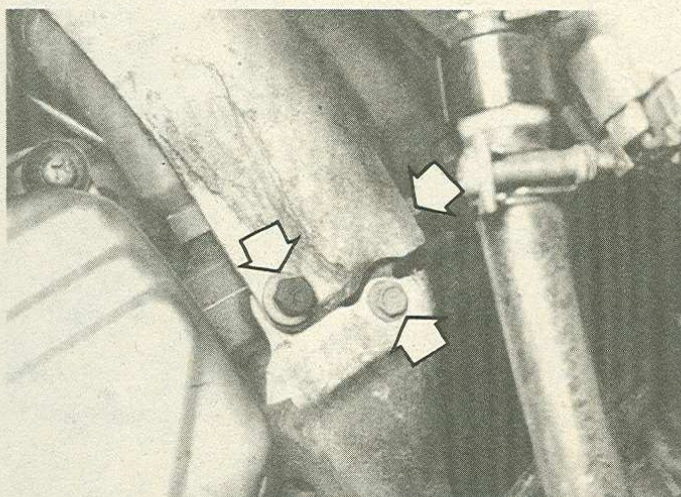
8.15 Disconnect the bolts (arrows) securing the metal heater hose flange to the back of the intake manifold



8.16 Remove the eight intake manifold hold-down bolts in the proper sequence



8.17 Lift straight up on the intake manifold to remove it



9.6 Remove the retaining bolts (arrows) attaching the heat shield to the crossover pipe

15 Disconnect the metal heater hose flange from the back of the manifold (see illustration).

16 Loosen the eight intake manifold securing bolts in numerical order (see illustration).

17 Lift straight up on the intake manifold (see illustration).

18 Clean all the old gasket material and sealant from the mounting surfaces with a gasket scraper. Don't scratch the mounting surfaces.

19 Install a new intake gasket. No sealant is necessary.

20 Installation of the intake manifold is the reverse of removal.

9 Exhaust manifold — removal and installation

Refer to illustrations 9.6, 9.8, 9.9, 9.11, 9.13, 9.17a and 9.17b

1 Relieve the fuel pressure (Chapter 1).

2 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally contact the negative terminal.

3 Remove the intake collector and throttle chamber assembly (Section 4).

4 Cover the intake ports with a shop rag to prevent anything from falling into the engine.

5 Raise the vehicle and support it securely on jackstands.

6 Remove the bolts securing the crossover heat shield to the crossover pipe (see illustration).

7 Remove the crossover connecting pipe bolts from the left side of the vehicle.

8 Remove the two upper crossover pipe bolts from the right side of the vehicle (see illustration).

9 From underneath the vehicle, remove the lower bolt from the right side of the crossover connecting pipe (see illustration).

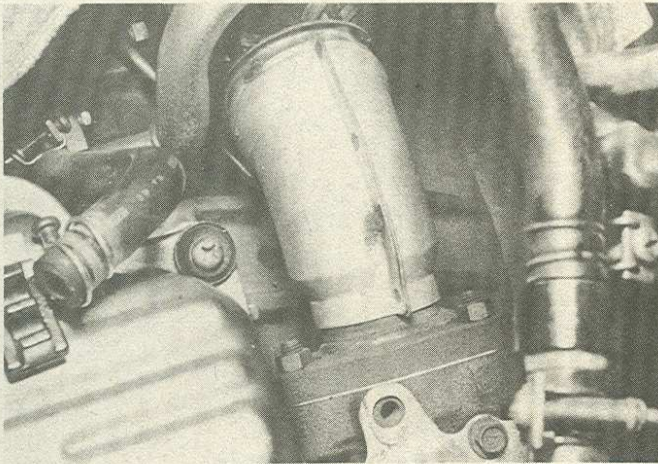
Right side

10 From the right side of the vehicle, remove the heat shield bolts securing the two heat shield halves to the right exhaust manifold.

11 Remove the exhaust manifold retaining bolts in numerical order (see illustration).

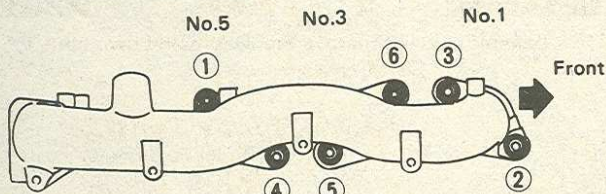
12 If your vehicle is equipped with cruise control, disconnect both cruise control bracket bolts and place the cruise control unit to one side to allow removal of the exhaust manifold.

13 Remove the exhaust manifold by lifting up on the rear of the manifold, then lift the manifold out of the engine compartment (see illustration).

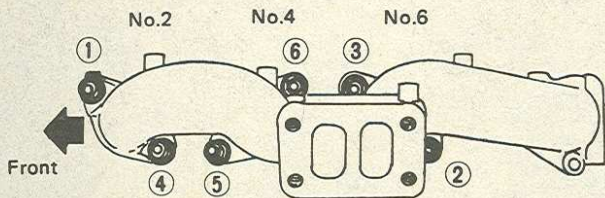


9.8 Remove the crossover pipe

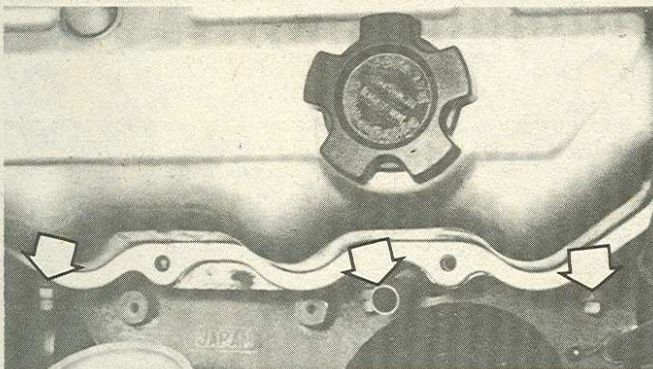
R.H. EXHAUST MANIFOLD



L.H. EXHAUST MANIFOLD



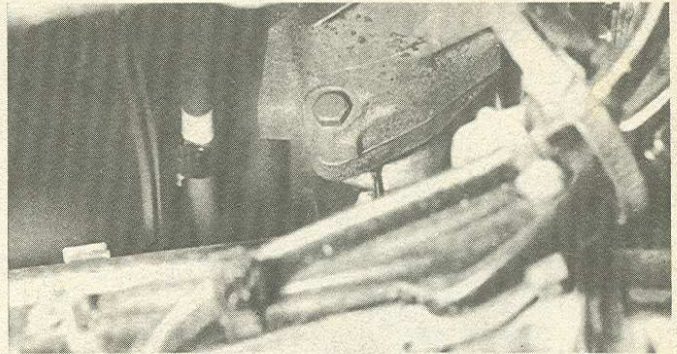
9.11 Loosen the exhaust manifold retaining bolts in the sequence shown



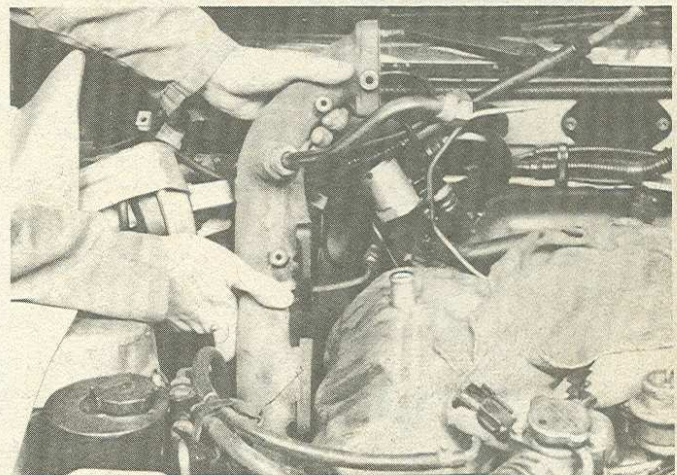
9.17a Remove the three upper bolts securing the manifold to the block

Left side

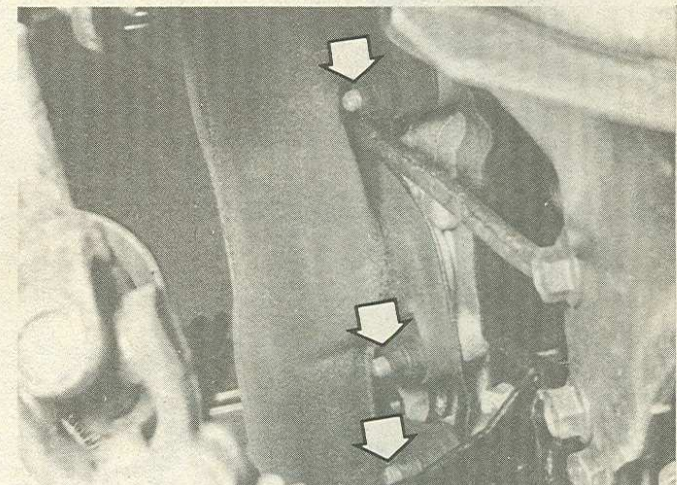
- 14 **Note:** On turbo equipped models it will be necessary to remove the head and exhaust manifold as an assembly (Section 13).
 15 Remove the heat shield bolts securing the heat shield to the left exhaust manifold.
 16 Remove the bolts securing the exhaust manifold to the exhaust pipe.



9.9 Remove the crossover connecting bolts from the left and right manifolds underneath



9.13 Raise the rear of the exhaust manifold and lift it out of the engine compartment



9.17b Remove the three lower bolts securing the manifold to the block

- 17 Working from above — and underneath, when necessary — remove the exhaust manifold bolts, three on top and three on bottom (see illustrations) in the proper sequence (refer to illustration 9.11). **Note:** If you are only replacing the left side exhaust manifold gasket on normally aspirated models, removal of the manifold is not necessary. If you are removing the manifold prior to some other service procedure, remove the top two air compressor retaining bolts and the intake air tube to allow the manifold to be lifted from the engine compartment.

Installation

18 Prior to installation of either manifold, clean all gasket mating surfaces.

19 Install a new gasket onto the studs retaining the manifold to the head. No sealant is necessary.

20 Install the manifold and tighten the nuts in the proper sequence (see illustration) to the specified torque.

21 Installation of the remaining components is the reverse of removal.

10 Vibration damper — removal and installation

Refer to illustrations 10.4 and 10.6

1 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally contact the negative terminal.

2 Remove the fan shroud and fan assembly (Chapter 3).

3 Remove the drivebelts (Chapter 1).

4 Remove the pulley retaining bolts and remove the pulleys. **Caution:** Before removing the pulleys, mark their location in relation to the vibration damper with paint in order to retain proper timing marks during installation (see illustration).

5 Remove the starter bolts and push the starter away from the flywheel gear. Wedge a pry bar between the flywheel/driveplate teeth to prevent the crankshaft from turning while loosening the damper bolt.

6 Loosely install the damper retaining bolt to provide the gear puller with something to push against. Then install a suitable puller onto the damper and pull the damper from the end of the crankshaft (see illustration).

7 To install the damper, position the damper on the nose of the crankshaft, align the keyway and install the retaining bolt.

8 The remaining installation steps are the reverse of the removal procedure.

11 Timing belt — removal, installation and adjustment

Removal and installation

Refer to illustrations 11.13, 11.15, 11.16, 11.20a and 11.20b

1 Relieve the fuel pressure (Chapter 1).

2 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally contact the negative terminal.

