

AUTOMOTIVE TROUBLESHOOTING

Grading OIL
SAT 140

PHILIPPINE TRADE TRAINING CENTER

2003

THIS MANUAL IS FOR TRAINING PURPOSES ONLY AND NOT FOR SALE

**CAR PREVENTIVE
MAINTENANCE
AND
BASIC
TROUBLESHOOTING**

OVERVIEW :

An old saying " **Prevention is better than cure**" can be compare with the lives of the people same as with the vehicle. Vehicle industry experts are predicting that nowadays the average age of automobiles on the roads will be 10 years. But without proper maintenance , a car might last only half that long.

The best way to prolong the life of your vehicle (one of the company and consumer's most significant investment) is through a regular , *preventive maintenance*.

WHAT DRIVING MEANS ?

DRIVE TO BE ALIVE

Competence in driving is much more than just steering a car from point A to point B. Once the driver sits behind the steering wheel, he or she takes full responsibility for the lives of the automobile's occupants, other motorists on the road and pedestrian. An irresponsible or incompetent driver is a potential killer.

- The risk of a car accident can be greatly lessened, if not totally eliminated, by simply adopting sensible driving and car safety habits — in two words — common sense.
- Most motoring experts believe that there are three vital factors in driving:
 - 1. driver's competence
 - 2. roadworthiness and safety features
 - 3. other driver's on the road

**ENSURING THAT YOUR CAR IS IN TIPTOP
SHAPE IS ALWAYS THE FIRST STEP**

**MOST VEHICLES BREAK DOWN DUE TO ONE OF
FIVE COMMON CAUSES**

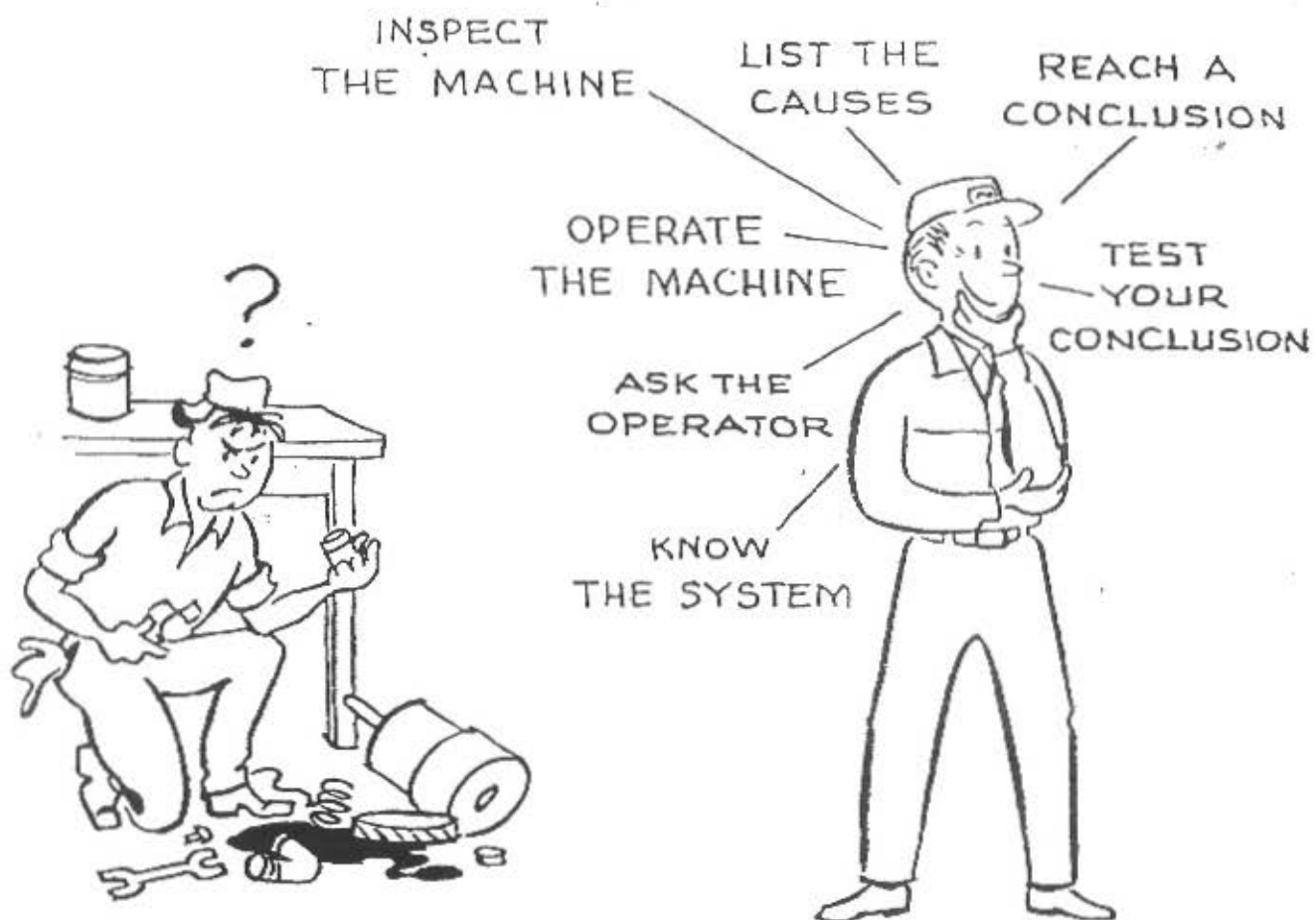
- 1. Out of gas
- 2. The engine has stalled and won't start
- 3. A dead / weak battery
- 4. A flat tire
- 5. An overheating engine

