Chapter 1
Tune-up and routine maintenance

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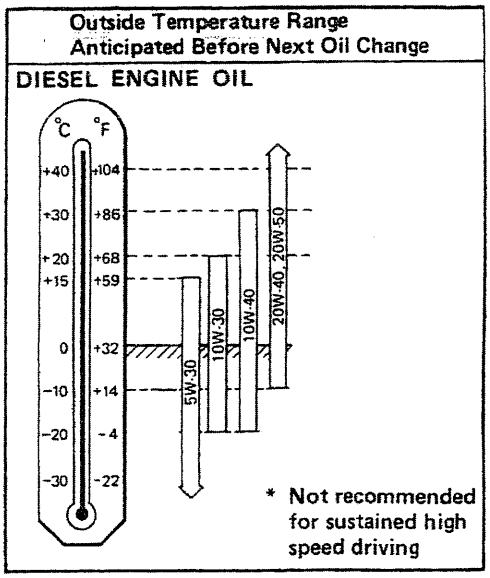
Specifications

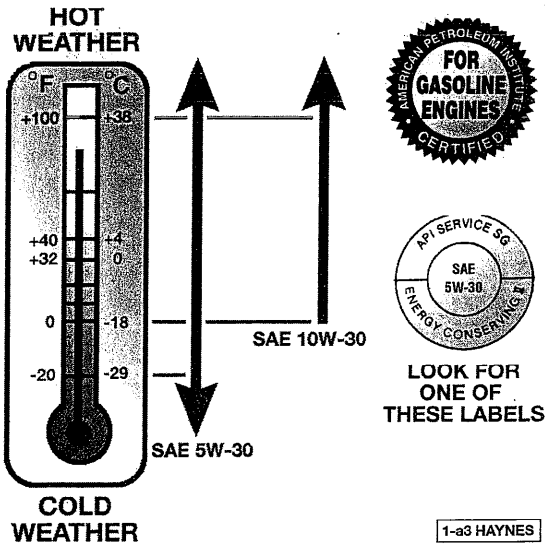
Recommended lubricants and fluids

Note: *Listed here are manufacturer recommendations at the time this manual was written. Manufacturers occasionally upgrade their fluid and lubricant specifications, so check with your local auto parts store for current recommendations.*

Engine oil	
Petrol engines	
Type	API grade SG or SH energy conserving oil
Viscosity	See accompanying chart



Diesel engine oil viscosity chart - use only oils intended for diesel engines (API grade CC or CD)



Engine oil viscosity chart (petrol engines - for best fuel economy and cold starting, select the lowest SAE viscosity grade for the expected temperature range

Recommended lubricants and fluids (continued)

Engine oil (continued)	
Diesel engine	
Type	API grade CC or CD energy conserving oil
Viscosity	See accompanying chart
Coolant	Ethylene glycol based anti-freeze
Brake fluid	DOT 3
Clutch fluid	DOT 3 brake fluid
Power steering fluid	DEXRON II ATF
Automatic transmission fluid	Nissan Matic D
Manual transmission lubricant	API GL-4 or GL-5 SAE 80W or 90W gear oil
Transfer lubricant, models built prior to Oct. 1991	API GL-4 or GL-5 SAE 80W-90 gear oil
Transfer lubricant, models built after Oct. 1991	DEXRON II ATF
Differential lubricant, standard	API GL-5 SAE 80W-90 hypoid gear oil
Differential lubricant, limited slip	Limited slip differential hypoid gear oil
Chassis grease	NLGI no. 2 lithium base chassis grease
Auto free-running hub grease	Nissan part no. KRC19-00025 or equivalent
Front axle joint grease	NLGI no. 2 moly disulphide

Capacities*

Engine oil (with filter change)	
4.2 litre petrol engine	8.3 litres
4.2 litre diesel engine	9.2 litres
3.0 litre engine	6.4 litres
Cooling system (includes reservoir tank)	
With heater	
4.2 litre engine	
Automatic transmission	13.6 litres
Manual transmission	13.9 litres
3.0 litre engine	11.9 litres
Without heater	
4.2 litre engine	
Automatic transmission	13.0 litres
Manual transmission	13.3 litres
3.0 litre engine	11.2 litres
Automatic transmission (drain and refill)	8.4 litres
Manual transmission (drain and refill)	
FS5R50A transmission	3.9 litres
FS5R30A transmission	5.1 litres
Transfer (drain and refill)	2.0 litres

Differential	
Front axle	
All except pick-up	5.4 litres
Pick-up	4.3 litres
Rear axle	
H33B series axle	
Without locking feature	2.1 litres
With locking feature	3.0 litres
H260 series axle	4.7 litres

**All capacities approximate. Add as necessary to bring to appropriate level.*

Ignition system

Spark plug type and gap

4.2 litre petrol engines	
With carburettor	NGK BP5ES @ 0.8 to 0.9 mm
With EFI	NGK BPR5ES @ 0.8 to 0.9 mm
3.0 litre engines	NGK BKR6E @ 0.8 to 0.19 mm
Spark plug wire resistance, maximum	30,000 ohms

Distributor ignition points

Point gap	0.45 to 0.55 mm
Dwell angle	34 to 40 degrees

Ignition timing and idle speed*

4.2 litre petrolengine	9 to 11 degrees BTDC @ 600 to 700 RPM
3.0 litre engine	1 to 5 degrees BTDC @ 800 to 900 RPM

Note: *Use the information printed on the Vehicle Emissions Control Information label, if different than the Specifications listed here.*
**With the distributor vacuum line disconnected and plugged.*

Idle mixture

Carburetted models	1.0% to 2.0% CO

Firing order and distributor rotation

All petrol models	1-5-3-6-2-4, counterclockwise

Valve clearances (engine hot)

4.2 litre petrol engine	0.38 mm
4.2 litre diesel engine	0.35 mm
3.0 litre engine	Not adjustable
3.0 litre engines	Not adjustable

Clutch pedal

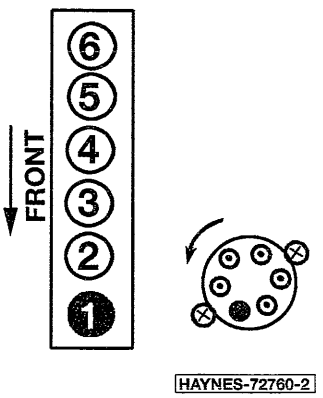
Height	202 to 212 mm
Free play	1 to 3 mm
Stop lamp switch clearance	0.3 to 1.0 mm

Brakes

Disc brake pad lining thickness (minimum)	2 mm
Drum brake shoe lining thickness (minimum)	1 mm
Brake pedal	
Height	
Automatic transmission models	202 to 212 mm
Manual transmission models	192 to 202 mm
Free play	1 to 3 mm
Parking brake adjustment notches	
Warning light energising	2 notches
At normal of handle force	7 to 9 notches

Suspension and steering

Steering wheel freeplay limit	35 mm
Balljoint allowable movement	0.0 mm

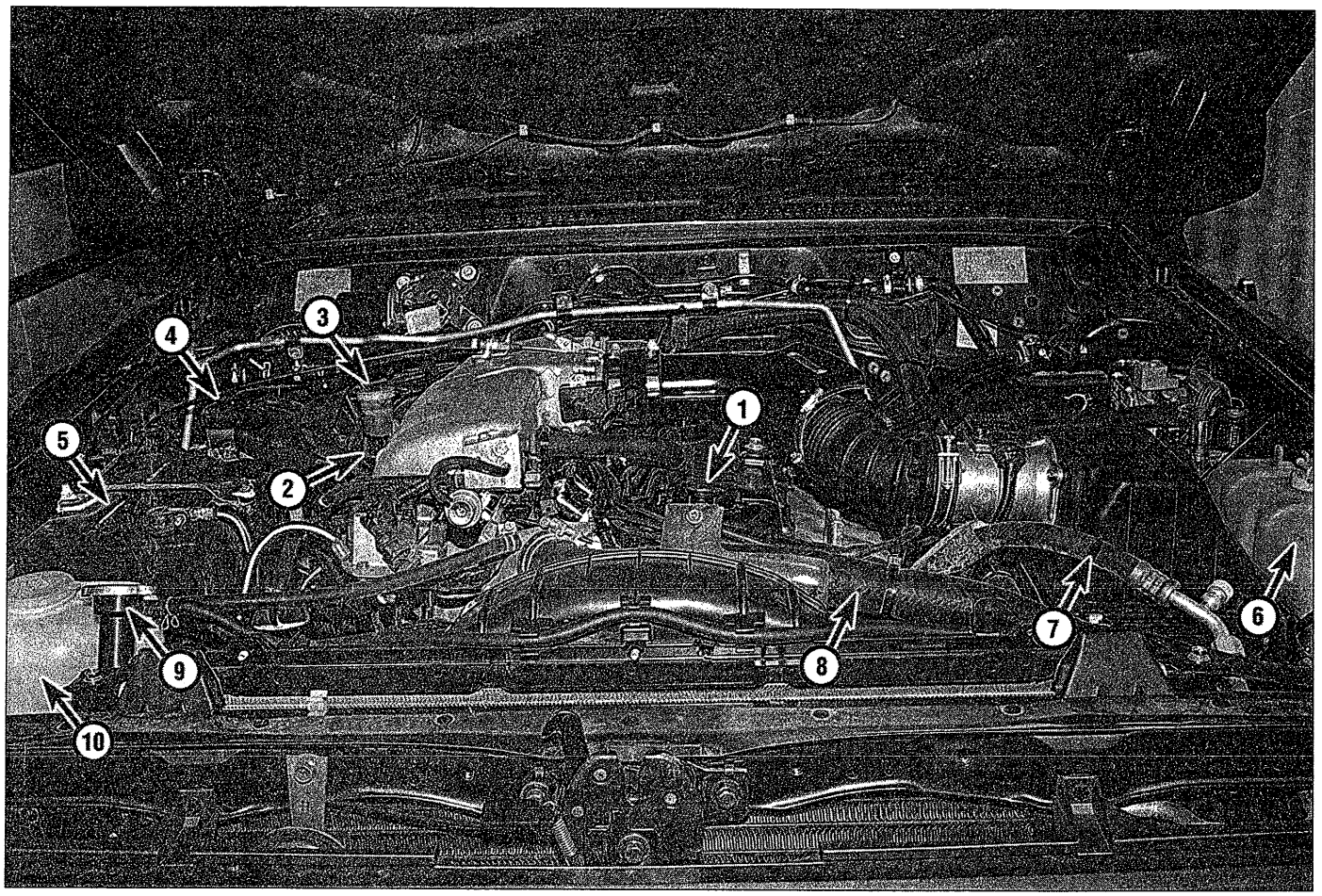


Cylinder location and distributor rotation -

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

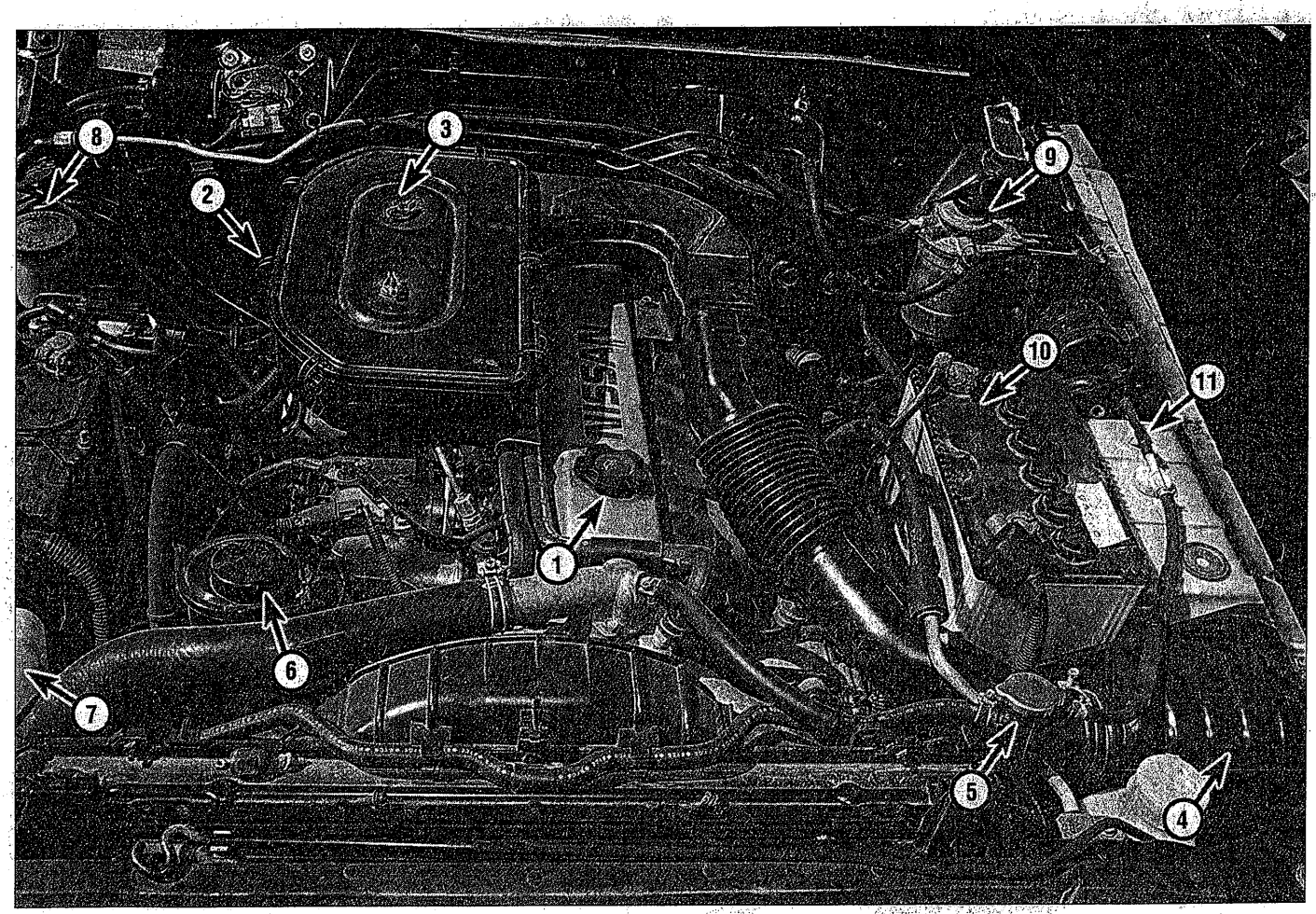
Torque specifications

	Nm (unless otherwise specified)
Air cleaner wing nuts	3 turns after contact with air cleaner
Alternator securing bolt	59 to 75
Alternator adjusting lock bolt	21 to 26
Alternator adjusting bar bolt	43 to 55
Automatic transmission pan bolts	6 to 8
Body mount bolts, wagon and hardtop, except rear 2	31 to 39
Body mount bolts, wagon and hardtop, rear 2	55 to 71
Body mount bolts, pickup, small bolts	43 to 55
Body mount bolts, pickup, large bolts	Tighten until bolt protrudes 3 mm
Brake rotor to hub bolts	50 to 68
Carburettor nuts	16 to 19
Clutch master cylinder pushrod lock nut	8 to 11
Clutch pedal stop lock nut	16 to 22
Differential fill/drain plug	
Front	39 to 59
Rear	59 to 98
Distributor bolt	13 to 16
Engine block drain plug	34 to 44
Engine oil drain plug	29 to 39
Front wheel hub lower flange bolts	30 to 40
Manual transmission fill/drain plug	25 to 34
Rocker cover screw, 4.2 litre engine	1 to 3
Spark plugs	20 to 29
Transfer fill/drain plug	25 to 34
Valve rocker adjusting nuts	16 to 22
Wheel bearing outer lock nut, manual hubs	167 to 196
Wheel lug nuts	118 to 147



Engine compartment locations - 4.2 litre petrol engine

1 *Oil filler cap*
2 *Oil dipstick*
3 *Clutch master cylinder reservoir*
4 *Master cylinder reservoir*
5 *Battery*
6 *Windscreen wiper washer reservoir*
7 *Air cleaner housing*
8 *Upper radiator hose*
9 *Radiator cap*
10 *Coolant recovery bottle*



Engine compartment locations - 4.2 litre diesel engine

1 *Oil filler cap*
2 *Engine oil dipstick*
3 *Air cleaner*
4 *Pre cleaner*
5 *Radiator cap*
6 *Power steering reservoir*
7 *Windscreen washer reservoir*
8 *Brake master cylinder reservoir*
9 *Fuel filter and lift pump*
10 *Battery*
11 *Coolant reservoir*

Nissan Patrol/ Ford Maverick Maintenance Schedule

Every 500 kilometres or weekly, whichever comes first

Check the engine oil level (Section 4)
Check the engine coolant level (Section 4)
Check the windscreen washer fluid level (Section 4)
Check the brake and clutch fluid level (Section 4)
Check the tyres and tyre pressures (Section 5)

Every 5,000 kilometres or 3 months, whichever comes first

All items listed above, plus . . .
Check the automatic transmission fluid level (Section 6)
Check the power steering fluid level (Section 7)
Change the engine oil and filter (diesel engines) (Section 8)

Every 10,000 kilometres or 6 months, whichever comes first

Change the engine oil and filter (petrol engines) (Section 8)*
Inspect and renew, if necessary, all underbonnet hoses (Section 9)
Check, adjust and renew, if necessary, the drive belts (Section 10)
Rotate the tyres (Section 11)
Check the clutch and brake pedals for proper height and freeplay (Section 12)
Check the seat belts (Section 13)
Check and service the battery (Section 14)
Lubricate the chassis components (Section 15)*
Check and renew, if necessary, the windscreen wiper blades (Section 16)
Check the idle speed and mixture adjustment (Section 17)
Inspect the exhaust system (Section 18)
Inspect the suspension and steering components (Section 19)
Service the fuel filter (diesel engine) (Section 20)

Every 20,000 kilometres or 12 months, whichever comes first

All items listed above, plus . . .
Renew the air filter and PCV filter (Section 21)
Check the Positive Crankcase Ventilation (PCV) system (Section 22)
Inspect the fuel system (Section 23)
Check the cooling system (Section 24)
Check the ignition timing (Section 25)
Renew the ignition points (non-electronic ignition models only) (Section 26)
Inspect the automatic pre-heat air cleaner (carburetted engines only) (Section 27)
Tighten the body mounts (Section 28)*
Check the brakes (Section 29)*
Check the manual transmission, transfer and differential lubricants (Section 30)
Renew the spark plugs (Section 31)
Check the carburettor choke (Section 32)
Check the EGR valve (Section 33)
Adjust the valve clearances (4.2 litre engines only) (Section 34)

Every 40,000 kilometres or 24 months, whichever comes first

All items listed above, plus . . .
Inspect the spark plug wires, distributor cap and rotor (Section 35)
Change the automatic transmission fluid (Section 36)**
Change the manual, differential and transfer transmission lubricants (Section 37)
Service the cooling system (drain, flush and refill) (Section 38)
Inspect, repack and adjust the front wheel bearings and hubs (Section 39)*
Inspect the evaporative emissions control system (Section 40)
Renew the fuel filter (Section 41)*
Check the cyclone pre-air filter (Section 42)*
Check the oxygen sensor (fuel injected engines only) (Section 43)

Every 100,000 kilometres

Renew the timing belt (3.0 litre engines only) (see Chapter 2B)

**This item is affected by "severe" operating conditions, as described below. If the vehicle is operated under severe conditions, perform all maintenance indicated with an asterisk (*) at 5,000 kilometre/three-month intervals. Severe conditions exist if you mainly operate the vehicle . . .*

in dusty areas
towing a trailer
idling for extended periods and/or driving at low speeds when outside temperatures remain below freezing and most trips are less than six kilometres long
driving in water often
driving in sand or mud often
driving on salted roads

***If operated under one or more of the following conditions, change the automatic transmission fluid every 25,000 kilometres:*

in heavy city traffic where the outside temperature regularly reaches 32-degrees C or higher
in hilly or mountainous terrain
frequent trailer pulling

2 Introduction

This Chapter is designed to help the home mechanic maintain the Nissan Patrol/Ford Maverick for peak performance, economy, safety and long life.

On the following pages is a master maintenance schedule, followed by Sections dealing specifically with each item on the schedule. Visual checks, adjustments, component renewal and other helpful items are included. Refer to the accompanying illustrations of the engine compartment and the underside of the vehicle for the location of various components.

Servicing your Patrol or Maverick in accordance with the maintenance schedule and the following Sections will provide it with a planned maintenance program that should result in a long and reliable service life. This is a comprehensive plan, so maintaining some items but not others at the specified service intervals will not produce the same results.

As you service your vehicle, you will discover that many of the procedures can, and should, be grouped together because of the nature of the particular procedure you're performing or because of the close proximity of two otherwise unrelated components to one another.

For example, if the vehicle is raised for any reason, you should inspect the exhaust, suspension, steering and fuel systems while you're under the vehicle. When you're rotating the tyres, it makes good sense to check the brakes and wheel bearings since the wheels are already removed.

Finally, let's suppose you have to borrow or rent a torque wrench. Even if you only need to tighten the spark plugs, you might as well check the torque of as many critical fasteners as time allows.

The first step of this maintenance program is to prepare yourself before the actual work begins. Read through all Sections pertinent to the procedures you're planning to do, then make a list of and gather together all the parts and tools you will need to do the job. If it looks as if you might run into problems during a particular segment of some procedure, seek advice from your local parts man or dealer service department.

3 Tune-up general information

The term tune-up is used in this manual to represent a combination of individual operations rather than one specific procedure.

If, from the time the vehicle is new, the routine maintenance schedule is followed closely and frequent checks are made of fluid levels and high wear items, as suggested throughout this manual, the engine will be kept in relatively good running condition and the need for additional work will be minimised.

More likely than not, however, there will be times when the engine is running poorly due to lack of regular maintenance. This is even more likely if a used vehicle, which has not received regular and frequent maintenance checks, is purchased. In such cases, an engine tune-up will be needed outside of the regular routine maintenance intervals.

The first step in any tune-up or diagnostic procedure to help correct a poor running engine is a cylinder compression check. A compression check (see Chapter 2, Part C) will help determine the condition of internal engine components and should be used as a guide for tune-up and repair procedures. If, for instance, the compression check indicates serious internal engine wear, a conventional tune-up won't improve the performance of the engine and would be a waste of time and money. Because of its importance, the compression check should be done by someone with the right equipment and the knowledge to use it properly.

The following procedures are those most often needed to bring a generally poor running engine back into a proper state of tune.