3 Drain the cooling system (Chapter 1).

4 Set the number 1 cylinder at TDC on its compression stroke (Section 3).

5 Remove the intake collector (Section 4).

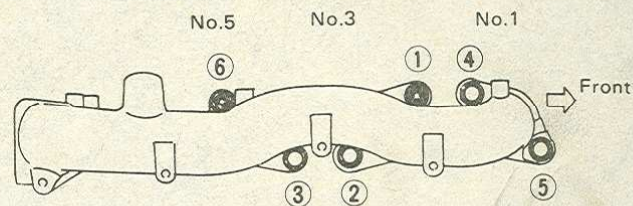
6 Remove the rocker arm covers (Section 5).

7 Loosen the rocker arm shaft retaining bolts (Section 6).

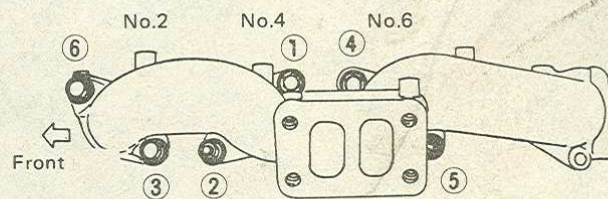
8 Remove all of the drivebelts (Chapter 1).

9 Remove the fan and fan shroud (Chapter 3).

R.H. exhaust manifold



L.H. exhaust manifold



9.20 Tighten the exhaust manifold bolts in the sequence shown

10 Remove the air conditioning compressor idler pulley, if equipped (Chapter 3).

11 Remove the vibration damper (Section 10). **Note:** Do not allow the crankshaft to rotate during removal of the damper. If the crankshaft moves, the number one piston will no longer be at TDC.

12 Disconnect the lower radiator hose from the metal connection pipe and loosen the hose clamp at the other end of the metal connection pipe.

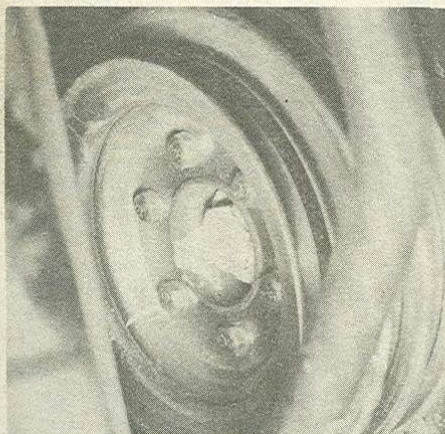
13 Remove the two bolts which attach the metal connection pipe to the engine block and remove the metal connection pipe (see illustration).

14 Remove the bolts securing the upper section and the lower part of the timing cover.

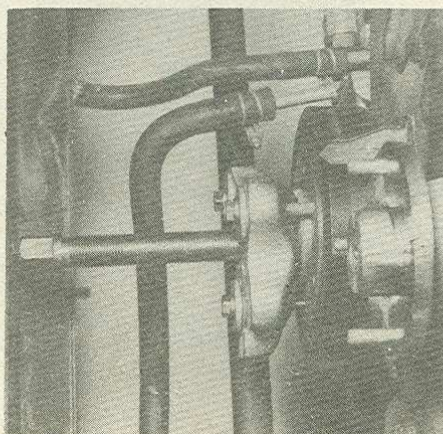
15 Confirm that the number 1 piston is still at TDC on its compression stroke by verifying that the timing marks on all three timing belt pulleys are aligned with their respective stationary alignment marks (see illustration). The stationary marks for the two camshaft pulleys are notches on the rear timing belt cover. The stationary mark for the crankshaft pulley is a notch in the oil pump housing. If the marks don't line up, install the crankshaft damper retaining bolt in the crankshaft and use a wrench to turn the engine over until the all timing marks are realigned. Remove the crankshaft bolt.

16 Relieve tension on the timing belt by loosening the bolt in the middle of the timing belt tensioner (see illustration).

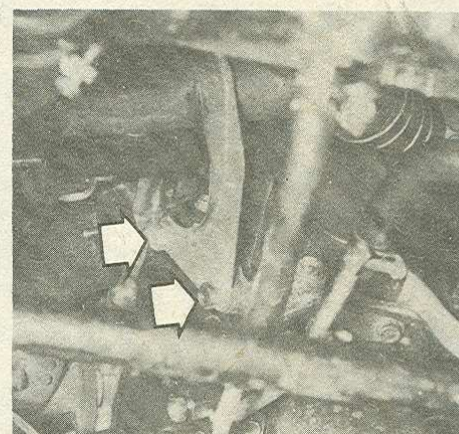
17 Remove the timing belt from the timing gears by sliding it forward.



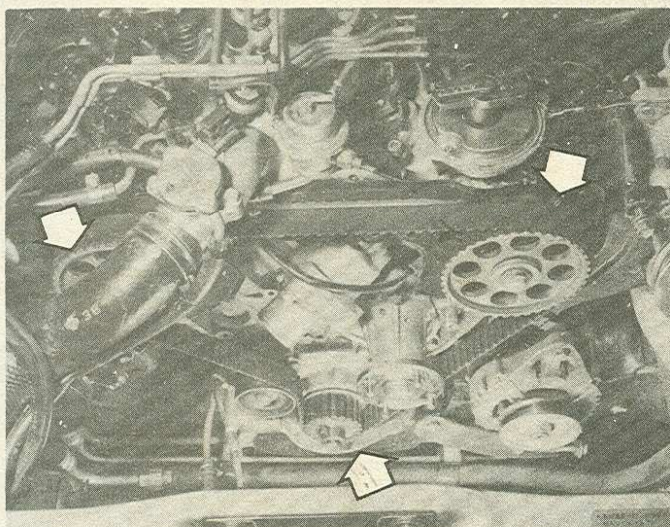
10.4 Remove the pulleys by removing the six retaining bolts, but mark the pulley relationship to the crankshaft vibration damper first to keep the timing marks in their correct alignment



10.6 Install the puller and remove the vibration damper from the end of the crankshaft



11.13 Remove the two bolts (arrows) retaining the metal coolant connection pipe to the engine block and remove the pipe



11.15 Once the timing belt cover is off, check all three timing marks for alignment and realign them if necessary

Note: If the belt is cracked, worn or contaminated with oil or coolant, replace it with a new one.

18 Prepare to install the timing belt by turning the tensioner clockwise with an Allen wrench and temporarily tightening the locking nut.

19 Install the timing belt with the directional arrow pointing forward.

20 Align the factory white lines on the timing belt with the punch mark on each of the camshaft pulleys and the crankshaft pulley. Make sure that all three sets of timing marks are properly aligned (see illustrations). **Note:** If one of the white lines on the timing belt is a dotted line, align the dotted line with the right-side camshaft pulley punch mark.

Adjustment

All models

Refer to illustrations 11.21 and 11.22

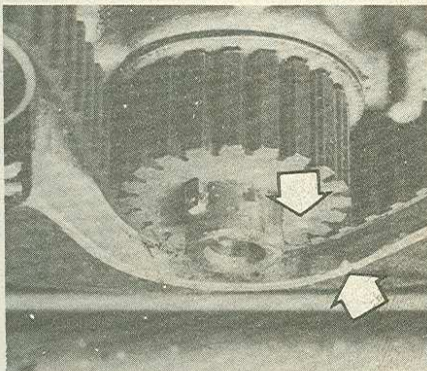
21 If the tensioner was removed, reinstall it and make sure the spring is positioned properly (see illustration). Keep the tensioner steady with the Allen wrench and loosen the locking nut.

22 Using the Allen wrench, swing the tensioner 70-degrees to 80-degrees in a clockwise direction and temporarily tighten the locking nut (see illustration).

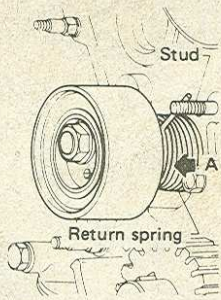
23 Install all of the spark plugs.

24 Slowly turn the crankshaft clockwise two or three full revolutions, then return the number one piston to TDC on the compression stroke.

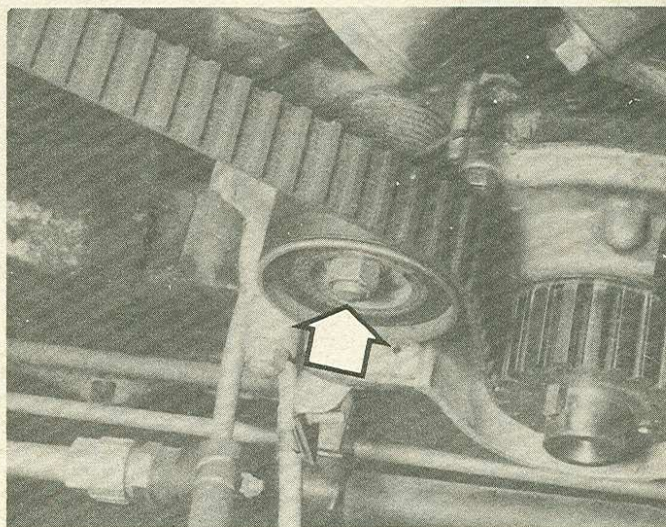
Caution: If resistance is felt while turning the crankshaft, it's an indication that the pistons are coming into contact with the valves. Go back over the procedure to correct the situation before proceeding.



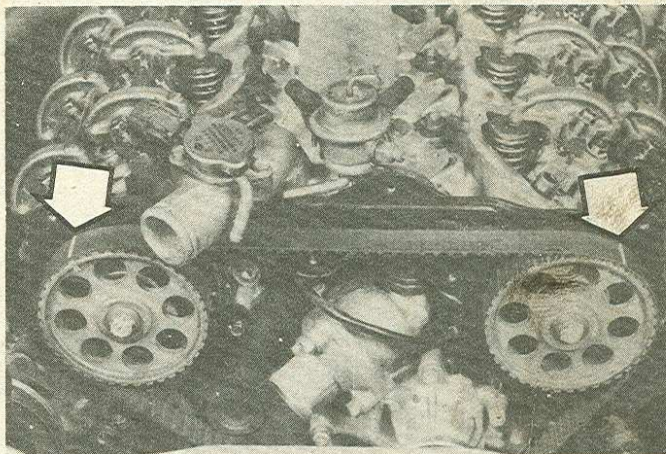
11.20b Confirm that the crankshaft timing pulley mark is aligned with the notch on the oil pump housing before releasing the timing belt tensioner



11.21 Belt tensioner spring mounting details (if the stud is removed, use Loctite on the threads during installation)



11.16 Loosen the nut (arrow) in the middle of the timing belt tensioner



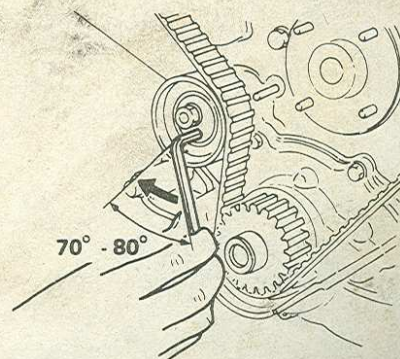
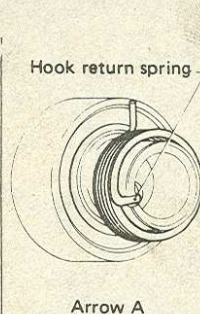
11.20a Align the white marks on the belt with the punch marks on the timing belt pulley and on the timing cover backing plate to insure correct timing

1984 thru 1987 models

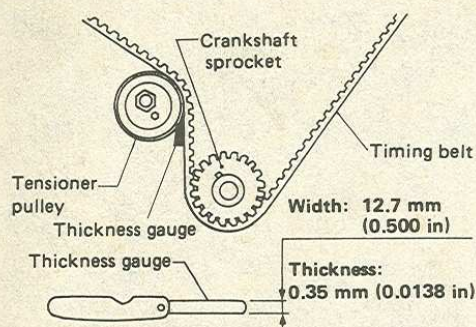
Refer to illustrations 11.26, 11.27 and 11.31

25 Loosen the tensioner locking nut while keeping the tensioner steady with the Allen wrench.

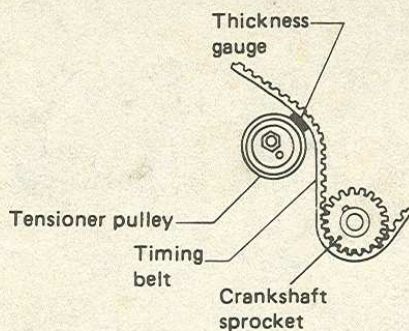
26 Place a 0.0138-inch thick feeler gauge adjacent to the tensioner



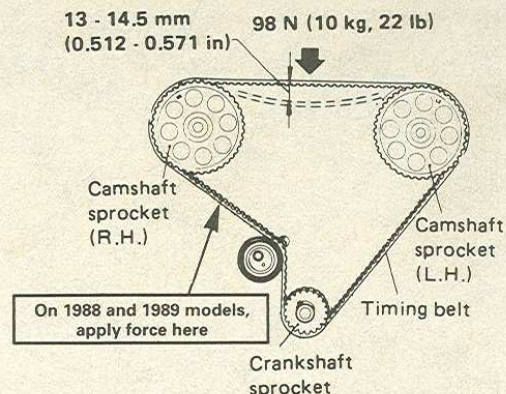
11.22 Use an Allen wrench to turn the tensioner pulley 70° to 80° in a CLOCKWISE direction



11.26 Position the feeler gauge between the tensioner pulley and the belt as shown here, . . .



11.27 . . . then turn the crankshaft to move the feeler gauge to the point shown here (it must be exact, so work carefully)



11.31 The deflection of the timing belt is checked exactly half-way between the two camshaft pulleys

pulley (see illustration).

