

Chapter 4 Fuel and exhaust systems

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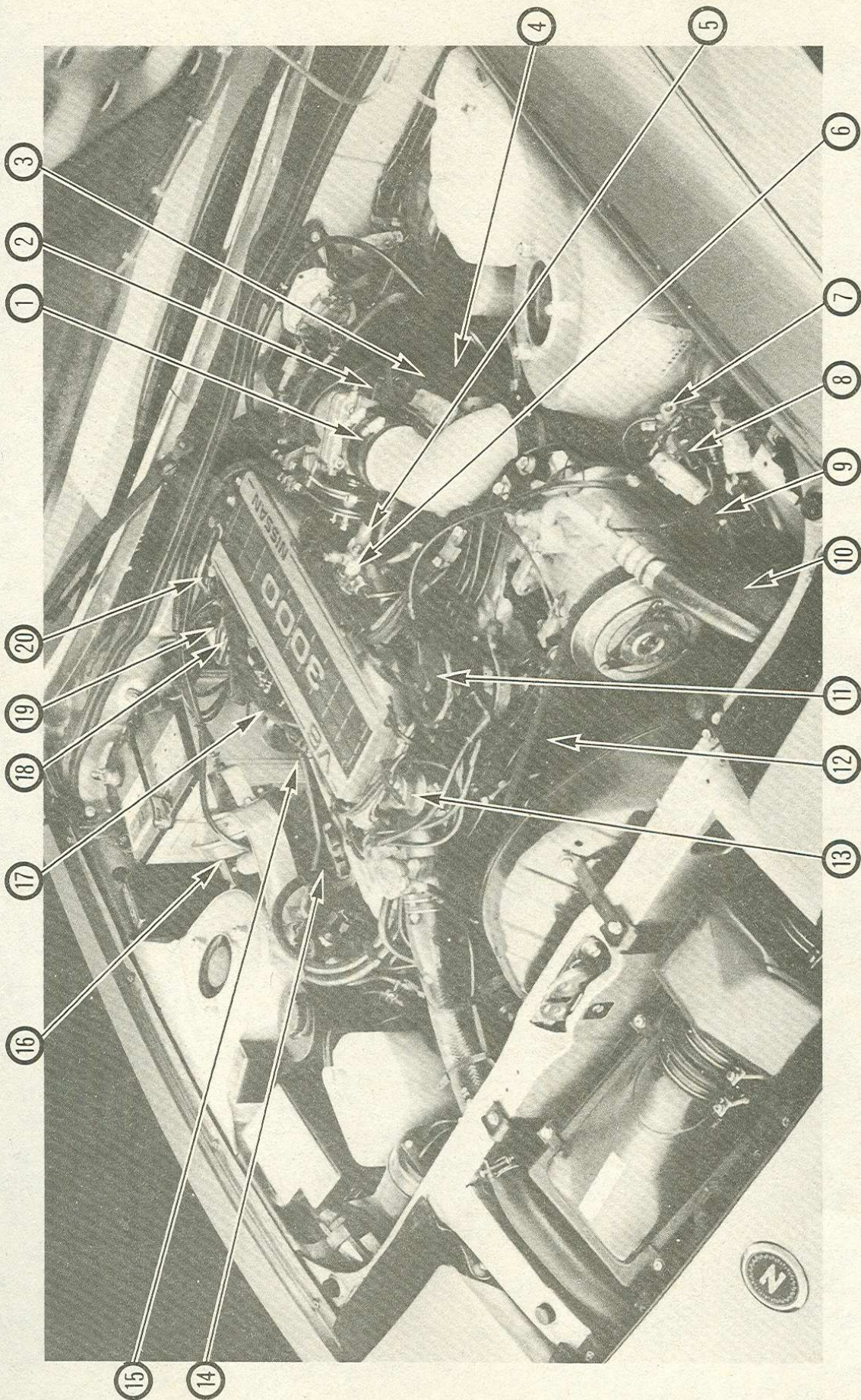
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Specifications

Fuel pump cut-off discharge pressure	61 to 71 psi
Regulator pressure	36.3 psi
Air regulator air flow (at 20-degrees C/68-degrees F)	971 cu ft/hr (512 for 1987 and later models)
Turbocharger maximum pressure	320 to 380 mm Hg (12.60 to 14.96 in Hg)
Fuel pressure at idle	30 psi (approximate)
Fuel pressure as throttle pedal is depressed	
VG30E	37 psi (approximate)
VG30ET	44 psi (approximate)
Air flow meter voltage between terminals B and D	
1984 thru 1986	1.6 ± 0.5V
1987 on	2 to 4V
Cylinder head and fuel temperature sensor thermistor resistance (1984 thru 1986)	
at -10-degrees C (14-degrees F)	7.0 to 11.4 K-ohms
at 20-degrees C (68-degrees F)	2.1 to 2.9 K-ohms
at 50-degrees C (122-degrees F)	0.68 to 1.0 K-ohms
Cylinder head and fuel temperature sensors thermistor resistance (1987 on)	
at 20-degrees C (68-degrees F)	2.3 to 2.7 K-ohms
at 50-degrees C (122-degrees F)	0.77 to 0.87 ohm
at 80-degrees C (176-degrees F)	0.30 to 0.33 ohm
Exhaust gas sensor heater resistance	5 to 6 K-ohms
Turbocharger axial play	0.013 to 0.091mm (0.0005 to 0.0036 in)

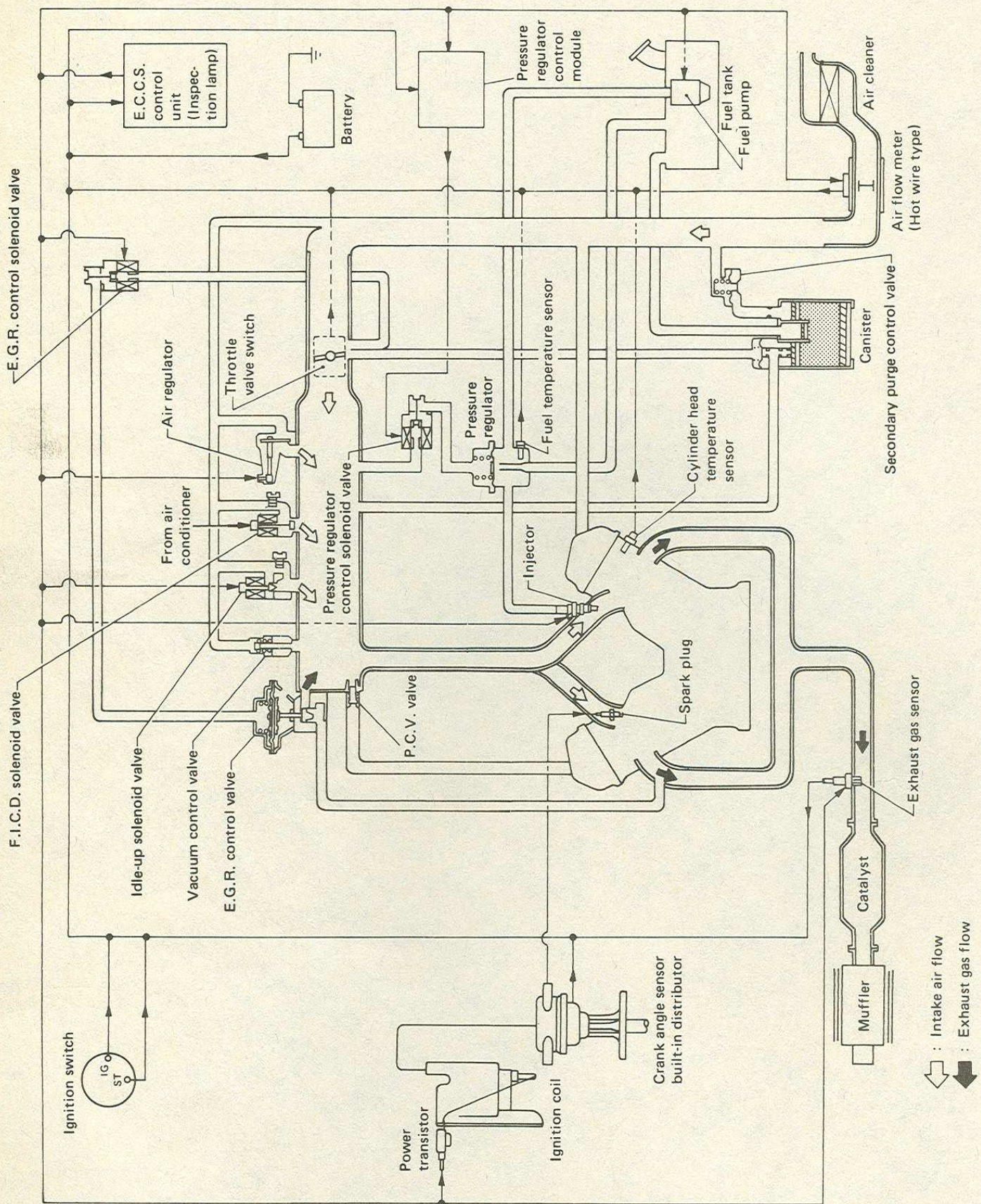
Torque specifications

	Kg-m	Ft-lbs
Accelerator cable adjusting nut	0.8 to 1.0	5.8 to 7.2
Throttle chamber securing bolt	1.8 to 2.2	13 to 16
Intake collector bolt	1.8 to 2.2	13 to 16
Cylinder head temperature sensor	1.2 to 1.6	9 to 12
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
EGR control valve	1.8 to 2.3	13 to 17
EGR tube	3.5 to 4.5	25 to 33
Detonation sensor	2.5 to 3.5	18 to 25
Fuel hose clamp	0.10 to 0.15	0.7 to 1.1
Throttle pedal hold down bolt	0.4 to 0.5	2.9 to 3.6
Fuel pump retaining bolt	0.23 to 0.31	1.7 to 2.2
Fuel tank gauge retaining bolt	0.23 to 0.31	1.7 to 2.2
Filler neck-to-tank retaining bolt	0.23 to 0.31	1.7 to 2.2
Fuel tank strap retaining bolt	3.2 to 4.3	23 to 31
Heat shield retaining bolts and nuts	0.4 to 0.5	2.9 to 3.6
Exhaust manifold to header pipe retaining nuts	4.7 to 6.2	34 to 45
Header pipe to catalytic converter	3.2 to 4.3	23 to 31
Exhaust pipe to catalytic converter	3.2 to 4.3	23 to 31
U-bolt retaining nut	2.3 to 3.7	17 to 27
Exhaust tube mounting bolts and nuts	0.93 to 1.2	6.7 to 8.7
Exhaust pipe to muffler inlet pipe	1.8 to 2.8	13 to 20
Turbo-to-exhaust manifold nut	4.5 to 5.5	33 to 40
Turbo oil drain pipe to turbo bolt	1.0 to 1.2	7 to 9
Turbo coolant delivery tube bolt	3.2 to 4.2	23 to 30
Oil delivery tube to block bolt	1.5 to 2.0	11 to 14
Oil delivery tube to turbo bolt	1.0 to 2.2	7 to 16

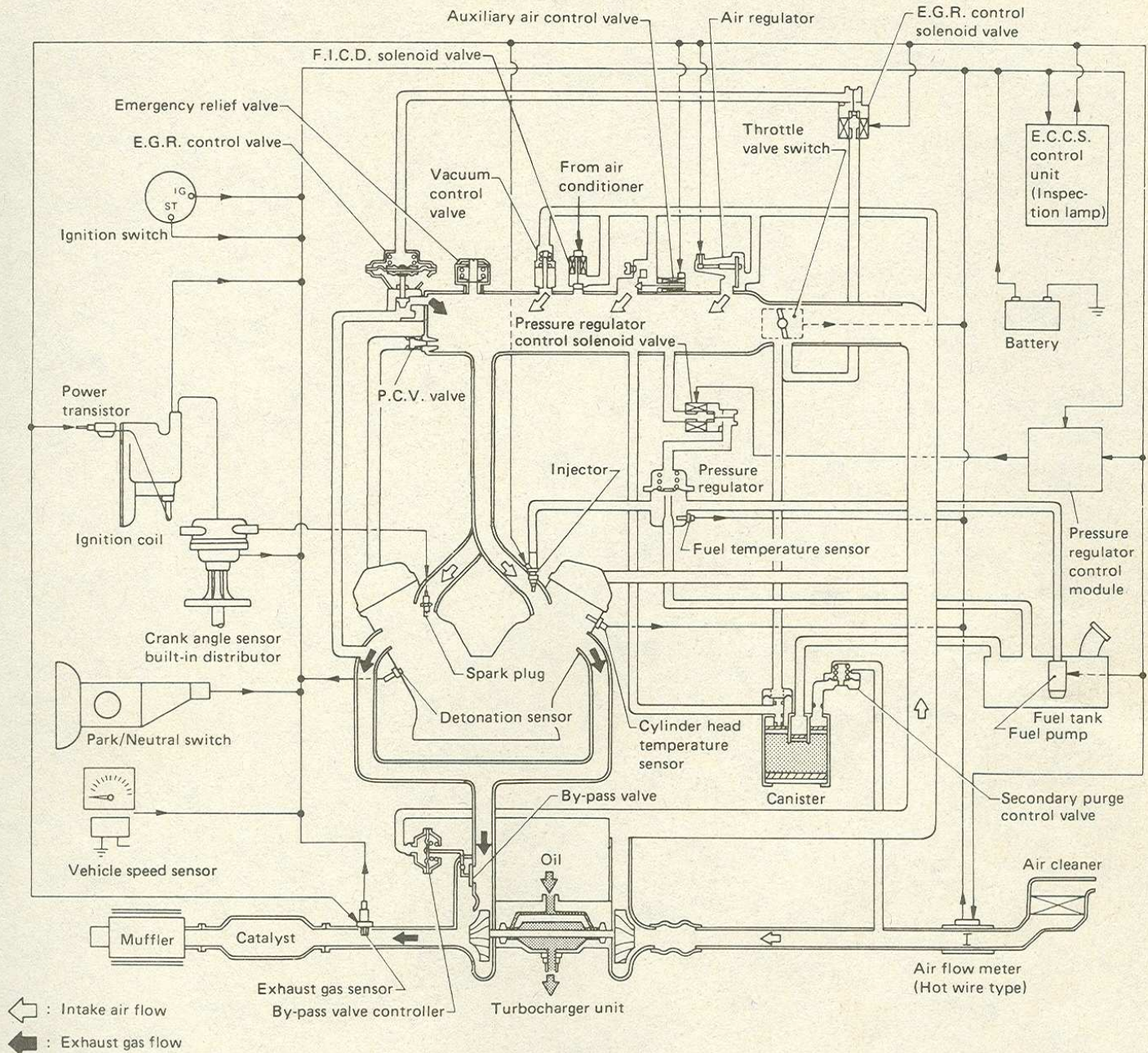


1.1 EFI component locations

- | | | |
|-------------------------------|--|--|
| 1) Throttle chamber | 7) Pressure regulator control solenoid valve | 16) Pressure regulator control module (under battery tray) |
| 2) Throttle valve switch | 8) Power transistor | 17) Air regulator |
| 3) Exhaust gas sensor | 9) Ignition coil | 18) EGR control solenoid valve |
| 4) Turbocharger (if equipped) | 10) Air flow meter | 19) EGR control valve |
| 5) F.I.C.D. | 11) Crank angle sensor (distributor) | 20) Injector |
| 6) Idle-up solenoid (VG30E) | 12) Cylinder head temperature sensor | |
| | 13) Pressure regulator and fuel temperature sensor | |
| | 14) Fuel filter | |
| | 15) Detonation sensor (VG30ET) | |



1.2a Use this ECCS diagram for the VG30E to understand how the air/fuel/exhaust system interacts



1.2b On the VG30ET model, the air is introduced into the turbocharger first, then force fed into the engine

1 EFI (Electronic Fuel Injection) system — general information

Refer to illustrations 1.1, 1.2a and 1.2b

The VG30E and VG30ET engines use an Electronic Fuel Injection (EFI) fuel system in place of the conventional carburetor (see illustrations). Electronic fuel injection provides optimum mixture ratios, and this, together with the immediate response characteristics of the fuel injection, permits the engine to run on the weakest possible fuel/air mixture. This vastly reduces the exhaust gas toxic emission. The fuel system is interrelated with and works in conjunction with the emissions control and exhaust systems covered in Chapter 6. Thus, some elements that relate directly to the fuel system are covered in that Chapter.