Minor tune-up

Check all engine related fluids (Section 4)
Clean, inspect and test the battery (Section 14)
Check the cooling system (Section 24)
Check all underbonnet hoses (Section 9)
Check the PCV valve (petrol engines) (Section 22)
Check the air filter and the PCV filter (Section 21)
Renew the spark plugs (petrol engines) (Section 31)
Renew the ignition points (early 4.2 litre petrol models only) (Section 26)
Inspect the spark plug wires, distributor cap and rotor (petrol engines) (Section 35)
Check and adjust the valve clearances (4.2 litre models only) (Section 34)
Check and adjust the idle speed and mixture (Section 17)
Check and adjust the ignition timing (petrol engines) (Section 25)
Check and adjust the drivebelts (Section 10)

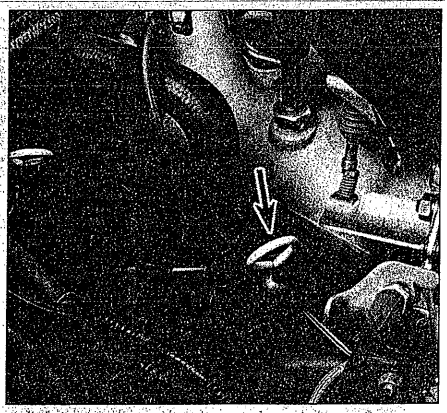
Major tune-up

All items listed under Minor tune-up, plus . . .

Check the EGR system (Section 32)
Renew the PCV valve (Section 21)
Renew the air filter and the PCV filter (Section 20)
Check the fuel system (Section 22)
Renew the fuel filter (Section 40)
Renew the distributor cap, rotor and spark plug wires (Section 34)
Check the ignition system (Chapter 5)
Check the charging system (Chapter 5)

4 Fluid level checks (every 500 kilometres or weekly)

Note: *The following are fluid level checks to be done on a 500-kilometre or weekly basis. Additional fluid level checks can be found in specific maintenance procedures which follow. Regardless of intervals, be alert to fluid leaks under the vehicle which would indicate a fault to be corrected immediately.*



4.2 The engine oil dipstick is located on the right side of the engine compartment

1 Fluids are an essential part of the lubrication, cooling, brake and windscreen washer systems. Because the fluids gradually become depleted and/or contaminated during normal operation of the vehicle, they must be periodically replenished. See *Recommended lubricants and fluids* at the beginning of this Chapter before adding fluid to any of the following components. **Note:** *The vehicle must be level when fluid levels are checked.*

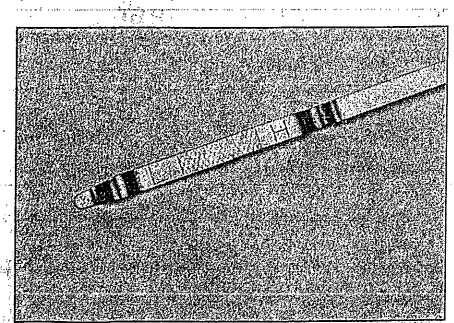
Engine oil

Refer to illustrations 4.2, 4.4 and 4.6

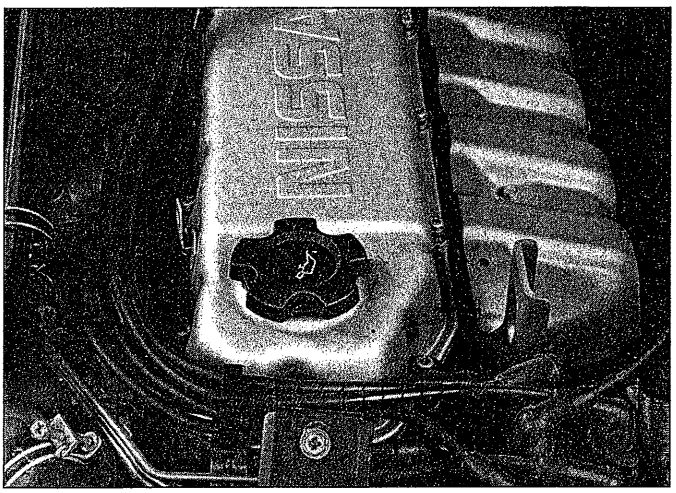
2 The engine oil level is checked with a dipstick that extends through a tube and into the sump at the bottom of the engine **(see illustration)**.

3 The oil level should be checked before the vehicle has been driven, or a few minutes after the engine has been shut off. If the oil is checked immediately after driving the vehicle, some of the oil will remain in the upper engine components, resulting in an inaccurate reading on the dipstick.

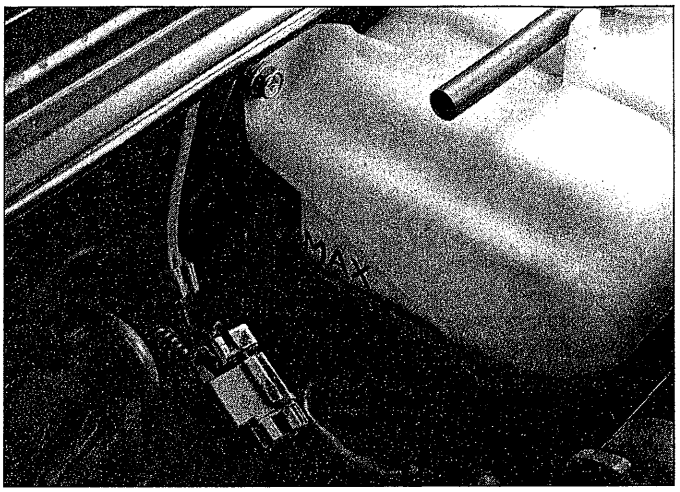
4 Pull the dipstick out of the tube and wipe all the oil from the end with a clean rag or paper towel. Insert the clean dipstick all the way back into the tube, then pull it out again. Note the oil at the end of the dipstick. Add oil as necessary to keep the level between the L and H marks on the dipstick **(see illustration)**.



4.4 The oil level must be kept in the cross-hatched area at all times



4.6 Add oil through the filler cap located in the valve cover



4.9 Keep the coolant reservoir clean so that it will be easy to read the MIN and MAX markings

5 Do not overfill the engine by adding too much oil since this may result in oil-fouled spark plugs, frothy oil or oil seal failures.

6 Oil is added to the engine after removing the cap from the valve cover **(see illustration)**. A funnel may help to reduce spills.

7 Checking the oil level is an important preventive maintenance step. A consistently low oil level indicates oil leakage through damaged seals, defective gaskets or past worn rings or valve guides. If the oil looks milky or has water droplets in it, the cylinder head gasket may be blown or the head or block may be cracked. The engine should be checked immediately. The condition of the oil should also be checked. Whenever you check the oil level, slide your thumb and index finger up the dipstick before wiping off the oil. If you see small dirt or metal particles clinging to the dipstick, the oil should be changed (see Section 8).

Engine coolant

Refer to illustration 4.9

Warning: *Do not allow antifreeze to come in contact with your skin or painted surfaces of the vehicle. Flush contaminated areas immediately with plenty of water. Don't store new coolant or leave old coolant lying around where it's accessible to children or pets – they're attracted by its sweet smell. Ingestion of even a small amount of coolant can be fatal! Wipe up garage floor and drip pan spills immediately. Keep antifreeze containers covered and repair cooling system leaks as soon as they're noticed.*

8 All vehicles covered by this manual are equipped with a pressurised coolant recovery system. A coolant reservoir is connected by a hose to the base of the coolant filler cap. As the coolant warms during engine operation, coolant escapes through a pressurised filler cap, then through a connecting hose into the reservoir. As the engine cools, the coolant is automatically drawn back into the cooling system to maintain the correct level.

9 The coolant level should be checked regularly. It must be between the MIN and MAX lines on the tank **(see illustration)**. The level will vary with the temperature of the engine. When the engine is cold, the coolant level should be at or slightly above the LOW mark on the tank. Once the engine has warmed up, the level should be at or near the FULL mark. If it isn't, allow the fluid in the tank to cool, then remove the cap from the reservoir and add coolant to bring the level up to the FULL line. Use only ethylene/glycol type coolant and water in the mixture ratio recommended by your owner's manual. Do not use supplemental inhibitor additives. If only a small amount of coolant is required to bring the system up to the proper level, water can be used. However, repeated additions of water will dilute the recommended antifreeze and water solution. In order to maintain the proper ratio of antifreeze and water, it is advisable to top up the coolant level with the correct mixture. Refer to your owner's manual for the recommended ratio.

10 If the coolant level drops within a short time after replenishment, there may be a leak in the system. Inspect the radiator, hoses, engine coolant filler cap, drain plugs and water pump. If no leak is evident, have the radiator cap pressure tested by your dealer.

Warning: *Never remove the radiator cap when the engine is running or has just been shut down, because the cooling system is hot. Escaping steam and scalding liquid could cause serious injury.*

11 If it is necessary to open the radiator cap, wait until the system has cooled completely, then wrap a thick cloth around the cap and turn it to the first stop. If any steam escapes, wait until the system has cooled further, then remove the cap.

12 When checking the coolant level, always note its condition. It should be relatively clear. If it is brown or rust coloured, the system should be drained, flushed and refilled. Even if the coolant appears to be normal, the corrosion inhibitors wear out with use, so it must be renewed at the specified intervals.

13 Do not allow antifreeze to come in contact with your skin or painted surfaces of the vehicle. Flush contacted areas immediately with plenty of water.

Windscreen washer fluid

Refer to illustration 4.14

14 Fluid for the windscreen washer system may be stored in two places depending on model year of the vehicle. The primary reservoir for the front windscreen/headlight washer system is located on the right (driver) side of the engine compartment near the radiator **(see illustration)**. In milder climates, plain water can be used to top up the reservoir, but the reservoir should be kept no more than two-thirds full to allow for expansion should the water freeze. In colder climates, the use of a specially designed windscreen washer fluid, available at your dealer and any auto parts store, will help lower the freezing point of the fluid. Mix the solution with water in accordance with the manufacturer's directions on the container. Do not use regular antifreeze. It will damage the vehicle's paint.

Battery electrolyte

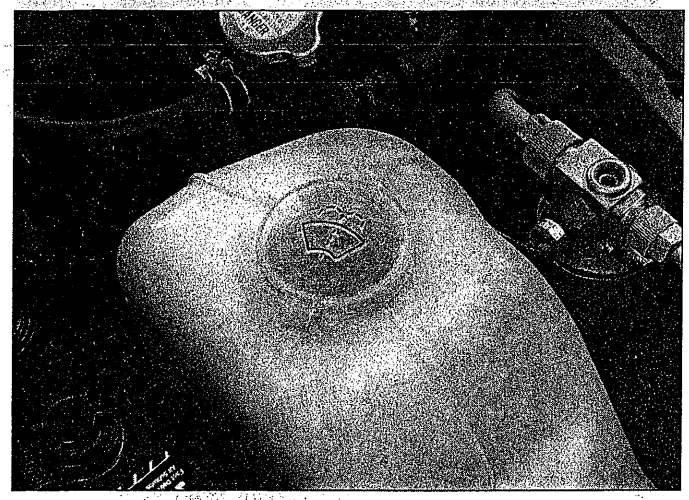
Refer to illustration 4.15

15 On models not equipped with a sealed battery, check the electrolyte level **(see illustration)** of all six battery cells. It must be between the upper and lower levels. If the level is low, remove the filler/vent cap and add distilled water. Refit and securely re-tighten the cap. **Caution:** *Overfilling the cells may cause electrolyte to spill over during periods of heavy charging, causing corrosion or damage.*

Brake and clutch fluid

Refer to illustration 4.17

16 The brake master cylinder is mounted on the front of the power booster unit in the engine compartment. The hydraulic clutch master cylinder used on manual transmission vehicles is located next to the brake master cylinder.



4.14 The reservoir for the windscreen washer is near the battery. Never add coolant to this reservoir

4.15 Each cell of the battery should be checked for low electrolyte level (maintenance-type battery only)

17 To check the fluid level of the brake and clutch master cylinders, simply look at the MAX and MIN marks on the reservoir **(see illustration)**. The level should be about 6 mm below the maximum fill line.

18 If the level is low, wipe the top of the reservoir cover with a clean rag to prevent contamination of the brake system before lifting the cover.

19 Add only the specified brake fluid to the brake and clutch reservoirs (refer to *Recommended lubricants and fluids* at the front of this Chapter or to your owner's manual). Mixing different types of brake fluid can damage the system. **Warning:** *Use caution when filling either reservoir - brake fluid can harm your eyes and damage painted surfaces. Do not use brake fluid that has been opened for more than one year or has been left open. Brake fluid absorbs moisture from the air. Excess moisture can cause a dangerous loss of braking.*

20 While the reservoir cap is removed, inspect the master cylinder reservoir for contamination. If deposits, dirt particles or water droplets are present, the system should be drained and refilled.

21 After filling the reservoir to the proper level, make sure the lid is properly seated to prevent fluid leakage and/or system pressure loss.

22 The fluid in the brake master cylinder will drop slightly as the brake pads at each wheel wear down during normal operation. If either master cylinder requires repeated replenishing to keep it at the proper level, this is an indication of leakage in the brake or clutch system, which should be corrected immediately. If the brake system shows an indication of leakage check all brake lines and connections, along with the calipers, wheel cylinders and booster (see Section 28 for more information). If the hydraulic clutch system shows an indication of leakage check all clutch lines and connections, along with the clutch slave cylinder (see Chapter 8 for more information).

23 If, upon checking the brake or clutch master cylinder fluid level, you discover one or both reservoirs empty or nearly empty, the systems should be bled (see Chapters 8 and 9).

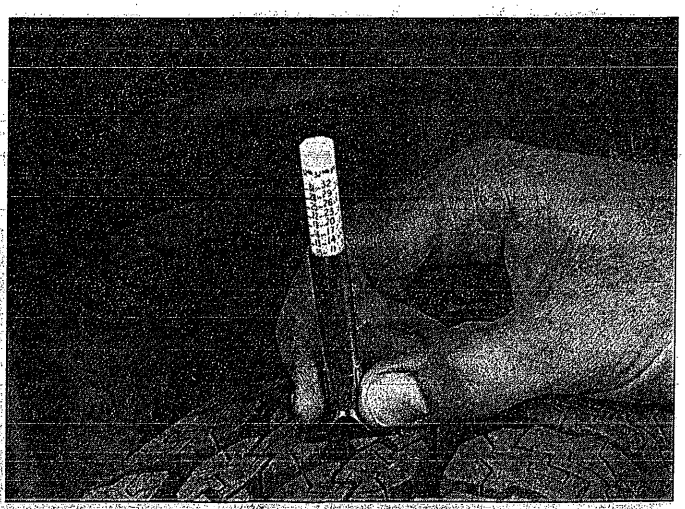
5 Tyre and tyre pressure checks (every 500 kilometres or weekly)

Refer to illustrations 5.2, 5.3, 5.4a, 5.4b and 5.8

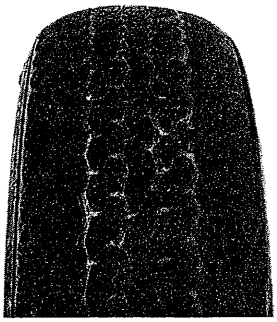
1 Periodic inspection of the tyres may spare you the inconvenience of being stranded with a flat tyre. It can also provide you with vital information regarding possible problems in the steering and suspension systems before major damage occurs.

2 The original tyres on this vehicle are equipped with 12 mm wear bands that will appear when tread depth reaches 1.6 mm, but they don't appear until the tyres are worn out. Tread wear can be monitored with a simple, inexpensive device known as a tread depth indicator **(see illustration)**.

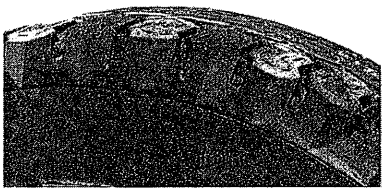
4.17 The brake master cylinder also uses a translucent fluid reservoir to make checking the level easy



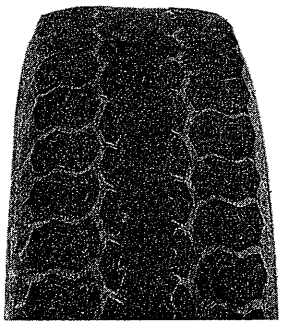
5.2 Use a tyre tread depth indicator to monitor tyre wear - they are available at auto parts stores and service stations and cost very little



UNDERINFLATION



CUPPING

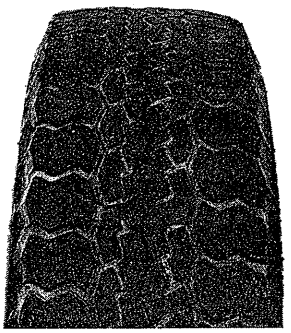


OVERINFLATION

Cupping may be caused by:

- **Underinflation and/or mechanical irregularities such as out-of-balance condition of wheel and/or tyre, and bent or damaged wheel.**
- **Loose or worn steering tie-rod or steering idler arm.**
- **Loose, damaged or worn front suspension parts.**

INCORRECT TOE-IN OR EXTREME CAMBER



FEATHERING DUE TO MISALIGNMENT

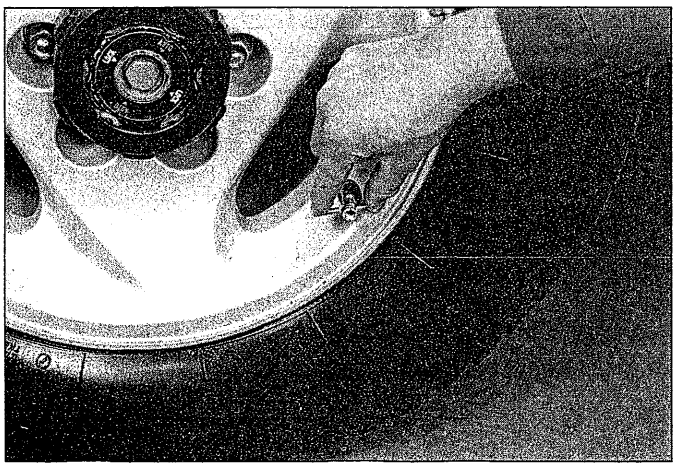
5.3 This chart will help you determine the condition of the tyres, the probable cause(s) of abnormal wear and the corrective action necessary

3 Note any abnormal tread wear **(see illustration)**. Tread pattern irregularities such as cupping, flat spots and more wear on one side than the other are indications of front end alignment and/or balance problems. If any of these conditions are noted, take the vehicle to a tyre shop or service station to correct the problem.

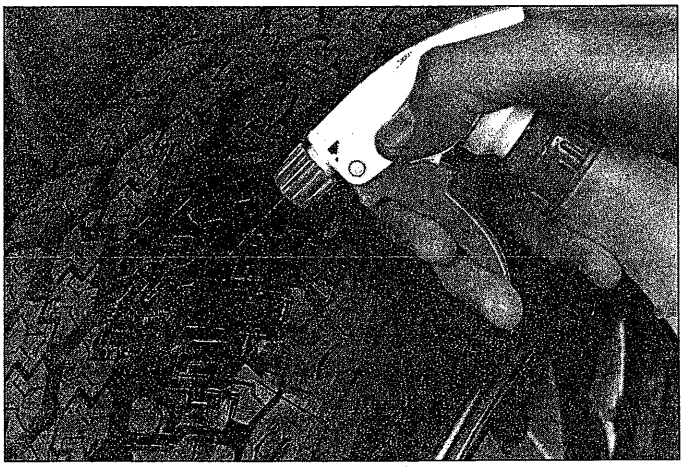
4 Look closely for cuts, punctures and embedded nails or tacks. Sometimes a tyre will hold air pressure for a short time or leak down very slowly after a nail has embedded itself in the tread. If a slow leak persists, check the valve stem core to make sure it's tight **(see illustration)**. Examine the tread for an object that may have embedded itself in the tyre or for a "plug" that may have begun to leak (radial tyre punctures are repaired with a rubber plug that's fitted in the hole). If a puncture is suspected, it can be easily verified by spraying a solution of soapy water onto the puncture area **(see illustration)**. The soapy solution will bubble if there's a leak. Unless the puncture is unusually large, a tyre shop or service station can usually repair the tyre.

5 Carefully inspect the inner sidewall of each tyre for evidence of brake fluid leakage. If you see any, inspect the brakes immediately.

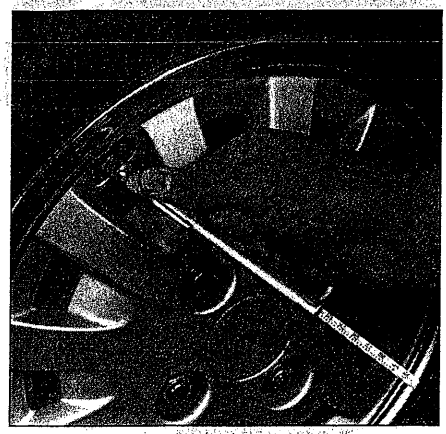
6 Correct air pressure increases the lifespan of the tyres, improves fuel economy and enhances overall ride quality. Tyre pressure cannot be accurately estimated by looking at



5.4a If a tyre loses air on a steady basis, check the valve core first to make sure it is tight (special inexpensive wrenches are available at auto parts stores)



5.4b If the valve core is tight, raise the corner of the vehicle with the low tyre and spray a soapy water solution onto the tread as the tyre is turned slowly - leaks will cause small bubbles to appear



5.8 To extend the life of the tyres, check the air pressure at least once a week with an accurate gauge (don't forget the spare!)

a tyre, especially if it's a radial. A tyre pressure gauge is essential. Keep an accurate gauge in the vehicle. The pressure gauges attached to the nozzles of air hoses at gas stations are often inaccurate.

7 Always check tyre pressure when the tyres are cold. Cold, in this case, means the vehicle has not been driven over a kilometre in the three hours preceding a tyre pressure check. A pressure rise of two to four kilograms is not uncommon once the tyres are warm.

8 Unscrew the valve cap protruding from the wheel or hubcap and push the gauge firmly onto the valve stem **(see illustration)**. Note the reading on the gauge and compare the figure to the recommended tyre pressure shown on the placard on the driver's side door pillar. Be sure to refit the valve cap to keep dirt and moisture out of the valve stem mechanism. Check all four tyres and, if necessary, add enough air to bring them up to the recommended pressure.

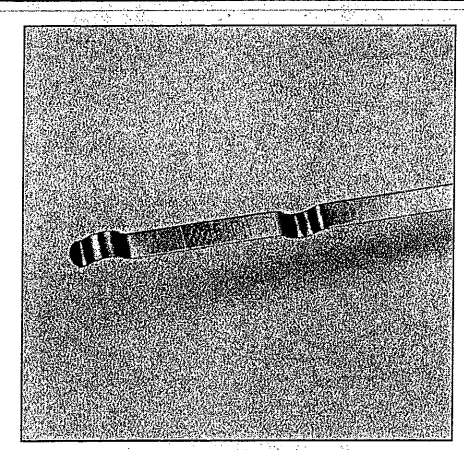
9 Don't forget to keep the spare tyre inflated to the specified pressure (consult your owner's manual).