27 Slowly turn the crankshaft clockwise until the feeler gauge is between the belt and the tensioner pulley (see illustration).

28 Tighten the tensioner locking nut, keeping the tensioner steady with the Allen wrench.

29 Turn the crankshaft to remove the feeler gauge.

30 Slowly turn the crankshaft two or three revolutions and return the number one piston to TDC.

31 Check the deflection of the timing belt by applying 22 pounds of force midway between the camshaft pulleys (see illustration). The belt should deflect 0.512 to 0.571-inch (13 to 14.5 mm). Readjust the

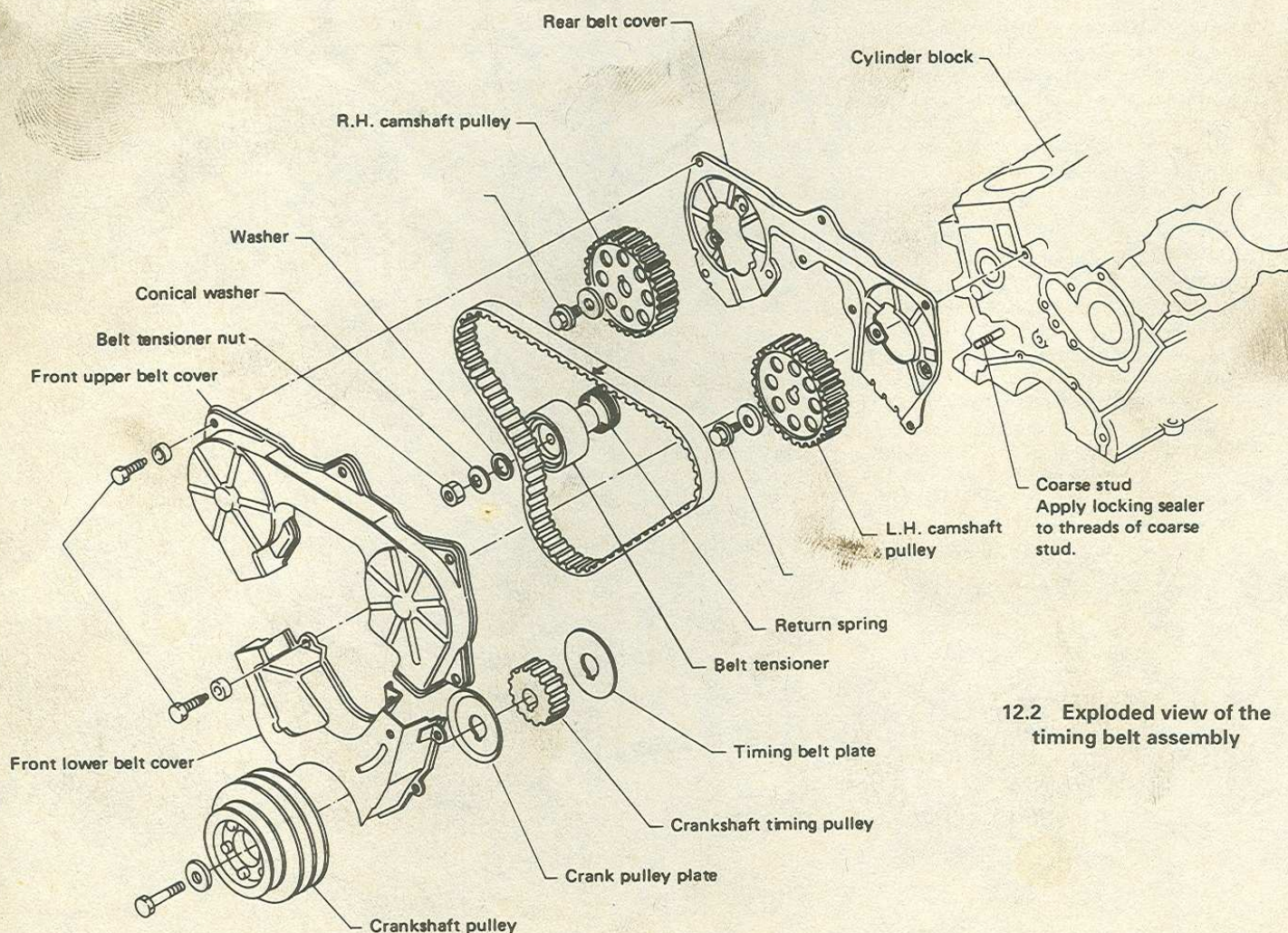
belt if necessary.

32 Install the various components removed during disassembly, referring to the appropriate Sections in this Chapter.

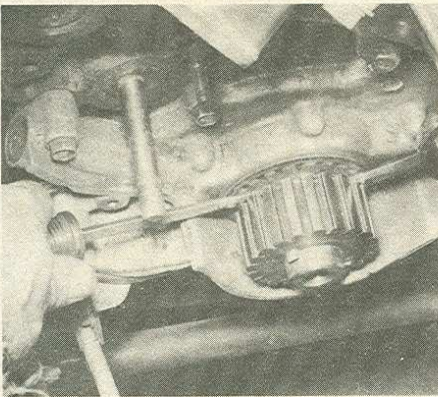
1988 and 1989 models

33 Apply 22 pounds of force to the timing belt midway between the right hand camshaft sprocket and the tensioner (see illustration 11.31).

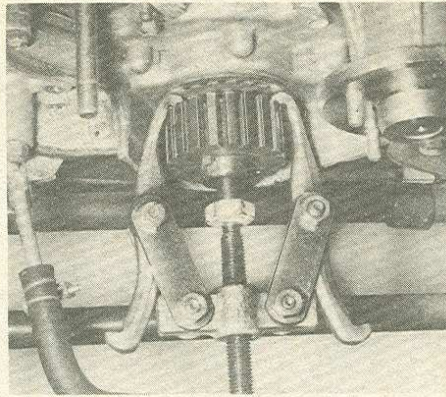
34 Follow the procedure in Steps 25 through 30 above, then reinstall the timing belt covers and other components removed to gain access to the belt.



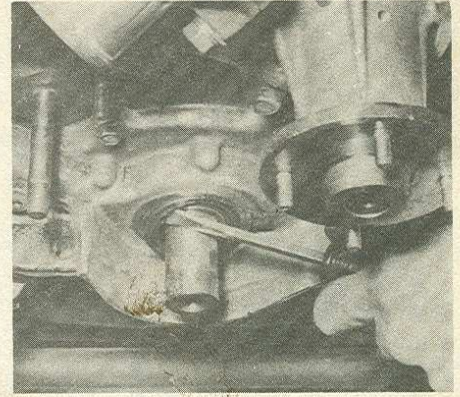
12.2 Exploded view of the timing belt assembly



12.3 Use two screwdrivers to pry the crankshaft timing gear off the end of the crankshaft



12.4 Insert the crankshaft pulley retaining bolt into the crankshaft to protect the threads and give the gear puller something to push against



12.6 Insert a screwdriver between the crankshaft and front oil seal to pry the seal out

12 Engine front oil seals — removal and installation

Refer to illustrations 12.2, 12.3, 12.4, 12.6, 12.7, 12.8a, 12.8b, 12.13, 12.14, 12.15a and 12.15b

Crankshaft oil seal

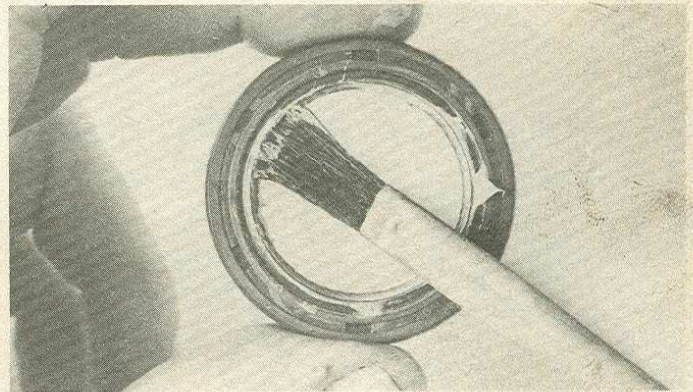
- 1 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally contact the negative terminal.
- 2 Remove the fan shroud and fan assembly (Chapter 3), drivebelts (Chapter 1), pulleys (Section 10), vibration damper (Section 10) and timing belt (Section 11) (see illustration).
- 3 Wedge two screwdrivers behind the crankshaft timing pulley (see illustration). Carefully pry the pulley off the crankshaft. Some timing belt pulleys can be pried off easily with screwdrivers. Others are more difficult to extract because corrosion fuses them onto the nose of the crank. If the gear on your vehicle proves difficult to pry off, don't try to get it all the way off with screwdrivers. Instead, slide it just far enough to fasten the tangs of a puller.
- 4 Once there is enough space between the gear and the oil pump housing to install a small gear puller, thread the timing pulley attaching bolt into the nose of the crankshaft and install a puller. The bolt provides a firm base for the puller to push against and protects the threads (see illustration).
- 5 Turn the bolt of the puller until the pulley comes off. Remove the timing belt plate.
- 6 Remove the front oil seal by inserting a screwdriver between the seal and crankshaft. Pry out the old seal (see illustration).
- 7 Apply a thin coat of assembly lube to the inside of the seal (see illustration).
- 8 Fabricate a seal installation tool by cutting a short length of pipe of equal or slightly smaller outside diameter than the seal itself. File the end of the pipe that will bear down on the seal until it is free of

sharp edges. You will also need a large washer, slightly larger in O.D. than the pipe, on which the bolt head can seat (see illustration). Install the oil seal by pressing it into position with the seal installation tool (see illustration). When you see and feel the seal stop moving, don't turn the bolt any further or you will damage the seal.