The EFI system consists of three subsystems: The fuel flow system, the air flow system and the electrical signaling system (see illustration). The various components that make up the entire EFI system are detailed in Section 2.

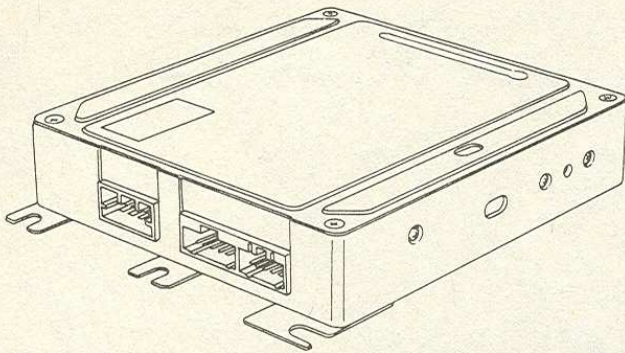
Fuel from the tank is delivered under pressure by an electric fuel pump. The amount of fuel to be injected is determined by the injection pulse duration as well as by a pressure difference between fuel pressure and intake manifold vacuum pressure. The Electronic Concentrated

Control System (ECCS) control unit controls only the injection pulse duration. For this reason, the pressure difference between the fuel pressure and intake manifold vacuum pressure must be maintained at a constant level. Since the intake manifold vacuum pressure varies with engine operating conditions, a pressure regulator is placed in the fuel line to regulate the fuel pressure in response to changes in the intake manifold pressure. Where manifold conditions are such that the fuel pressure could be beyond that specified, the pressure regulator returns surplus fuel to the tank.

An injection of fuel occurs once every rotation of the engine. Because the injection signal comes from the control unit, all six injectors operate simultaneously and independent of the engine stroke. Each injection supplies half the amount of fuel required by the cylinder, and the length of the injection period is determined by information fed to the control unit by various sensors included in the system.

Elements affecting the injection duration include: Engine rpm, quantity and temperature of the intake air, throttle valve opening, temperature of the engine coolant, intake manifold vacuum pressure and amount of oxygen in the exhaust gases.

Because the EFI system operates at high fuel pressure, any leak can affect system efficiency and present a serious fire risk. Also, since the



2.1 The ECCS unit controls the amount of fuel that is injected, ignition timing, idle speed, fuel pump operation and feedback of the mixture ratio

intake air flow is critical to the operation of the system, even a slight air leak will cause an incorrect air/fuel mixture. **Note:** *Certain precautions should be observed when working on the EFI system:*

- Do not disconnect either battery cable while the engine is running.
- Prior to any operation in which the fuel line will be disconnected, the high pressure in the system must first be eliminated. This procedure is described in Chapter 1. Disconnect the negative battery cable to eliminate the possibility of sparks occurring while fuel is present.
- Prior to removing any EFI component, be sure the ignition switch is Off and the negative battery cable is disconnected.
- The EFI wiring harness should be kept at least four inches (10 mm) away from adjacent harnesses. This includes a CB antenna feeder cable. This is to prevent electrical pulses in other systems from interfering with EFI operation.
- Be sure all EFI wiring connections are tight, clean and secure, as a poor connection can cause extremely high voltage surges in the ignition coil which could drain the IC circuit.
- The accelerator should *Not* be depressed prior to starting the engine. Immediately after starting, do not rev the engine unnecessarily.

The electric fuel pump uses relays, located in the engine compartment, that are designed so that should the engine stop (causing the alternator to turn off and the oil pressure to drop), the fuel pump will cease to operate.

Some basic checks of the EFI components are included in this Chapter. However, the complexity of the system prevents many problems from being accurately diagnosed by the home mechanic. If a problem develops in the system which cannot be pinpointed by the checks listed here, it is best to take the vehicle to a Nissan dealer to locate the fault.

2 ECCS components — general description

Refer to illustrations 2.1, 2.2a, 2.2b, 2.2c, 2.3, 2.4, 2.5, 2.6, 2.8, 2.9, 2.10, 2.11, 2.12, 2.14, 2.15, 2.17, 2.18 and 2.24.

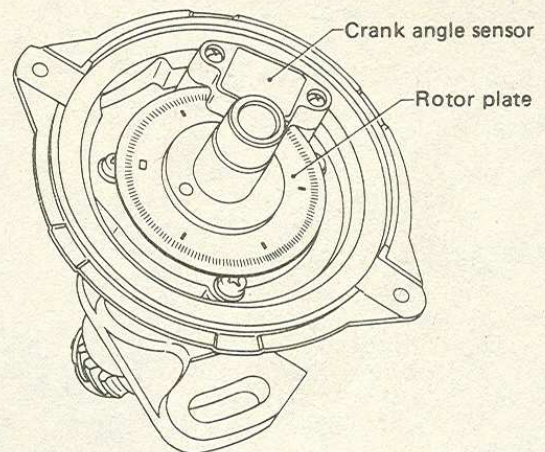
ECCS control unit

1 The Electronic Concentrated Control System (ECCS) control unit is a microcomputer with electrical connectors for receiving input/output signals and for power supply, inspection lamps and a diagnostic mode selector. The control unit regulates the amount of fuel that is injected, as well as the ignition timing, idle speed, fuel pump operation and the feedback of the mixture ratio (see illustration).

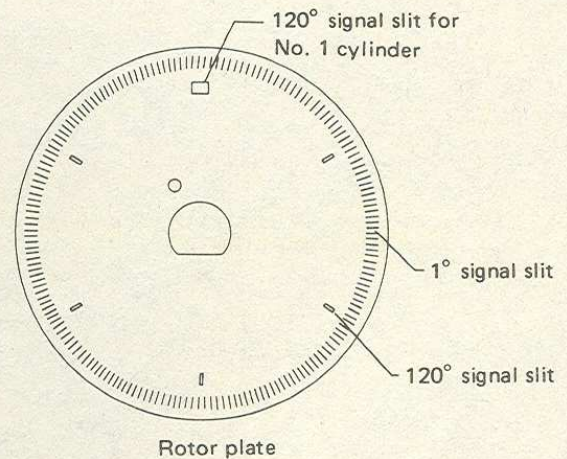
Crank angle sensor

2 The crank angle sensor could be regarded as the right hand to the ECCS control unit, as it is the basic signal sensor for the entire ECCS system. It monitors the engine speed, piston position and it sends signals to the ECCS control unit for control of the fuel injection, ignition timing, idle speed, fuel pump operation and the EGR function (see illustrations).

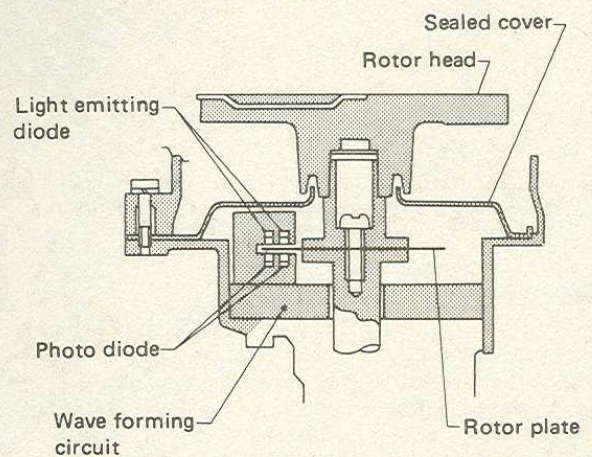
The crank angle sensor has a rotor plate and a wave forming circuit. The assembly consists of a rotor plate with 360 slits representing 1° signals (engine speed signal) and six slits for 120° signals (crank angle



2.2a The crank angle sensor is the main signal sensor for the ECCS



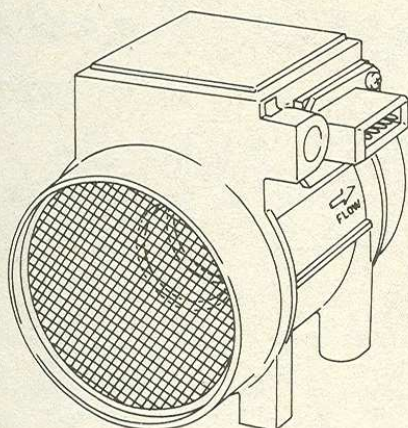
2.2b The rotor plate has 360 slits to indicate engine speed and 6 slits for crank angle signal



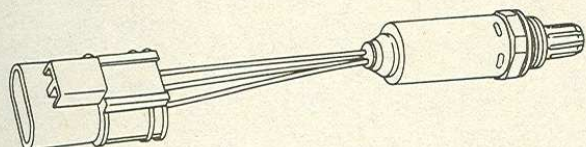
2.2c Light passes through the slits in the rotor plate, sending signals in the form of on-off pulses to the control unit

signal). Light emitting diodes (LED) and photo diodes are built into the wave forming circuit.

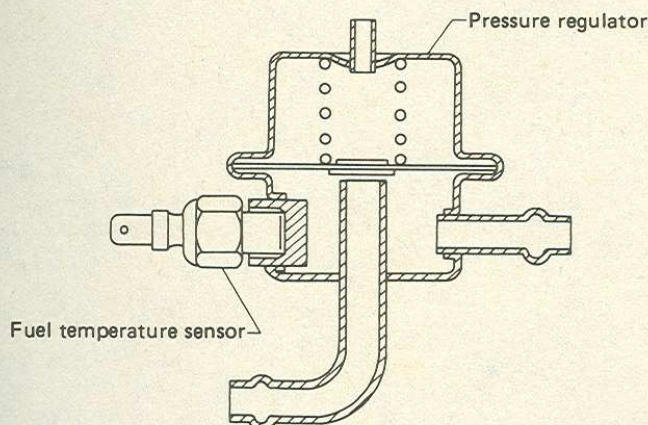
In operation, the signal rotor plate passes through the space between the LED and photo diode and the slits in the signal rotor plate intermittently cut off the light sent to the photo diode from the LED. This causes an alternating voltage and the voltage is converted into an on/off pulse by the wave forming circuit. The on/off signal is sent to the control unit for processing.



2.3 The air flow meter measures the mass flow rate of intake air



2.5 The exhaust gas sensor monitors the quantity of oxygen in the exhaust gas



2.8 The fuel temperature sensor lets the E.C.C.S. control module know to enrich the mixture when the fuel temperature is too high

Air Flow meter

3 The air flow meter measures the mass flow rate of intake air. The control circuit emits an electrical output signal which varies in relation to the amount of heat dissipated from a hot wire placed in the stream of intake air (see illustration).

Cylinder head temperature sensor

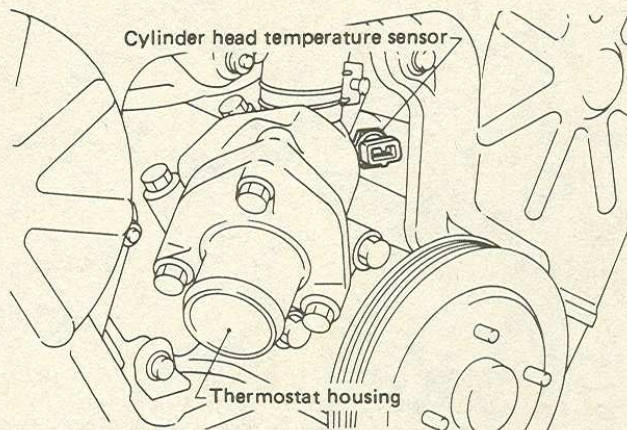
4 The cylinder head temperature sensor is located in the left cylinder head and monitors changes in the cylinder head temperature and transmits a signal to the ECCS control unit (see illustration).

Exhaust gas sensor

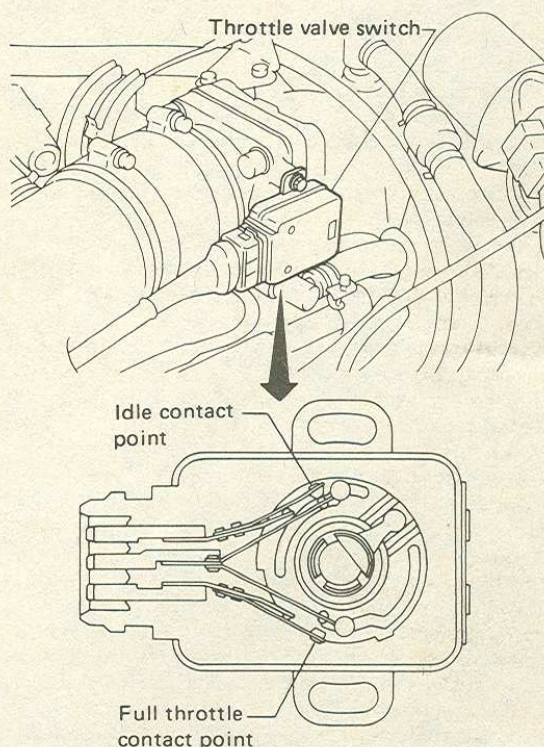
5 Mounted in the exhaust manifold, the exhaust gas sensor monitors the quantity of oxygen in the exhaust gases (see illustration).

Throttle valve switch

6 The throttle valve switch is attached to outside of the throttle chamber and actuates in response to accelerator pedal movement. The switch is equipped with two contacts, one for idle and the other for



2.4 The cylinder head temperature sensor is located behind the thermostat housing and timing belt cover



2.6 The throttle switch informs the control unit when the accelerator is at idle and on electronically controlled automatic transmission equipped models it informs the control unit when the throttle is wide open

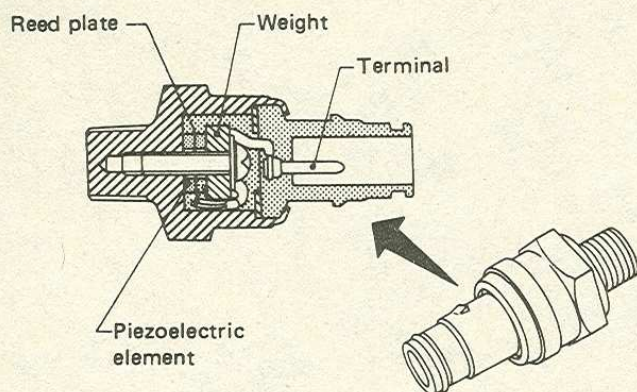
full throttle contact. The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position. The full throttle contact is used for electronic controlled automatic transmissions only (see illustration).

Vehicle speed sensor

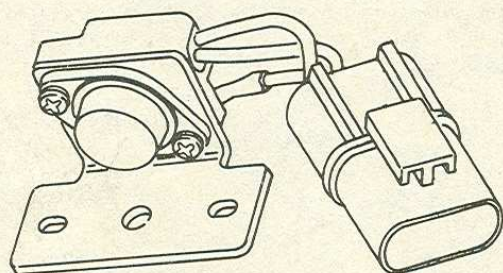
7 The vehicle speed sensor provides a vehicle speed signal to the ECCS control unit. Two types of speed sensor are employed, depending upon the type of speedometer installed. Needle type speedometer models utilize a reed switch, which is installed in the speedometer unit and transforms vehicle speed into a pulse signal which is sent to the control unit. The digital type speedometer consists of an LED, photo diode, shutter and wave forming circuit.

Fuel temperature sensor

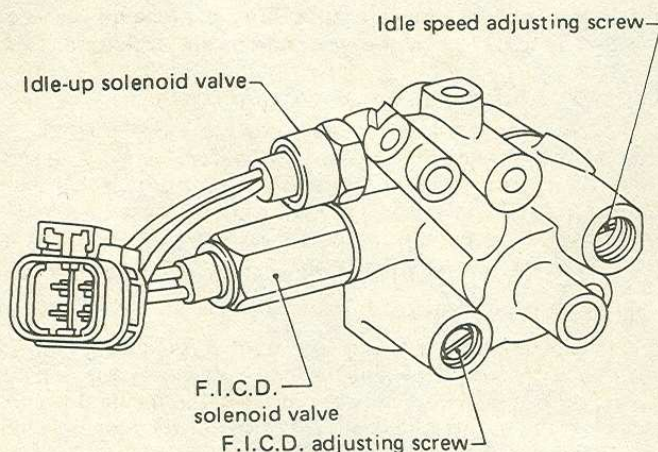
8 The fuel temperature sensor is built into the pressure regulator and senses the fuel temperature. When the fuel temperature is higher than the specified level, the ECCS control unit enriches the mixture injected to compensate. The fuel temperature sensor should not be removed from the regulator. Always replace as an assembly (see illustration).