6 Automatic transmission fluid level check (every 5,000 kilometres or 3 months)

Refer to illustration 6.6

1 The level of the automatic transmission fluid should be carefully maintained. Low fluid level can lead to slipping or loss of drive, while overfilling can cause foaming, loss of fluid and transmission damage.

2 The transmission fluid level should only be checked when the transmission is hot (at its normal operating temperature). If the vehicle has just been driven over 15 kilometres (25 kilometres in a frigid climate), and the fluid temperature is above 60 degrees C, the transmission is hot. **Caution:** *If the vehicle has just been driven for a long time at high speed or in city traffic in hot weather, or if it has been pulling a trailer, an accurate fluid level reading cannot be obtained. Allow the fluid to cool down for about 30 minutes.*



6.6 The transmission fluid level can be checked when it is cold by reading the side of the dipstick marked for that condition

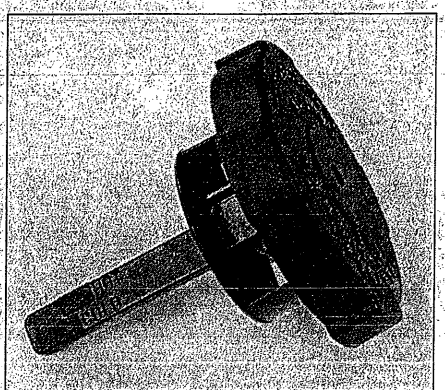
3 If the vehicle has not been driven, park the vehicle on a level area, set the parking brake, then start the engine and bring it to operating temperature. While the engine is idling, depress the brake pedal and move the selector lever through all the gear ranges, beginning and ending in Park.

4 With the engine still idling, remove the dipstick from its tube. It is located near the firewall on the driver side of the engine compartment. Check the level of the fluid on the dipstick and note its condition.

5 Wipe the fluid from the dipstick with a clean rag and reinsert it back into the filler tube until the cap seats.

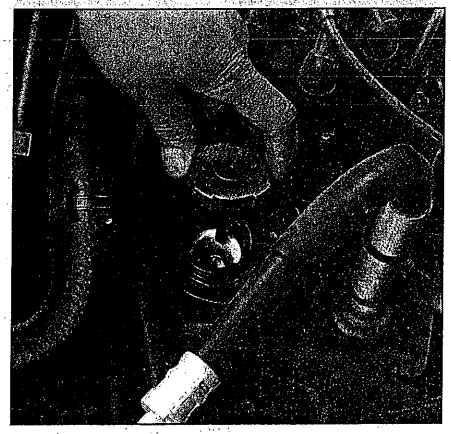
6 Pull the dipstick out again and note the fluid level. If the transmission is cold, the level should be in the COLD range on the dipstick. If it is hot, the fluid level should be higher **(see illustration)**. If the level is at the low side of either range, add the specified automatic transmission fluid through the dipstick tube with a funnel.

7 Add just enough of the recommended fluid to fill the transmission to the proper level. It takes about one half litre to raise the level from the low mark to the high mark when the fluid is hot, so add the fluid a little at a time and keep checking the level until it is correct.



7.6 The dipstick is marked for the proper fluid levels hot and cold

8 The condition of the fluid should also be checked along with the level. If the fluid at the end of the dipstick is black or a dark reddish brown colour, or if it emits a burned smell, the fluid should be changed (see Section 35). If you are in doubt about the condition of the fluid, purchase some new fluid and compare the two for colour and smell.



7.5 The power steering dipstick is located directly in the cap of the pump. Twist it to remove it

7 Power steering fluid level check (every 5,000 kilometres or 3 months)

Refer to illustrations 7.5 and 7.6

1 Unlike manual steering, the power steering system relies on fluid which may, over a period of time, require replenishing.

2 The fluid reservoir for the power steering pump is located on the pump body at the front of the engine.

3 For the check, the front wheels should be pointed straight ahead and the engine should be off.

4 Use a clean rag to wipe off the reservoir cap and the area around the cap. This will help prevent any foreign matter from entering the reservoir during the check.

5 Twist off the cap and determine the temperature of the fluid at the end of the dipstick with your finger **(see illustration)**.

6 Wipe off the fluid with a clean rag, reinsert the dipstick, then withdraw it and read the fluid level. The fluid should be at the proper level, depending on whether it was checked hot or cold **(see illustration)**. Never allow the fluid level to drop below the lower mark on the dipstick.

7 If additional fluid is required, pour the specified type directly into the reservoir, using a funnel to prevent spills.

8 If the reservoir requires frequent fluid additions, all power steering hoses, hose connections and the power steering pump should be carefully checked for leaks.

8 Engine oil and filter change (every 10,000 kilometres or 6 months, petrol engines- every 5,000 kilometres or 3 months, diesel engines)

Refer to illustrations 8.2, 8.7, 8.13 and 8.15

1 Frequent oil changes are the best preventive maintenance the home mechanic can give the engine, because aging oil becomes diluted and contaminated, which leads to premature engine wear.

2 Make sure that you have all the necessary tools before you begin this procedure **(see illustration)**. You should also have plenty of rags or newspapers handy for mopping up any spills.

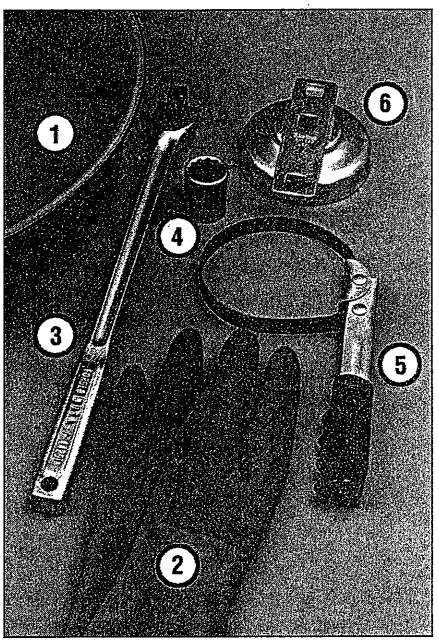
3 Access to the underside of the vehicle is greatly improved if the vehicle can be lifted on a hoist, driven onto ramps or supported by jackstands.

4 If this is your first oil change, get under the vehicle and familiarise yourself with the location of the oil drain plug. The engine and exhaust components will be warm during the actual work, so try to anticipate any potential problems before the engine and accessories are hot.

5 Park the vehicle on a level spot. Start the engine and allow it to reach its normal operating temperature (the needle on the temperature gauge should be at least above the bottom mark). Warm oil and contaminates will flow out more easily. Turn off the engine when it's warmed up. Remove the filler cap in the valve cover.

6 Raise the vehicle and support it on jackstands. **Warning:** *To avoid personal injury, never get beneath the vehicle when it is supported by only by a jack. The jack provided with your vehicle is designed solely for raising the vehicle to remove and renew the wheels. Always use jackstands to support the vehicle when it becomes necessary to place your body underneath the vehicle.*

7 Being careful not to touch the hot exhaust components, place the drain pan



8.2 These tools are required when changing the engine oil and filter

1 ***Drain pan*** *- It should be fairly shallow in depth, but wide to prevent spills*
2 ***Rubber gloves*** *- When removing the drain plug and filter, you will get oil on your hands (the gloves will prevent burns)*
3 ***Breaker bar*** *- Sometimes the oil drain plug is tight, and a long breaker bar is needed to loosen it*
4 ***Socket*** *- To be used with the breaker bar or a ratchet (must be the correct size to fit the drain plug - six-point preferred)*
5 ***Filter wrench*** *- This is a metal band-type wrench, which requires clearance around the filter to be effective*
6 ***Filter wrench*** *- This type fits on the bottom of the filter and can be turned with a ratchet or breaker bar (different-size wrenches are available for different types of filters)*

under the drain plug in the bottom of the pan and remove the plug **(see illustration)**. You may want to wear gloves while unscrewing the plug the final few turns if the engine is really hot.

8 Allow the old oil to drain into the pan. It may be necessary to move the pan farther under the engine as the oil flow slows to a trickle. Inspect the old oil for the presence of metal shavings.

9 After all the oil has drained, wipe off the drain plug with a clean rag. Even minute metal particles clinging to the plug would immediately contaminate the new oil.

10 Inspect the drain plug gasket and renew it if it appears worn. Clean the area around the drain plug opening, refit the plug and tighten it to the recommended torque, but do not strip the threads.

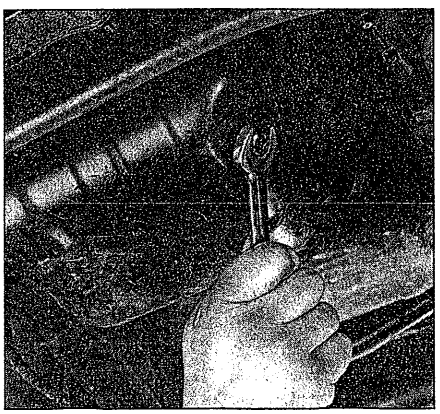
11 Move the drain pan into position under the oil filter.

12 Remove all tools, rags, etc. from under the vehicle, being careful not to spill the oil in the drain pan, then lower the vehicle.

13 Loosen the oil filter (s) **(see illustration)** by turning it counterclockwise with the filter wrench. Any standard filter wrench should work. Once the filter is loose, use your hands to unscrew it from the block. Just as the filter is detached from the block, immediately tilt the open end up to prevent the oil inside the filter from spilling out. **Warning:** *The engine exhaust manifold may still be hot, so be careful.*

14 With a clean rag, wipe off the mounting surface on the block. If a residue of old oil is allowed to remain, it will smoke when the block is heated up. It will also prevent the new filter from seating properly. Also make sure that the none of the old gasket remains stuck to the mounting surface.

15 Compare the old filter with the new one to make sure they are the same type. Smear some engine oil on the rubber gasket of the new filter and screw it into place **(see illustration)**. Because over-tightening the filter will damage the gasket, do not use a filter wrench to tighten the filter. Tighten it by hand



8.7 The engine oil drain plug is usually very tight - it is usually better to use a box end spanner when removing it to avoid damaging the head

8.13 A special oil filter spanner will be required to remove the oil filter- don't use the spanner to fit the new one!

8.15 Lubricate the oil filter gasket with clean engine oil before refitting the filter on the engine

until the gasket contacts the seating surface. Then seat the filter by giving it an additional 3/4-turn.

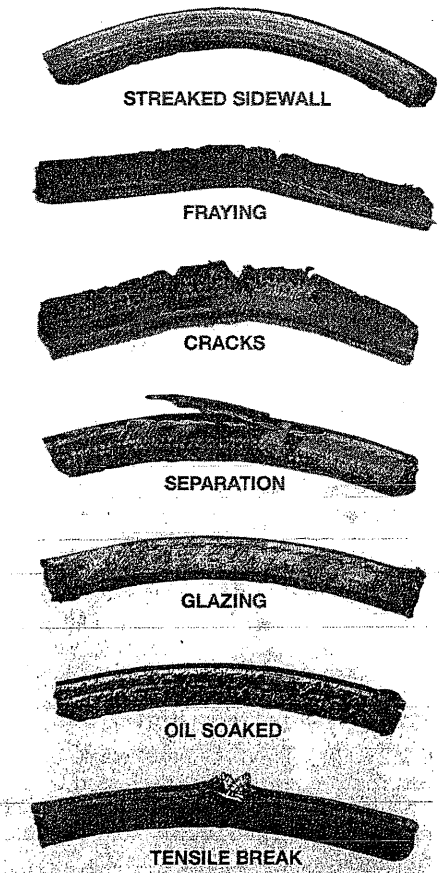
16 Add new oil to the engine through the oil filler cap in the valve cover. Use a spout or funnel to prevent oil from spilling onto the top of the engine. Pour five litres of fresh oil into the engine. Wait a few minutes to allow the oil to drain into the pan, then check the level on the oil dipstick (see Section 4 if necessary). If the oil level is at or near the H mark, refit the filler cap hand tight, start the engine and allow the new oil to circulate.

17 Allow the engine to run for about a minute. While the engine is running, look under the vehicle and check for leaks at the sump drain plug and around the oil filter. If either is leaking, stop the engine and tighten the plug or filter slightly.

18 Wait a few minutes to allow the oil to drain down into the pan, then recheck the level on the dipstick and, if necessary, add enough oil to bring the level to the H mark.

19 During the first few trips after an oil change, make it a point to check frequently for leaks and proper oil level.

20 The old oil drained from the engine cannot be reused in its present state and should be discarded. Oil reclamation centres, auto repair shops and gas stations will normally accept the oil, which can be recycled. After the oil has cooled, it can be drained into a suitable container (capped plastic jugs, topped bottles, milk cartons, etc.) for transport to one of these disposal sites.



10.3 Here are some of the more common problems associated with drivebelts (check the belts very carefully to prevent an untimely breakdown)

9 Underbonnet hose check and renewal (every 10,000 kilometres or 6 months)

General

1 **Warning:** *Renewal of air conditioning hoses must be left to a dealer service department or air conditioning shop that has the equipment to depressurise the system safely. Never remove air conditioning components or hoses until the system has been depressurised.*

2 High temperatures in the engine compartment can cause the deterioration of the rubber and plastic hoses used for engine, accessory and emission systems operation. Periodic inspection should be made for cracks, loose clamps, material hardening and leaks. Refer to Section 24 for more information on checking cooling system hoses.

3 Some, but not all, hoses are secured to the fittings with clamps. Where clamps are used, check to be sure they haven't lost their tension, allowing the hose to leak. If clamps aren't used, make sure the hose has not expanded and/or hardened where it slips over the fitting, allowing it to leak.

Vacuum hoses

4 It's quite common for vacuum hoses, especially those in the emissions system, to be colour coded or identified by coloured stripes moulded into them. Various systems require hoses with different wall thickness, collapse resistance and temperature resistance. When fitting new hoses, be sure the new ones are made of the same material.

5 Often the only effective way to check a hose is to remove it completely from the vehicle. If more than one hose is removed, be sure to label the hoses and fittings to ensure correct refitting.

6 When checking vacuum hoses, be sure to include any plastic T-fittings in the check. Inspect the fittings for cracks and the hose where it fits over the fitting for distortion, which could cause leakage.

7 A small piece of vacuum hose (6 mm inside diameter) can be used as a stethoscope to detect vacuum leaks. Hold one end of the hose to your ear and probe around vacuum hoses and fittings, listening for the "hissing" sound characteristic of a vacuum leak. **Warning:** *When probing with the vacuum hose stethoscope, be very careful not to come into contact with moving engine components such as the drivebelt, cooling fan, etc.*

Fuel hose

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.*

8 Check all rubber fuel lines for deterioration and chafing. Check especially for cracks in areas where the hose bends and just before fittings, such as where a hose attaches to the fuel filter.

9 Only high quality fuel line should be used for fuel line renewal. Never, under any circumstances, use unreinforced vacuum line, clear plastic tubing or water hose for fuel lines.

10 Spring-type clamps are commonly used on fuel lines. These clamps often lose their tension over a period of time, and can be "sprung" during removal. Renew all spring-type clamps with screw clamps whenever a hose is renewed.

Metal lines

11 Sections of metal line are often used in the fuel system. Check carefully to be sure the line has not been bent or crimped and that cracks have not started in the line.

12 If a section of metal fuel line must be renewed, only seamless steel tubing should be used, since copper and aluminium tubing don't have the strength necessary to withstand normal engine vibration.

13 Check the metal brake lines where they enter the master cylinder and brake proportioning unit (if used) for cracks in the lines or loose fittings. Any sign of brake fluid leakage calls for an immediate thorough inspection of the brake system.

10 Drivebelt check, adjustment and renewal (every 10,000 kilometres or 6 months)

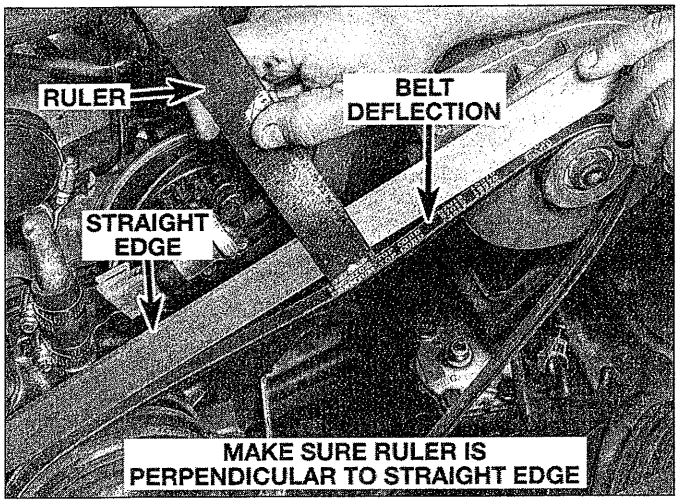
Check

Refer to illustrations 10.3 and 10.4

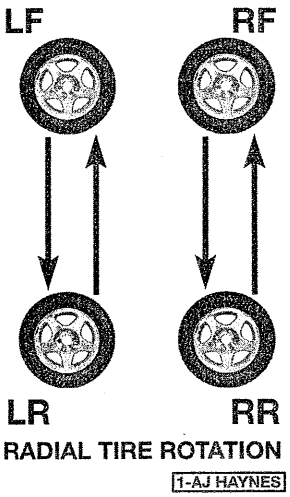
1 The drivebelts, or V-belts as they are sometimes called, are located at the front of the engine and play an important role in the overall operation of the vehicle and its components. Due to their function and material make-up, the belts are prone to failure after a period of time and should be inspected and adjusted periodically to prevent major engine damage.

2 The number of belts used on a particular vehicle depends on the accessories fitted. Drivebelts are used to turn the fan, alternator, power steering pump, water pump and air conditioning compressor. Depending on the pulley arrangement, more than one of these components may be driven by a single belt.

3 With the engine off, open the bonnet and locate the various belts at the front of the engine. Using your fingers (and a flashlight, if necessary), move along the belts checking for cracks and separation of the belt plies. Also check for fraying and glazing, which gives the belt a shiny appearance **(see illustration)**. Both sides of each belt should be



10.4 Measuring drivebelt deflection with a straightedge and ruler



11.2 Tyre rotation diagram for radial tyres

inspected, which means you will have to twist the belt to check the underside.

4 The tension of each belt is checked by pushing on the belt at a distance halfway between the pulleys. Push firmly with your thumb and see how much the belt moves (deflects) **(see illustration)**. As a rule of thumb, if the distance from pulley centre-to-pulley centre is between 175 and 300 mm, the belt should deflect 6 mm. If the belt travels between pulleys spaced 300 to 400 mm apart, the belt should deflect 12 mm for a V-belt or 6 mm for a serpentine belt.

Adjustment

5 If it is necessary to adjust the belt tension, either to make the belt tighter or looser, it is done by moving the adjustable belt-driven accessory on the bracket.

6 For each belt on the engine there will be one component with an adjusting bolt and a pivot bolt. These bolts must be loosened to enable you to move the component.

7 After the two bolts have been loosened, move the component away from the engine to tighten the belt or toward the engine to loosen the belt. Hold the accessory in position and check the belt tension. If it is correct, tighten the two bolts until just snug, then recheck the tension. If the tension is all right, tighten the bolts.

8 On earlier models it will be necessary to use some sort of lever to move the accessory while the belt is adjusted. If this must be done to gain the proper leverage, be very careful not to damage the component being moved or the part being pried against. Power steering pumps are particularly vulnerable.

Renewal

9 To renew a belt, follow the above procedures for drivebelt adjustment but slip the belt off the pulleys and remove it. Since belts tend to wear out more or less at the same time, it's a good idea to renew all of them at the same time. Number each belt and the corresponding pulley grooves so the new belts can be fitted properly.

10 Take the old belts with you when purchasing new ones in order to make a direct comparison for length, width and design.

11 Adjust the belts as described earlier in this Section.

11 Tyre rotation (every 10,000 kilometres or 6 months)

Refer to illustration 11.2

1 The tyres should be rotated at the specified intervals and whenever uneven wear is noticed. Since the vehicle will be raised and the tyres removed anyway, check the brakes (see Section 28) at this time.

2 Radial tyres must be rotated in a specific pattern **(see illustration)**.

3 Refer to the information in *Jacking and towing* at the front of this manual for the proper procedures to follow when raising the vehicle and changing a tyre. If the brakes are to be checked, do not apply the parking brake as stated. Make sure the tyres are blocked to prevent the vehicle from rolling.

4 Preferably, the entire vehicle should be raised at the same time. This can be done on a hoist or by jacking up each corner and then lowering the vehicle onto jackstands placed under the frame rails. Always use four jackstands and make sure the vehicle is firmly supported.

5 After rotation, check and adjust the tyre pressures as necessary and be sure to check the lug nut tightness.

6 For further information on the wheels and tyres, refer to Chapter 10.

12 Clutch/brake pedal height and freeplay adjustment (every 10,000 kilometres or 6 months)

1 The height of the clutch and brake pedals is the distance the pedal sits from the floor. If the pedal height is not within the specified range, it must be adjusted. To make measurements, pull back the carpet and place the end of your scale directly on the melt sheet which is adhered to the steel floor pan. Measure to the top of the pedal pad.

Brake pedal height

2 Before measuring the brake pedal height, make sure the pedal is in the fully returned position, then start the engine and depress the accelerator several times to activate the brake power booster. Measure the pedal height and adjust if necessary. To adjust the pedal height, loosen the locknut and back the brake switch out for the necessary clearance, then loosen the locknut on the brake pushrod. Turn the pushrod to adjust the pedal height in the middle of the specified range, then retighten the locknut. **Warning:** *The pushrod must not extend out so that its end is outside of the opening in the clevis.*

3 Adjust the pedal switch by turning it clockwise until the clearance is as listed in this Chapter's Specifications. Ensure that the brake lights are not on when the brake pedal is released.