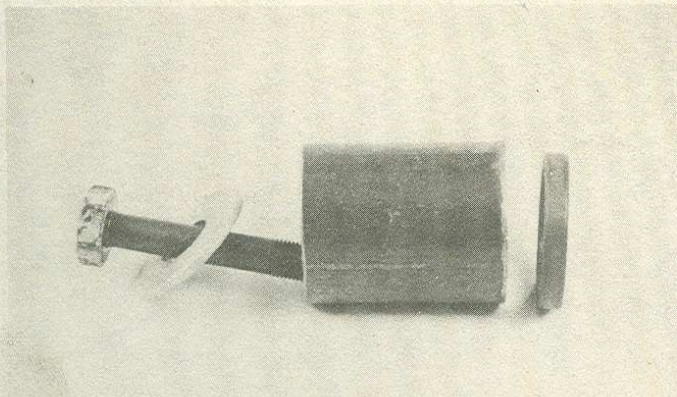
- 9 Slide the timing belt plate onto the nose of the crankshaft.
- 10 Insert the Woodruff key into its groove on the crankshaft.
- 11 Apply a thin coat of assembly lube to the inside of the crankshaft timing pulley and slide it onto the crankshaft.

Camshaft oil seal

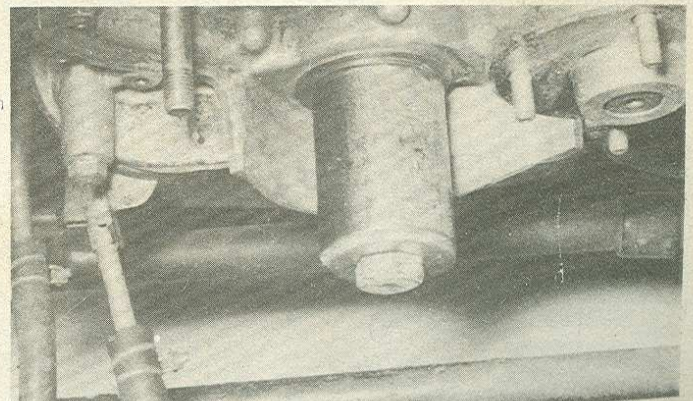
- 12 Repeat Steps 1 and 2.
- 13 Insert a screwdriver through the top hole in the camshaft pulley



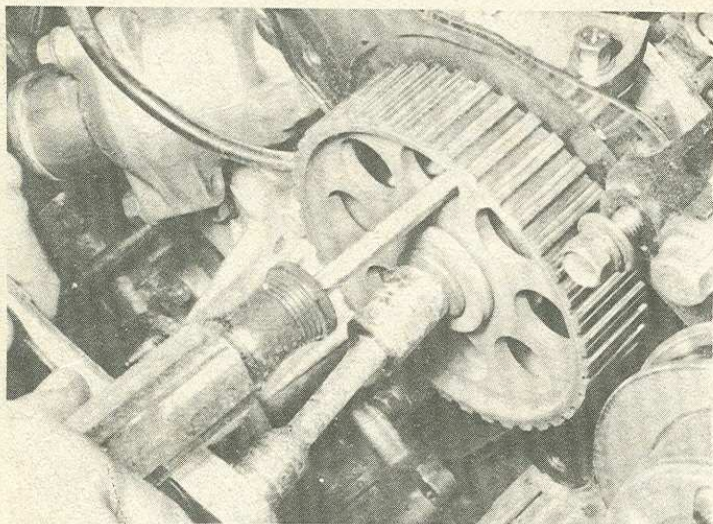
12.7 Apply a thin coat of assembly lube to the inside of the seal before installing it onto the shaft



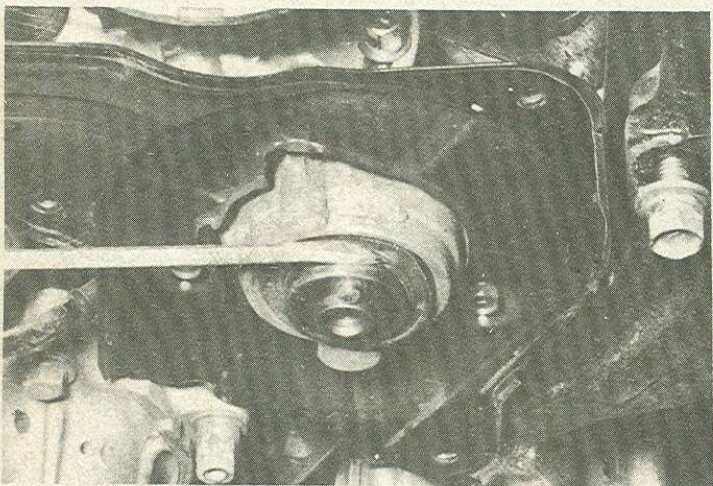
12.8a Fabricate a seal installation tool by using a piece of pipe with the same diameter as the seal and a large washer



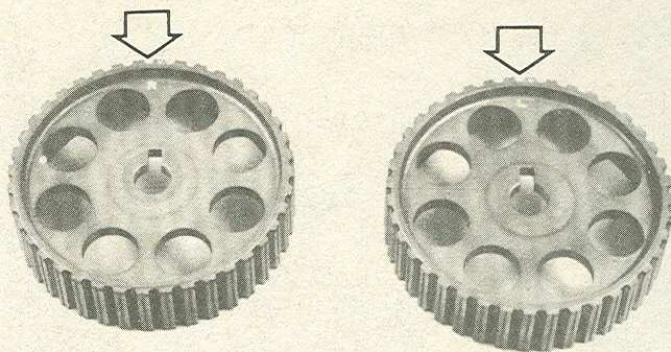
12.8b Insert the bolt through the washer and pipe, then screw it into the crankshaft and tighten it, pressing the seal into position



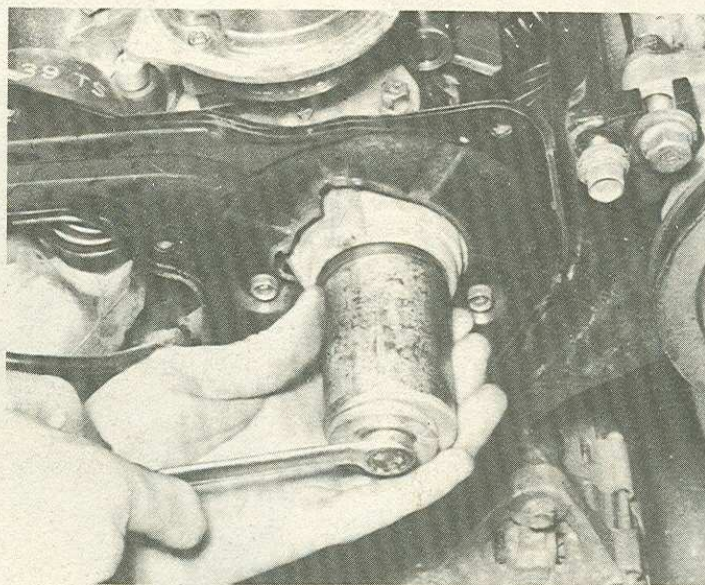
12.13 Insert a screwdriver through the camshaft pulley to hold it while loosening the pulley retaining bolt



12.15a Insert a screwdriver between the shaft and seal and pry it out



12.14 When installing the camshaft timing belt pulleys, note the R and L marks which designate the right and left cylinder heads



12.15b The same tool you fabricated for installation of the crankshaft front seal can be used to install the camshaft seals

to lock it into place while turning the retaining bolt (see illustration).

14 Once the bolt is out, the pulley can be removed by hand. **Note:** Each gear is marked with either an R or L (see illustration). If you are removing both camshaft pulleys, don't mix them up. They must be installed on the same cam from which they were removed.

15 Remove the old oil seal (see illustration) and press the new seal into place (see illustration) (Step 6, 7 and 8 above). The same seal installation tool you fabricated for the crankshaft seal can be used for both camshaft seals.

16 Insert a screwdriver through the top hole in the camshaft pulley to lock it in place while you tighten the retaining bolt.

17 Installation of the remaining components is the reverse of removal.

13 Cylinder heads — removal and installation

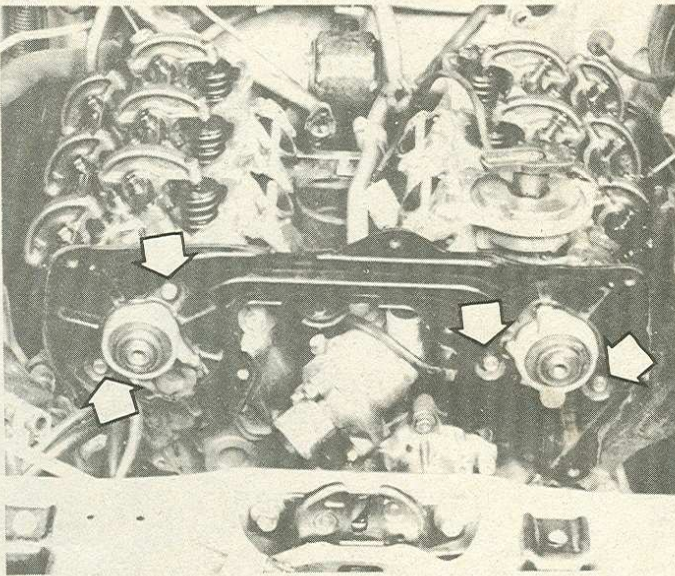
Refer to illustrations 13.9, 13.12a, 13.12b, 13.14, 13.18a, 13.18b, 13.19, 13.28, 13.30 and 13.31

- 1 Relieve the fuel pressure (Chapter 1).
- 2 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally contact the negative terminal.
- 3 Drain the engine coolant (Chapter 1).
- 4 Remove the intake collector (Section 4).
- 5 Remove the timing belt (Section 11).
- 6 Remove the injector assembly (Chapter 4).
- 7 Remove the intake manifold (Section 8).
- 8 Remove both cam pulleys (Section 12).

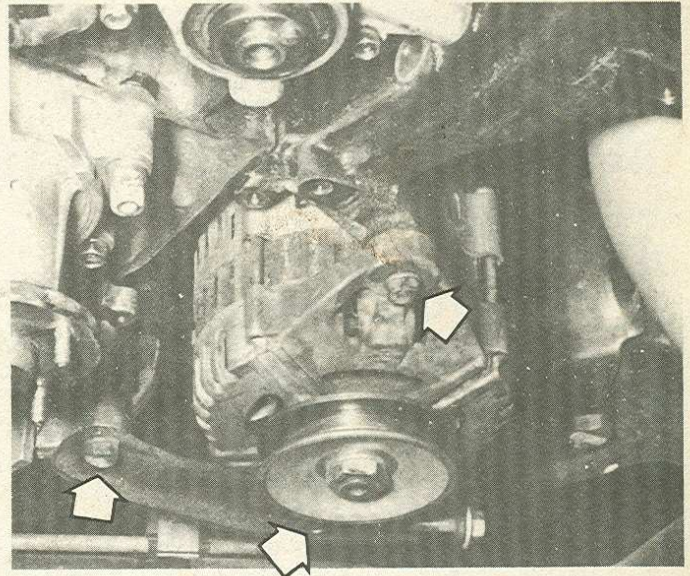
- 9 Remove the rear timing cover plate by removing the four bolts (see illustration).

Left cylinder head — removal

- 10 Remove the air conditioning compressor from its bracket and set it aside. It may be helpful to secure the compressor with wire to make sure it stays clear (Chapter 3).
- 11 Remove the distributor hold-down bolt and pull the distributor out of the engine (Chapter 5).
- 12 On normally aspirated models, remove the alternator bolts and wire the alternator out of the way (see illustrations).
- 13 On turbo models, disconnect the turbo from the exhaust manifold and lay it in the engine compartment out of the work area.
- 14 Remove the bolts attaching the air conditioner/alternator bracket to the engine and remove the bracket (see illustration).
- 15 Remove the bolt and two nuts attaching the crossover pipe to the left side of the exhaust (Section 9).
- 16 Remove the nuts from the exhaust manifold on the left side and slide the manifold away from the cylinder head (Section 9).
- 17 Remove the rocker arm components (Section 6) (see illustration).
- 18 Loosen and remove the cylinder head bolts in several stages in the proper numerical sequence (see illustration). Head bolts must be installed in their original locations. To keep them from getting mixed up, fabricate an organizer out of cardboard with holes punched in it. Insert the head bolts into the cardboard in the order they are removed. Be sure to mark the cardboard L and R and indicate the front of the engine (see illustration).