2.9 A detonation sensor is installed on the engine block of VG30ET models to sense engine knock conditions



2.11 The ignition signal is amplified by the power transistor, which triggers the proper high voltage in the secondary circuit



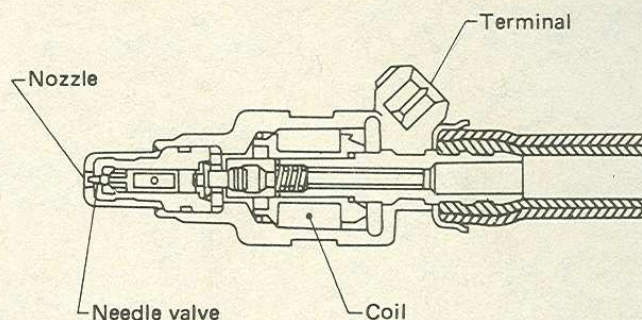
2.14 The idle-up solenoid acts to stabilize idle speed when engine load is heavy

Detonation sensor (turbo models only)

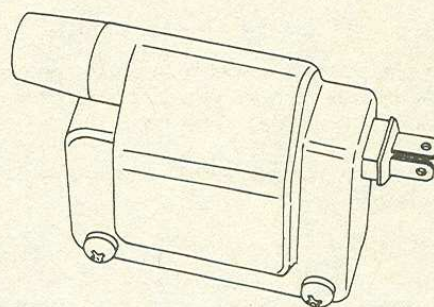
9 Attached to the cylinder block, the detonation sensor is capable of sensing engine knock conditions. Any knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This pressure is then converted into a voltage signal which is delivered as output to the control unit (see illustration).

Fuel injector

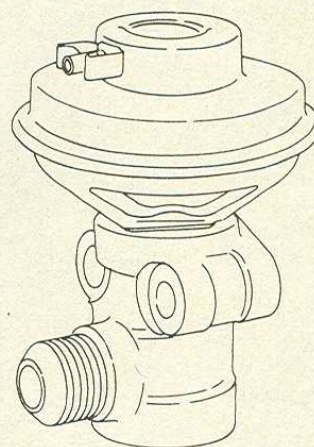
10 The fuel injector supplies each cylinder with fuel. The injector is a small, precision solenoid valve. As the ECCS control unit outputs an injection signal to each fuel injector, the coil built into the injector pulls the needle valve back and fuel is sprayed through the nozzle into the intake manifold. The amount of fuel injected is controlled by the ECCS control unit by injection pulse duration (see illustration).



2.10 The fuel injector receives a signal from the control unit and the needle valve opens to inject fuel into the intake manifold. The amount of fuel injected is determined by the pulse duration



2.12 The ignition coil



2.15 The EGR valve controls the amount of exhaust gas to circulated into the intake manifold

Power transistor

11 The ignition signal from the ECCS control unit is amplified by the power transistor, which connects and disconnects the coil primary circuit to induce the proper high voltage in the secondary circuit (see illustration).

Ignition coil

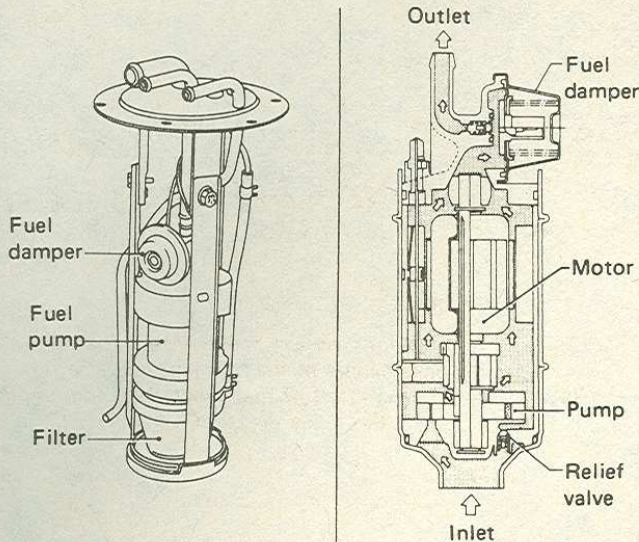
12 The molded type ignition coil provides spark for the combustion process (see illustration).

Auxiliary air control (AAC) valve (turbo models only)

13 The AAC valve is attached to the intake collector. The ECCS control unit actuates the AAC valve by an on/off pulse. The longer the on-duty signal is left on, the larger the amount of air that will be allowed to flow through the AAC valve.

Idle-up solenoid valve (non-turbo models only)

14 The idle-up solenoid valve is attached to the intake collector. The solenoid is actuated to stabilize idle speed when the engine load is heavy



2.17 The fuel pump is a wet type pump, where the vane rollers are directly coupled to a electric motor which is filled with fuel

because of electric load, such as power steering pump, air conditioning, etc. (see illustration).

EGR control valve

15 The EGR control valve controls the quantity of exhaust gas circulated to the intake manifold through movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve. **Note:** When installing the EGR guide tube, be careful of its direction. The outlet faces the rear of the engine. Otherwise the distribution efficiency of the exhaust gas will be reduced (see illustration).

EGR control solenoid valve

16 The EGR control solenoid valve cuts the intake manifold vacuum signal for EGR control. The solenoid valve actuates in response to the on/off signal from the ECCS control unit. When the solenoid is off, a vacuum signal from the intake manifold is fed into the EGR control valve. As the control unit outputs an on signal, then the coil pulls the plunger downward, and cuts the vacuum signal (see illustration).

Fuel pump

17 The fuel pump, which is located in the fuel tank, is a wet type pump where the vane rollers are directly coupled to a motor which is filled with fuel (see illustration).

Air regulator

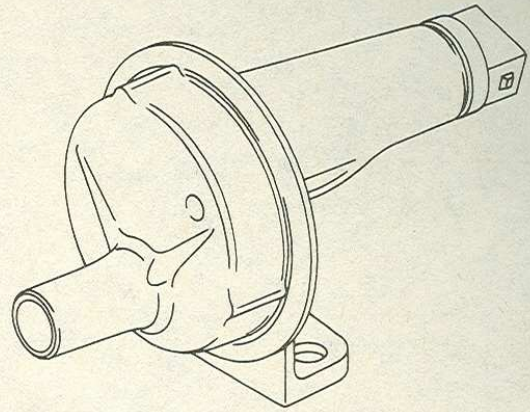
18 The air regulator gives an air bypass when the engine is cold to allow fast idle during warm-up. A bimetal heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air bypass port is open. As the engine starts and electric current flows through a heater, the bimetal begins to rotate the shutter to close off the bypass port. The air passage remains closed until the engine is stopped and the bimetal temperature drops (see illustration).

Air injection valve (AIV)

19 The air injection valve sends secondary air to the exhaust manifold by means of a vacuum caused by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (vacuum), secondary air is sent to the exhaust manifold. When the exhaust pressure is above the atmospheric pressure the reed valve will prevent the secondary air from being sent back to the air cleaner.

AIV control solenoid valve

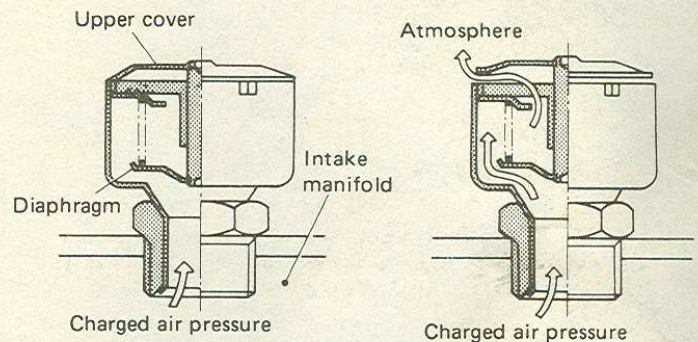
20 The AIV control solenoid valve controls an intake manifold vacuum signal for the AIV control. The solenoid valve actuates in response to the on/off signal from the ECCS control unit. When the solenoid is Off the vacuum signal from the intake manifold is cut. As this happens the control unit outputs an On signal and the coil pulls the plunger downward, feeding the vacuum signal to the AIV control valve.



2.18 The air regulator gives an air bypass when the engine is cold to provide fast idle during warm-up

When the pressure in the intake manifold is below 52.0 kPa (390 mmHg, 15.35 inHg)

When the pressure in the intake manifold is above 52.0 kPa (390 mmHg, 15.35 inHg)



2.24 In case the bypass valve fails, the emergency relief valve will open to release pressure in the intake manifold

Pressure regulator control solenoid valve

21 The pressure regulator control solenoid valve cuts the intake manifold vacuum signal for pressure regulator control. The solenoid valve actuates in response to the on/off signal from the ECCS control unit. When it is Off, a vacuum signal from the intake manifold is fed into the pressure regulator. As the control unit outputs an On signal, the coil pulls the plunger downward, cutting the vacuum signal.

Vacuum control valve

22 The vacuum control valve is provided to reduce the engine lubricating oil consumption when the intake manifold vacuum increases to a very high level during deceleration. As the manifold vacuum increases beyond the specified value, the valve will open, allowing air to be drawn into the intake manifold.

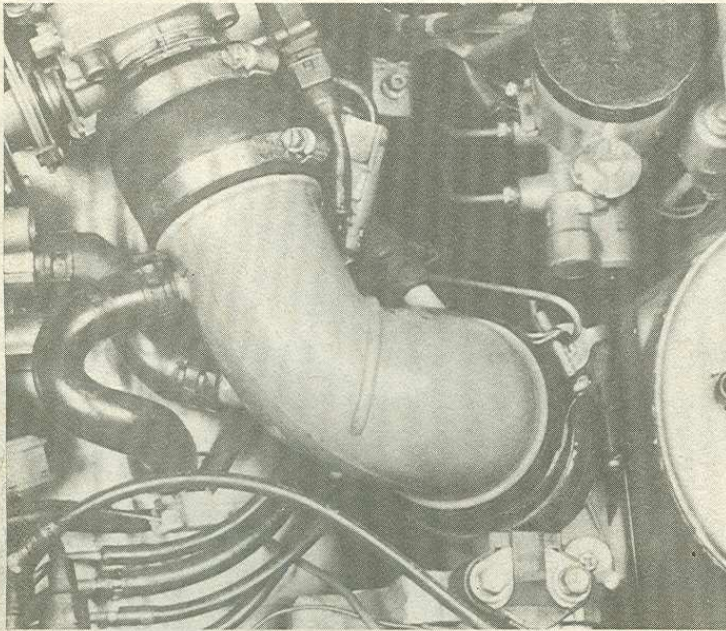
Turbocharger

23 The turbocharger is mounted to the left exhaust manifold and is designed to utilize the exhaust gas to spin the turbine wheel, which is connected to the compressor wheel. Pressurized air is supplied by the compressor through the throttle chamber into the intake manifold.

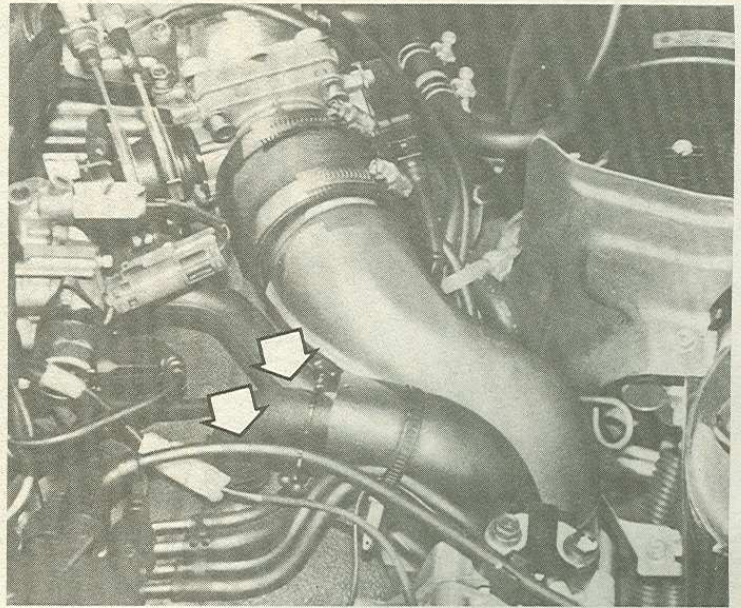
To prevent the turbocharger from an excessive rise in supercharging pressure, the turbine speed is maintained within a safe range by controlling the amount of exhaust gas that passes through the turbine. The system consists of a bypass valve, which allows some of the exhaust gas to bypass the turbine and to flow directly into the exhaust pipe.

Emergency relief valve

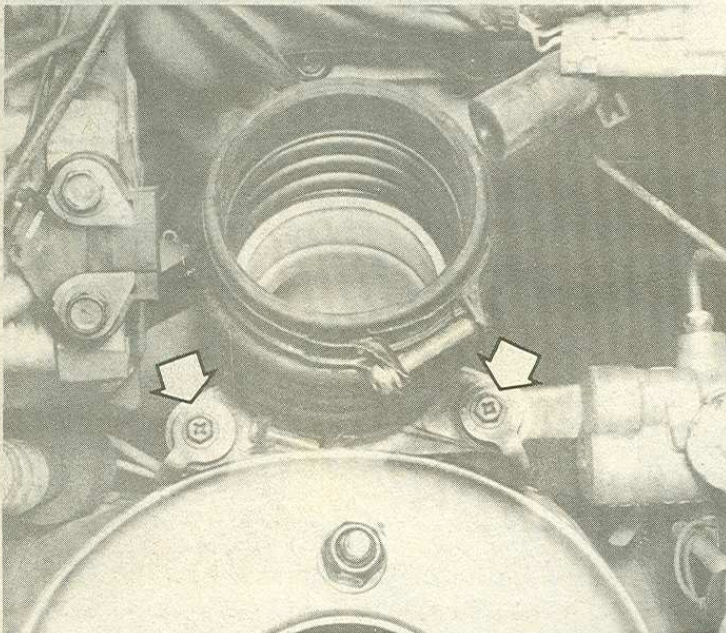
24 To prevent an abnormal rise in supercharging pressure, and possible engine damage, in case the bypass valve should fail to open properly, an emergency valve is installed as a safety device in the intake manifold. The valve opens when the pressure in the intake manifold is above 63.3 kPa (18.70 in Hg) (see illustration).



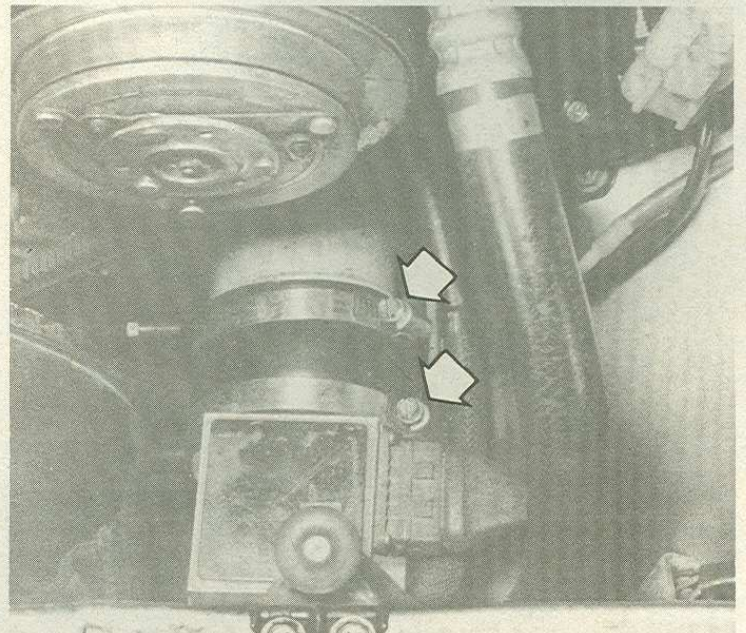
3.1a On non-turbo models remove the three air hoses then loosen the large clamps at each end to remove the upper inlet air tube



3.1b On turbo models, remove the two air hoses (one not shown, underneath) then loosen the end clamps. It will be necessary to remove the retaining bolt securing the rocker arm hose to the inlet tube (arrows)



3.3 Remove the two bolts attaching the lower inlet tube to the fender well (arrows)



3.4 Disconnect the lower inlet tube from the air flow meter by loosening the hose clamps (arrows)

3 Air inlet tubes — removal and installation

Refer to illustrations 3.1a, 3.1b, 3.3 and 3.4

Upper tube

1 Remove the three air hoses from the tube (two hoses on turbo models) and loosen the two large hose clamps at each end of the tube (see illustrations). On turbo models disconnect the retaining bolt attaching the air hose running into the rocker arm cover.