Brake pedal freeplay

4 Check the free play and adjust the brake lamp switch as before if it is not correct.

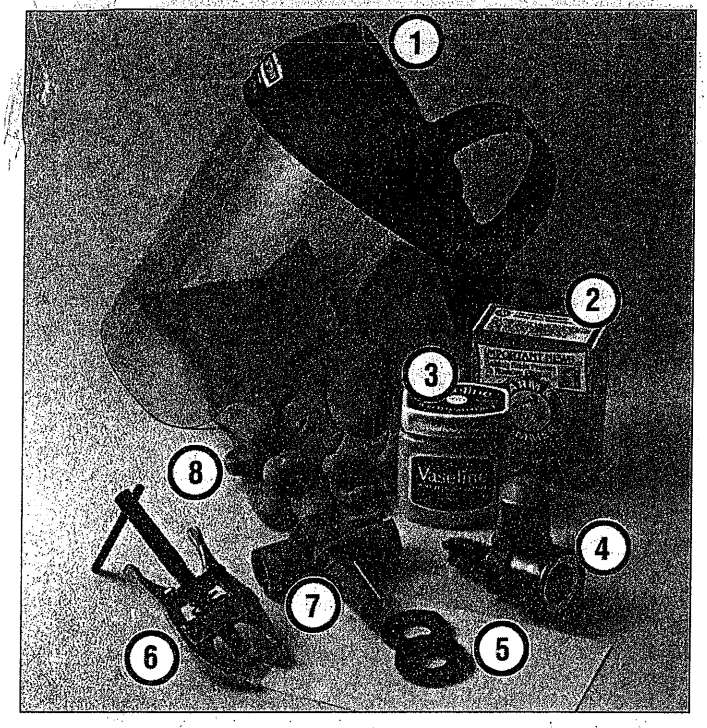
Clutch pedal height

5 Adjust the clutch pedal height with the pedal stop. Loosen the locknut, adjust the stop until the correct pedal height is reached, then tighten the locknut.

Clutch pedal free play

6 The freeplay is the pedal slack, or the distance the pedal can be depressed before it begins to have any effect on the clutch system. If the pedal freeplay is not within the specified range, it must be adjusted.

7 To adjust the clutch pedal freeplay loosen the locknut on the clutch pushrod. Then back off the pushrod to adjust the pedal freeplay to the specified range and retighten the locknut.



14.1 Tools and materials required for battery maintenance

1 ***Face shield/safety goggles*** *- When removing corrosion with a brush, the acidic particles can easily fly up into your eyes*
2 ***Baking soda*** *- A solution of baking soda and water can be used to neutralise corrosion*
3 ***Petroleum jelly*** *- A layer of this on the battery posts will help prevent corrosion*
4 ***Battery post/cable cleaner*** *- This wire brush cleaning tool will remove all traces of corrosion from the battery posts and cable clamps*
5 ***Treated felt washers*** *- Placing one of these on each post, directly under the cable clamps, will help prevent corrosion*
6 ***Puller*** *- Sometimes the cable clamps are very difficult to pull off the posts, even after the nut/bolt has been completely loosened. This tool pulls the clamp straight up and off the post without damage*
7 ***Battery post/cable cleaner*** *- Here is another cleaning tool which is a slightly different version of Number 4 above, but it does the same thing*
8 ***Rubber gloves*** *- Another safety item to consider when servicing the battery; remember that's acid inside the battery!*

13 Seat belt check (every 20,000 kilometres or 12 months)

1 Check the seat belts, buckles, latch plates and guide loops for any obvious damage or signs of wear.
2 Make sure the seat belt reminder light comes on when the key is turned on.
3 The seat belts are designed to lock up during a fast stop or impact, yet allow free movement during normal driving. The retractors should hold the belt against your chest while driving and rewind the belt when the buckle is unlatched.
4 If any of the above checks reveal problems with the seat belt system, renew parts as necessary.

14 Battery check, maintenance and charging (every 10,000 kilometres or 6 months)

Refer to illustrations 14.1, 14.6a, 14.6b, 14.7a and 14.7b

Warning: *Certain precautions must be followed when checking and servicing the battery. Hydrogen gas, which is highly flammable, is always present in the battery cells, so keep lighted tobacco and all other open flames and sparks away from the battery. The electrolyte inside the battery is actually dilute sulfuric acid, which will cause injury if splashed on your skin or in your eyes. It will also ruin clothes and painted surfaces. When removing the battery cables, always detach the negative cable first and hook it up last!*

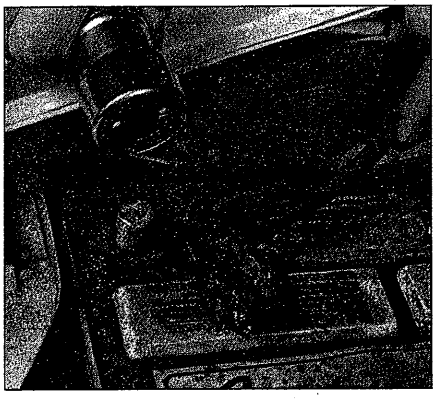
Maintenance

1 A routine preventive maintenance program for the battery in your vehicle is the only way to ensure quick and reliable starts. But before performing any battery maintenance, make sure that you have the proper equipment necessary to work safely around the battery **(see illustration)**.
2 There are also several precautions that should be taken whenever battery maintenance is performed. Before servicing the battery, always turn the engine and all accessories off and disconnect the cable from the negative terminal of the battery.
3 The battery produces hydrogen gas, which is both flammable and explosive. Never create a spark, smoke or light a match around the battery. Always charge the battery in a ventilated area.
4 Electrolyte contains poisonous and corrosive sulfuric acid. Do not allow it to get in your eyes, on your skin on your clothes. Never ingest it. Wear protective safety glasses when working near the battery. Keep children away from the battery.
5 Note the external condition of the battery. If the positive terminal and cable clamp on your vehicle's battery is equipped with a rubber protector, make sure that it's not torn or damaged. It should completely cover the terminal. Look for any corroded or loose connections, cracks in the case or cover or loose hold-down clamps. Also check the entire length of each cable for cracks and frayed conductors.
6 If corrosion, which looks like white, fluffy deposits **(see illustration)** is evident, particularly around the terminals, the battery should be removed for cleaning. Loosen the cable clamp bolts with a wrench, being careful to remove the earth cable first, and slide them off the terminals **(see illustration)**. Then disconnect the hold-down clamp bolt and nut, remove the clamp and lift the battery from the engine compartment.

14.6a Battery terminal corrosion usually appears as light, fluffy powder

14.6b Removing the cable from a battery post with a wrench - sometimes special battery pliers are required for this procedure if corrosion has caused deterioration of the nut hex (always remove the negative cable first and hook it up last!)

14.7a When cleaning the cable clamps, all corrosion must be removed (the inside of the clamp is tapered to match the taper on the post, so don't remove too much material)



14.7b Regardless of the type of tool used on the battery posts, a clean, shiny surface should be the result

7 Clean the cable clamps thoroughly with a battery brush or a terminal cleaner and a solution of warm water and baking soda **(see illustration)**. Wash the terminals and the top of the battery case with the same solution but make sure that the solution doesn't get into the battery. When cleaning the cables, terminals and battery top, wear safety goggles and rubber gloves to prevent any solution from coming in contact with your eyes or hands. Wear old clothes too - even diluted, sulfuric acid splashed onto clothes will burn holes in them. If the terminals have been extensively corroded, clean them up with a terminal cleaner **(see illustration)**. Thoroughly wash all cleaned areas with plain water.

8 Make sure that the battery tray is in good condition and the hold-down clamp bolts are tight. If the battery is removed from the tray, make sure no parts remain in the bottom of the tray when the battery is refitted. When refitting the hold-down clamp bolts, do not overtighten them.

9 Any metal parts of the vehicle damaged by corrosion should be covered with a zinc-based primer, then painted.

10 Information on removing and refitting the battery can be found in Chapter 5. Information on jump starting can be found at the front of this manual. For more detailed battery checking procedures, refer to the *Haynes Automotive Electrical Manual*.

Charging

Warning: *When batteries are being charged, hydrogen gas, which is very explosive and flammable, is produced. Do not smoke or allow open flames near a battery. Wear eye protection when near the battery during charging. Also, make sure the charger is unplugged before connecting or disconnecting the battery from the charger.*

Note: *The manufacturer recommends the battery be removed from the vehicle for charging because the gas that escapes during this procedure can damage the paint. Fast charging with the battery cables connected can result in damage to the electrical system.*

11 Slow-rate charging is the best way to restore a battery that's discharged to the point where it will not start the engine. It's also a good way to maintain the battery charge in a vehicle that's only driven a few kilometres between starts. Maintaining the battery charge is particularly important in the winter when the battery must work harder to start the engine and electrical accessories that drain the battery are in greater use.

12 It's best to use a one or two-amp battery charger (sometimes called a "trickle" charger). They are the safest and put the least strain on the battery. They are also the least expensive. For a faster charge, you can use a higher amperage charger, but don't use one rated more than 1/10th the amp/hour rating of the battery. Rapid boost charges that claim to restore the power of the battery in one to two hours are hardest on the battery and can damage batteries not in good condition. This type of charging should only be used in emergency situations.

13 The average time necessary to charge a battery should be listed in the instructions that come with the charger. As a general rule, a trickle charger will charge a battery in 12 to 16 hours.

14 Remove all the cell caps (if equipped) and cover the holes with a clean cloth to prevent spattering electrolyte. Disconnect the negative battery cable and hook the battery charger cable clamps up to the battery posts (positive to positive, negative to negative), then plug in the charger. Make sure it is set at 12-volts if it has a selector switch.

15 If you're using a charger with a rate higher than two amps, check the battery regularly during charging to make sure it doesn't overheat. If you're using a trickle charger, you can safely let the battery charge overnight after you've checked it regularly for the first couple of hours.

16 If the battery has removable cell caps, measure the specific gravity with a hydrometer every hour during the last few hours of the charging cycle. Hydrometers are available inexpensively from auto parts stores - follow the instructions that come with the hydrometer. Consider the battery charged when there's no change in the specific gravity reading for two hours and the electrolyte in the cells is gassing (bubbling) freely. The specific gravity reading from each cell should be very close to the others. If not, the battery probably has a bad cell(s).

17 Some batteries with sealed tops have built-in hydrometers on the top that indicate the state of charge by the colour displayed in the hydrometer window. Normally, a bright-coloured hydrometer indicates a full charge and a dark hydrometer indicates the battery still needs charging.

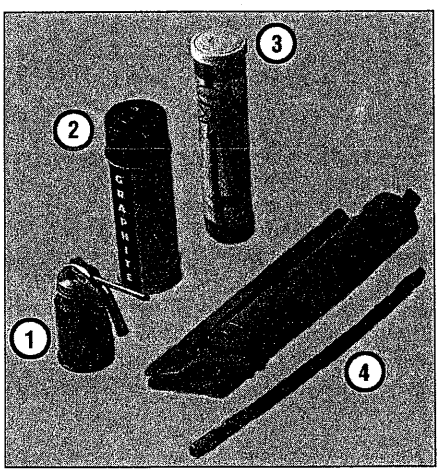
18 If the battery has a sealed top and no built-in hydrometer, you can hook up a voltmeter across the battery terminals to check the charge. A fully charged battery should read 12.6 volts or higher after the surface charge has been removed.

19 Further information on the battery and jump starting can be found in Chapter 5 and at the front of this manual.

15 Chassis lubrication (every 10,000 kilometres or 6 months)

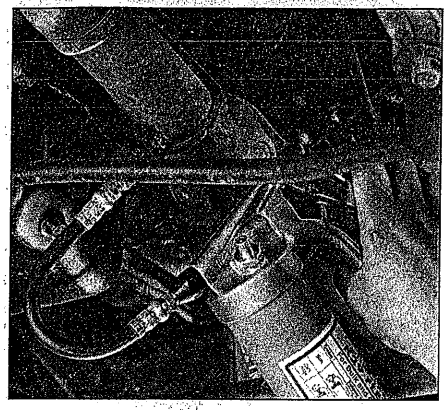
Refer to illustrations 15.1 and 15.8

1 Refer to *Recommended lubricants and fluids* at the front of this Chapter to obtain the necessary grease, etc. You will also need a grease gun **(see illustration)**. Occasionally plugs will be fitted rather than grease fittings.

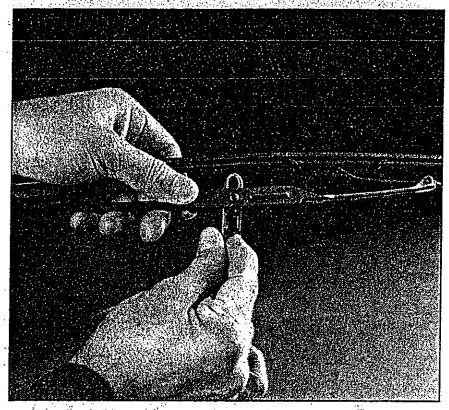


15.1 Materials required for chassis and body lubrication

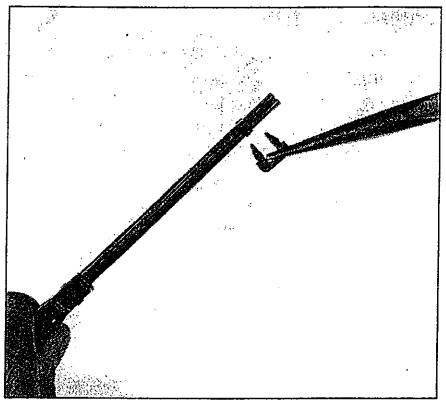
1 ***Engine oil*** *- Light engine oil in a can like this can be used for door and bonnet hinges*
2 ***Graphite spray*** *- Used to lubricate lock cylinders*
3 ***Grease*** *- Grease, in a variety of types and weights, is available for use in a grease gun. Check the Specifications for your requirements*
4 ***Grease gun*** *- A common grease gun, shown here with a detachable hose and nozzle, is needed for chassis lubrication. After use, clean it thoroughly*



15.8 Don't forget to lubricate the slip collars on the driveshafts



16.5 In order to renew the wiper blades, first separate the blade assembly from the wiper arm



16.6 Pliers are usually needed to remove the clip from the end of the blade

If so, grease fittings will have to be purchased and fitted.

2 Look under the vehicle for grease fittings or plugs on the steering, suspension, and driveline components. They are normally found on the tie-rod ends and universal joints. If there are plugs, remove them and fit grease fittings, which will thread into the component. An automotive parts store will be able to supply the correct fittings. Straight, as well as angled, fittings are available.

3 For easier access under the vehicle, raise it with a jack and place jackstands under the frame. Make sure it is safely supported by the stands. If the wheels are to be removed at this interval for tyre rotation or brake inspection, loosen the lug nuts slightly while the vehicle is still on the ground.

4 Before beginning, force a little grease out of the nozzle to remove any dirt from the end of the gun. Wipe the nozzle clean with a rag.

5 With the grease gun and plenty of clean rags, crawl under the vehicle and begin lubricating the components.

6 Wipe the top of both steering knuckles free of dirt, then detach the pipe plug from each steering knuckle. Insert the nozzle, then squeeze the trigger on the grease gun to force grease into the component. For all other suspension and steering components, continue pumping grease into the fitting until it oozes out of the joint between the two components. If it escapes around the grease gun nozzle, the fitting is clogged or the nozzle is not completely seated on the fitting. Resecure the gun nozzle to the fitting and try again. If necessary, renew the fitting.

7 Wipe the excess grease from the components and the grease fitting. Repeat the procedure for the remaining fittings.

8 Lubricate the driveshaft slip yoke by pumping grease into the fitting until it can be seen coming out of the slip yoke seal **(see illustration)**.

9 Lubricate conventional universal joints until grease can be seen coming out of the contact points.

10 While you are under the vehicle, clean and lubricate the parking brake cable along with the cable guides and levers. This can be done by smearing some chassis grease onto the cable and its related parts with your fingers.

11 Lubricate the contact points on the steering knuckle stop and adjustment bolt.

12 Open the bonnet and smear a little chassis grease on the bonnet latch mechanism. Have an assistant pull the bonnet release lever from inside the vehicle as you lubricate the cable at the latch.

13 Lubricate all the hinges (door, bonnet, etc.) with engine oil to keep them in proper working order.

14 The key lock cylinders can be lubricated with spray-on graphite or silicone lubricant, which is available at auto parts stores.

15 Lubricate the door weatherstripping with silicone spray. This will reduce chafing and retard wear.

16 If the vehicle has been used in water, remove one of the bolts from the bottom of each front hub. Check with a probe for any water which may have become trapped. Refer to Section 37 for further information.

17 On manual transmission vehicles that have been used in water, remove the plug from the bottom of the bellhousing to check for moisture and drain any that has accumulated.

16 Wiper blade inspection and renewal (every 10,000 kilometres or 6 months)

Refer to illustrations 16.5, 16.6 and 16.7

1 The windscreen wiper and blade assembly should be inspected periodically for damage, loose components and cracked or worn blade elements.

2 Road film can build up on the wiper blades and affect their efficiency, so they should be washed regularly with a mild detergent solution.

3 The action of the wiping mechanism can loosen bolts, nuts and fasteners, so they should be checked and tightened, as necessary, at the same time the wiper blades are checked.

4 If the wiper blade elements are cracked, worn or warped, or no longer clean adequately, they should be renewed.

5 Lift the arm assembly away from the glass for clearance. It will lock in position. Press on the clip, then slide the wiper blade arm assembly off **(see illustration)**.

6 Use needle-nose pliers to remove the clip at the end of the arm **(see illustration)**.

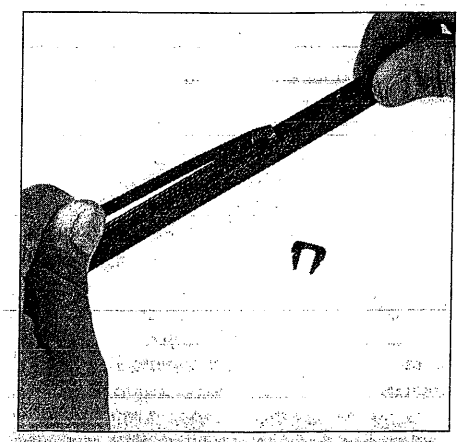
7 Pull out the old rubber and discard it **(see illustration)**.

8 Refitting is the reverse of removal. Make sure that the new insert is securely locked into the arm. Test the wipers briefly to ensure that they are solidly mounted.

17 Idle speed and mixture adjustment (every 10,000 kilometres or 6 months)

Refer to illustration 17.4

Note:. *The idle speed can be adjusted on fuel injected models using these procedures, however, the idle mixture is controlled by the computer and various sensors. Refer to Chapter 4B for more information on fuel injected vehicles.*



16.7 Carefully slide the old insert out of the wiper blade - work on only one blade at a time to avoid confusion

Petrol engines

1 Engine idle speed is the speed at which the engine operates when fully warmed and when no accelerator pedal force is applied. The idle speed is critical to the performance of the engine as well as many engine subsystems.

2 Make sure the parking brake is firmly set and the wheels blocked to prevent the vehicle from rolling. This is especially true if the specifications require the transmission to be in Drive. An assistant inside the vehicle pressing on the brake pedal is the safest method.

3 A hand-held tachometer must be used when adjusting idle speed to get an accurate reading. The exact hook-up for these meters varies with the manufacturer, so follow the particular directions included with the instrument.

4 For most applications, the idle speed is set by turning an adjustment screw which is located next to the throttle lever **(see illustration)**. This screw changes the amount the throttle plate is held open by the throttle linkage.

5 For all applications, the engine must be completely warmed-up to operating temperature, which will automatically render the choke and fast idle inoperative.

6 Once you have located the idle screw, experiment with different length screwdrivers until the adjustment can be easily made without coming into contact with hot or moving engine components.

7 If the air cleaner is removed, the vacuum hose to the snorkel should be plugged.

8 Since the manufacturer recommended many different adjustment procedures over the time period covered by this manual, it would be impractical to cover all types in this Section. Most models have a tune-up decal or Vehicle Emission Control Information (VECI) label located in the engine compartment with instructions for setting idle speed. If no VECI label is found refer to the Specifications Section at the beginning of this Chapter and to the adjustment procedures specified in Chapter 4A.

9 The idle mixture is adjusted at the same time as the idle speed. This manual assumes that you do not have access to an exhaust emissions analyser. If you do, adjust the idle mixture screw to yield the percentage of CO as listed in this Chapter's Specifications.

10 Adjust the idle mixture screw (carburettor only) until the smoothest possible idle is found **(see illustration 17.4)**. Turn the screw clockwise one additional turn. Reset the idle speed if necessary.

Diesel engine

11 The engine idle speed should be checked on diesel engines every 20,000 kilometres.

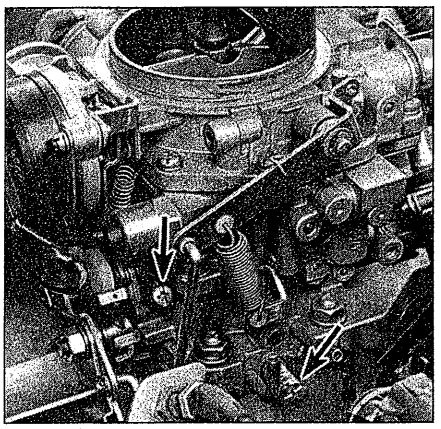
12 Before checking the idle speed, make certain that the injection timing is correct and that the injector nozzles are clean. All other systems must be in proper order, including the valve clearances and the air filter.

13 Warm the engine to operating temperature. Turn off all accessories including the lights, air conditioner and heater. The vehicle must be in Neutral or Park with the parking brake set.

14 Remove the clamps which secure the number one injector tube. Attach the lead of a special diesel tachometer to the number one injector tube.

15 Run the engine at approximately 2,000 rpm for two minutes, then allow it to idle for one minute. Observe the idle speed. Compare the reading with that on the VECI label in the engine compartment. If this information is not available, set the idle speed to 700 to 750 rpm.

16 Locate the adjustment screw on the top of the injection pump. Loosen the lock-nut and adjust the screw while observing the tachometer. Tighten the lock-nut.



17.4 The upper screw near the throttle linkage adjusts the idle speed - the one at the base of the carburettor is for the mixture setting

18 Exhaust system check (every 10,000 kilometres or 6 months)

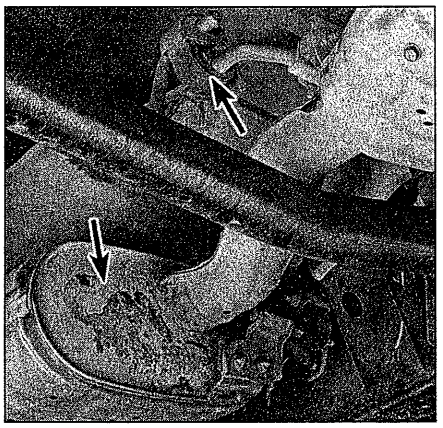
Refer to illustration 18.2

1 With the engine cold (at least three hours after the vehicle has been driven), check the complete exhaust system from the manifold to the end of the tailpipe. Be careful around the catalytic converter (if equipped), which may be hot even after three hours. The inspection should be done with the vehicle on a hoist to permit unrestricted access. If a hoist isn't available, raise the vehicle and support it securely on jackstands.

2 Check the exhaust pipes and connections for signs of leakage and/or corrosion indicating a potential failure. Make sure that all brackets and hangers are in good condition and tight **(see illustration)**. Leaks usually show up as black sooty stains on surrounding areas.