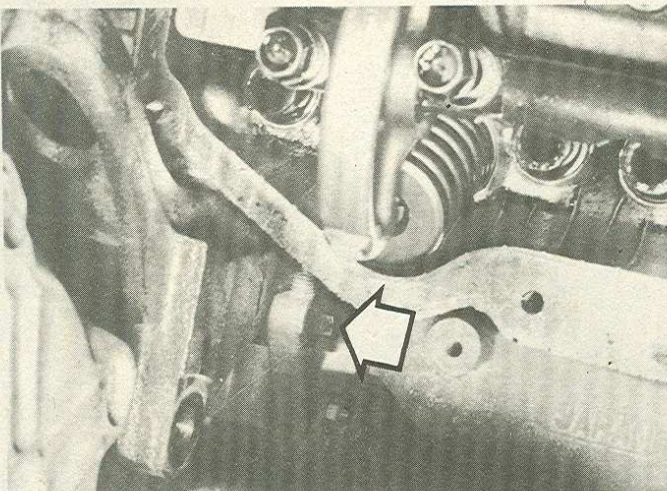


13.9 Remove the four retaining bolts and the rear timing cover plate

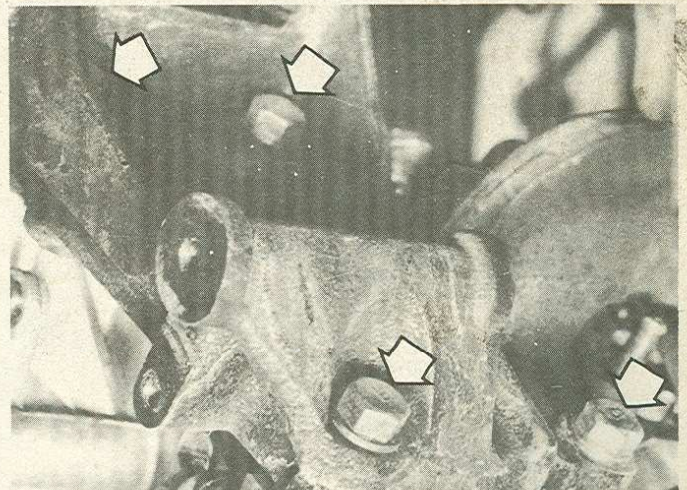


13.12a Remove the front retaining bolts on the alternator (arrows)

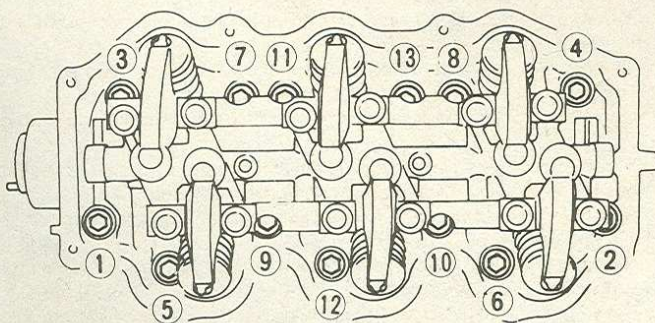
2A



13.12b Remove the rear alternator bolt (arrow) and lower the alternator out of the work area



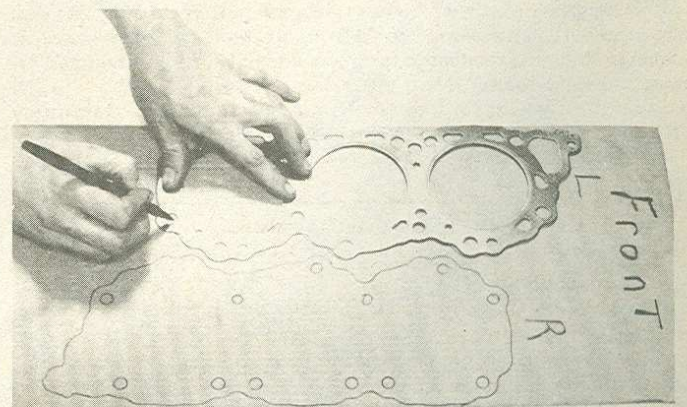
13.14 Remove four bolts (arrows) to remove the air conditioning/alternator bracket on non-turbo models or the air conditioning bracket on the turbo models



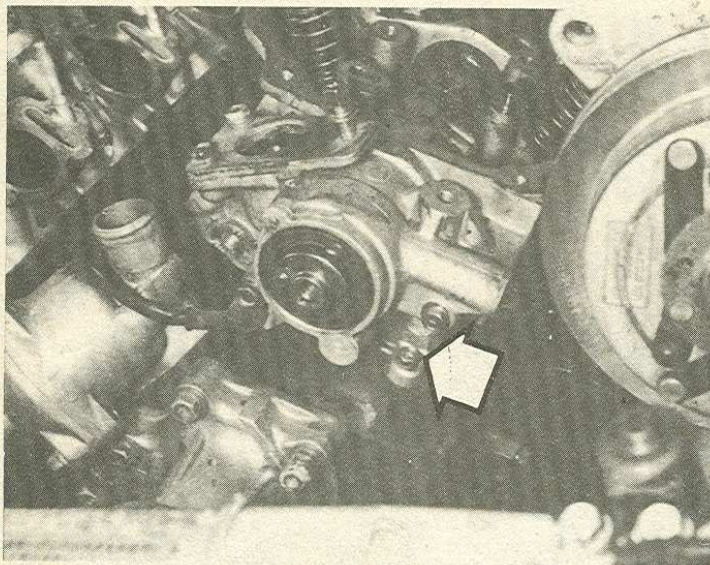
ENGINE FRONT

Loosen in numerical order.

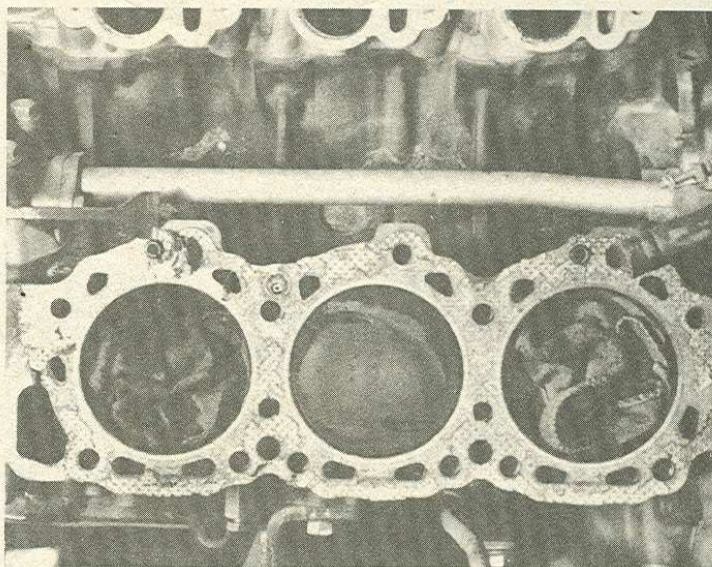
13.18a Loosen the cylinder head bolts in the sequence shown



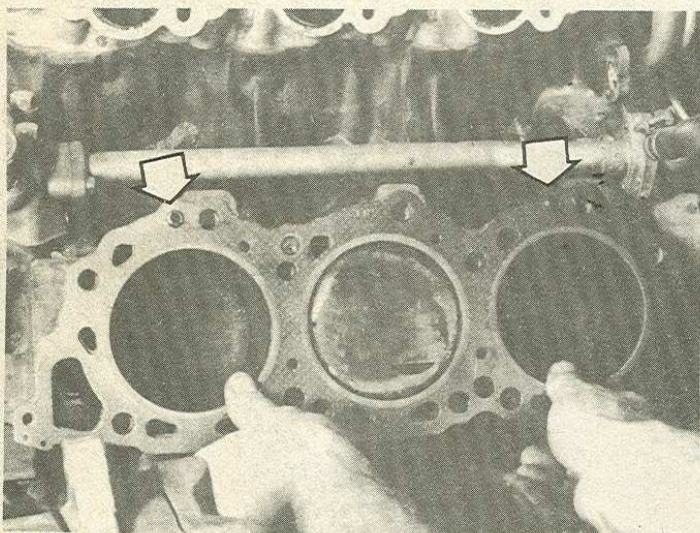
13.18b Fabricate a bolt holder from a piece of cardboard to keep the bolts in order. Be sure to indicate left, right and front on the cardboard



13.19 Remove the small bolt securing the cylinder head (arrow) before attempting to remove the head



13.28 Stuff rags into the cylinders to prevent debris from falling into the cylinders



13.30 After scraping off all old gasket material, place the new gasket on the head, making sure that the gasket seats properly on the alignment dowels (arrows)

- 19 Remove the small bolt, located at the lower front of the head, securing the head to the block (see illustration).
- 20 Lift the head off the block. If you find it necessary to pry the head from the block, don't scratch or gouge the mating surfaces.

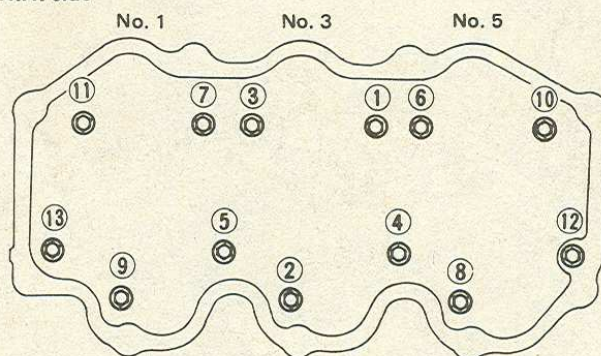
Right cylinder head — removal

- 21 After Steps 1 through 9 are completed, remove the power steering pump (Chapter 10).
- 22 Disconnect the right side exhaust crossover connecting pipe bolts (Section 9).
- 23 Remove the exhaust manifold (Section 9).
- 24 Remove the rocker arm components (Section 6).
- 25 Remove the cylinder head bolts and keep them in order as described in Step 18.
- 26 Remove the small bolt, located at the rear of the head, which secures the cylinder head to the engine block.
- 27 Lift the head off the engine. If you find it necessary to pry off the head, avoid damaging the mating surfaces.

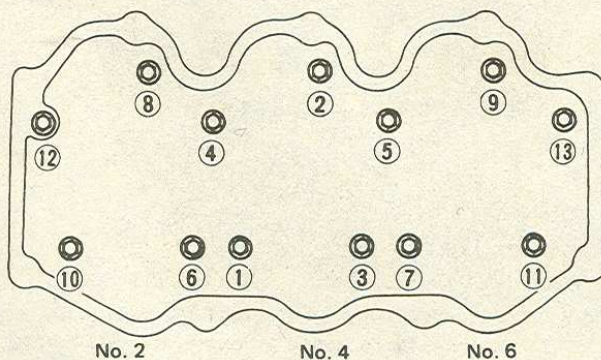
Installation

- 28 Insert shop rags into the cylinders to prevent gasket material from falling into the bores (see illustration).