When do we perform Basic Car Maintenance ?

- Daily ?
- Weekly ?
- Once a month ?
- Every 3 months ?



DIAGNOSIS AND TESTING OF SYSTEM



Which Would You Rather Be?

Checklists for Preventive Maintenance

DAILY CHECKS

These basic and simple checks should be done every day. If, however, you skip a day, be sure you add this list to the list of weekly checks.

Check

1. Lights
2. Horn
3. Windshield-wiper operation
4. Windshield-washer operation
5. Outside rearview mirror
6. Front-windshield cleanliness
7. Rear-windshield cleanliness
8. Side-window cleanliness
9. Tires (visual check)

WEEKLY CHECKS

With the car stationary and engine cold

1. Engine-oil level
2. Battery-fluid level
3. Radiator-coolant level
4. Windshield-washer-reservoir fluid level
5. Power-steering-reservoir fluid level
6. Tire air pressure
7. Tires for cuts and tire-wear patterns
8. Brake-pedal action
9. Fan belts and cooling-system hoses

With the engine running at operating temperature

1. Automatic-transmission-fluid level
2. Refrigerant charge in air conditioner
3. Fluid leaks

On the road

1. Brake performance and pedal height
2. Automatic-transmission performance
3. Manual-transmission and clutch performance
4. Steering
5. Engine performance
6. Instrument operation
7. Any unusual rattles or noises

MONTHLY CHECKS

Brakes

1. Brake-pedal action
2. Master-cylinder-fluid level
3. Parking-brake action

Steering

1. Steering action
- Power-steering-reservoir action

Signals

1. Horn
2. Turn signal; operation
3. Hazard-warning-flasher-light operation

Shock absorbers

1. Shock-absorber action
2. Shock-absorber leaks

Seat belts

1. Hardware for firm latching
2. Belts for cuts and wear

Tires

1. Inflation
2. Wear patterns
3. Possible cuts

Exhaust system

1. Possible leaking exhaust-system components
2. Leaks by looking for gray or black discoloring at joints

Visibility

1. Glass for chips and cracks
2. Window operation
3. Loose mirrors
4. Windshield-washer-fluid level
5. Windshield-wiper blades
6. Defroster action

Door locks and latches

1. Door-lock and latch performance
2. Hood latch

Ignition system

1. Spark plugs
2. Distributor points
3. Distributor cap and rotor
4. Ignition coil and wires
5. Spark-plug wires
6. Point dwell and ignition timing

SEASONAL CHECKS

Some services need to be done only once or twice a year, if you drive under normal conditions and cover from about 10,000 to 12,000 miles a year. These are often called seasonal checks, and many of them are necessary because of varying weather conditions in different parts of the country.