3 Inspect the underside of the body for holes, corrosion, open seams, etc. which may allow exhaust gasses to enter the passenger compartment. Seal all body openings with silicone sealant or body putty.

4 Rattles and other noises can often be traced to the exhaust system, especially the hangers, mounts and heat shields. Try to move the pipes, mufflers and catalytic converter. If the components can come in contact with the body or suspension parts, secure the exhaust system with new brackets and hangers.



18.2 Corrosion will be apparent at the ends of the muffler. Check all of the rubber mounts for cracking at the same time

19 Suspension and steering check (every 10,000 kilometres or 6 months)

Refer to illustrations 19.6a and 19.6b

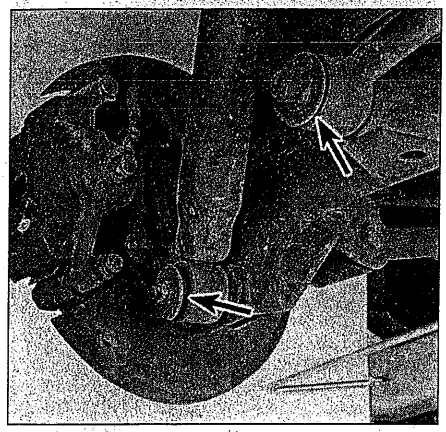
Note: *For detailed illustrations of the steering and suspension components, refer to Chapter 10.*

With the wheels on the ground

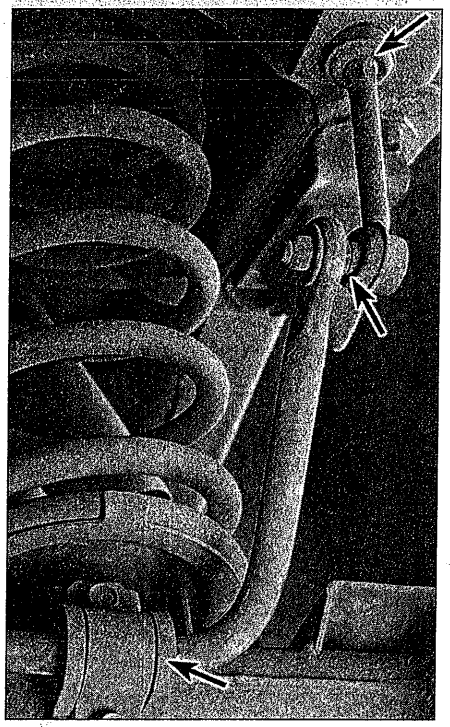
1 With the vehicle stopped and the front wheels pointed straight ahead, rock the steering wheel gently back and forth. If freeplay is excessive, a front wheel bearing, main shaft yoke, intermediate shaft yoke, steering knuckle bearing or tie rod end is worn or the steering gear is out of adjustment or broken. Refer to Chapter 10 for the appropriate repair procedure.

2 Other symptoms, such as excessive vehicle body movement over rough roads, swaying (leaning) around corners and binding as the steering wheel is turned, may indicate faulty steering and/or suspension components.

3 Check the shock absorbers by pushing down and releasing the vehicle several times at each corner. If the vehicle does not come back to a level position within one or two bounces, the shocks/struts are worn and must be renewed. When bouncing the vehicle up and down, listen for squeaks and noises from the suspension components.



19.6a The suspension system uses many rubber bushes which must be inspected. If they are severely cracked, broken or missing altogether, they must be renewed immediately



19.6b Rubber bushes will degenerate quickly if they are allowed to become oil-soaked - repair all oil leaks as soon as possible

Under the vehicle

4 Raise the vehicle with a floor jack and support it securely on jackstands. See *jacking and towing* at the front of this book for proper jacking points.

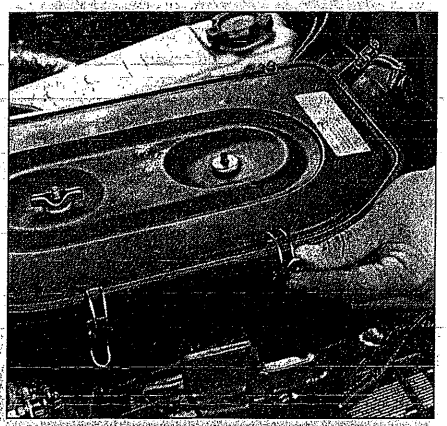
5 Check the tyres for irregular wear patterns and proper inflation. See Section 5 for information regarding tyre wear.

6 Inspect the universal joint between the steering shaft and the steering gear housing. Check the steering gear housing for grease leakage. Check the steering linkage for looseness or damage. Check the tie-rod ends for excessive play. Look for loose bolts, broken or disconnected parts and deteriorated rubber bushes on all suspension and steering components **(see illustrations)**. While an assistant turns the steering wheel from side to side, check the steering components for free movement, chafing and binding. If the steering components do not seem to be reacting with the movement of the steering wheel, try to determine where the slack is located.

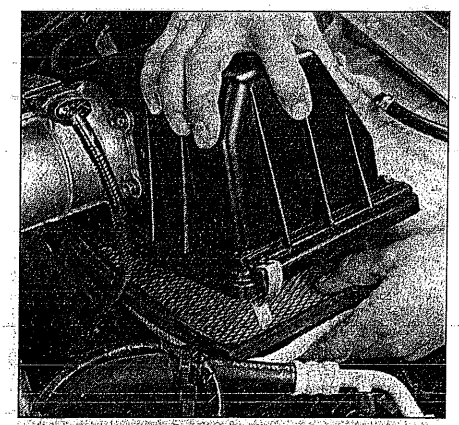
7 Check the wheel bearings. Do this by spinning the front wheels. Listen for any abnormal noises and watch to make sure the wheel spins true (doesn't wobble). Grab the top and bottom of the tyre and pull in-and-out on it. Notice any movement which would indicate a loose wheel bearing assembly. If the bearings are suspect, they should be checked and repacked.

8 Check the steering knuckle, moving the knuckle up and down with a prise bar to ensure that knuckle bearings have no play. If the bearings are suspect, they should be checked and repacked. Refer to Chapter 10 for more information.

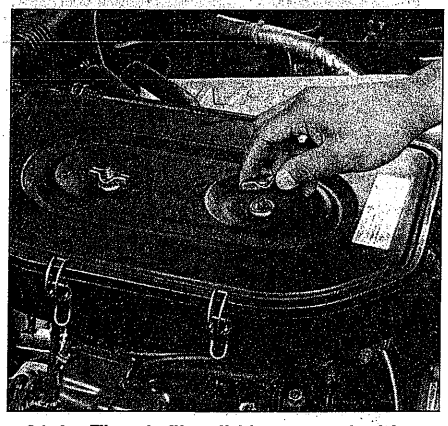
9 Inspect the driveshafts for worn U-joints and for excessive play in the slip yoke and spline area (see Chapter 8).



21.4b The air filter lid can be quickly removed without the use of tools - there is no excuse for not checking the filter regularly



21.4c Be careful when servicing the air filter on fuel injected models - the air flow meter is attached to the air filter lid and it is delicate



21.4a The air filter lid is secured with a combination of wing-nuts and clips on carburetted models - make sure that you tighten the wing-nuts three full turns after they first contact the lid when reassembling it

10 Check the transfer case and differentials for evidence of fluid leakage.

20 Fuel filter service (diesel engine) (every 10,000 kilometres or 12 months)

Caution: *Drain the fuel filter at once if the fuel filter warning light or buzzer alerts you.*

1 Turn the engine OFF. Place a small container in the engine compartment under the fuel filter.

2 Open the drain valve on the bottom of the filter no more than five turns and allow any water to escape.

3 When clear fuel runs out, tighten the valve.

4 Bleed the fuel system before attempting to start the engine (refer to Chapter 4C).

21 Air filter and PCV filter check and renewal (every 20,000 kilometres or 12 months)

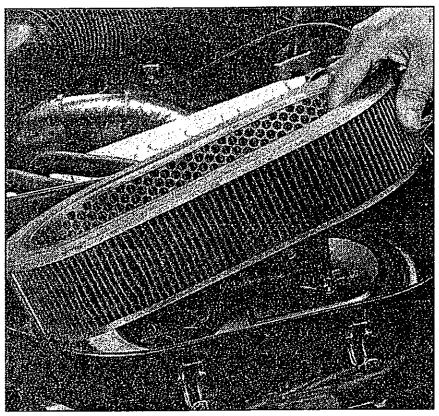
Refer to illustrations 21.4a, 21.4b, 21.4c, 21.5a and 21.5b

Note: *Refer to Section 42 for the service procedure for the cyclone pre-air filter.*

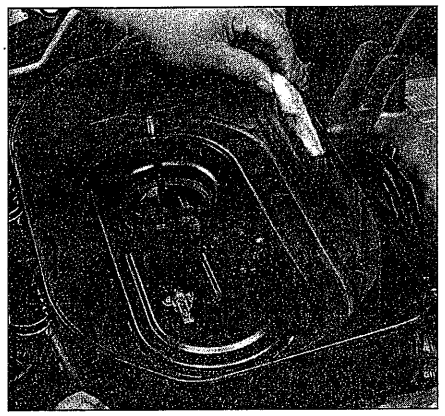
1 At the specified intervals, the air filter should be renewed. A thorough preventive maintenance schedule would also require the filters to be inspected between filter changes.

2 On carburetted models, the air filter housing is mounted on top of the carburettor in the engine compartment. On diesel engines, two air filters are used. The prefilter can be cleaned with compressed air (from the inside out) when it has become dirty. The main filter is serviced as with the petrol engine filters.

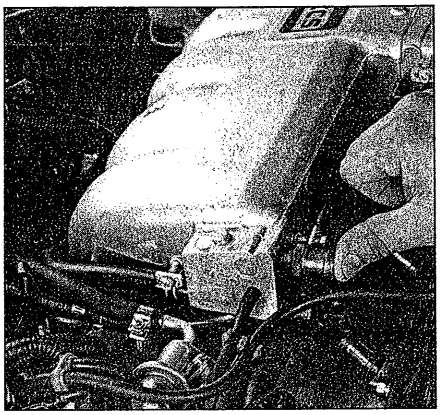
3 On fuel injected models, the air filter housing is located at the front of the engine compartment.



21.5a Lift the air filter out and then clean the housing thoroughly



21.5b The PCV filter should be renewed every time the air filter is renewed



22.3 Place a thumb over the PCV valve with the engine idling - a strong vacuum should be felt

4 On carburetted models, remove the wing nut(s) and the cover retaining clips **(see illustrations)**. Then detach all hoses that would interfere with the removal of the air cleaner cover from the air cleaner housing. On fuel injected models, unclip the cover and pull it aside **(see illustration)**. While the top cover is off, be careful not to drop anything down into the carburettor or air cleaner assembly.

5 Lift the air filter element out of the housing **(see illustration)** and wipe out the inside of the air cleaner housing with a clean rag. The PCV filter is secured to the side of the air filter housing. Renew it at the same time as the air filter **(see illustration)**.

6 Inspect the outer surface of the filter element. If it is dirty, renew it. If it is only moderately dusty, it can be reused by blowing it clean from the back to the front surface with compressed air. Because it is a pleated paper type filter, it cannot be washed or oiled. If it cannot be cleaned satisfactorily with compressed air, discard and renew it. **Caution:** *Never drive the vehicle with the air cleaner removed. Excessive engine wear could result and backfiring could even cause a fire under the bonnet.*

7 Place the new filter in the air cleaner housing, making sure it seats properly.

8 Refitting of the cover is the reverse of removal. See the Specifications in this Chapter for the correct tightening procedure for the air filter lid wing nuts.

9 Some later model vehicles use an air cleaner service indicator lamp to alert the driver that the air filter and/or the cyclone pre-air filter are extremely dirty. Both filters should be serviced immediately when the lamp is lit.

10 The indicator is usually located at the rear of the carburettor. Make certain that the red part of the indicator is not visible when the engine is idling. **Note:** *The indicator switch can be tested by removing it and applying a vacuum of 10.0 to 11.5 kPa to it using a hand vacuum pump. Use an ohmmeter to check that the switch has continuity at that vacuum level and that continuity disappears when vacuum is released.*

22 Positive Crankcase Ventilation (PCV) valve check and renewal (petrol engines) (every 20,000 kilometres or 12 months)

Refer to illustration 22.3

1 The PCV valve is located in the inlet manifold.

2 With the engine idling at normal operating temperature, pull the PCV hose from the PCV valve.

3 Place your finger over the valve **(see illustration)**. If there's no vacuum, renew the valve. Renew any plugged or deteriorated hoses at the same time.

4 Turn off the engine, remove and shake the PCV valve, listening for a rattle. If the valve doesn't rattle, renew it.

5 To renew the valve, remove it from the inlet manifold.

6 When purchasing a PCV valve, make sure it's for your particular vehicle and engine size. Compare the old valve with the new one to make sure they're the same.

7 Fit the new valve into the inlet manifold.

8 Inspect all rubber hoses and grommets for damage and hardening. Renew them, if necessary.

9 Press the PCV hose securely into position.

23 Fuel system check (every 20,000 kilometres or 12 months)

Warning: *Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. Since petrol is carcinogenic, wear latex gloves when there's a possibility of being exposed to fuel, and, if you spill any fuel on your skin, rinse it off immediately with soap and water. Mop up any spills immediately and do not store fuel-soaked rags where they could ignite. The fuel system is under constant pressure, so, if any fuel lines are to be disconnected, the fuel pressure in the system must be relieved first (see Chapter 4, Part A for more information). When you perform any kind of work on the fuel system, wear safety glasses and have a Class B type fire extinguisher on hand.*

1 The fuel system is most easily checked with the vehicle raised on a hoist so the components underneath the vehicle are readily visible and accessible.

2 If the smell of fuel is noticed while driving or after the vehicle has been in the sun, the system should be thoroughly inspected immediately.

3 Remove the fuel tank cap and check for damage, corrosion and an unbroken sealing imprint on the gasket. Renew the cap if necessary.

4 With the vehicle raised and safely supported, inspect the fuel tank and filler neck for punctures, cracks and other damage. The connection between the filler neck and the tank is particularly critical. Sometimes a rubber filler neck will leak because of loose clamps or deteriorated rubber. These are problems a home mechanic can usually rectify. **Warning:** *Do not, under any circumstances, try to repair a fuel tank (except rubber components). A welding torch or any open flame can easily cause fuel vapours inside the tank to explode.*

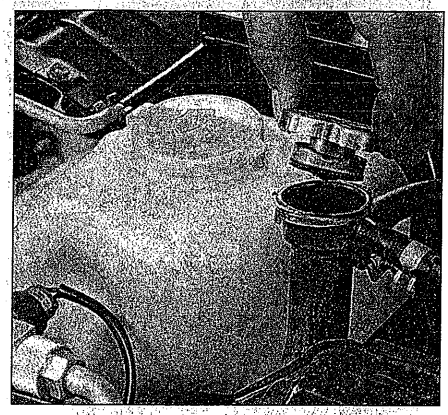
5 Carefully check all rubber hoses and metal lines leading away from the fuel tank. Check for loose connections, deteriorated hoses, crimped lines and other damage. Follow the lines to the front of the vehicle, carefully inspecting them all the way to the carburettor or fuel injectors. Repair or renew damaged sections as necessary.

6 If a fuel odour is still evident after the inspection, refer to Chapter 6 and check the EVAP system.

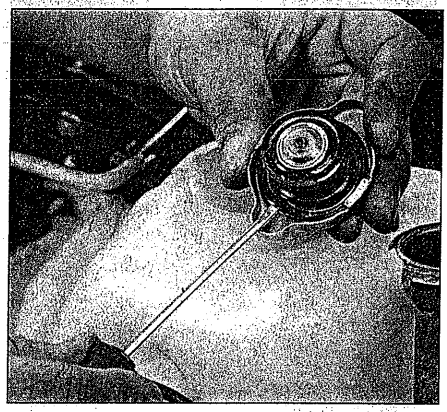
24 Cooling system check (every 20,000 kilometres or 12 months)

Refer to illustrations 24.3a, 24.3b and 24.4

1 Many major engine failures can be attributed to a faulty cooling system. If the vehicle is equipped with an automatic trans-



24.3a The engine must have cooled completely any time you attempt to remove the radiator cap - it is best to remove before the vehicle has been driven for the day



24.3b The cap is a critical element of the cooling system - make certain that the rubber seals in it are not deformed or cracked

mission, the cooling system also cools the transmission fluid and thus plays an important role in prolonging transmission life.

2 The cooling system should be checked with the engine cold. Do this before the vehicle is driven for the day or after it has been shut off for at least three hours.

3 Remove the radiator cap by turning it to the left until it reaches a stop **(see illustration)**. If you hear a hissing sound (indicating there is still pressure in the system), wait until this stops. Now press down on the cap with the palm of your hand and continue turning to the left until the cap can be removed. Thoroughly clean the cap, inside and out, with clean water **(see illustration)**. Also clean the filler neck on the radiator. All traces of corrosion should be removed. The coolant inside the radiator should be relatively transparent. If it is rust coloured, the system should be drained and refilled (see Section 37). If the coolant level is not up to the top, add additional antifreeze/coolant mixture (see Section 4).

4 Carefully check the large upper and lower radiator hoses along with the smaller diameter heater hoses which run from the engine to the firewall. Inspect each hose along its entire length, renewing any hose which is cracked, swollen or shows signs of deterioration. Cracks may become more apparent if the hose is squeezed **(see illustration)**. Regardless of condition, it's a good idea to renew hoses every two years.

5 Make sure all hose connections are tight. A leak in the cooling system will usually show up as white or rust coloured deposits on the areas adjoining the leak. If wire-type clamps are used at the ends of the hoses, it may be a good idea to renew them with more secure screw-type clamps.

6 Use compressed air or a soft brush to remove bugs, leaves, etc. from the front of the radiator or air conditioning condenser. Be careful not to damage the delicate cooling fins or cut yourself on them.

7 Every other inspection, or at the first indication of cooling system problems, have the cap and system pressure tested. If you don't have a pressure tester, most petrol stations and repair shops will do this for a minimal charge.

25 Ignition timing check and adjustment (petrol engines) (every 40,000 kilometres or 24 months)

Refer to illustrations 25.2, 25.3, 25.6 and 25.11

Note: *It is imperative that the procedures included on the tune-up or Vehicle Emissions Control Information (VECI) label be followed when adjusting the ignition timing. The label will include all information concerning preliminary steps to be performed before adjusting the timing, as well as the timing specifications. If no VECI label is found, refer to the specifications chart at the beginning of this Chapter.*

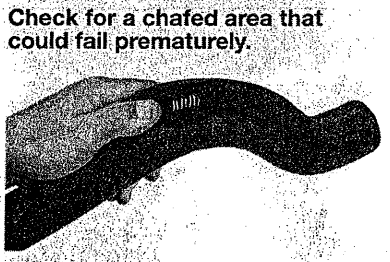
1 At the specified intervals, the ignition timing should be checked and adjusted.

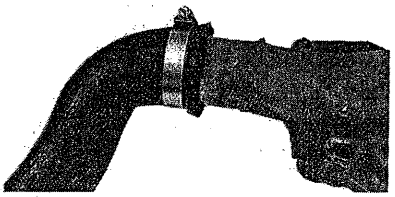
2 Various procedures (depending on the model of the vehicle) must be performed to disable the distributor or computer advance mechanism before attempting to check the timing. Locate the Tune-up or VECI label under the bonnet and read through and perform all preliminary instructions concerning ignition timing **(see illustration)**. If no VECI label is found, refer to the Specifications Section at the beginning of this Chapter. Generally, the distributor vacuum hose will be disconnected on carburetted models and the AAC wiring will be disconnected on fuel injected models.

3 Before attempting to check the timing some special tools will be needed for this procedure **(see illustration)**.

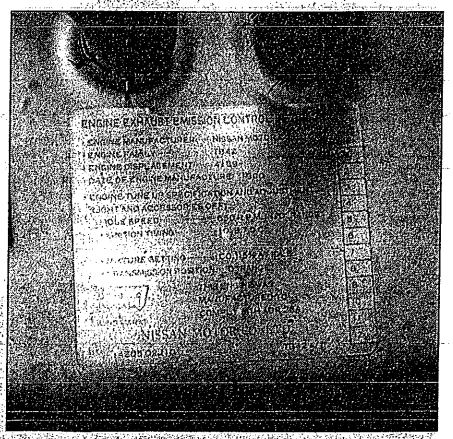
4 Check that the idle speed is as specified (see Section 17).

5 Connect a timing light in accordance with the manufacturer's instructions. Generally, the light will be connected to power and earth sources and to the number one spark

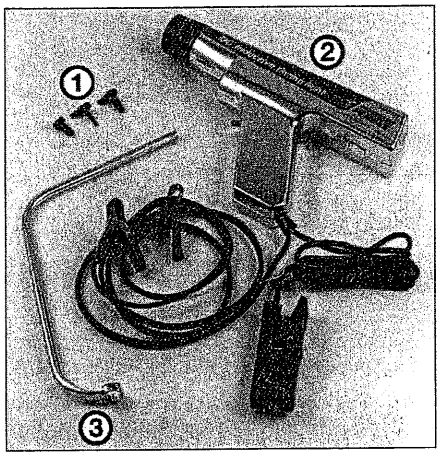




24.4 Hoses, like drivebelts, have a habit of failing at the worst possible time - to prevent the inconvenience of a blown radiator or heater hose, inspect hem carefully as shown here



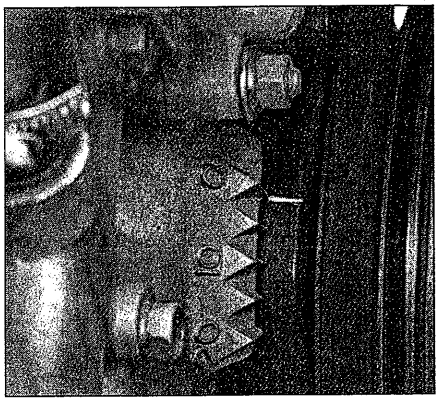
25.2 There should be a sticker in the engine compartment which will give you important information regarding all of the tune-up operations



25.3 Tools needed to check and adjust the ignition timing

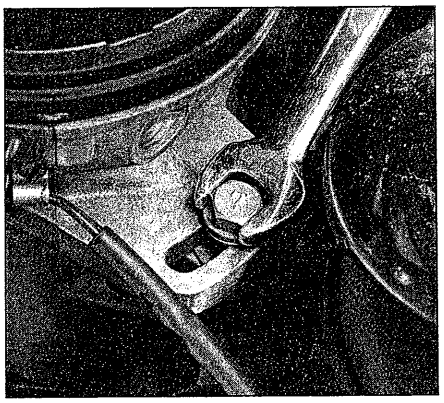
1 ***Vacuum plugs*** *- Vacuum hoses will, in most cases, have to be disconnected and plugged. Moulded plugs in various shapes and sizes are available for this*
2 ***Inductive pick-up timing light*** *- Flashes a bright, concentrated beam of light when the number one spark plug fires. Connect the leads according to the instructions supplied with the light*
3 ***Distributor wrench*** *- On some models, the hold-down bolt for the distributor is difficult to reach and turn with conventional wrenches or sockets. A special wrench like this must be used*

plug wire (refer to the cylinder location diagram in this Chapter's Specifications).
6 Locate the timing marks on the engine **(see illustration)**. Clean them off with solvent if necessary so you can see the numbers or marks and small grooves.