Lower tube

- 2 If equipped with air conditioning, remove the compressor.
- 3 Remove the two bolts securing the air inlet tube to the fender well on non-turbo models (see illustration).
- 4 Loosen the hose clamps at each end of the air inlet tube on turbo models and at the air flow meter on non-turbo models (see illustration).
- 5 Pull the air inlet tube from the air flow meter (and turbo, if equipped)

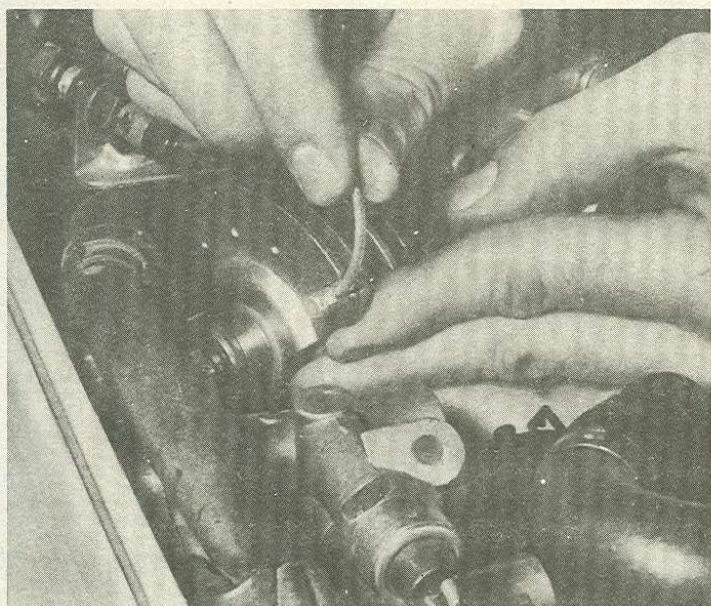
and lift the tube out of the engine compartment.

- 6 Installation of both tubes is the reverse of the removal procedures.

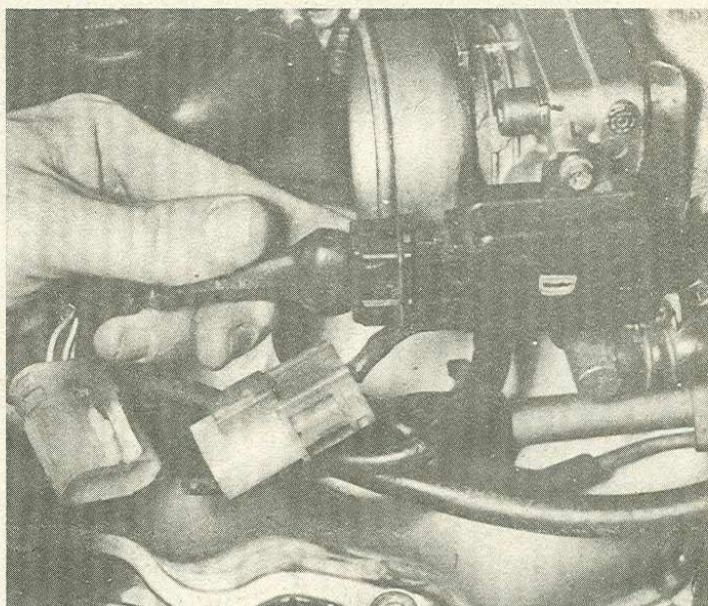
4 Throttle chamber — removal and installation

Refer to illustrations 4.1, 4.2, 4.3 and 4.5

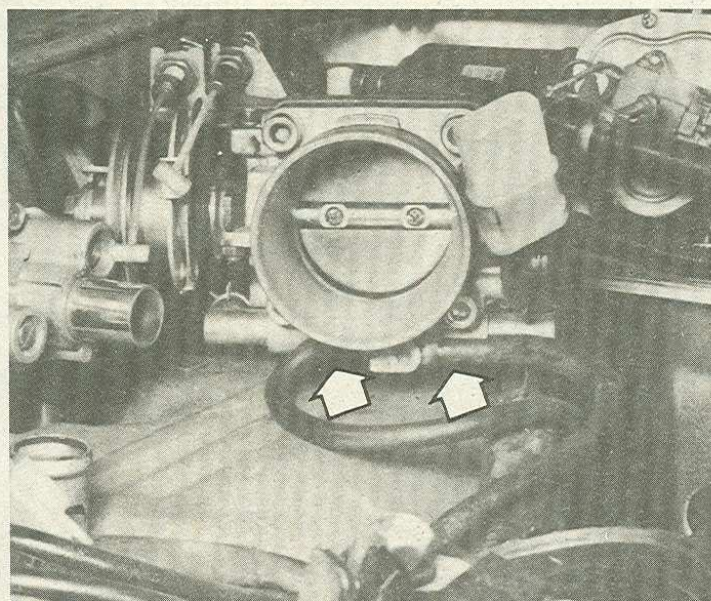
- 1 Disconnect the throttle cable by raising the throttle chamber actuating valve and sliding the cable from the actuator (see illustration).
- 2 Disconnect the two electrical connectors from the throttle valve switch sensor (see illustration).
- 3 Disconnect the vacuum lines from each side of the throttle chamber (see illustration).
- 4 Use a Phillips screwdriver to loosen the coolant hoses from each side of the throttle chamber.
- 5 Remove the four Allen head bolts and remove the throttle chamber from the intake collector (see illustration).
- 6 Reverse the removal procedures for installation.



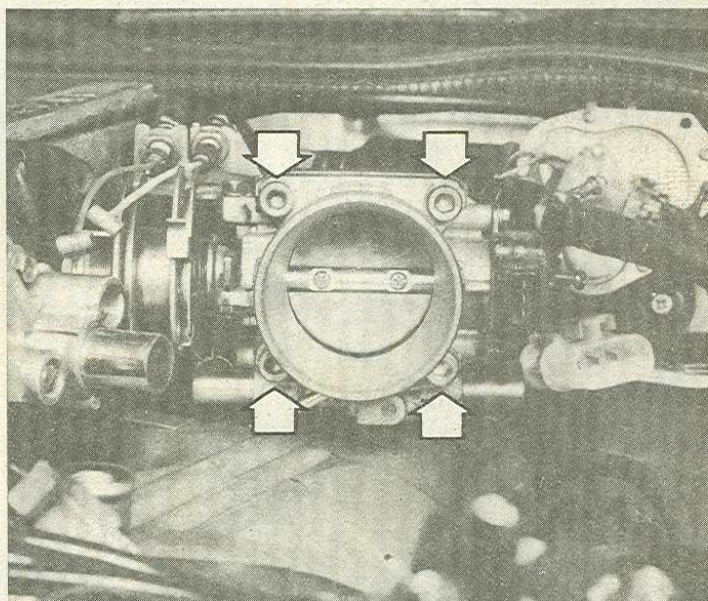
4.1 Raise the actuator and slide the accelerator cable end out of the retaining slot



4.2 After pulling the white connector apart, pull the TVS connector from the throttle valve switch



4.3 Disconnect the two vacuum lines from the lower part of the chamber (arrows)



4.5 Remove the four Allen head bolts retaining the chamber to the intake collector (arrows)

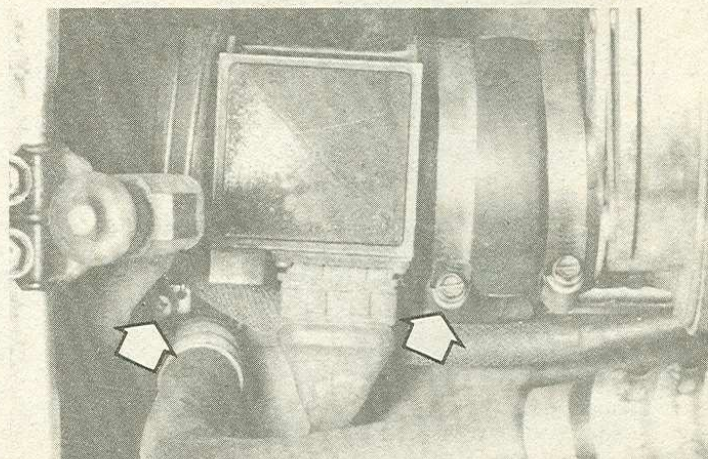
5 Air flow meter — removal and installation

Refer to illustration 5.3

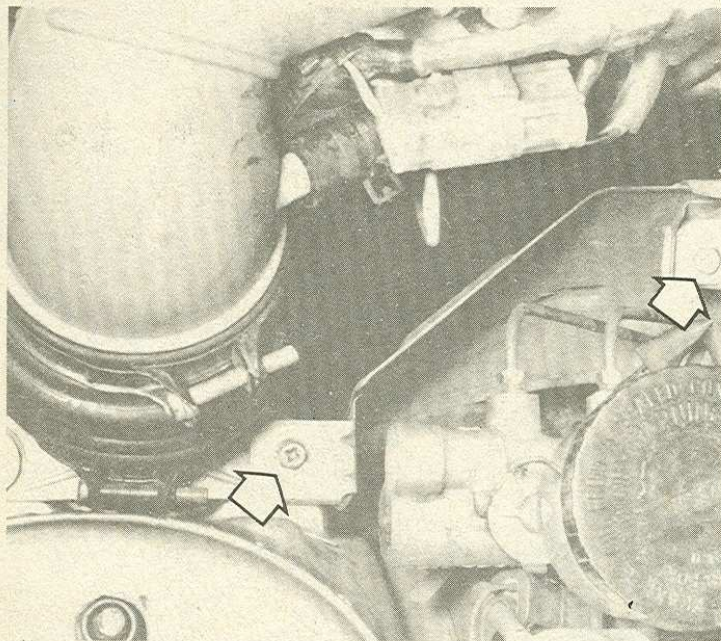
- 1 Loosen the bolts securing the air filter housing to the body.
- 2 Disconnect the air flow meter electrical connector by pulling the connector apart.
- 3 Loosen the large hose clamps at each end of the air flow meter (see illustration).
- 4 Push the air filter housing forward and work the air flow meter from the air tube.
- 5 To install, work the air flow meter into the air filter housing tube then work the other end onto the air flow meter and tighten all retaining bolts and hose clamps.

6 Cylinder head temperature sensor — removal and installation

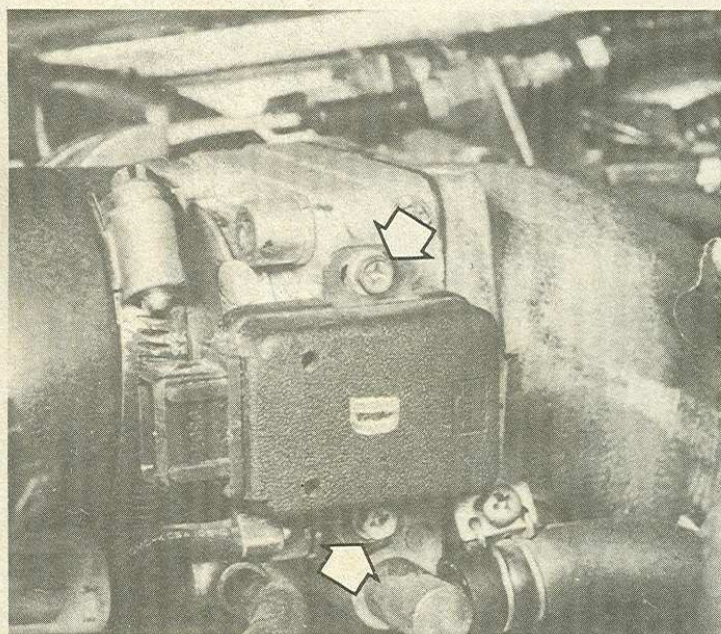
- 1 Refer to timing belt removal in Chapter 2a and remove the timing belt and timing belt rear cover.



5.3 Disconnect the air flow meter by removing the electrical connector and loosening the large hose clamps at each end of the meter (arrows)



7.1 Remove the heat shield retaining bolts (arrows)



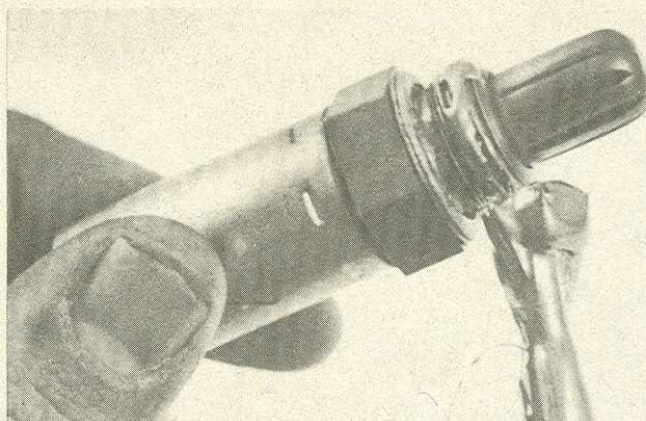
8.2 Remove the two throttle valve switch bolts (arrows)

- 2 Disconnect the temperature sensor electrical connector located on the front of the left cylinder head.
- 3 Remove the sensor from the head.
- 4 To install, wrap the new sensor threads with teflon tape then secure the sensor to the block.
- 5 Reverse the remaining removal procedures for installation.

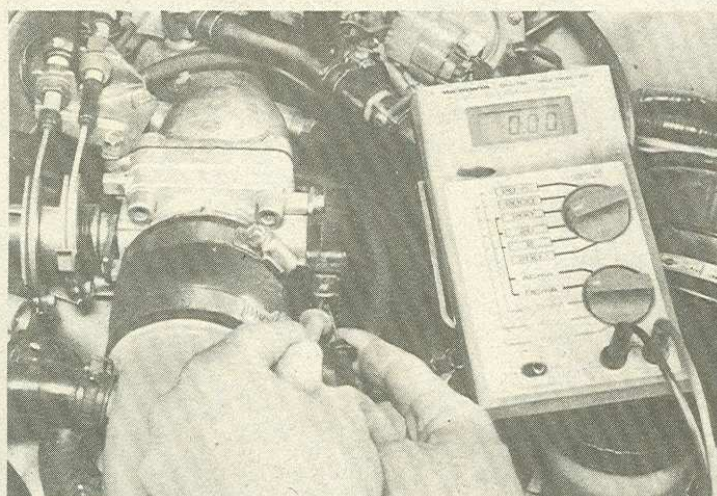
7 Exhaust gas sensor — removal and installation

Refer to illustrations 7.1 and 7.5

- 1 Remove the two master cylinder heat shield retaining bolts attached to the master cylinder and the left fender well and remove the heat shield (see illustration).
- 2 Remove the left exhaust manifold heat shield retaining bolts and remove the heat shield.
- 3 Disconnect the exhaust gas sensor electrical connector.
- 4 Remove the exhaust gas sensor from the exhaust manifold.
- 5 If a new sensor is to be installed the threads should come with an anti-seize compound on them. If installing the old sensor, apply anti-



7.5 Coat the threads with anti-seize compound before installing the sensor



8.6 With an ohmmeter connected to the top two terminals, rotate the TVS counterclockwise and the meter should show no continuity

seize compound to the threads before installation (see illustration).

- 6 Reverse the remaining removal procedures for installation.