R.H. side

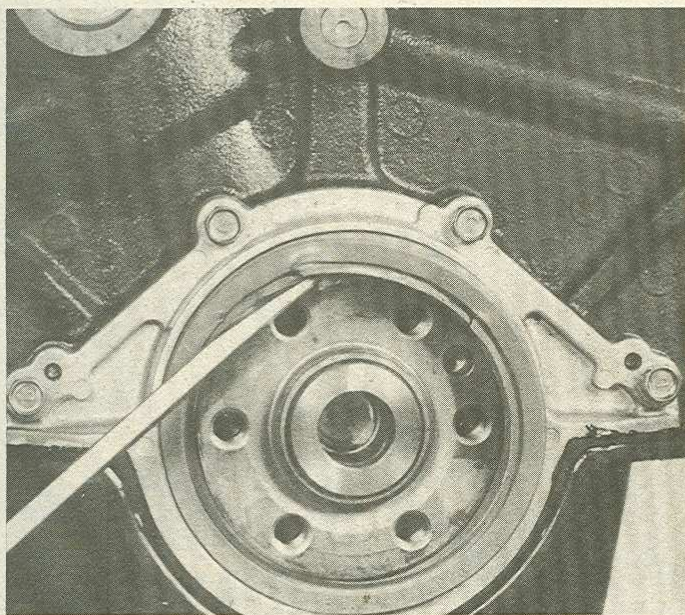


L.H. side



13.31 Cylinder head tightening sequence

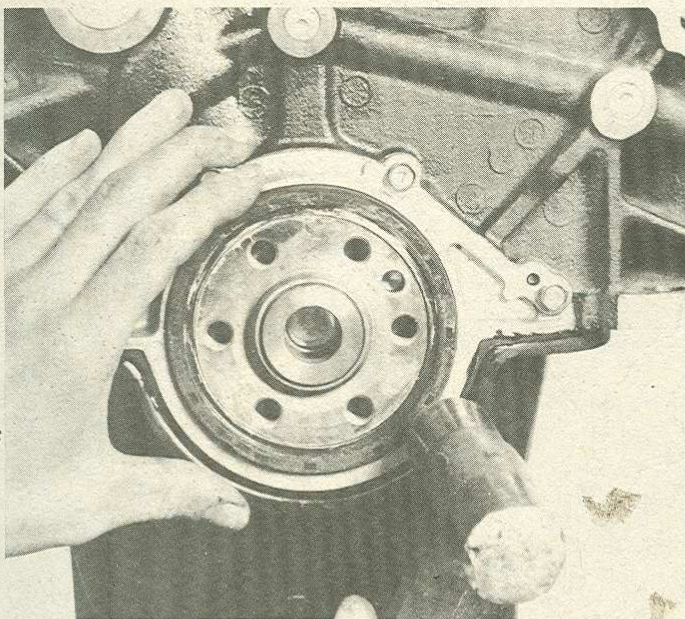
- 29 Remove all traces of gasket material from both the cylinder head and engine block mating surfaces with a gasket scraper.
- 30 Install the new gasket. No sealant is necessary. Use the alignment dowels for proper positioning (see illustration). Remove the shop rags from the cylinders.
- 31 Using the alignment dowels for proper positioning, install the head. Tighten the head bolts in the proper sequence (see illustration) to the specified torque.
- 32 Install the lifter/guide assembly (Section 7) and rocker arm shaft assembly (Section 6). Leave the bolts loose to facilitate installation of the timing belt.
- 33 Installation is the reverse of the removal procedure for the remaining components.



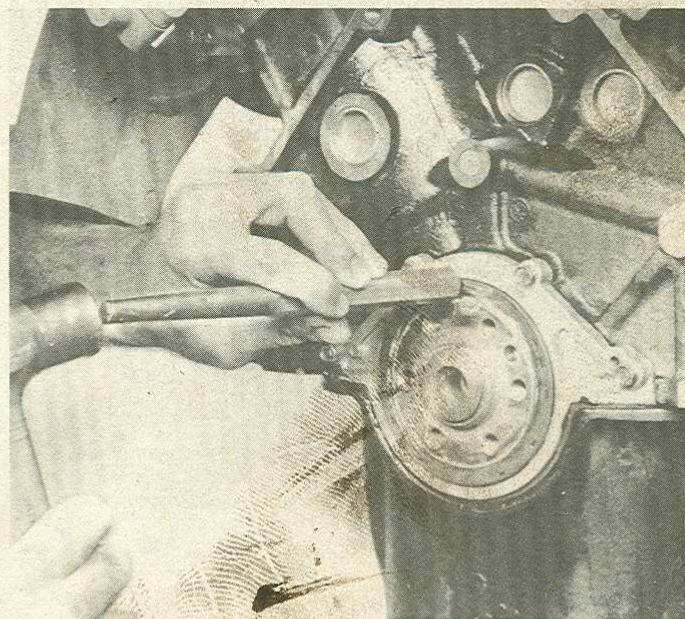
14.3 Insert a screwdriver between the seal and crankshaft then pry it out



14.4 Apply a small amount of grease to the inside of the new seal



14.5 Push the seal onto the crankshaft, then gently tap the seal into its recessed groove in the retainer



14.6 Once the seal is flush with the retainer face, use a blunt punch to carefully drive the seal the rest of the way

14 Rear engine oil seal — replacement

Refer to illustrations 14.3, 14.4, 14.5 and 14.6

- 1 Remove the transmission (see Chapter 7A for manual transmissions, Chapter 7B for automatics).
- 2 Remove the flywheel/driveplate (Chapter 8).
- 3 Insert a screwdriver between the oil seal and crankshaft, then pry the seal out of its retainer (see illustration).
- 4 Lubricate the inside of the new oil seal with grease to facilitate its installation (see illustration).
- 5 Push the seal onto the crankshaft and gently tap it into its bore with a soft face hammer (see illustration).
- 6 Once the seal face is flush with the seal retainer and the crankshaft flange, very carefully drive the seal the rest of the way into the retainer

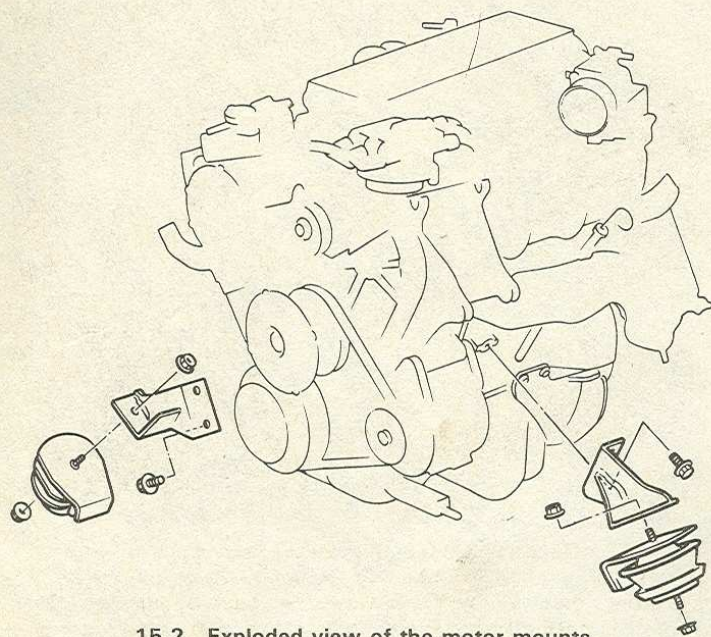
with the blunt end of a punch. A soft brass punch is best (see illustration). **Caution:** Be extremely careful. Take your time and drive the seal gently and evenly into place. Damaging a new seal will result in an oil leak.

- 7 Installation is the reverse of removal.

15 Engine mounts — removal and installation

Refer to illustration 15.2

- 1 Engine mounts should be periodically inspected for hardening or cracking of the rubber, or separation of the rubber from the metal backing.
- 2 Replace the front mounts by loosening the nuts and bolts retaining



15.2 Exploded view of the motor mounts

them to the engine mounting bracket and suspension crossmember, on both sides of the engine (see illustration).

3 Take the weight of the engine off the mounts by placing a jack and wooden block under the oil pan. Carefully raise the engine enough to allow removal of the mounts.

4 If you intend to use the old mounts again, mark them clearly to ensure that they are installed, right side up, on the same side as before. Remove the nuts and bolts retaining the mounts and remove the mounts, noting the correct installed position.

5 Installation is the reverse of the removal procedure.

16 Engine removal — methods and precautions

If it has been decided that an engine must be removed for overhaul or major repair work, certain preliminary steps should be taken.

Locating a suitable work area is extremely important. A shop is, of course, the most desirable place to work. Adequate work space, along with storage space for the vehicle, is very important. If a shop or garage is not available, at the very least a flat, level, clean work surface made of concrete or asphalt is required.

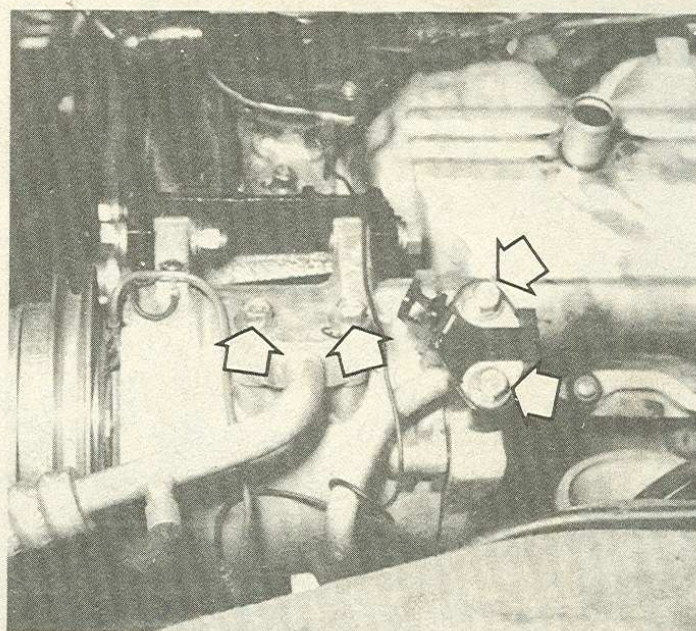
Cleaning the engine compartment and engine prior to removal will help keep tools clean and organized.

An engine hoist or A-frame will be necessary. Make sure that the equipment is rated in excess of the combined weight of the engine and its accessories. Safety is of primary importance, considering the potential hazards involved in lifting the engine out of the vehicle.

If the engine is removed by a novice, a helper should be available. Advice and aid from someone more experienced would also be helpful. There are many instances when one person cannot simultaneously perform all of the operations required when lifting the engine out of the vehicle.

Plan the operation ahead of time. Arrange for or obtain all of the tools and equipment you will need prior to beginning the job. Some of the equipment necessary to perform engine removal and installation safely and with relative ease are (in addition to an engine hoist) a heavy duty floor jack, complete sets of wrenches and sockets as described in the front of this manual, wooden blocks and plenty of rags and cleaning solvent for mopping up the inevitable spills. If the hoist is to be rented, make sure that you arrange for it in advance and perform beforehand all of the operations possible without it. This will save you money and time.