25.6 These are the timing marks on the 4.2 litre engine - number one piston will be at top dead centre when the white mark is aligned with the zero

7 Use chalk or paint to mark the groove in the crankshaft pulley.
8 Mark the timing tab in accordance with the number of degrees called for on the VECI label or the tune-up label in the engine compartment.
9 Make sure the timing light is clear of all moving engine components, then start the engine and warm it up to normal operating temperature.
10 Aim the flashing timing light at the timing mark by the crankshaft pulley, again being careful not to come in contact with moving parts. The marks should appear to be stationary. If the marks are in alignment, the timing is correct.
11 If the notch on the crankshaft pulley is not aligned with the correct mark on the timing tab, loosen the distributor hold-down bolt and rotate the distributor until the notch is aligned with the correct timing mark **(see illustration)**.
12 Retighten the hold-down bolt and recheck the timing.
13 Turn off the engine and disconnect the



25.11 Loosen the distributor locking bolt only enough to allow you to adjust the timing

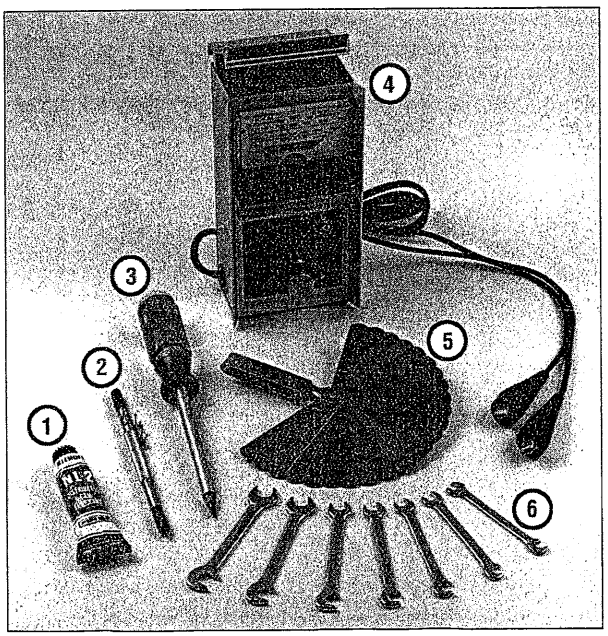
timing light. Reconnect the vacuum advance hose or the AAC wiring, if removed, and any other components which were disconnected.

26 Ignition points check, renewal and adjustment (every 20,000 kilometres or 12 months)

Refer to illustration 26.1

Check and renewal

1 The ignition points must be renewed at regular intervals on early petrol vehicles not equipped with electronic ignition. All later vehicles are equipped with electronic ignitions which do not require regular service. Occasionally the rubbing block will wear enough to require adjustment of the points or the contacts themselves will become burned or eroded. It's also possible to clean and dress them with a fine file, but renewal is recommended since they are relatively accessible and inexpensive. Several special tools are required for this procedure **(see illustration)**.



26.1 Tools and materials needed for contact point renewal and dwell angle adjustment

1 ***Distributor cam lube*** *- Sometimes this special lubricant comes with the new points; however, it's a good idea to buy a tube and have it on hand*
2 ***Screw starter*** *- This tool has special claws which hold the screw securely as it's started, which helps prevent accidental dropping of the screw*
3 ***Magnetic screwdriver*** *- Serves the same purpose as 2 above. If you don't have one of these special screwdrivers, you risk dropping the point mounting screws down into the distributor body*
4 ***Dwell meter*** *- A dwell meter is the only accurate way to determine the point setting (gap). Connect the meter according to the instructions supplied with it.*
5 ***Blade-type feeler gauges*** *- These are required to set the initial point gap (space between the points when they are open)*
6 ***Ignition wrenches*** *- These special wrenches are made to work within the tight confines of the distributor. Specifically, they are needed to loosen the nut/bolt which secures the leads to the points*

2 After removing the distributor cap and rotor (see Section 34), the ignition points are plainly visible. They can be examined by gently levering them open to reveal the condition of the contact surfaces. If they're rough, pitted, covered with oil or burned, they should be renewed, along with the condenser. **Caution:** *This procedure requires the removal of small screws which can easily fall down into the distributor. To retrieve them, the distributor would have to be removed and disassembled. Use a magnetic or spring-loaded screwdriver and be extra careful.*

3 If not already done, remove the distributor cap.

4 Position the cap (with the spark plug wires still attached) out of the way. Use a length of wire to hold it out of the way, if necessary.

5 Remove the rotor, by grasping the rotor with one hand and pulling straight up on the rotor to remove it.

6 Note how the wires in the distributor are routed, then disconnect the primary wire leads from the points. The wires may be attached with a small nut (which should be loosened, but not removed), a small screw or by a spring-loaded terminal.

7 Loosen the screws which secure the ignition points to the breaker plate, but don't completely remove the screws (most ignition point sets have slots at these locations). Slide the points out of the distributor.

8 The condenser can now be removed from the breaker plate. Loosen the mounting strap screw and slide the condenser out or completely remove the condenser and strap. If you remove both the condenser and strap, be careful not to drop the mounting screw down into the distributor body.

9 Before fitting the new points and condenser, clean the breaker plate and the cam on the distributor shaft to remove all dirt, dust and oil.

10 Apply a small amount of distributor cam lube (usually supplied with the new points, but also available separately) to the lobes.

11 Position the new condenser and tighten the mounting strap screw securely.

12 Slide the new point set into place and make sure the protrusions on the breaker plate fit into the holes in the point base (to properly position the point set), then tighten the screws.

13 Attach the primary and condenser wires to the new points. Make sure the wires are routed so they don't interfere with breaker plate or advance weight movement.

Adjustment

Refer to illustration 36.16

14 Although the final dwell angle will be adjusted later, make the initial gap adjustment now, which will allow the engine to be started.

15 Make sure that the point rubbing block is resting on one of the high points of the cam. If it isn't, rotate the crankshaft with a breaker bar and socket attached to the large bolt that holds the vibration damper in place.

16 With the rubbing block on a cam high point (points open), insert a 0.50 mm gauge between the contact surfaces. Insert a screwdriver into the slot between the breaker plate and the point base to adjust the gap. The gap is correct when a slight amount of drag is felt as the feeler gauge is withdrawn.

17 Inspect and fit the rotor and distributor cap as described in Section 35.

18 Whenever new ignition points are fitted or the original points are cleaned, the dwell angle must be checked and adjusted. Precise adjustment of the dwell angle requires an instrument called a dwell meter. Combination tach/dwell meters are commonly available at reasonable cost from auto parts stores.

19 If a dwell meter is not available, the initial adjustment described above will be sufficient until a competent automotive repair facility can adjust the dwell angle for you.

20 Hook the dwell meter up following the manufacturer's instructions.

21 Start the engine and allow it to run at idle until normal operating temperature is reached (the engine must be warm to obtain an accurate reading). Record the dwell reading on the meter. If the reading is not within specifications it will need to be adjusted.

22 Dwell angle specifications can be found in this Chapter's Specifications and on the VECI label or tune-up decal in the engine compartment. If there's a discrepancy between the two, assume the VECI label or tune-up decal is correct.

23 If the dwell angle is incorrect, readjust the point gap as described above in Step 16. Repeat this process until the meter reading is as specified. **Note:** *Opening the point gap will decrease the dwell reading while closing the point gap will increase the dwell reading.*

27 Pre-heat air cleaner check (carburetted models) (every 20,000 kilometres or 12 months)

1 Carburetted engines are equipped with a thermostatically controlled air cleaner which draws air to the carburettor from different locations, depending upon engine temperature.

2 This is a visual check. If access is limited, a small mirror may have to be used.

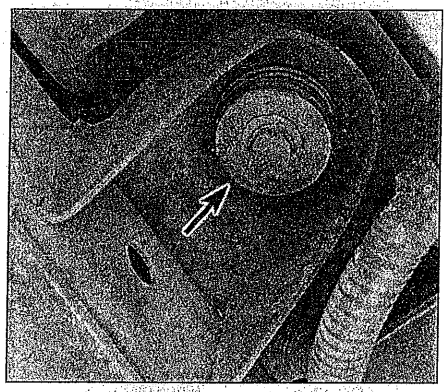
3 Open the bonnet and locate the damper door inside the air cleaner assembly. It is inside the long snorkel of the air cleaner housing.

4 If there is a flexible air duct attached to the end of the snorkel, leading to an area behind the grille, disconnect it at the snorkel. This will enable you to look through the end of the snorkel and see the damper inside. A mirror may be needed if you can't look safely into the end of the snorkel.

5 The check should be done when the engine is cold. Start the engine and look through the snorkel at the damper, which should move to a closed position. With the damper closed, air cannot enter through the end of the snorkel, but instead enters the air cleaner through the flexible duct attached to the exhaust manifold and the heat stove passage.

6 As the engine warms up to operating temperature, the damper should open to allow air through the snorkel end. Depending on outside temperature, this may take 10 to 15 minutes. To speed up this check you can reconnect the snorkel air duct, drive the vehicle, then check to see if the damper is completely open.

7 If the thermostatic air cleaner isn't operating properly , see Chapter 6 for more information.



28.1 The bolts which secure the body to the frame may become loose during extended severe use - they must be checked for tightness as a regular maintenance procedure

28 Body mounts check and tightening (every 20,000 kilometres or 12 months)

Refer to illustration 28.1

1 There are ten body mounting nuts and bolts on wagon and hardtop models **(see illustration)**. Utility models use twenty mounting fasteners. These should be checked for tightness periodically if the vehicle has been put to severe use.

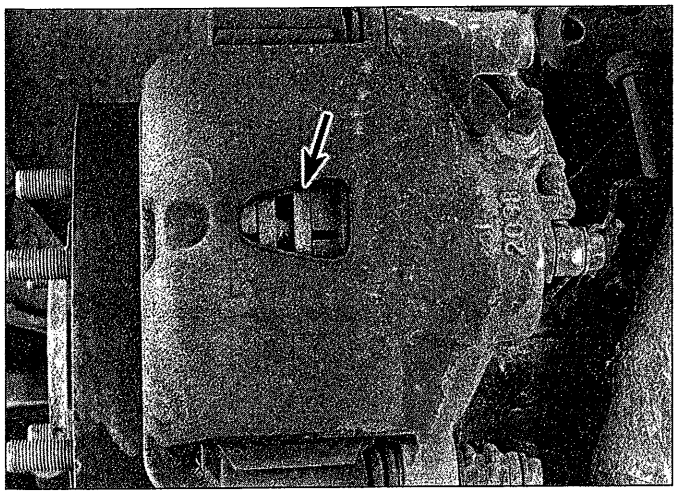
2 Remove any dirt or mud from around the heads of the nuts and bolts.

3 Use a torque wrench to tighten all the bolts. Renew any missing components.

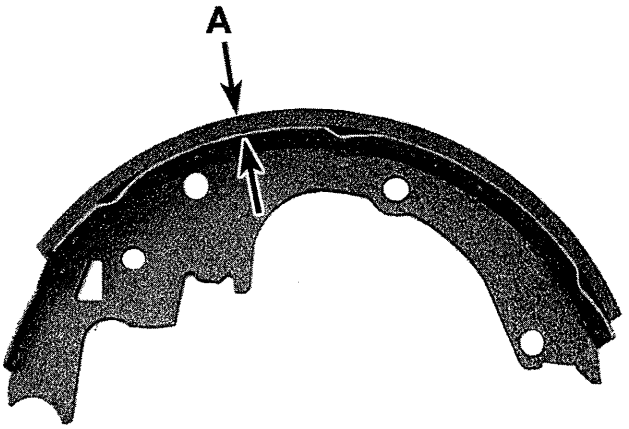
4 Refer to the torques listed in this Chapter's Specifications.

29 Brake check (every 20,000 kilometres or 12 months)

Warning: *The dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents*



29.5 It is not necessary to completely disassemble the front brakes in order to check the pad thickness - simply remove a wheel and look through this window



29.12 If the lining is bonded to the brake shoe, measure the lining thickness from the outer surface to the metal shoe, as shown here; if the lining is riveted to the shoe, measure from the lining outer surface to the rivet head

to clean brake parts. Use brake system cleaner only! Try to use non-asbestos renewal parts whenever possible.

Note: *For detailed photographs of the brake system, refer to Chapter 9.*

1 In addition to the specified intervals, the brakes should be inspected every time the wheels are removed or whenever a defect is suspected. Any of the following symptoms could indicate a potential brake system defect: The vehicle pulls to one side when the brake pedal is depressed; the brakes make squealing or dragging noises when applied; brake pedal travel is excessive; the pedal pulsates; brake fluid leaks, usually onto the inside of the tyre or wheel.

2 Loosen the wheel lug nuts.

3 Raise the vehicle and place it securely on jackstands.

4 Remove the wheels (see *Jacking and towing* at the front of this book, or your owner's manual, if necessary).

Disc brakes

Refer to illustration 29.5

5 There are two pads (an outer and an inner) in each caliper. The pads are visible through inspection holes in each caliper **(see illustration)**.

6 Check the pad thickness by looking at each end of the caliper and through the inspection hole in the caliper body. If the lining material is less than the thickness listed in this Chapter's Specifications, renew the pads. **Note:** *Keep in mind that the lining material is riveted or bonded to a metal backing plate and the metal portion is not included in this measurement.* If the lining is of the riveted type, it will be impossible to measure the amount of pad remaining above the heads of the rivets using this method. the calipers will have to be at least partially removed to check this.

7 If it is difficult to determine the exact thickness of the remaining pad material by the above method, or if you are at all concerned about the condition of the pads, remove the caliper(s) for further inspection (refer to Chapter 9).

8 Once the calipers are removed, measure the pad thickness with a dial or vernier caliper.

9 Measure the disc thickness with a micrometer to make sure that it still has service life remaining. If any disc is thinner than the specified minimum thickness, renew it (refer to Chapter 9). Even if the disc has service life remaining, check its condition. Look for scoring, gouging and burned spots. If these conditions exist, remove the disc and have it resurfaced (see Chapter 9).

10 Before refitting the wheels, check all brake lines and hoses for damage, wear, deformation, cracks, corrosion, leakage, bends and twists, particularly in the vicinity of the rubber hoses at the calipers. Check the clamps for tightness and the connections for leakage. Make sure that all hoses and lines are clear of sharp edges, moving parts and the exhaust system. If any of the above conditions are noted, repair, reroute or renew the lines and/or fittings as necessary (see Chapter 9).

Drum brakes

Refer to illustration 29.12

11 Refer to Chapter 9 and remove the rear brake drums.

12 Note the thickness of the lining material on the rear brake shoes **(see illustration)** and look for signs of contamination by brake fluid and grease. If the lining material is within 1.0 mm of the recessed rivets or metal shoes, renew the brake shoes. The shoes should also be renewed if they are cracked, glazed (shiny lining surfaces) or contaminated with brake fluid or grease. See Chapter 9 for the renewal procedure.

13 Check the shoe return and hold-down springs and the adjusting mechanism to make sure they're refitted correctly and in good condition. Deteriorated or distorted springs, if not renewed, could allow the linings to drag and wear prematurely.

14 Check the wheel cylinders for leakage by carefully peeling back the rubber boots. If brake fluid is noted behind the boots, the wheel cylinders must be renewed (see Chapter 9).

15 Check the drums for cracks, score marks, deep scratches and hard spots, which will appear as small discoloured areas. If imperfections cannot be removed with emery cloth, the drums must be resurfaced by an automotive machine shop (see Chapter 9 for more detailed information).

16 Refer to Chapter 9 and refit the brake drums.

17 Refit the wheels and snug the wheel lug nuts finger tight.

18 Remove the jackstands and lower the vehicle.

19 Tighten the wheel lug nuts to the torque listed in this Chapter's Specifications.

Brake booster check

20 Sit in the driver's seat and perform the following sequence of tests.

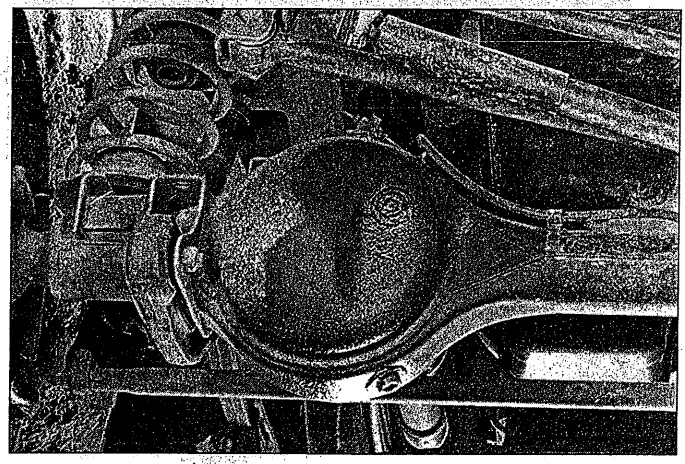
21 With the engine stopped, depress the brake pedal several times - the travel distance should not change.

22 With the brake fully depressed, start the engine - the pedal should move down a little when the engine starts.

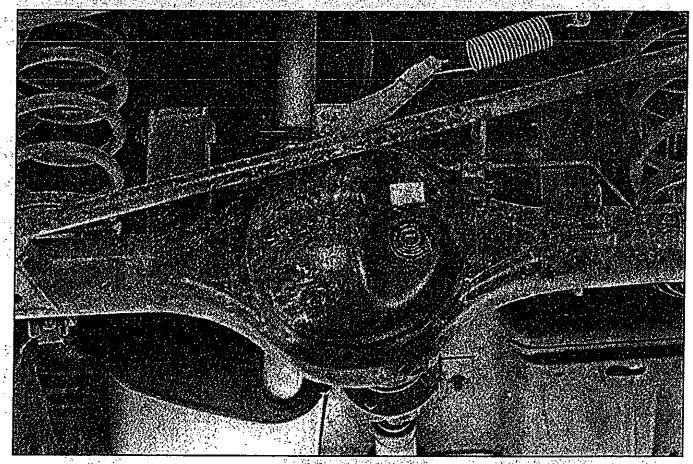
23 Depress the brake, stop the engine and hold the pedal in for about 30 seconds - the pedal should neither sink nor rise.

24 Restart the engine, run it for about a minute and turn it off. Then firmly depress the brake several times - the pedal travel should decrease with each application.

25 If your brakes do not operate as described above when the preceding tests are performed, the brake booster is either in need of repair or has failed. Refer to Chapter 9 for the removal procedure.



30.2a The filler plug for the front differential should be removed to check the fluid level . .



30.2b . . . every time the rear differential is checked

Parking brake

26 Slowly pull up on the parking brake and count the number of clicks you hear until the handle is up as far as it will go. The adjustment should be within the specified number of clicks listed in this Chapter's Specifications. If you hear more or fewer clicks, adjust the parking brake (refer to Chapter 9).

27 An alternative method of checking the parking brake is to park the vehicle on a steep hill with the parking brake set and the transmission in Neutral (be sure to stay in the vehicle during this check!). If the parking brake cannot prevent the vehicle from rolling, it is in need of adjustment (see Chapter 9).

28 However, on vehicles with rear disc brakes the parking brake assembly itself should be visually inspected every 12 months (or whenever a fault is suspected).

29 With the vehicle raised and supported on jackstands, remove the rear wheels.

30 Remove the rear discs as outlined in Chapter 9. Support the caliper assemblies with a coat hanger or heavy wire and do not disconnect the brake line from the caliper.

31 With the disc removed, the parking brake components are visible and can be inspected for wear and damage. The linings should last the life of the vehicle. However, they can wear down if the parking brake system has been improperly adjusted. There is no minimum thickness specification for the parking brake shoes, but as a rule of thumb, if the shoe material is less 0.8 mm thick, you should renew them. Also check the springs and adjuster mechanism and inspect the disc for deep scratches and other damage. For more information on the brake system see Chapter 9.

30 Manual transmission, transfer and differential lubricant level check (every 20,000 kilometres or 12 months)

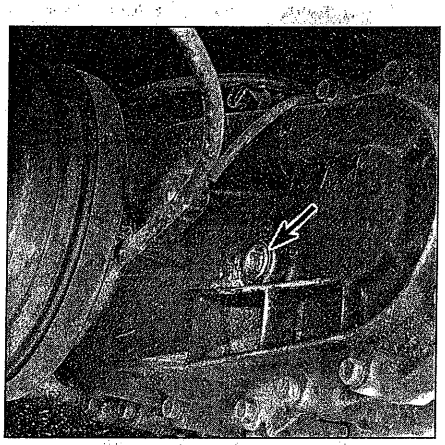
Refer to illustrations 30.2a, 30.2b and 30.2c

1 All three of these components have a filler plug which must be removed to check the lubricant level. If the vehicle is raised to gain access to the plugs, be sure to support it safely on jackstands - DO NOT crawl under a vehicle which is supported only by a jack! Be sure the vehicle is level or the check may be inaccurate.

2 Using a wrench, unscrew each fill plug **(see illustrations)** and use a finger to reach inside the housing to determine the lubricant level. The level should be at or near the bottom of the plug hole.