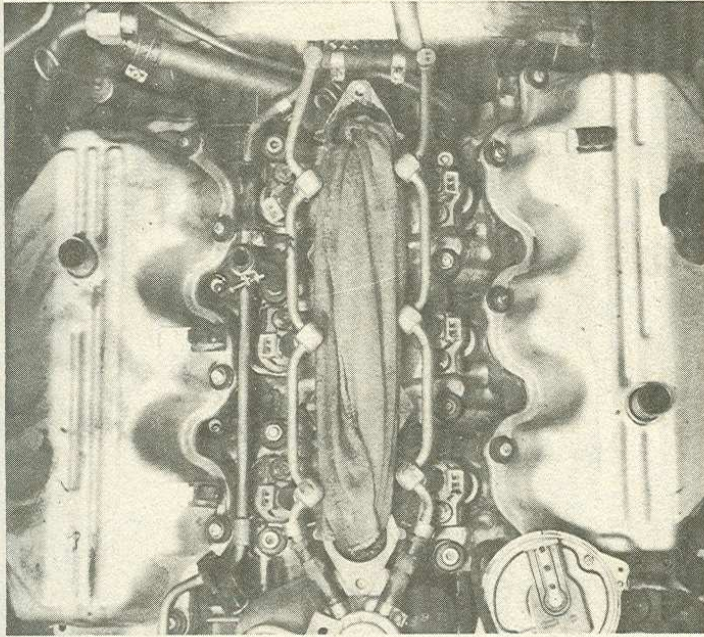
8 Throttle valve switch — removal, installation and adjustment

Refer to illustrations 8.2 and 8.5

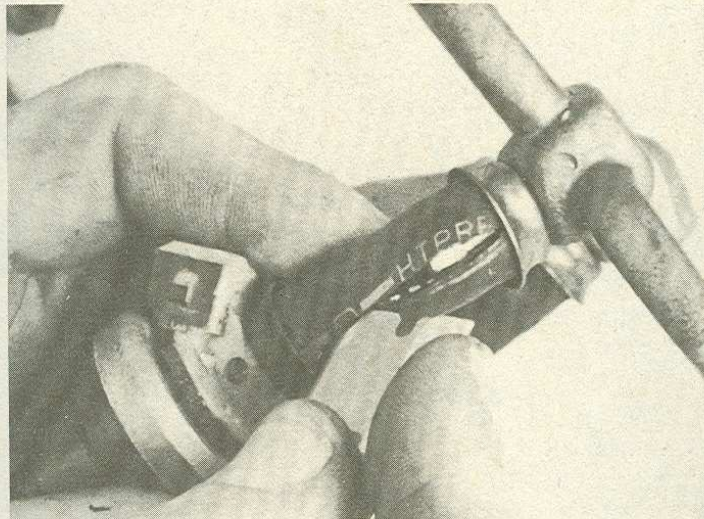
- 1 Unplug both electrical connectors (only one on manual transmission equipped models) attached to the throttle valve switch.
- 2 Remove the two bolts and lift the throttle valve switch from the throttle chamber (see illustration). **Note:** Any time the throttle valve switch bolts are loosened it will be necessary to readjust the switch.
- 3 Reverse the removal procedures for installation but do not tighten down the retaining bolts.
- 4 With the engine idling at normal operating temperature, confirm that engine idle speed is within specifications. If not, correct idle speed, referring to Chapter 1 if necessary.
- 5 With the throttle valve switch electrical connector disconnected, connect an ohmmeter to the top two terminals.
- 6 Rotate the throttle valve switch counterclockwise and the meter should show no continuity (see illustration).
- 7 Rotate the throttle valve switch clockwise until continuity is established, then tighten the retaining bolts.
- 8 Replace the throttle valve switch electrical connector.

9 Fuel temperature sensor — removal and installation

Never remove the fuel temperature sensor from the pressure regulator. Always replace as an assembly. See the fuel pressure regulator procedure for removal and installation.



11.5 Cover the intake ports with a rag



11.9 To replace an injector, carefully cut through the hose

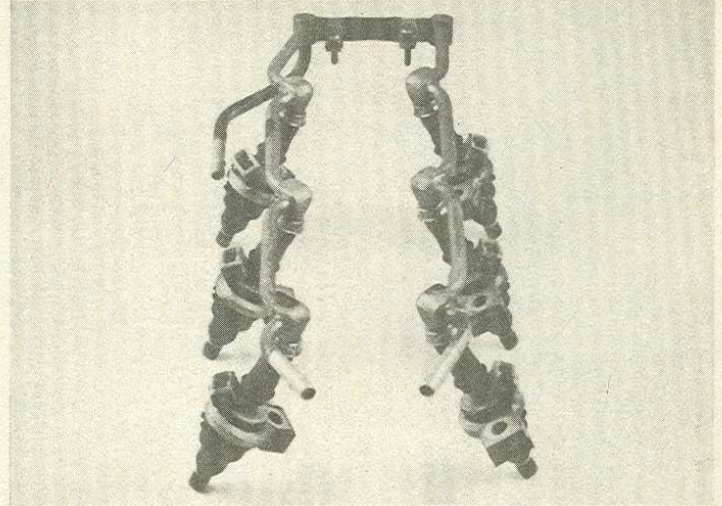
10 Detonation sensor (turbo models) — removal and installation

- 1 Locate the detonation sensor on the right side of the cylinder block.
- 2 Disconnect the electrical connector.
- 3 Remove the sensor from the cylinder block.
- 4 Reverse the removal procedure for installation.

11 Fuel injector — removal and installation

Refer to illustrations 11.5, 11.8, 11.9, 11.10a, 11.10b, 11.12a, 11.12b, 11.12c, 11.14 and 11.16

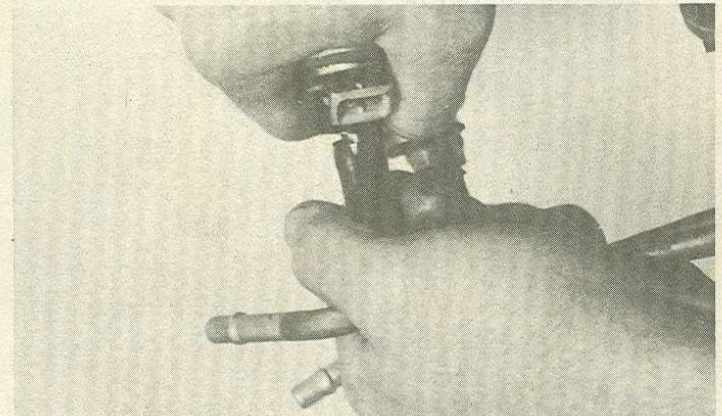
- 1 Refer to Chapter 1 and relieve the fuel pressure.
- 2 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally come in contact with the negative terminal of the battery, as this would once again allow power into the electrical system of the vehicle.
- 3 Remove the upper air intake tube.
- 4 Remove the top part of the intake collector with the throttle chamber attached.
- 5 Cover the intake ports with a rag (see illustration).
- 6 Disconnect the spark plug wires at the plugs and remove the



11.8 After removing the fuel lines and injector retaining bolts the injectors will come off as an assembly



11.10a Be sure the hose seats against the umbrella

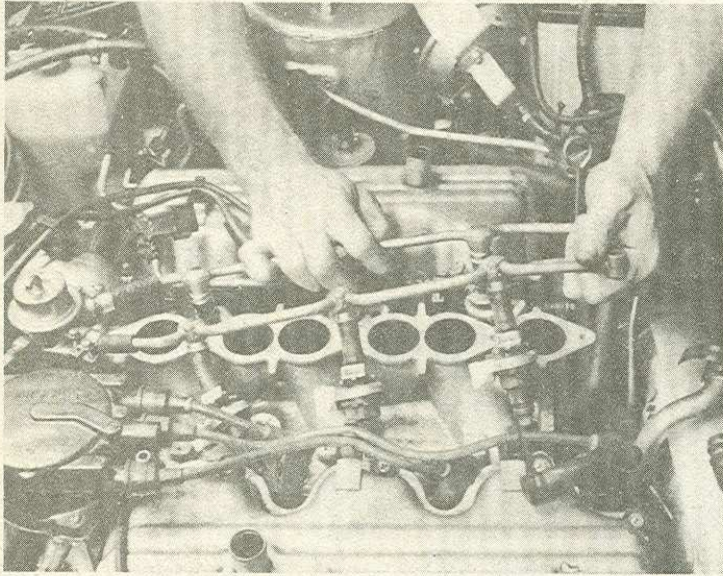


11.10b Even with the hose wet it will take considerable force to seat the injector

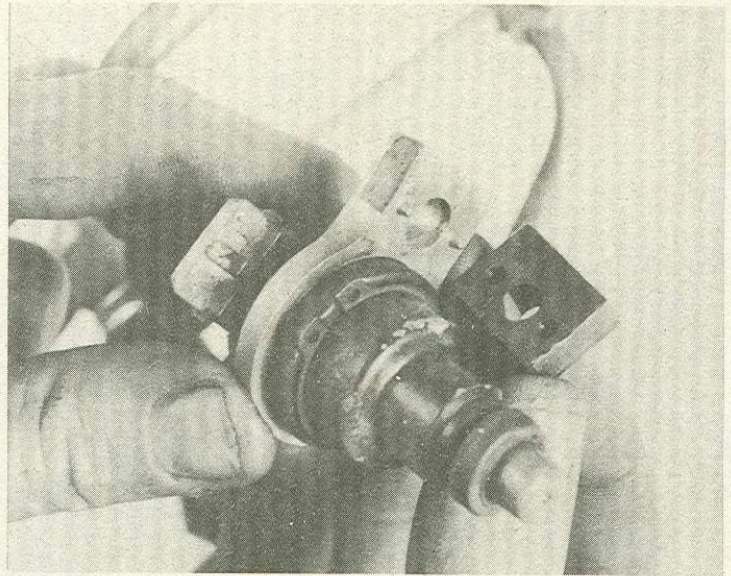
- distributor cap and move the wire assembly out of the work area.
- 7 Disconnect the fuel rails at the fuel regulator and fuel inlet tubes by loosening the hose clamps and pulling the hose from the tubing.
- Note:** When disconnecting the fuel lines place a rag around the connection to catch any leaking fuel.
- 8 Remove each of the injector retaining bolts and lift off the injector assembly (see illustration).

Injector replacement

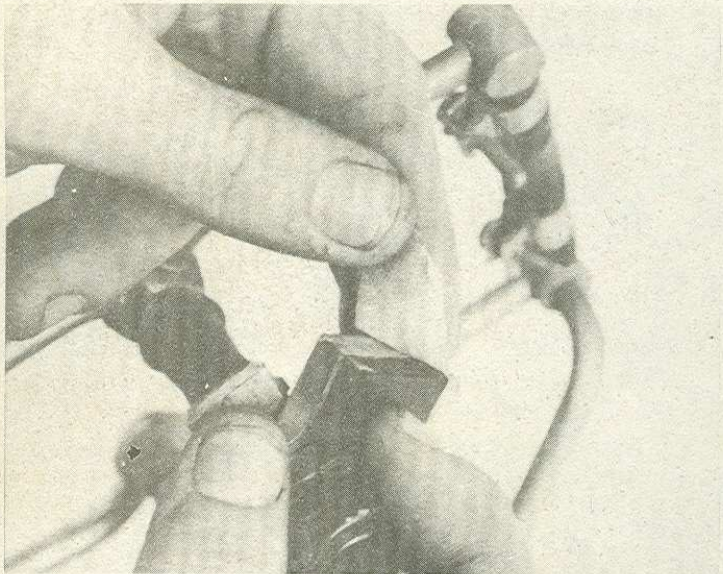
- 9 If any of the individual injectors are to be replaced, determine the injector to be replaced and carefully cut through the hose to free the injector from the rail assembly (see illustration).
- 10 To install the new injector wet the new hose with gasoline, place the umbrella onto the fuel rail and press the rubber hose onto the fuel rail. Be sure the hose seats against the umbrella (see illustrations).



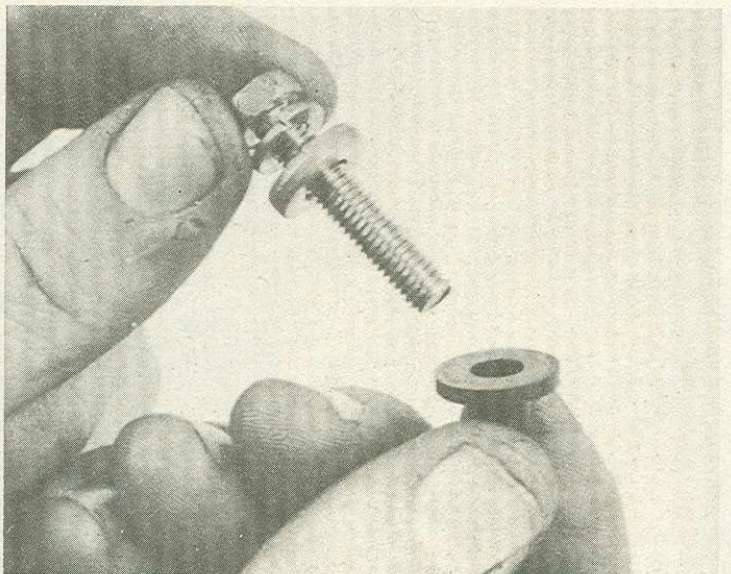
11.12a After lubricating the fuel line hoses with gas, slip the injector rail assembly into place



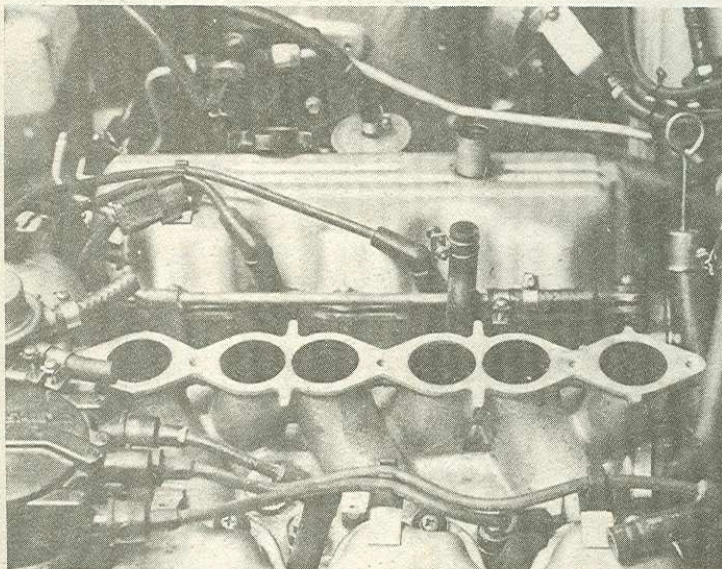
11.12b Make sure the flat spacer is installed properly



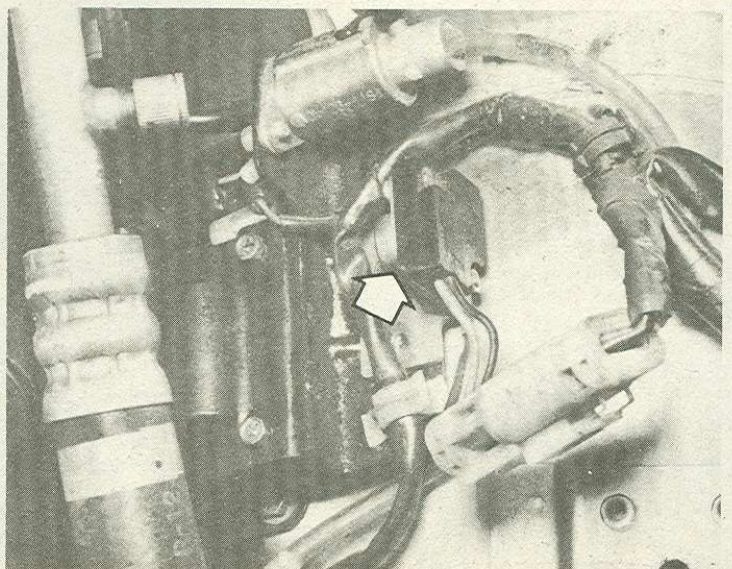
11.12c To facilitate installation tape the spacer to each injector