Plan for the vehicle to be out of use for a considerable amount of time. A machine shop will be required to perform some of the work which the do-it-yourselfer cannot accomplish due to a lack of special equipment. These shops often have a busy schedule, so it would be



17.12 Disconnect the hoses attached to the air compressor by removing the retaining bolts (arrows) on each line

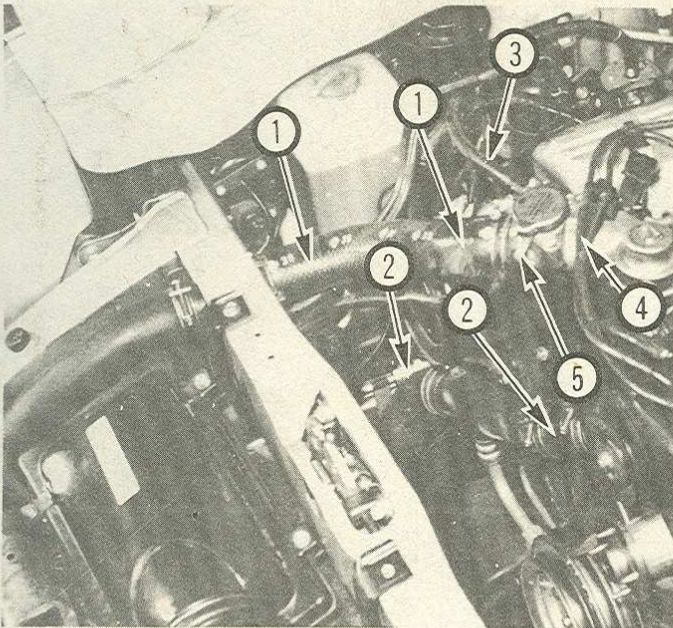
wise to consult them before removing the engine in order to accurately estimate the amount of time required to rebuild or repair components that may need work.

Always use extreme caution when removing and installing the engine. Serious injury can result from careless actions. Plan ahead. Take your time and a job of this nature, although major, can be accomplished successfully.

17 Engine — removal and installation

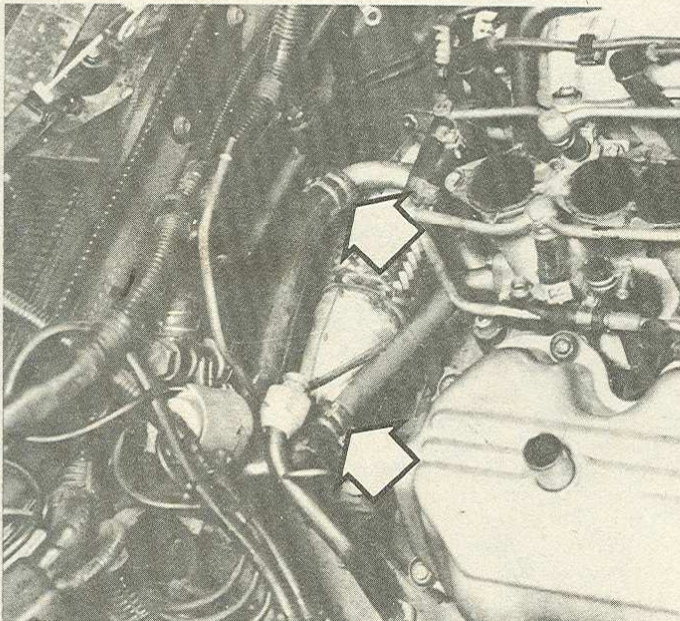
Refer to illustrations 17.12, 17.14, 17.17, 17.18, 17.21, 17.22, 17.23, 17.24, 17.25, 17.26, 17.31, 17.32, 17.35, 17.36 and 17.37

- 1 If the vehicle is equipped with air conditioning, take it to a factory dealer or certified air conditioning specialist and have the system evacuated.
- 2 Relieve the fuel pressure, Chapter 1.
- 3 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally contact the negative terminal.
- 4 Raise the vehicle and support it securely on jackstands.
- 5 Drain the engine oil (Chapter 1).
- 6 Drain the cooling system (Chapter 1).
- 7 Open the hood, remove the bolts securing the stay to the hood, and install the stay in the lower hole provided for the securing bolts. Install the securing bolts.
- 8 Remove the intake collector (Section 4).
- 9 Remove the engine drivebelts (Chapter 1).
- 10 Remove the radiator shroud and fan assembly (Chapter 3).
- 11 Disconnect the distributor coil wire at the distributor and tuck it out of the way behind the coil.
- 12 Remove the four bolts retaining the two coolant hoses to the air compressor (see illustration). **Note:** You should have already had the pressure in the air conditioning system relieved by a professional.
- 13 Remove the air compressor (Chapter 3).
- 14 Disconnect the upper and lower radiator hoses, the bypass hose and the inlet and outlet fuel line hoses (see illustration).
- 15 Unplug the power steering pump electrical connector (Chapter 10).
- 16 Disconnect the two hoses connected to the power steering pump.
- 17 Unbolt the large banjo bolt to remove the high pressure line. The low pressure hose is removed by loosening the hose clamp and pulling the hose from the nipple (see illustration). **Note:** Place a pan under the pump to catch leaking power steering fluid.
- 18 Disconnect the two heater hoses at the rear of the engine by



17.14 Disconnect the engine hoses

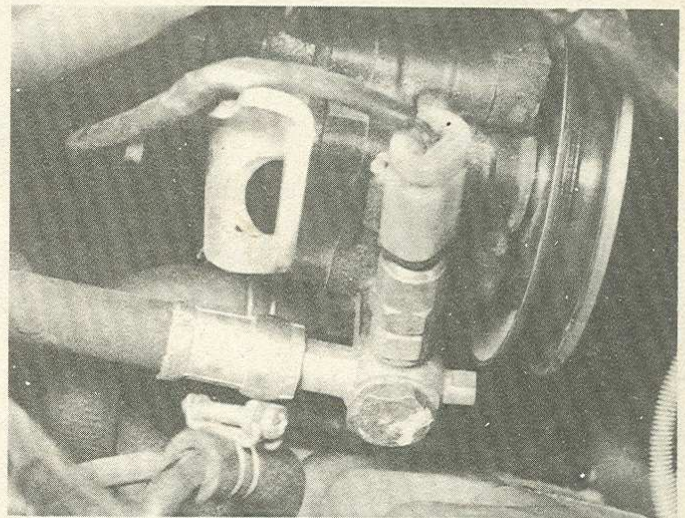
- | | |
|------------------------|---------------------------|
| 1) Upper radiator hose | 4) Fuel outlet hose |
| 2) Lower radiator hose | 5) Radiator overflow hose |
| 3) Fuel inlet hose | |



17.18 Disconnect the heater hoses by removing the hose clamps (arrows) connecting them to the inlet and outlet pipes

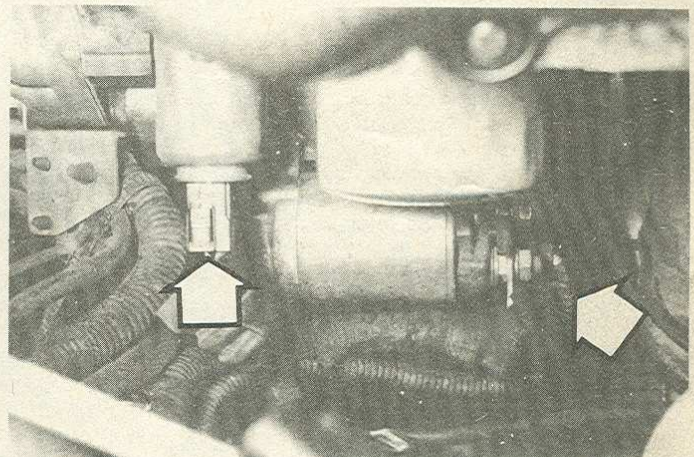
loosening the clamps where the rubber hoses connect to the metal inlet and outlet tubes (see illustration).

- 19 Remove the bolts securing the right exhaust crossover pipe to the exhaust manifold (Section 9).
- 20 Remove the nuts retaining the right exhaust manifold and remove it (Section 9).
- 21 Disconnect the oil sending unit electrical connector and disconnect the electrical wires to the starter (see illustration).
- 22 From underneath the car, remove the two starter bolts and remove the starter (see illustration).

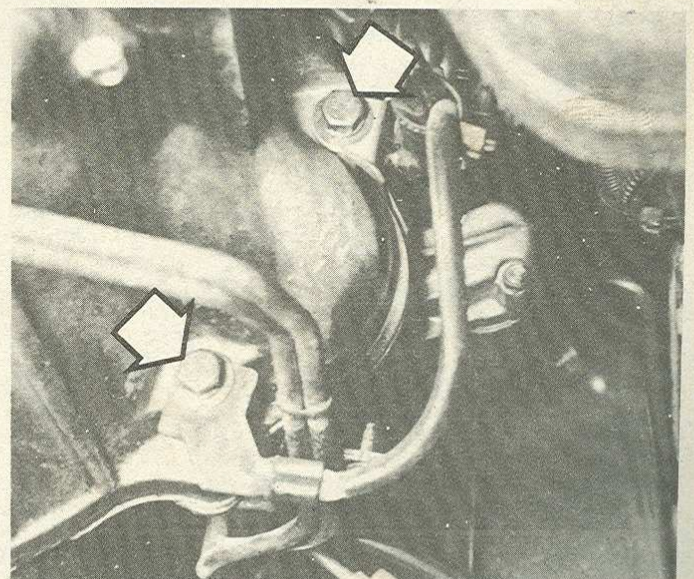


17.17 Disconnect the high pressure hose from the power steering pump by unbolting the large bolt on the banjo fitting, then remove the low pressure hose by unscrewing the hose clamp and pulling the hose from the nipple

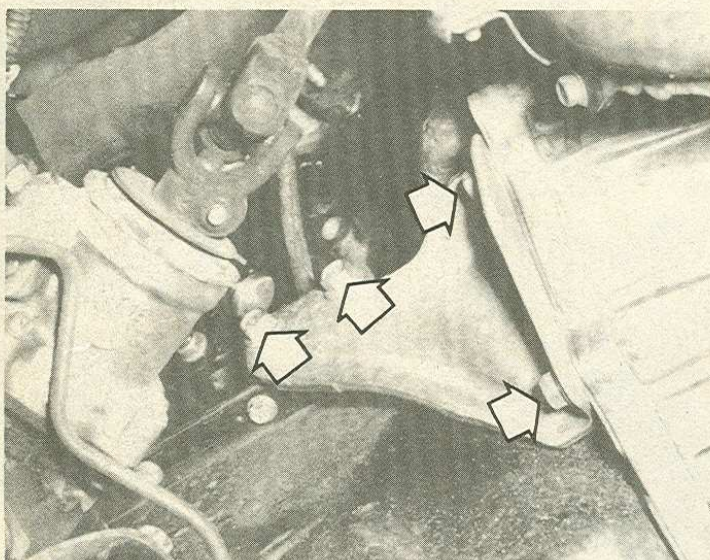
2A



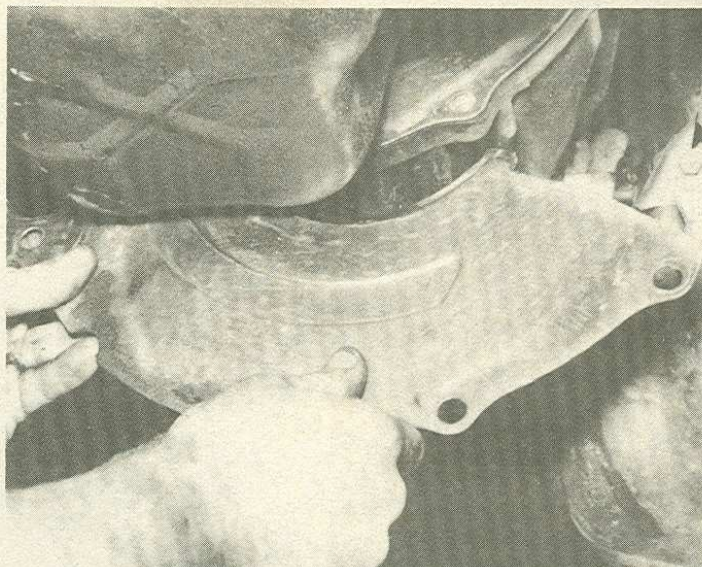
17.21 Disconnect the oil sending unit electrical connector and both electrical wires attached to the starter (arrows)