3 If it isn't, add the recommended lubricant through the plug hole with a pump or squeeze bottle.

4 Refit and tighten the plug and check for leaks after the first few kilometres of driving.

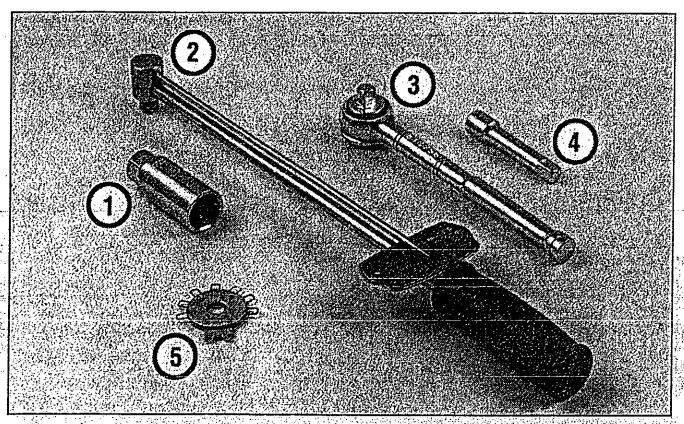


30.2c Don't forget to check the transfer lubricant using the same method as for the differentials

31 Spark plug renewal (petrol engines) (every 20,000 kilometres or 12 months)

Refer to illustrations 31.1, 31.4 and 31.5

1 Spark plug renewal requires a spark plug socket which fits onto a ratchet spanner. This socket is lined with a rubber grommet to protect the porcelain insulator of the spark plug and to hold the plug while you insert it into the spark plug hole. You will also need a wire-type feeler gauge to check and adjust



31.1 Tools required for changing spark plugs

1 ***Spark plug socket*** *- This will have special padding inside to protect the spark plug's porcelain insulator*
2 ***Torque wrench*** *- Although not mandatory, using this tool is the best way to ensure the plugs are tightened properly*
3 ***Ratchet*** *- Standard hand tool to fit the spark plug socket*
4 ***Extension*** *- Depending on model and accessories, you may need special extensions and universal joints to reach one or more of the plugs*
5 ***Spark plug gap gauge*** *- This gauge for checking the gap comes in a variety of styles. Make sure the gap for your engine is included*

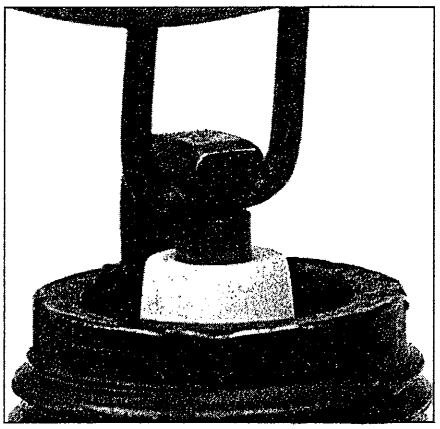
the spark plug gap and a torque wrench to tighten the new plugs to the specified torque **(see illustration)**.

2 If you are renewing the plugs, purchase the new plugs, adjust them to the proper gap and then renew each plug one at a time. **Note:** *When buying new spark plugs, it's essential that you obtain the correct plugs for your specific vehicle. This information can be found in the Specifications Section at the beginning of this Chapter, on the Vehicle Emissions Control Information (VECI) label located on the underside of the bonnet or in the owner's manual. If these sources specify different plugs, purchase the spark plug type specified on the VECI label because that information is provided specifically for your engine.*

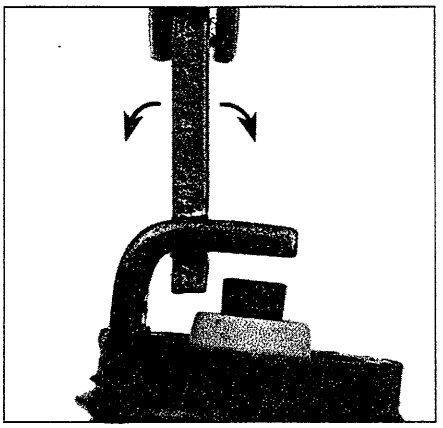
3 Inspect each of the new plugs for defects. If there are any signs of cracks in the porcelain insulator of a plug, don't use it.

4 Check the electrode gaps of the new plugs. Check the gap by inserting the wire gauge of the proper thickness between the electrodes at the tip of the plug **(see illustration)**. The gap between the electrodes should be identical to that listed in this Chapter's Specifications or on the VECI label. If the gap is incorrect, use the notched adjuster on the feeler gauge body to bend the curved side electrode slightly **(see illustration)**.

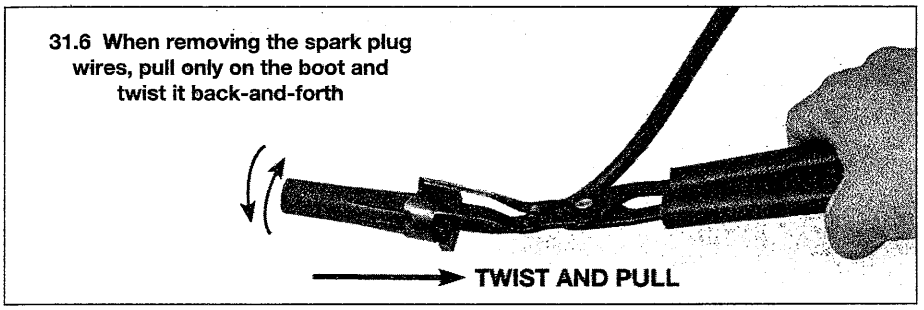
5 If the side electrode is not exactly over the centre electrode, use the notched adjuster to align them. **Caution:** *If the gap of a new plug must be adjusted, bend only the base of the side electrode - do not touch the tip.*



31.4 Spark plug manufacturers recommend using a wire-type gauge when checking the gap - if the wire does not slide between the electrodes with a slight drag, adjustment is required



31.5 To change the gap, bend the side electrode only, as indicated by the arrows, and be very careful not to crack or chip the porcelain insulator surrounding the centre electrode



31.6 When removing the spark plug wires, pull only on the boot and twist it back-and-forth

Removal

Refer to illustrations 31.6 and 31.8

6 To prevent the possibility of mixing up spark plug wires, work on one spark plug at a time. Remove the wire and boot from one spark plug. Grasp the boot - not the cable - as shown, give it a half twisting motion and pull straight up **(see illustration)**.

7 If compressed air is available, blow any dirt or foreign material away from the spark plug area before proceeding (a common bicycle pump will also work).

8 Remove the spark plug **(see illustration)**.

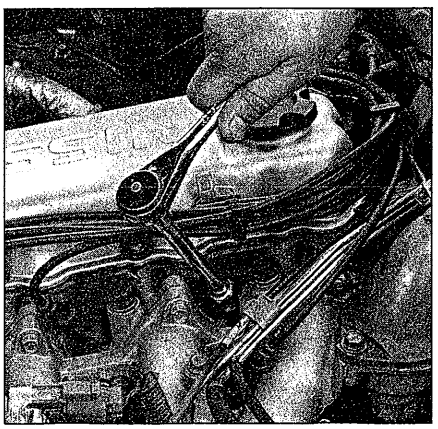
9 Whether you are renewing the plugs at this time or intend to reuse the old plugs, compare each old spark plug with the chart shown on the inside back cover of this manual to determine the overall running condition of the engine.

Refitting

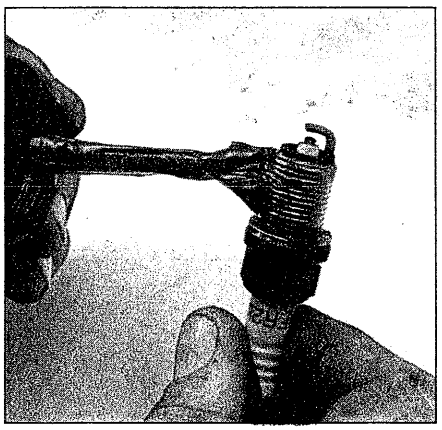
Refer to illustrations 31.10a and 31.10b

10 Prior to fitting, apply a coat of anti-seize compound to the plug threads **(see illustration)**. It's often difficult to insert spark plugs into their holes without cross-threading them. To avoid this possibility, fit a short piece of rubber hose over the end of the spark plug **(see illustration)**. The flexible hose acts as a universal joint to help align the plug with the plug hole. Should the plug begin to cross-thread, the hose will slip on the spark plug, preventing thread damage. Tighten the plug to the torque listed in this Chapter's Specifications.

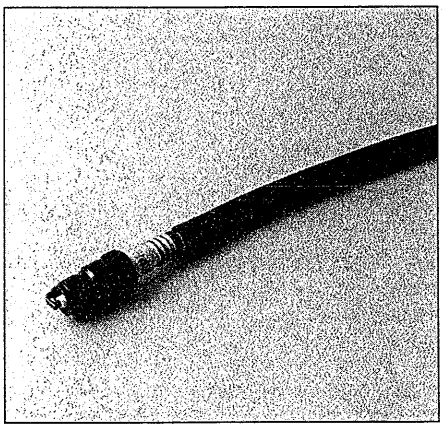
11 Attach the plug wire to the new spark plug, again using a twisting motion on the boot until it is firmly seated on the end of the spark plug.



31.8 Renew one spark plug at a time to avoid confusion with the spark plug wires



31.10a Anti-seize will help prevent future problems with removing them



31.10b A length of rubber hose will save time and prevent damaged threads when refitting the spark plugs

12 Follow the above procedure for the remaining spark plugs, renewing them one at a time to prevent mixing up the spark plug wires.

32 Carburettor choke check (every 20,000 kilometres or 12 months)

Refer to illustration 32.3

1 The choke operates when the engine is cold, and thus this check can only be performed before the vehicle has been started for the day.

2 Open the bonnet and remove the top plate of the air cleaner assembly. If any vacuum hoses must be disconnected, make sure you tag the hoses for refitting in their original positions. Place the top plate and fasteners aside, out of the way of moving engine components.

3 Look at the centre of the air cleaner housing. You will notice a flat plate (arrow) at the carburettor opening **(see illustration)**.

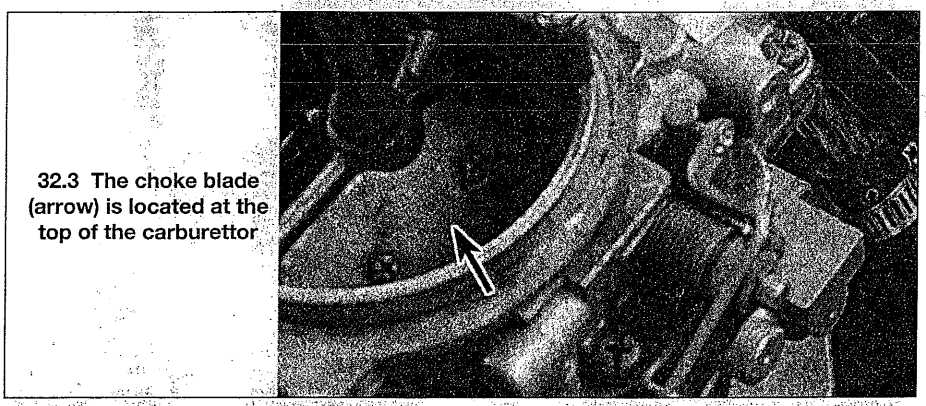
4 Press the accelerator pedal to the floor. The plate should close completely. Start the engine and then watch the plate at the carburettor. **Warning:** *Do not position your face directly over the carburettor, as the engine could backfire, causing serious burns.* When the engine starts, the choke plate should open slightly.

5 Allow the engine to continue running at an idle speed. As the engine warms up to operating temperature, the plate should slowly open, allowing more cold air to enter through the top of the carburettor. It will be necessary to tap the throttle periodically to allow the choke to move.

6 After a few minutes, the choke plate should be fully open to the vertical position. Press quickly on the accelerator to make sure the fast idle cam disengages.

7 You will notice that the engine speed corresponds with the plate opening. With the plate fully closed, the engine should run at a fast idle speed. As the plate opens and the throttle is moved to disengage the fast idle cam, the engine speed will decrease.

8 If there is any problem with the operation of the choke, refer to Chapter 4.



32.3 The choke blade (arrow) is located at the top of the carburettor

33 Exhaust Gas Recirculation (EGR) system check (petrol engines) (every 20,000 kilometres or 12 months)

Note: *The EGR system is not fitted on all models.*

1 The EGR valve is usually located on the inlet manifold. Most of the time when a problem develops in this emissions system, it's due to a stuck or corroded EGR valve.

2 With the engine cold, to prevent burns, push on the EGR valve diaphragm. Using moderate force, you should be able to push the diaphragm up into the housing.

3 If the diaphragm doesn't move or is hard to move, renew the EGR valve. If in doubt about the condition of the valve, compare the free movement of your EGR valve with a new valve.

4 Refer to Chapter 6 for more information on the EGR system.

34 Valve clearance adjustment (4.2 litre petrol and diesel engines) (every 20,000 kilometres or 12 months)

Refer to illustration 34.3

1 Make sure the engine is warmed up to operating temperature before beginning this procedure. The adjustments must be made with the engine not running.

2 Refer to Chapter 2A and remove the valve cover, then use the crankshaft pulley and timing cover marks, to position the number one piston at TDC on the compression stroke (see Chapter 2A). **Note:** *Verify TDC for the number one piston by observing that both of the foremost two valves are closed and their rocker arms are loose.*

3 On petrol engines, measure the clearances of valves numbered 1, 2, 3, 6, 7 and 10. On diesel engines set valves numbered 1, 2, 4, 5, 8 and 9 as counted from the front of the engine **(see illustration)** Insert a feeler gauge of the specified thickness (see this Chapter's Specifications) between the valve stem tip and the rocker arm. The feeler gauge should slip between the valve stem tip and rocker arm with a slight amount of drag.

4 If the clearance is incorrect (too loose or too tight), loosen the locknut and turn the adjusting screw slowly until you can feel a slight drag on the feeler gauge as you withdraw it from between the valve stem tip and the rocker arm.

5 Once the clearance is adjusted, hold the adjusting screw with a screwdriver (to keep it from turning) and tighten the locknut to the torque listed in this Chapter's Specifications. Recheck the clearance to make sure it hasn't changed after tightening the locknut.

6 Rotate the crankshaft one complete revolution (360-degrees) and realign the marks so that the number one cylinder is at TDC on the exhaust stroke. The valves on number one cylinder will now both be slightly open and their rocker arms will not have any free play. Check the clearance of the remaining valves 4, 5, 8, 9, 11 and 12 on petrol engines **(see illustration 34.3)**. On diesel engines, set valves numbered 3, 6, 7, 10, 11 and 12.

7 If necessary, repeat the adjustment procedure described in Steps 3, 4 and 5 until all the valves are adjusted to specifications.

8 Refit the valve covers.

34 Spark plug wire, distributor cap and rotor check and renewal (petrol engines) (every 40,000 kilometres or 24 months)

Refer to illustrations 35.11 and 35.12

1 The spark plug wires should be checked whenever new spark plugs are fitted.

2 Begin this procedure by making a visual check of the spark plug wires while the engine is running. In a darkened garage (make sure there is adequate ventilation) start the engine and observe each plug wire. Be careful not to come into contact with any moving engine parts. If there is a break in the wire, you will see arcing or a small spark at the damaged area. If arcing is noticed, make a note to obtain new wires, then allow the engine to cool and check the distributor cap and rotor.

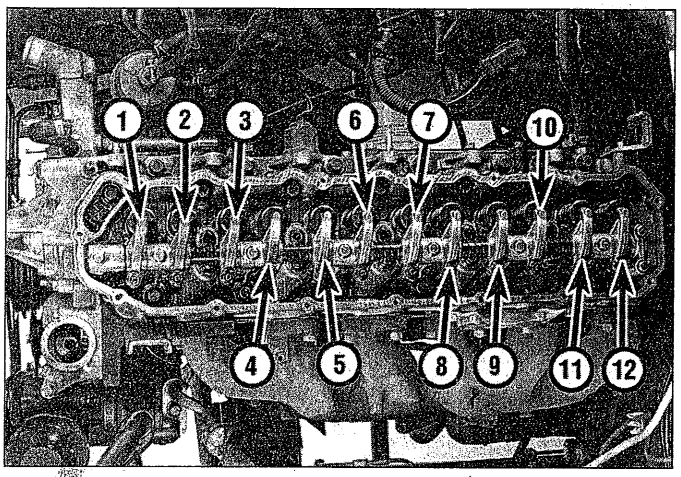
3 The spark plug wires should be inspected one at a time to prevent mixing up the order, which is essential for proper engine operation **(see illustration)**. Each original plug wire should be numbered to help identify its location. If the number is illegible, a piece of tape can be marked with the correct number and wrapped around the plug wire.

4 Disconnect the plug wire from the spark plug. A removal tool can be used for this purpose or you can grasp the rubber boot, twist the boot half a turn and pull the boot free. Do not pull on the wire itself.

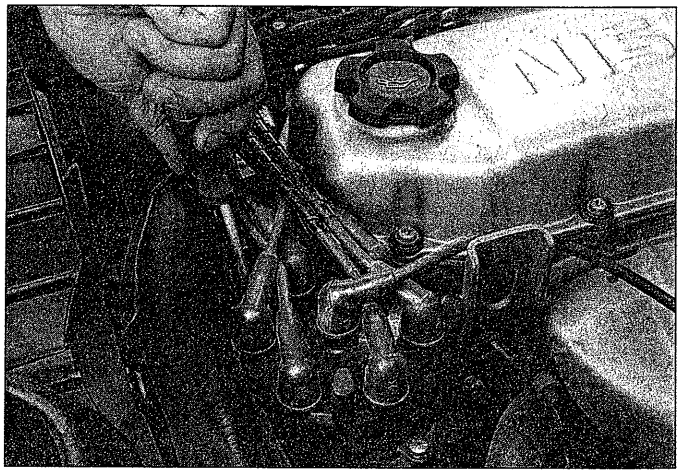
5 Check inside the boot for corrosion, which will look like a white crusty powder.

6 Push the wire and boot back onto the end of the spark plug. It should fit tightly onto the end of the plug. If it doesn't, remove the wire and use pliers to carefully crimp the metal connector inside the wire boot until the fit is snug.

7 Using a clean rag, wipe the entire length of the wire to remove built-up dirt and grease. Once the wire is clean, check for burns, cracks and other damage. Do not bend the wire sharply.



34.3 With the number one piston at TDC on the compression stroke, adjust valves 1, 2, 3, 6, 7 and 10. With the piston at TDC on the exhaust stroke the first two valves will be tight - adjust valves 4, 5, 8, 9, 11 and 12



35.11 Remove the distributor cap to renew the rotor and to check the condition of the cap - it will usually last longer than the rotor, but it is good practice to renew them both at the same time

8 Remove the rubber boot (if equipped) and disconnect the wire from the distributor. Again, pull only on the rubber boot. Check for corrosion and a tight fit. Renew the wire in the distributor.

9 Inspect the remaining spark plug wires, making sure that each one is securely fastened at the distributor and spark plug when the check is complete.

10 If new spark plug wires are required, purchase a set for your specific engine model. Remove and renew the wires one at a time to avoid mix-ups in the firing order.

11 Detach the distributor cap by loosening the cap retaining screws **(see illustration)**. Look inside it with a bright light for very small cracks, carbon tracks and worn, burned or loose.

12 Pull the rotor off the distributor shaft and examine it for the same kinds of tiny cracks and carbon tracks **(see illustration)**. Renew the cap and rotor if any damage or defects are noted. It is a good idea to renew the rotor whenever the spark plugs are renewed.

13 It is common practice to fit a new cap whenever new spark plug wires are fitted, but if you wish to continue using the old cap, make sure that you inspect it carefully.

14 When fitting a new cap, remove the wires from the old cap one at a time and attach them to the new cap in the exact same locations. **Note:** *If an accidental mix-up occurs, refer to the firing order Specifications at the beginning of this Chapter.*

36 Automatic transmission fluid and filter change (every 40,000 kilometres or 24 months)

Refer to illustrations 36.6, 36.8, 36.9, 36.11a, 36.11b, 36.11c and 36.11d

1 At the specified intervals, the transmission fluid should be drained and renewed. Since the fluid will remain hot long after driving, perform this procedure only after the engine has cooled down completely.

2 Before beginning work, purchase the specified transmission fluid (see *Recommended lubricants and fluids* at the front of this Chapter) and a new filter.

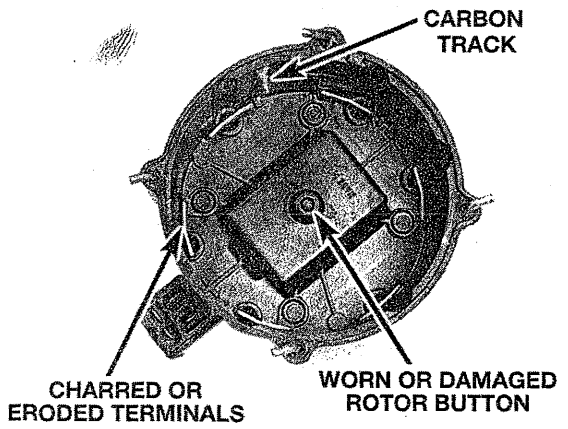
3 Other tools necessary for this job include a floor jack, jackstands to support the vehicle in a raised position, a drain pan capable of holding at least ten litres, newspapers and clean rags.

4 Raise the vehicle and support it securely on jackstands.

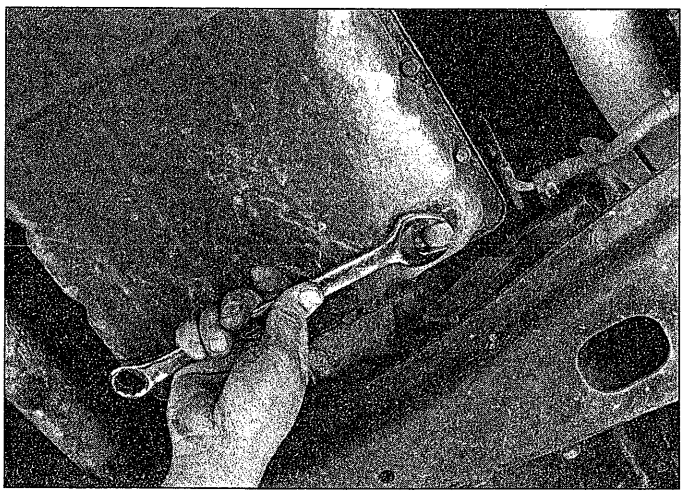
5 Detach the transmission pan rock shield (if equipped).

6 Place the pan beneath the transmission. Remove the drain plug and allow all the fluid to drain completely **(see illustration)**.