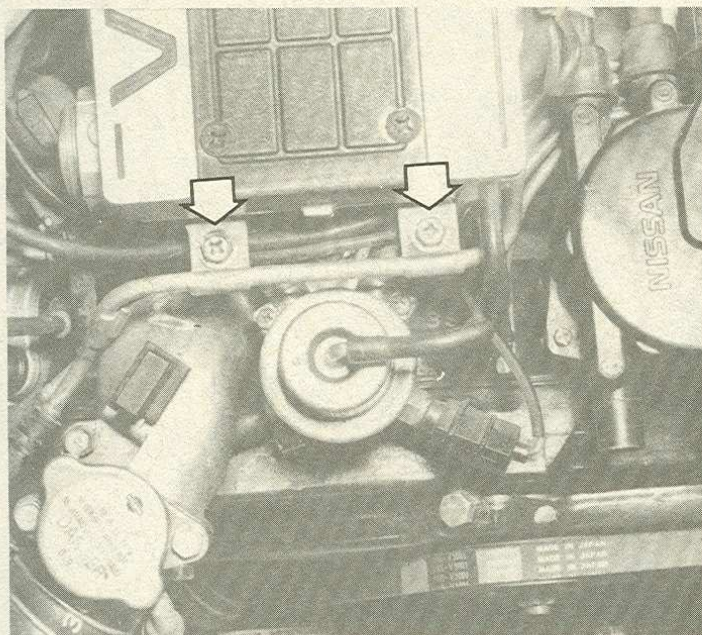
11.14 Proper bolt and washer/spacer installation sequence



11.16 Be sure to install a new gasket between the intake manifold and the collector



12.3 Disconnect the electrical connector and remove the hold-down bolt to remove the power transistor (arrow)



13.3 Remove the two injector assembly fuel lines (arrows)

Injector assembly installation

- 11 Install the fuel line hose clamps about a half of an inch up the hose.
- 12 Lubricate the fuel line hoses with gas and install the injector assembly into the fuel line hoses (see illustration). **Note:** *Make sure the injector flat side contacts the flat spacer (see illustrations).*
- 13 Once the hoses are attached insert each injector into its proper port.
- 14 Install and tighten the hold-down bolt for each injector (see illustration).
- 15 Working on the right side of the engine, install the metal spring clips onto the injector electrical connector and slip the connector onto each of the injectors on the right side.
- 16 Install a new gasket (see illustration) and set the intake collector in place, routing the right side wiring harness up on top of the collector.
- 17 Route the left side wiring harness up over the collector.
- 18 Install the fuel injector electrical connectors onto the injectors on the left side and secure with the metal clips.
- 19 Install the Allen head bolts that secure the collector to the intake manifold.
- 20 Connect the EGR tube to the collector.
- 21 Connect all electrical connectors and vacuum/fuel hoses that were disconnected during removal.
- 22 Connect all wiring harness hold-down straps to the collector.
- 23 Replace the air regulator to the collector and secure it with the two retaining bolts.
- 24 Install the electrical connector onto the air regulator.
- 25 Reverse the remaining removal procedures for installation.

12 Power transistor — removal and installation

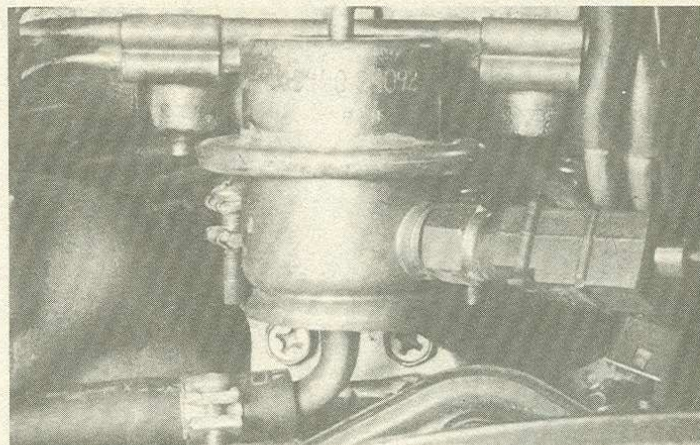
Refer to illustration 12.3

- 1 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, as this would once again allow power into the electrical system of the vehicle.
- 2 Remove the power transistor electrical connector.
- 3 Remove the hold-down bolt and lift off the power transistor (see illustration).
- 4 Reverse the removal procedures for installation.

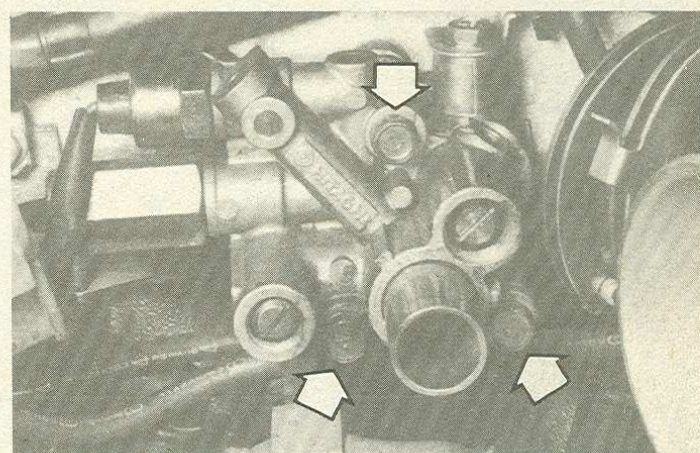
13 Fuel pressure regulator — removal and installation

Refer to illustrations 13.3 and 13.5

- 1 Relieve the fuel pressure.



13.5 Disconnect the fuel return line attached to the bottom of the regulator



14.5 Three bolts (arrows) hold the FICD to the intake collector (non-turbo model shown)

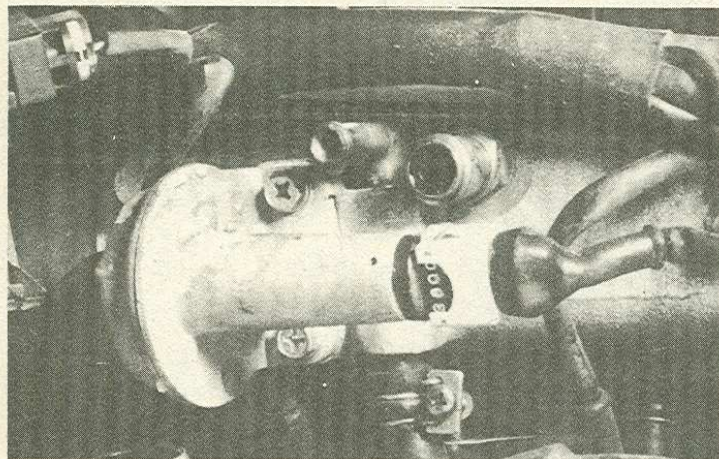
- 2 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally come in contact with the negative terminal of the battery, as this would once again allow power into the electrical system of the vehicle.
- 3 From the top of the regulator remove the two injector assembly fuel lines (see illustration).
- 4 Disconnect the vacuum line and fuel temperature sensor electrical connector.
- 5 Disconnect the return fuel line located under the regulator (see illustration).
- 6 Remove the two bolts and remove the regulator.
- 7 Installation is the reverse of the removal procedures. **Note:** *Wet the inside of the fuel lines with gasoline to facilitate hose installation.*

14 FICD (Fast Idle Control Device) valve — removal and installation

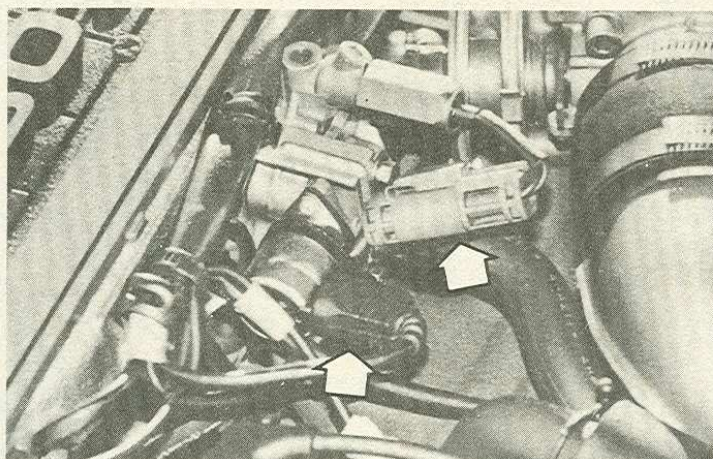
Refer to illustration 14.5

Note: *On non-turbo models the idle-up solenoid valve is attached to the FICD. On turbo models the auxiliary air control valve (AAC) is attached to the FICD.*

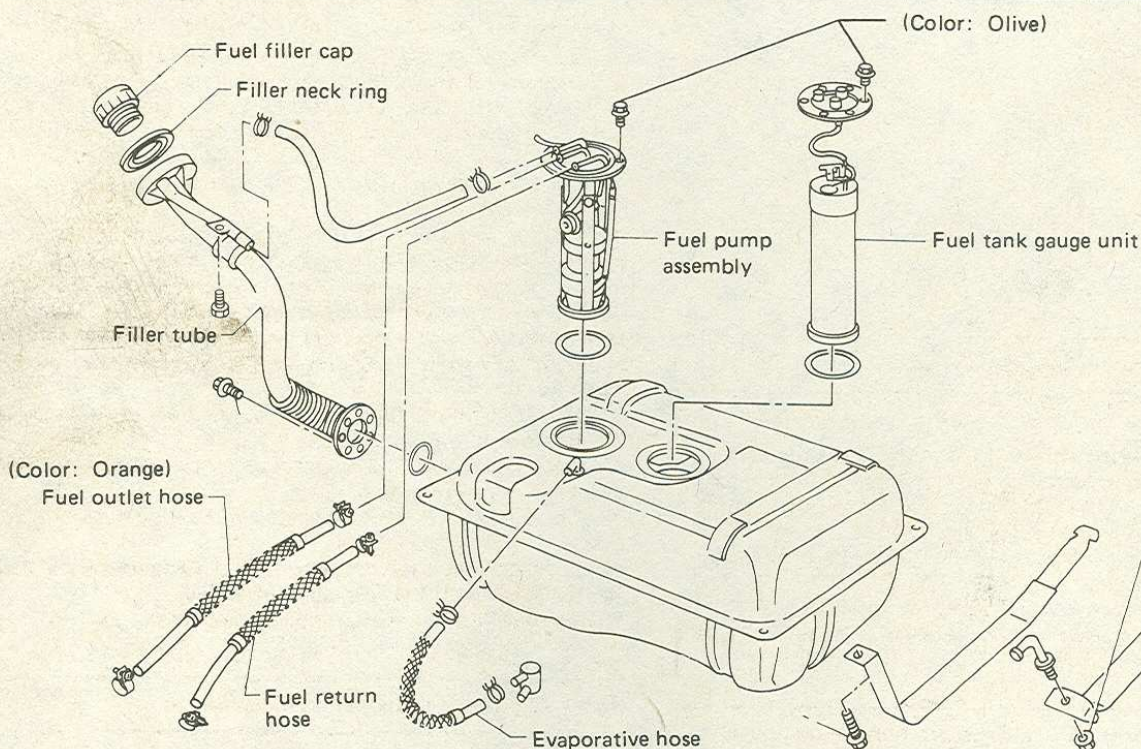
- 1 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally come in contact with the negative terminal of the battery, as this would once again allow power into the electrical system of the vehicle.
- 2 To gain access to the FICD remove the upper air inlet tube.
- 3 Disconnect the electrical connector.
- 4 Remove the wiring harness retaining bolt attaching the harness to the FICD valve.
- 5 Remove the three bolts retaining the FICD valve to the intake collector (see illustration).
- 6 Installation is the reverse of the removal procedure.



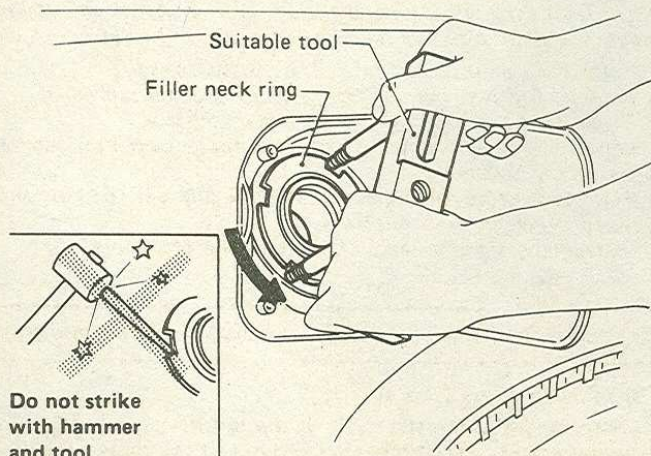
15.2 Disconnect the air regulator electrical connector



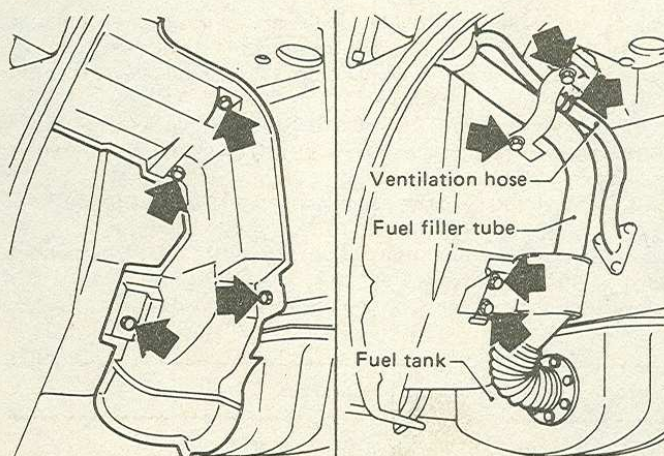
16.3 Disconnect the electrical connectors attached to the AAC and the FICD assembly (arrows)



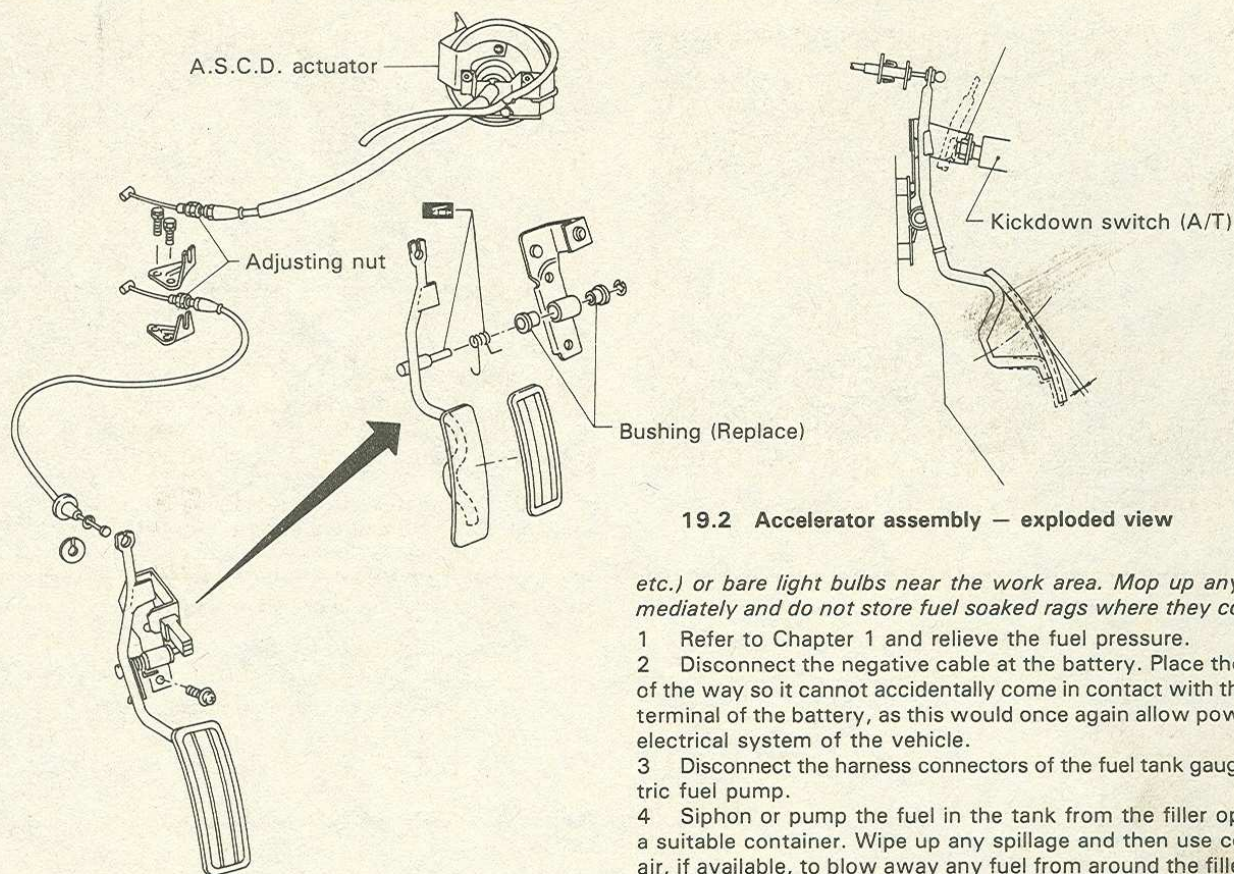
17.5a Use this exploded view of the fuel tank assembly to identify the components



17.5b Do not strike the filler neck ring to loosen it. You will need to fabricate a U-shaped tool to turn it



17.8 Remove the filler tube protectors and disconnect the ventilation hose



19.2 Accelerator assembly — exploded view

etc.) or bare light bulbs near the work area. Mop up any spills immediately and do not store fuel soaked rags where they could ignite.