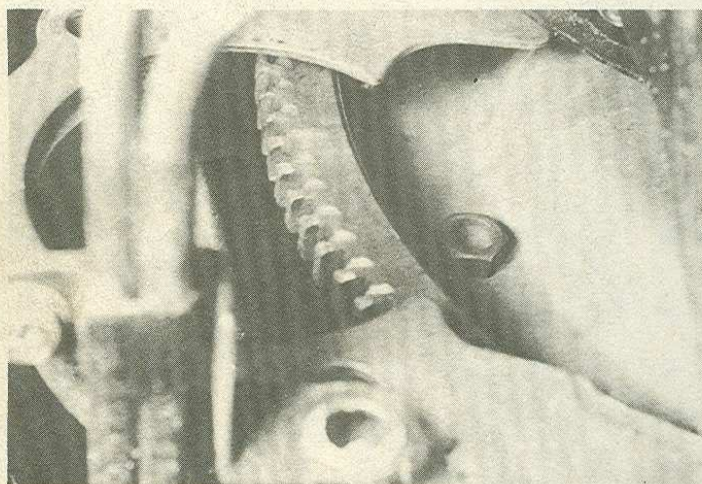
17.22 Remove the two starter retaining bolts (arrows) and remove the starter



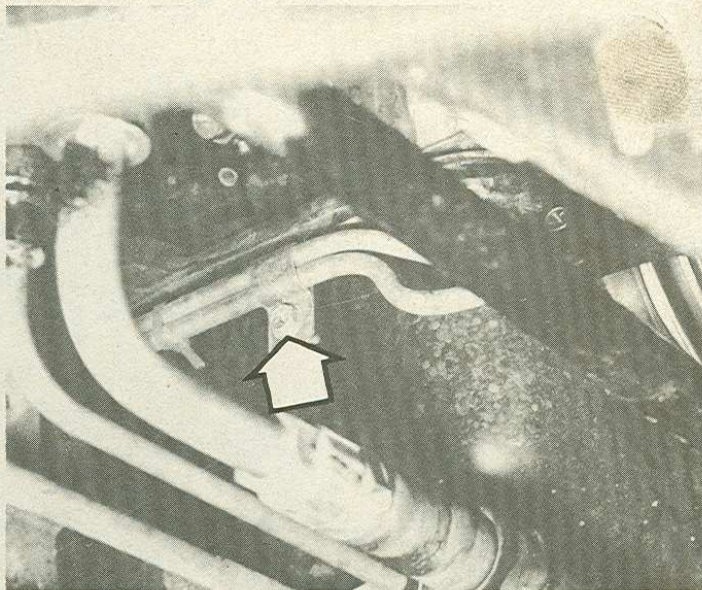
17.23 There are four retaining bolts on the left side engine-to-transmission bracket (arrows) and three on the other side



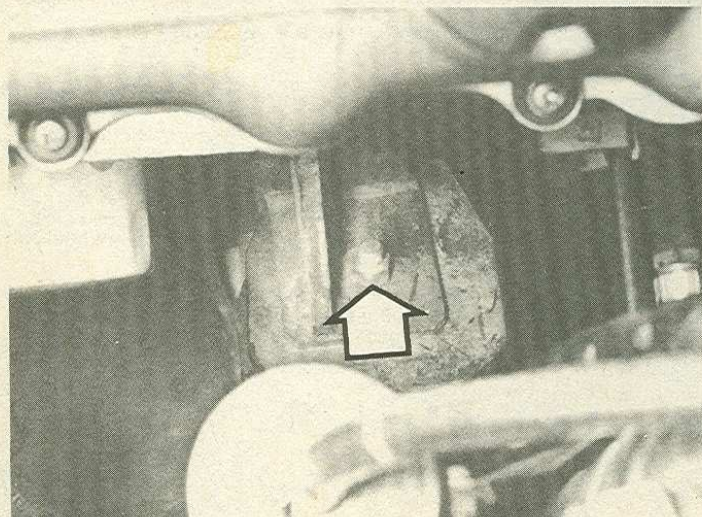
17.24 On automatic transmission equipped models, the torque converter dust plate can be slipped out from between the oil pan and the converter after the support brackets have been removed



17.25 On automatic transmission equipped models, the four torque converter retaining bolts on the driveplate can be removed through the transmission starter tunnel

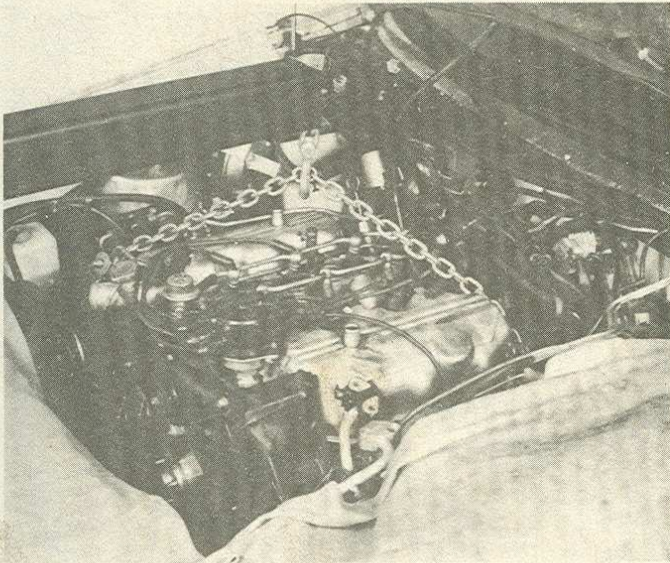


17.26 On automatic transmission equipped models, remove the two bolts attaching the transmission cooler lines to the engine (arrow)

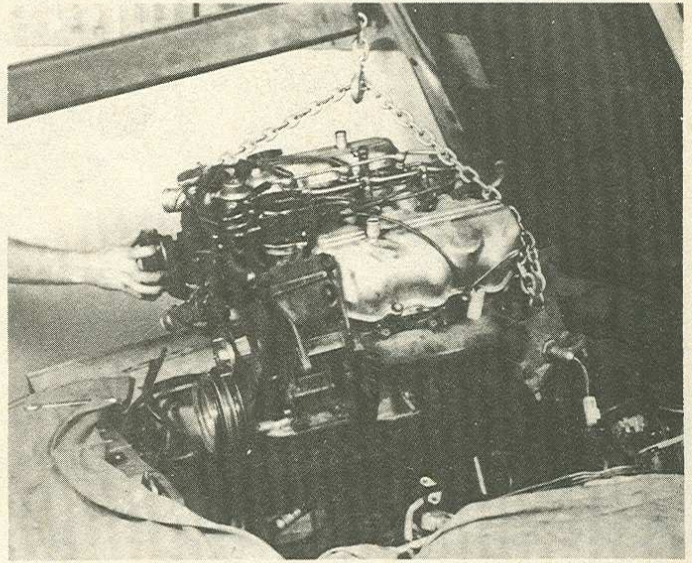


17.31 Remove the retaining nut (arrow) from the top of each motor mount

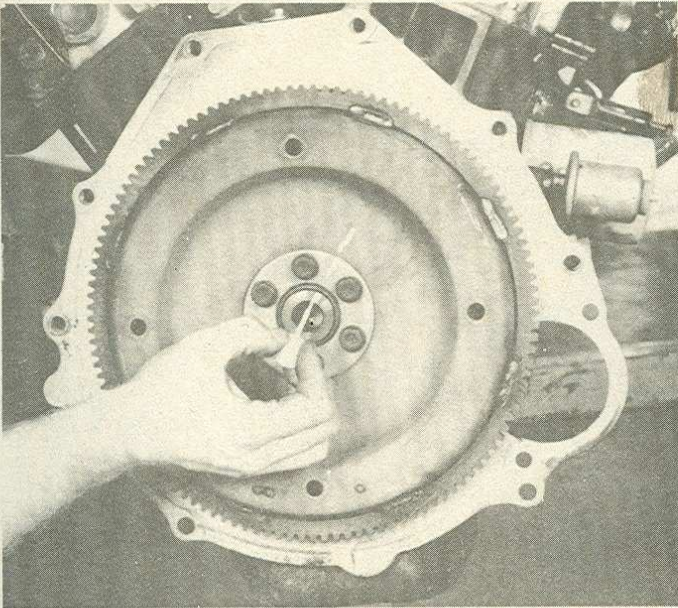
- 23 Remove the brackets attached to the transmission housing and to the side of the engine block. There are four retaining bolts on the left side bracket and three bolts on the right side (see illustration).
- 24 After the brackets have been removed, slide the torque converter dust plate out. It is between the torque converter and oil pan on automatic transmission equipped models (see illustration).
- 25 On automatic transmission equipped models, rotate the crankshaft and remove the four torque converter bolts located around the periphery of the driveplate. The bolts can be accessed through the starter housing opening in the front of the transmission (see illustration).
- 26 On automatic transmission equipped models, remove both bolts securing the two transmission fluid cooling lines to the engine (see illustration).
- 27 Remove the alternator (Chapter 5).
- 28 Disconnect the exhaust pipe from the left side exhaust manifold by removing the three retaining nuts (Section 9).
- 29 Place a jack under the transmission to support the transmission.



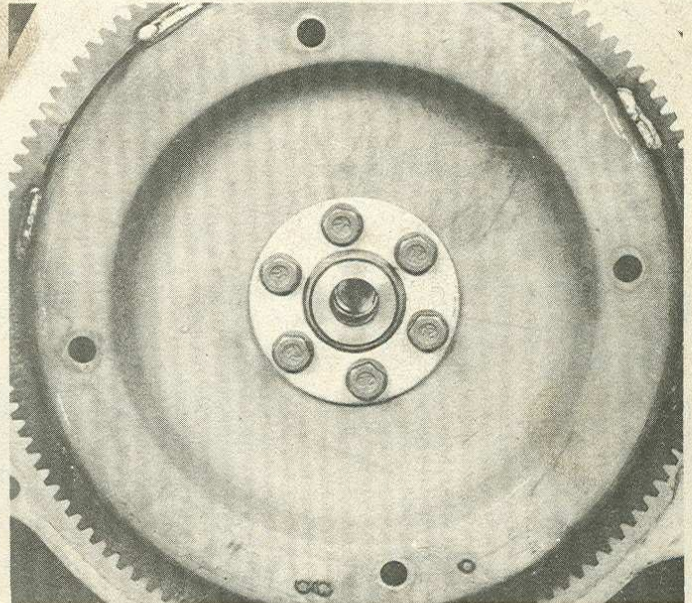
17.32 Hook a lifting chain to the lifting brackets located on the right front and left rear of the engine and hook the chain to an engine lifting hoist



17.35 Once the engine is disconnected from the transmission, raise it and roll it away from the engine compartment



17.36 To insure proper balance, mark the flywheel's relation to the crankshaft



17.37 Remove the six flywheel retaining bolts

Place a block of wood between the jack and the transmission to protect the transmission pan.

30 Remove the remaining engine-to-transmission bolts.

31 Remove the motor mount retaining nuts from the top of each motor mount (see illustration).

32 Affix a chain to the two engine lifting brackets. One bracket is located on the right front of the engine and the other at the left rear of the engine (see illustration).

33 Push the engine hoist into position and hook the lifting chain to the hoist. Hook the chain in the middle to allow the engine to be lifted evenly.

34 Raise the engine with the lift enough to take its weight off the engine mounts, then pull it loose from the transmission.

35 Raise the engine straight up until it clears the engine well, then roll it away from the engine compartment (see illustration).

36 Mark the flywheel's relation to the crankshaft so the flywheel can be replaced in its original position (see illustration).

37 With the engine on the hoist, remove the flywheel retaining bolts and remove the flywheel (see illustration).

38 Pull the engine backing plate off the rear of the engine.

39 Install the engine on an engine stand or secure it on a work bench prior to servicing it.