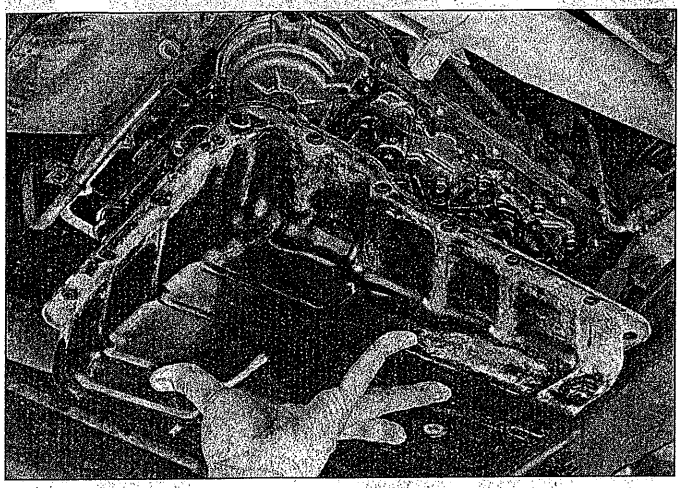
7 Remove the transmission pan bolts. If required, carefully tap on the pan to break the layer of gasket between the pan and the transmission case. **Note:** *Levering between the pan and the transmission case with a screwdriver or similar tool may result in damage to the sealing surface on the transmission case.*



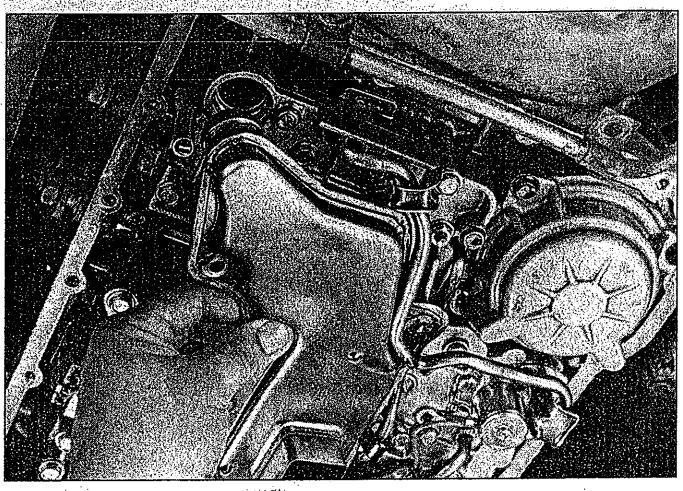
35.12 Shown here are some of the common defects to look for when inspecting the distributor cap (if in doubt about its condition, fit a new one)



36.6 Draining the transmission fluid on the Patrol/Maverick is made simple with this drain plug. Be careful - the fluid may be hot!



36.8 Lower the pan and allow the fluid left in it to drain into a container



36.9 The filter should be removed and renewed whenever the pan is removed

8 Lower the pan from the vehicle and drain the remaining transmission fluid from the pan **(see illustration)**.

9 Remove the filter retaining screws from the valve body and remove the filter **(see illustration)**.

10 Thoroughly inspect the bottom of the pan, the filter and the fluid. Although normally bright red, transmission fluid may turn dark red or brown during normal use. If you find the fluid very dark coloured, or if it smells burned, it usually indicates the transmission has been overheated. If you find small pieces of metal or clutch material in the pan or filter, it indicates wear or damage have occurred to the internal parts or clutches. If you have any concerns about the condition of your transmission based on what you find in the fluid, pan and filter, it's a good idea to take your vehicle to your dealer or a transmission shop for further evaluation.

11 Clean the pan with solvent and dry it with compressed air if available. Clean the magnet thoroughly **(see illustration)**. Use a gasket scraper to remove any traces of old gasket material remaining on the transmission case or valve body **(see illustration)**. **Note:** *Be very careful not to gouge the delicate aluminium gasket surface on the valve body.* Fit a new filter and gasket **(see illustration)**. Lubricate the O-ring for the filter with ATF to ease refitting **(see illustrations)**.

12 Make sure the gasket surface on the transmission pan is clean, then fit a new layer of gasket sealer to the pan. Place the pan against the transmission case. Working around the pan, tighten each bolt a little at a time to the torque listed in this Chapter's Specifications. Do not overtighten these bolts.

13 Lower the vehicle and add the specified type of automatic transmission fluid through the filler tube (see Section 6).

14 With the transmission in Park and the parking brake set, start the engine.

15 Move the gear selector through each range and back to Park. Check the fluid level and add fluid, if necessary, until the level is within the correct range on the dipstick.

16 Check under the vehicle for leaks during the first few trips. Check the fluid level again when the transmission is hot (see Section 6).

37 Manual transmission, transfer and differential lubricant change (every 40,000 kilometres or 24 months)

Refer to illustrations 37.3a and 37.3b

1 Raise the vehicle and support it securely on jackstands.

2 Move a drain pan, rags, newspapers and tools under the component being serviced first.

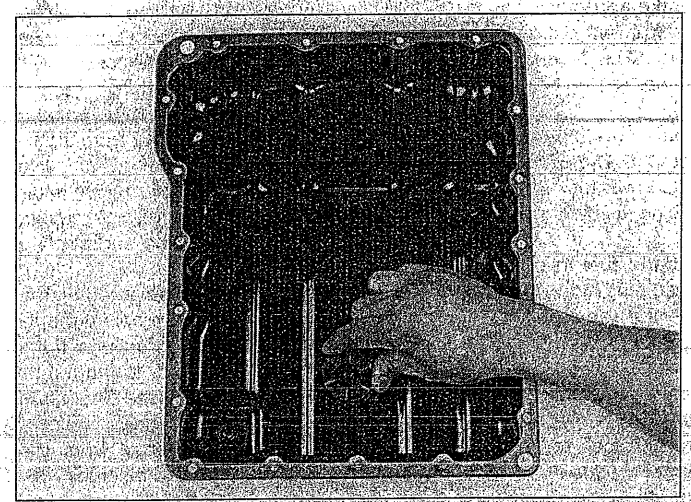
3 Remove the drain plug at the bottom of the case and allow the lubricant to drain into the pan **(see illustrations)**.

4 After the lubricant has drained completely, refit the plug and tighten it securely.

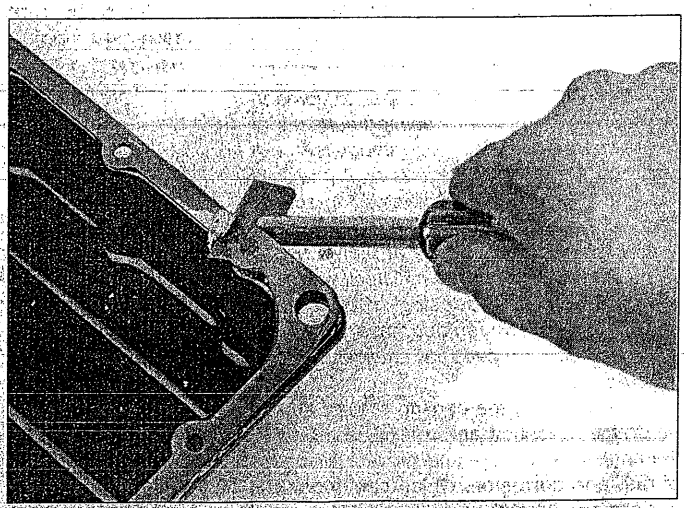
5 Remove the fill plug from the side of the case. Using a hand pump, syringe or funnel, fill the unit with the specified lubricant until it is level with the lower edge of the filler hole. Refit the fill plug and tighten it securely.

6 Lower the vehicle.

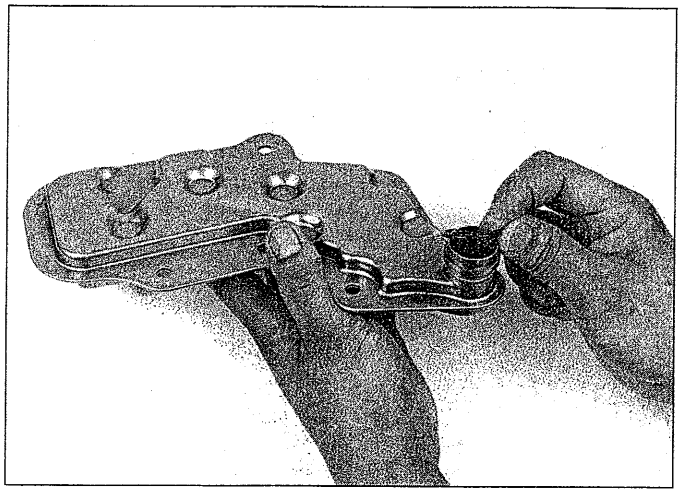
7 Drive the vehicle for a short distance, then check the drain and fill plugs for leakage.



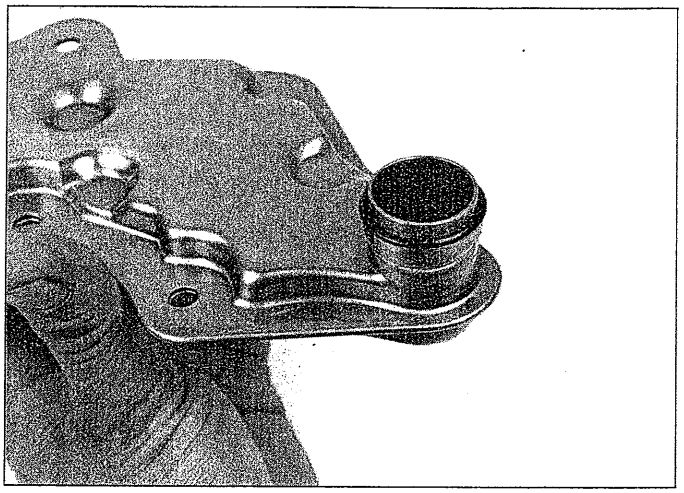
36.11a The interior of the pan must be cleaned meticulously. Remove the magnet and clean it separately of all iron residue



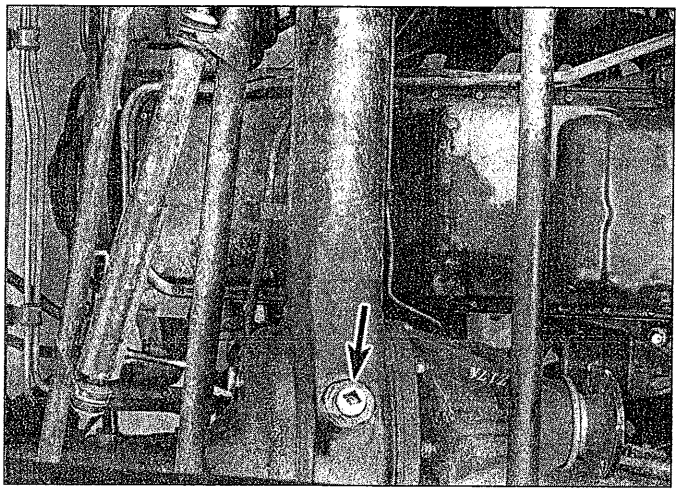
36.11b Scrape the gasket from the pan carefully to avoid deforming the flange



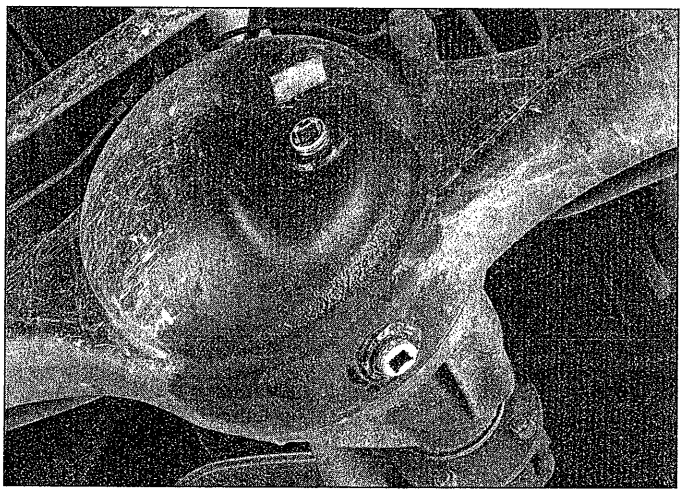
36.11c Do not forget to fit a new O-ring on the new filter.



36.11d The O-ring must be fully seated in place before the unit is refitted



37.3a The front differential has a convenient drain plug . . .



37.3b . . . as does the rear differential

38 Cooling system servicing (draining, flushing and refilling) (every 50,000 kilometres or 24 months)

Warning: *Do not allow antifreeze to come in contact with your skin or painted surfaces of the vehicle. Rinse off spills immediately with plenty of water. Antifreeze is highly toxic if ingested. Never leave antifreeze lying around in an open container or in puddles on the floor; children and pets are attracted by it's sweet smell and may drink it. Check with local authorities about disposing of used antifreeze. Many communities have collection centres which will see that antifreeze is disposed of safely.*

1 Periodically, the cooling system should be drained, flushed and refilled to replenish the antifreeze mixture and prevent formation of rust and corrosion, which can impair the performance of the cooling system and cause engine damage. When the cooling system is serviced, all hoses and the radiator cap should be checked and renewed if necessary.

2 Apply the parking brake and block the wheels. **Warning:** *If the vehicle has just been driven, wait several hours to allow the engine to cool down before beginning this procedure.*

3 Move a large container under the radiator drain to catch the coolant. The radiator drain plug is located on the lower tank of the radiator. Open the drain fitting (a pair of pliers may be required to turn it).

4 On 3.0 litre engines and fuel injected engines, loosen the air bleed plug at the thermostat housing. Remove the radiator cap and allow the radiator to drain, then, move the container under the driver's side of the engine block. Remove the engine block drain plug (located under the exhaust manifold) and allow the coolant in the block to drain **(see illustration 39.3)**. **Note:** *Frequently, the coolant will not drain from the block after the plug is removed. This is due to a rust layer that has built up behind the plug. Insert a Phillips screwdriver into the hole to break the rust barrier.*

5 While the coolant is draining, check the condition of the radiator hoses, heater hoses and clamps (refer to Section 9 if necessary).

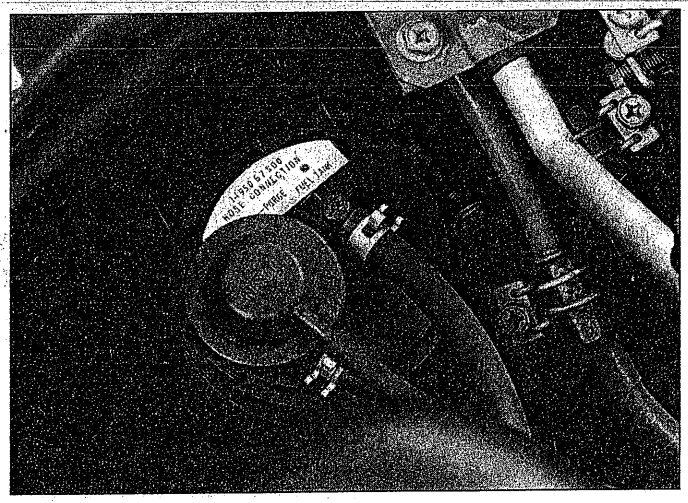
6 Renew any damaged clamps or hoses.

7 Once the system is completely drained, flush the radiator with fresh water from a garden hose until it runs clear at the drain. The flushing action of the water will remove sediments from the radiator but will not remove rust and scale from the engine and cooling tube surfaces.

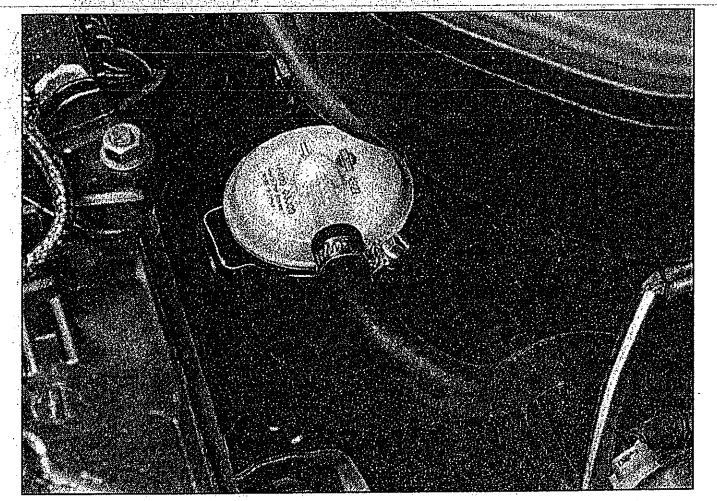
8 These deposits can be removed with a chemical cleaner. Follow the procedure outlined in the manufacturer's instructions. If the radiator is severely corroded, damaged or leaking, it should be removed (see Chapter 3) and taken to a radiator repair shop.

9 Remove the overflow hose from the coolant reservoir and flush the reservoir with clean water, then reconnect the hose.

10 Close and tighten the radiator drain fit-



40.2 The evaporation canister is located in the engine compartment - check it for cracks if you detect a petrol odour



41.2 The fuel filter can cause many performance problems - it should be renewed as a regular part of the service schedule. One bad tank of petrol can clog the filter completely

ting. Refit and tighten the block drain plug.
11 Place the heater temperature control in the maximum heat position.
12 Slowly add new coolant (a 50/50 mixture of water and antifreeze) to the radiator until it's full. Add coolant to the reservoir up to the lower mark. Tighten the air bleed plug, if equipped.
13 Leave the radiator cap off and run the engine in a well-ventilated area until the thermostat opens (coolant will begin flowing through the radiator and the upper radiator hose will become hot).
14 Turn the engine off and let it cool. Add more coolant mixture to bring the level back up to the lip on the radiator filler neck.
15 Squeeze the upper radiator hose to expel air, then add more coolant mixture if necessary. Renew the radiator cap.
16 Start the engine, allow it to reach normal operating temperature and check for leaks.

39 Front hub and wheel bearing check, repack and adjustment (every 50,000 kilometres or 24 months)

1 The service for the front hubs and wheel bearings is very involved and complex. The entire procedure is detailed in Chapter 8.
2 A simple check of the hubs can be done at more frequent intervals. Remove a bolt from the bottom of each swivel hub assembly. There should not be any signs of water dripping out.
3 Insert a wire into the hole. Move it around and then remove it and examine it to check for debris or mud.
4 If there is apparent water accumulation or obvious wear, refer to Chapter 8 for the complete service procedure.
5 Refit the bolt and tighten it to the torque specification listed in this Chapter.

40 Evaporative emissions control system check (petrol engines) (every 40,000 kilometres or 24 months)

Refer to illustration 40.2
1 The function of the evaporative emissions control system is to draw fuel vapours from the fuel tank and fuel system, store them in a charcoal canister and route them to the inlet manifold during normal engine operation.
2 The most common symptom of a fault in the evaporative emissions system is a strong fuel door in the engine compartment. If a fuel door is detected, inspect the charcoal canister, located in the front of the engine compartment **(see illustration)**. Check the canister and all hoses for damage and deterioration.
3 The evaporative emissions control system is explained in more detail in Chapter 6.

41 Fuel filter renewal (every 40,000 kilometres or 24 months)

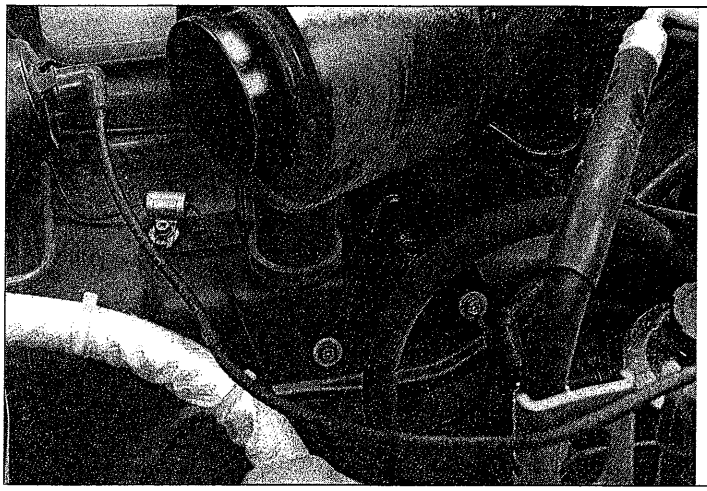
Warning: *Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. Since petrol is carcinogenic, wear latex gloves when there's a possibility of being exposed to fuel, and, if you spill any fuel on your skin, rinse it off immediately with soap and water. Mop up any spills immediately and do not store fuel-soaked rags where they could ignite. When you perform any kind of work on the fuel system, wear safety glasses and have a Class B Type fire extinguisher on hand.*
1 This job should be done with the engine cold (after sitting at least three hours). Place a metal container, rags or newspapers under the filter to catch spilled fuel.

Carburetted models

Refer to illustration 41.2
2 The fuel filter is located in the engine compartment **(see illustration)**. Locate it and place a container or some rags beneath it.
3 Obtain a golf tee, a tapered punch or another tapered object to insert into the fuel inlet hose to prevent leakage.
4 To renew the filter, release the clamps and slide them down the hoses, past the fittings on the filter.
5 Carefully twist and pull on the hoses to separate them from the filter. Insert the plug into the inlet hose. If the hoses are in bad shape, now would be a good time to renew them. Slide off the old clamps and fit new ones.
6 Pull the filter out of the clip and fit the new one, then hook up the hoses and reposition the clamps. Note that the arrow on the filter must point in the direction of fuel flow (toward the carburettor). Start the engine and check carefully for leaks at the filter hose connections.

Fuel injected models

Warning: *Refer to Chapter 4 and depressurize the fuel system before removing the filter!*
7 Locate the fuel filter under the bonnet near the battery. Place a container or some rags beneath it.
8 To renew the filter, release the clamps and slide them down the hoses, past the fittings on the filter.
9 Carefully twist and pull on the hoses to separate them from the filter. If the hoses are in bad shape, now would be a good time to renew them. Slide off the old clamps and fit new ones.



42.1 Check the cyclone pre-air filter frequently when driving in sandy or dusty conditions

10 Pull the filter out of the clip and fit the new one, then hook up the hoses and reposition the clamps. Note that the arrow on the filter must point in the direction of fuel flow (towards the engine).

11 Renew the fuse previously removed during the fuel pressure relief procedure. Start the engine and check carefully for leaks at the filter hose connections.

Diesel models

12 Drain the fuel filter completely into a container (refer to Section 20).

13 Disconnect the wiring at the base of the fuel filter. Unscrew the water sensor from the base of the filter.

14 Using an adjustable filter removal tool, remove the filter.

15 Apply a small amount of fuel or oil to the gasket on the new filter. Refitting is the reverse of removal. Tighten the new filter 2/3 of a turn after the gasket first makes contact with the adapter.

16 Bleed the fuel system (refer to Chapter 4C).

42 Cyclone pre-air filter check (every 40,000 kilometres or 24 months)

Refer to illustration 42.1

1 The cyclone-type pre-air filter is located in the air inlet duct upstream of the main air filter **(see illustration).** If the vehicle has been operated in extremely dusty or wet conditions, check it frequently.

2 Remove the main air ducts.

3 Pull the rubber water cover from the small lower tube and dump out any collected water or debris. Clean the unit thoroughly with a damp rag.

4 Renew the two large ducts and the lower duct seal.

43 Oxygen sensor check (fuel injected models only) (every 40,000 kilometres or 24 months)

Refer to Chapter 6 for this procedure.

44 Timing belt renewal (3.0 litre models) (every 100,000 kilometres)

Refer to Chapter 2B for this procedure.

Notes