- 1 Refer to Chapter 1 and relieve the fuel pressure.
- 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, as this would once again allow power into the electrical system of the vehicle.
- 3 Disconnect the harness connectors of the fuel tank gauge and electric fuel pump.
- 4 Siphon or pump the fuel in the tank from the filler opening into a suitable container. Wipe up any spillage and then use compressed air, if available, to blow away any fuel from around the filler opening.
- 5 Remove the fuel filler neck ring (see illustration). **Warning:** Do not strike the ring with a hammer or tool which could create a spark. Fabricate a U-shaped removal tool to turn the filler neck ring (see illustration).
- 6 Raise the vehicle and support it securely on jackstands.
- 7 Remove the right rear wheel.
- 8 Remove the fuel filler tube protectors and disconnect the ventilation hose (see illustration).
- 9 Disconnect the fuel hoses and evaporative hose on the fuel tube side.
- 10 Loosen the bolt and nut securing mounting bands and then remove the fuel tank with the filler tube attached.
- 11 Reverse the removal procedure for installation.

15 Air regulator — removal and installation

Refer to illustration 15.2

- 1 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, as this would once again allow power into the electrical system of the vehicle.
- 2 Disconnect the air regulator electrical connector (see illustration).
- 3 Disconnect the air regulator air tube.
- 4 Remove the two bolts and remove the air regulator.
- 5 Reverse the removal procedures for installation. **Note:** Use a new O-ring when installing the air regulator.

16 Auxiliary air control (AAC) valve (turbo only) — removal and installation

Refer to illustration 16.3

- 1 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, as this would once again allow power into the electrical system of the vehicle.
- 2 To gain access to the AAC remove the upper air inlet tube.
- 3 Disconnect the electrical connectors by pulling the connectors apart (see illustration).
- 4 Remove the wiring harness bolt attaching the harness to the AAC valve.
- 5 Remove the three bolts retaining the AAC (and FICD component assembly) valve to the intake collector.
- 6 Installation is the reverse of the removal procedure.

17 Fuel tank — removal and installation

Refer to illustrations 17.5a, 17.5b and 17.8

Warning: There are certain precautions which must be taken when inspecting or servicing fuel system components. Work in a well ventilated area and do not allow open flames (cigarettes, appliance pilot lights,

18 Fuel pump — removal and installation

Warning: There are certain precautions which must be taken when inspecting or servicing fuel system components. Work in a well ventilated area and do not allow open flames (cigarettes, appliance pilot lights, etc.) or bare light bulbs near the work area. Mop up any spills immediately and do not store fuel soaked rags where they could ignite.

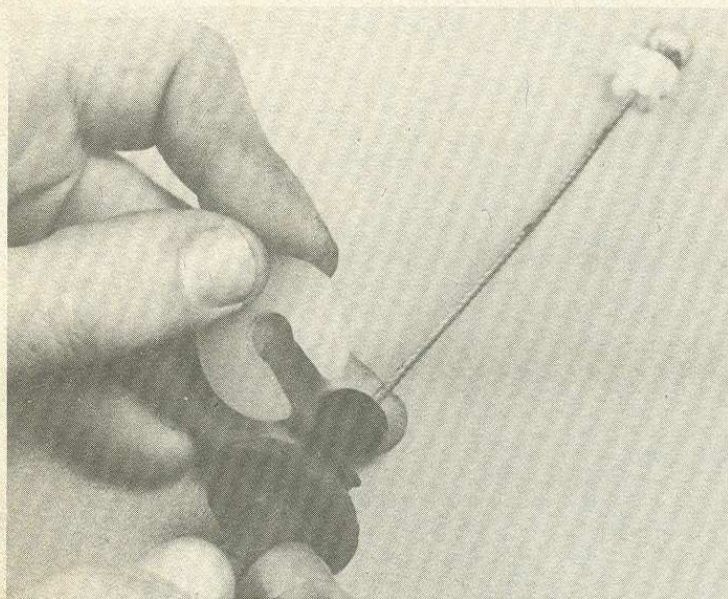
- 1 Refer to Chapter 1 and relieve the fuel pressure.
- 2 Refer to the previous Section and remove the fuel tank.
- 3 Disconnect the fuel pump electrical connector.
- 4 Loosen the hose clamps and pull the three hoses from the top of the fuel pump assembly.
- 5 Remove the retaining bolts securing the pump to the tank and lift the pump assembly from the tank.
- 6 Installation is the reverse of the removal procedures.

19 Accelerator cable — removal, installation and adjustment

Refer to illustrations 19.2 and 19.5

- 1 Disconnect the throttle cable at the throttle chamber by raising the actuator and sliding the cable end out of the retaining slot.
- 2 Disconnect the cable from the hold down/adjusting bracket by backing off on the throttle cable adjusting nut then lifting the cable from the hold down/adjusting bracket (see illustration).

- 3 Pull the cable from the two retaining clips located inside the engine compartment.
- 4 From inside the vehicle disconnect the cable from the accelerator pedal by pulling the white plastic grommet forward (toward you), releasing the cable from the accelerator pedal.



19.5 The slotted cable retaining washer is shown removed from the vehicle for clarity

ing the cable from the accelerator pedal.

- 5 Lift the retaining slotted washer from the rubber firewall retainer (see illustration).

6 From the engine compartment, pull the cable out of the firewall.
7 Installation is the reverse of the removal procedures.

- 8 Adjust slack from the cable by turning the front adjusting nut. **Note:** A properly adjusted cable should go from idle to full open with no slack in the cable when it returns to idle.

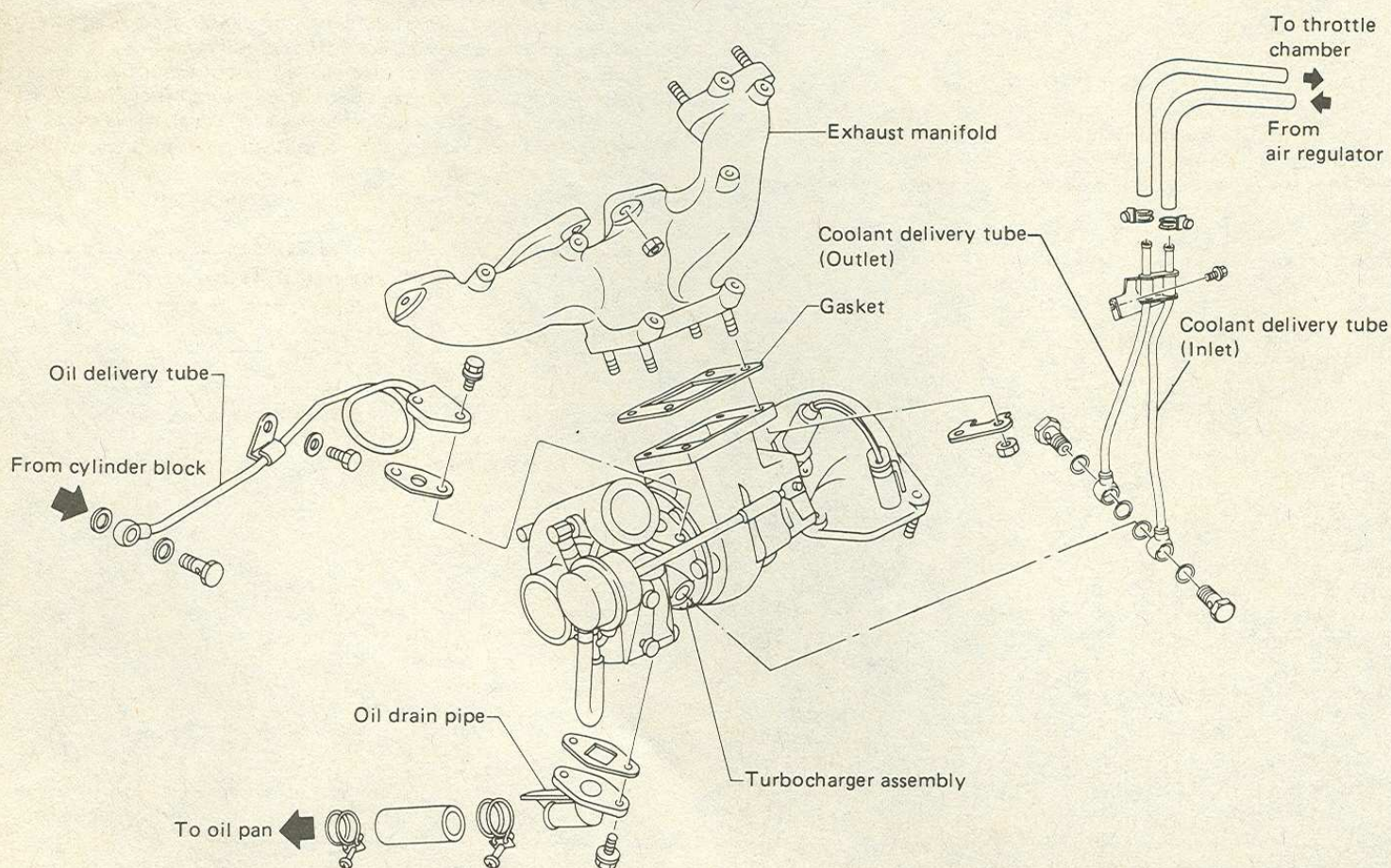
20 Turbocharger — general information

Refer to illustrations 20.1 and 20.2

1 The turbocharger, installed on the left exhaust manifold, is designed to compress the intake air flowing from the air cleaner (see illustration). The turbocharger uses two turbines. One turbine, situated in the exhaust gas flow, is turned by the gases leaving the exhaust manifold. It then turns the other turbine, which compresses the intake air and sends it into the intake manifold.

2 To prevent the supercharging pressure from becoming excessive, the system is equipped with an exhaust gas bypass valve, which opens at a predetermined pressure to allow exhaust gases to bypass the turbocharger and go straight into the exhaust pipe. An emergency relief valve is also incorporated into the intake collector to relieve excessive pressure at that point (see illustration).

3 Due to the failure of turbine bearings caused by exposure to extreme heat, water jackets were added in 1985 to the turbocharger and connected to the engine cooling system.



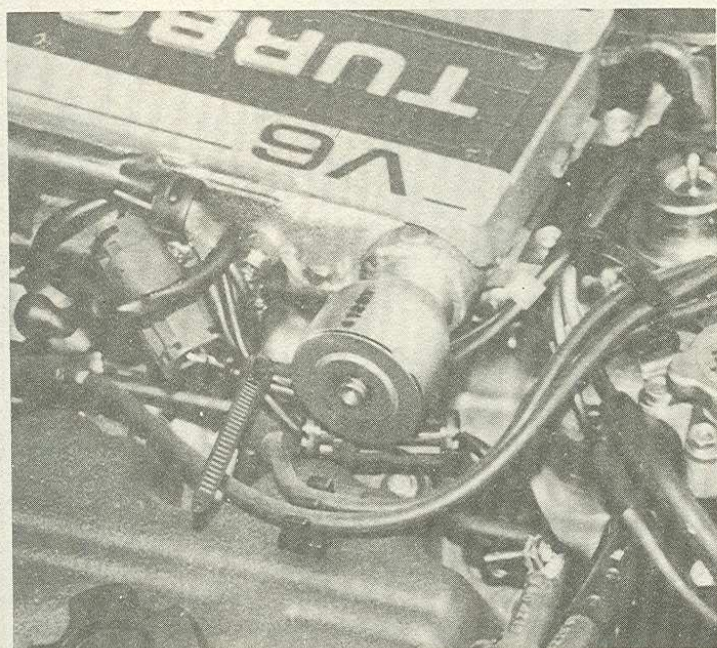
20.1 Turbocharger mounting — exploded view

21 Turbocharger — precautions

- 1 The turbocharger is driven by exhaust gases and routinely operates at extremely high temperatures. The turbocharger castings retain heat for a very long time and must not be touched for a period of at least three hours after the engine was last run. Even at this time, it is advisable to wear heavy gloves to prevent burns.
- 2 High rotation speed in the turbocharger means that bearing life and operation is dependent upon a constant flow of engine oil. Careful attention should be paid to the condition of the oil lines and the tightness of their fittings. Never overtighten the hollow bolts, as this will deform the unions and cause leakage.
- 3 Because the turbocharger is dependent upon clean oil, drain the engine oil and change the oil filter any time the turbocharger is removed. If a bearing fails in the turbocharger or in the engine, flush all engine and turbocharger oil passages completely before reassembly.
- 4 A turbocharger is a ducted fan, and, like any turbine, its greatest enemy is dirt and foreign objects. A stray nut, metal chip or rock passing through a turbine rotating at 120,000 rpm can cause extreme damage. The best defense against foreign object damage is to work on your engine and turbocharger unit only after the engine has been cleaned. Cover all inlets and pipes. Account for every nut, bolt, screw and washer before starting the engine after assembly is complete.

22 Turbocharger — removal and installation

- 1 If the turbo is equipped with coolant lines it will be necessary to drain the cooling system.
- 2 Lift the vehicle and support it securely on jackstands.
- 3 Refer to the exhaust Section and remove the front exhaust tube from the turbo.
- 4 Refer to Chapter 10 and remove the steering column lower joint.
- 5 Remove the retaining bolts from the heat shields and remove the shields.
- 6 Disconnect the exhaust gas sensor electrical connector.
- 7 Disconnect the oil delivery tube at the turbo.
- 8 Disconnect the oil drain pipe by loosening the rubber hose clamps and pulling the hose from the nipple.
- 9 Disconnect the inlet and outlet coolant delivery tubes from the turbo.
- 10 Disconnect the four turbo retaining bolts securing the turbo to the exhaust manifold.



20.2 The turbocharger emergency relief valve is attached to the intake collector

- 11 Remove the turbo out the bottom of the engine compartment.
- 12 Clean all traces of gasket and sealant material from the gasket mounting surfaces.
- 13 Installation is the reverse of the removal procedure. **Note:** *Install a new gasket and replace the metal washers on the hollow bolts connecting the coolant and oil delivery lines.*

23 Turbocharger — inspection

Refer to illustration 23.7

Note: *If any of the internal components, such as the waste gate, bearing(s) or oil seals are defective it will be necessary to replace the turbocharger as an assembly. New and factory rebuilt turbochargers are available from your Nissan dealer or local parts store.*

- 1 If the engine is lacking power, check for air leaks around the compressor, inlet/outlet tubes or the intake manifold and correct any faulty connection.
- 2 If the engine shows excessively high engine power check for a disconnected or cracked rubber hose on the bypass valve. Replace the hose if a defect is found.
- 3 If the engine exhibits excessively high oil consumption or the exhaust shows pale blue smoke, check for oil leaks at the lubricating oil passage connection.
- 4 Further checks will require removal of the turbocharger. Refer to the appropriate Section in this Chapter and remove the turbocharger.
- 5 With the turbocharger on the work bench, inspect the turbine and compressor wheel by visually checking for cracks, clogging, deformity or other damage.
- 6 Spin the wheels and check for free movement and abnormal noise or friction.

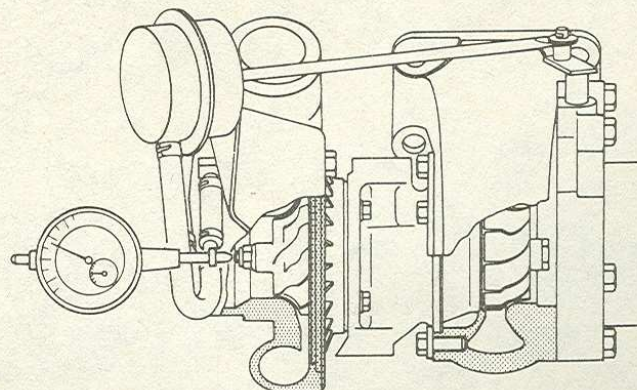
Checking axial play

- 7 Check axial play using a dial indicator positioned through the inlet opening on the compressor shaft (see illustration).
- 8 Using hand pressure only, move the compressor fan as far away from the dial indicator as possible and zero the indicator. Push the compressor wheel toward the dial indicator and compare clearance to the Specifications. If the reading shows too much free play the turbocharger will have to be replaced.

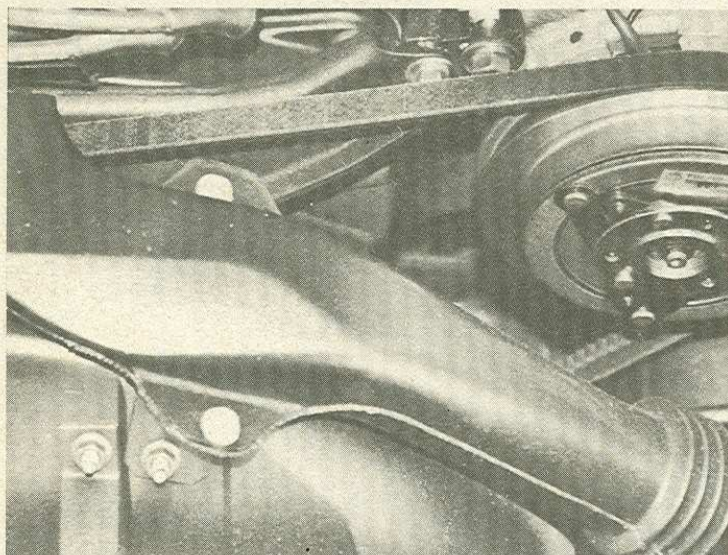
24 Injector cooling fan — removal and installation

Refer to illustrations 24.2 and 24.4

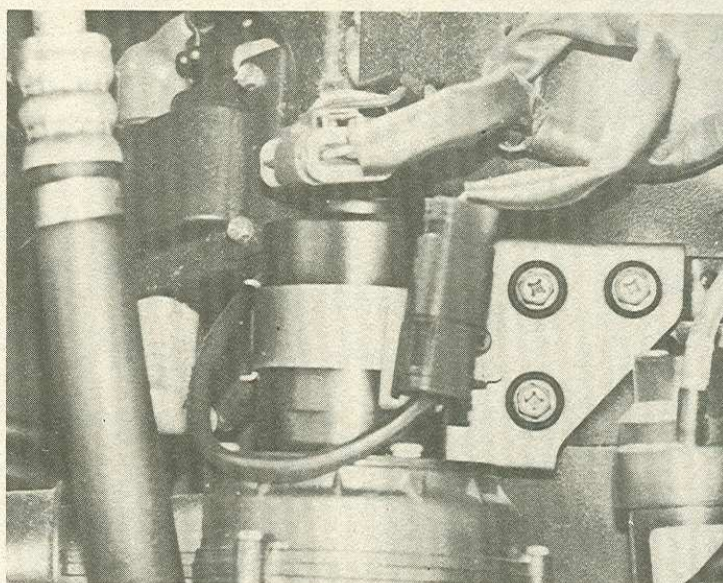
- 1 Disconnect the negative cable at the battery. Place the cable out of the way so it cannot accidentally come in contact with the negative terminal of the battery, as this would once again allow power into the electrical system of the vehicle.
- 2 Remove the air blower tube retaining nut and bolt from the radiator



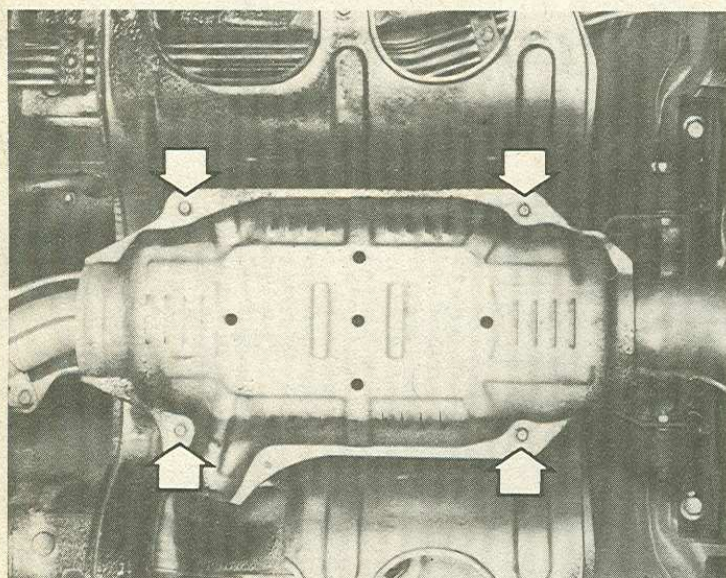
23.7 Check axial free play with a dial indicator positioned in the inlet opening on the compressor shaft



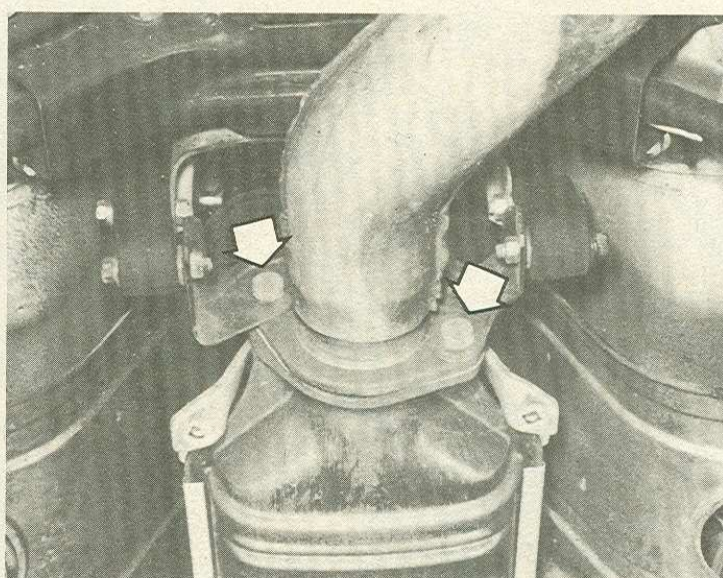
24.2 Remove the retaining nut and slide the bolt out of the fan shroud to remove the injector cooling fan blower tube



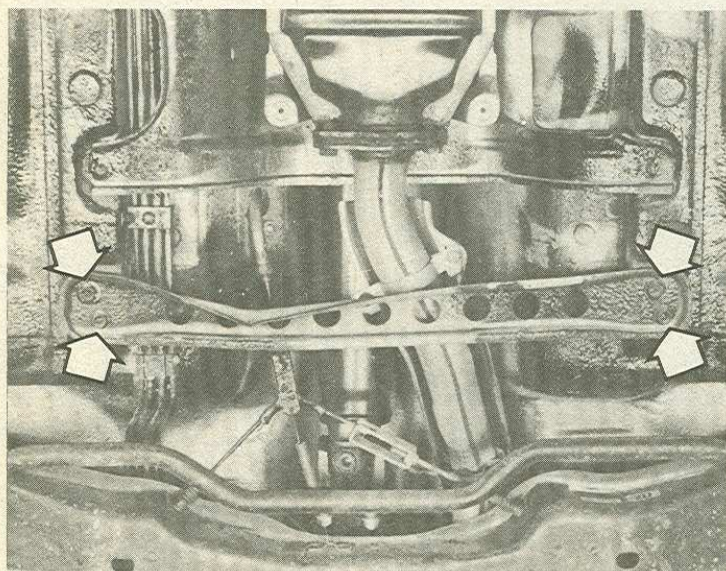
24.4 Disconnect the fan electrical connector and remove the three retaining bolts to remove the fan



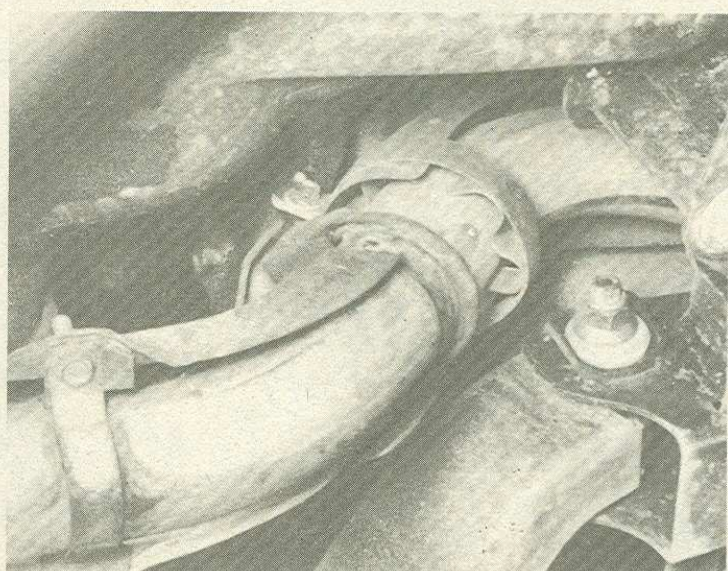
25.2 Remove the four bolts securing the heat shield to the catalytic converter (arrows)



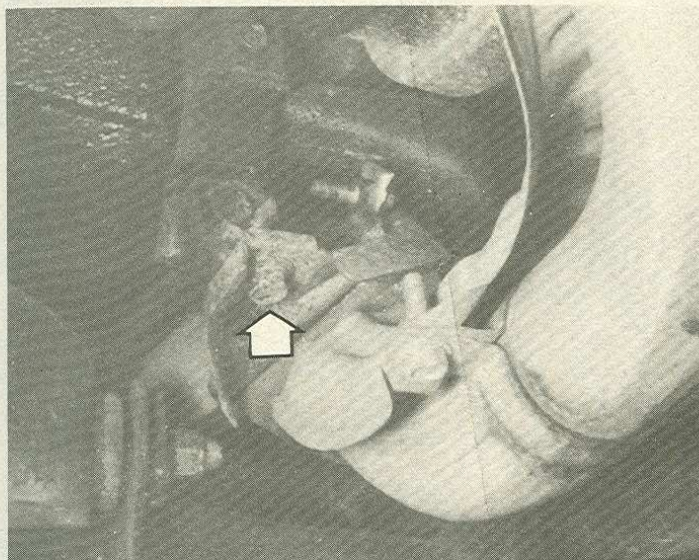
25.5 Loosen but do not remove the two bolts securing the front tube to the catalytic converter (arrows)



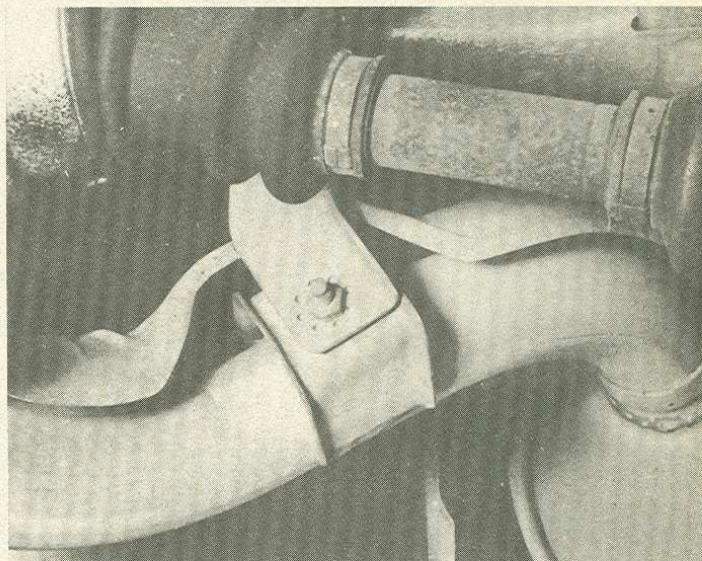
25.16 Remove the retaining bolts (arrows) and remove the crossover bracket



25.18 Remove the U-bolt and clamp attaching the extension tube to the center tube



25.25 Remove the bolt securing the front of the muffler assembly to the body (arrow)



25.26 Remove the bolt securing the tail pipe and muffler assembly to the body

- fan shroud and remove the tube from the fan (see illustration).
- 3 Disconnect the injector cooling fan electrical connector.
- 4 Remove the three bolts securing the fan to the fender well and remove the fan (see illustration).
- 5 Installation is the reverse of the removal procedure.

25 Exhaust components — removal and installation

Refer to illustrations 25.2, 25.5, 25.16, 25.18, 25.25 and 25.26

Front exhaust tube

- 1 Lift the vehicle and support it securely on jackstands.
- 2 Remove the lower catalytic converter shield by removing the four bolts (see illustration).
- 3 Use a piece of wire to secure the converter to the underside of the car.
- 4 Disconnect any brackets that hold the front exhaust tube to the transmission or body.
- 5 On non-turbo models, remove heat shield plates and the front exhaust tube as an assembly. On turbo models remove the heat shield retaining bolts and remove the heat shields. Loosen but do not remove the two bolts attaching the front tube to the catalytic converter (see illustration).
- 6 Remove the three bolts attaching the front tube to the exhaust manifold.
- 7 While supporting the front exhaust pipe, remove the two bolts holding the tube to the converter and lift out the tube.
- 8 Installation is the reverse of the removal procedure. **Note:** Be sure to use new gaskets and before installing the attaching bolts apply anti-seize compound to the threads.

Catalytic converter

- 9 Lift the vehicle and support it securely on jackstands.
- 10 Remove the lower catalytic converter heat shield.
- 11 Using a piece of strong wire, secure the exhaust center tube to the driveshaft.
- 12 While supporting the catalytic converter, break loose, but do not yet remove the four converter mounting bolts attaching the converter to the front and center exhaust tubes.

- 13 While supporting the converter, remove the four retaining bolts and remove the converter.
- 14 Installation is the reverse of the removal procedure. **Note:** Be sure to use new gaskets and before installing the attaching bolts apply anti-seize compound to the threads.

Exhaust center tube

- 15 Lift the vehicle and support it securely on jackstands.
- 16 Remove the rear crossover bracket by removing the four retaining bolts (see illustration).
- 17 Remove the heat shields from around the exhaust center tube.
- 18 Remove the U-bolt and clamp attaching the extension tube to the exhaust center tube (see illustration).
- 19 Lightly tap around the connection with a soft face hammer to break the connection loose.
- 20 Disconnect the exhaust center tube from the catalytic converter by removing the two retaining bolts.
- 21 The exhaust center tube can be removed by twisting and pulling it over the rear end housing.
- 22 Installation is the reverse of the removal procedure. **Note:** Be sure to use new gaskets and before installing the attaching bolts apply anti-seize compound to the threads. Also use Nissan exhaust sealant kit 20720-N2225 or an equivalent to eliminate gas leakage from the center tube connection.

Muffler assembly

- 23 Lift the vehicle and support it securely on jackstands.
- 24 Disconnect the U-bolt securing the exhaust center tube to the muffler assembly.
- 25 Remove the bracket retaining bolt securing the front of the muffler assembly to the body (see illustration).
- 26 Remove the bracket retaining bolt securing the tail pipe and muffler assembly to the body (see illustration).
- 27 Lower the muffler assembly from the vehicle.
- 28 Installation is the reverse of the removal procedure. **Note:** Be sure to use new gaskets and before installing the attaching bolts apply anti-seize compound to the threads. Also, use Nissan exhaust sealant kit 20720-N2225 or an equivalent to eliminate gas leakage from the center tube connection.