WINTER CHECKS

Cooling system

1. Inspect hoses and connections
2. Add fresh coolant if necessary

3. Check strength of coolant to be sure it meets temperature requirements in your area
4. Test radiator pressure cap
5. Be sure drive belts are in good condition and properly adjusted

Battery

1. Inspect and test battery
2. Clean cable terminals and battery posts
3. Be sure cables are in good condition

Ignition system

1. Remove and inspect spark plugs
2. Check distributor points
3. Inspect distributor cap and rotor
4. Visually check ignition coil and wires
5. Check spark-plug wires
6. Check point dwell and ignition timing

Fuel system

1. Check condition of carburetor air-cleaner-filter element. Replace if dirty.
2. Check automatic-choke operation
3. Add dry gas (anti-icer) to fuel tank

Lubrication

1. Change oil and oil filter
2. Lubricate chassis
3. Lubricate body points

Tires

1. Mount snow tires after inspecting them for adequate tread, general condition, and pressure
2. Check all tires for tread, general condition, and pressure
3. If snow tires are unnecessary in your area, rotate your regular tires

Brakes

1. Check fluid level in master cylinder and refill if necessary
2. Check system for leaks
3. Inspect linings for excessive wear
4. Be sure brakes are adjusted

Suspension and steering

1. Check steering linkage for tightness
2. Check power-steering-reservoir fluid level and refill if necessary
3. Check power-steering-pump drive belt for wear and adjustment
4. Check shock absorbers for leaks and operation

Visual equipment

1. Check windshield-wiper blades for condition and adjustment
2. Check windshield wipers for proper operation
3. Check windshield-washer system for proper operation
4. Check fluid or solvent in windshield reservoir
5. Check front-windshield defroster for proper operation
6. If your car has a rear-window defroster, check its operation

Other important inspections

1. Check exhaust system. No leaks should be detectable, and all parts should be firmly suspended by hangers and clamps.
2. Check automatic-transmission-fluid level
3. Check heater for proper operation

SUMMER CHECKS

Cooling system

1. Check system for leaks
2. Test radiator pressure cap
3. Check drive belts for wear and proper tension
4. Check thermostat operation
5. Check all hoses and clamps for signs of wear. Be sure clamps are tight.

Exhaust system

1. Check muffler and pipes for spots rusted through
2. Check clamps for tightness
3. Lubricate manifold-heat-control valve

Brakes

1. Check brake linings for wear
2. Check fluid level in master cylinder. Add fluid if necessary.
3. Check system for leaks
4. Check brake adjustment.

Lubrication

1. Change oil and oil filter
2. Lubricate chassis
3. Lubricate body points
4. Check positive-crankcase-ventilation (PCV) valve

Battery

1. Inspect and test battery
2. Clean cable terminals and battery posts
3. Be sure cables are in good condition

Ignition system

1. Remove and inspect spark plugs
2. Inspect distributor cap and rotor
3. Check distributor points on breaker-point ignitions
4. Check pickup coil and reluctor on electronic ignitions

5. Check ignition coil and wires
6. Check spark-plug wires
7. Check point dwell on breaker-point ignitions
8. Check ignition timing

Tires

1. Remove snow tires
2. Inspect tires for adequate tread and general condition
3. Rotate tires and have wheels balanced
4. Inflate tires to recommended pressure

Suspension and steering

1. Check for loose steering linkage
2. Check power-steering-fluid level and add fluid as necessary
3. Check power-steering-pump drive belt for wear and adjustment
4. Check shock absorbers for operation and leaks
5. Have front-end alignment checked

Visual equipment

1. Check windshield-wiper blades for condition and proper adjustment
2. Check windshield wipers for proper operation
3. Check windshield-washer system for proper operation
4. Check fluid in windshield-washer reservoir and fill if necessary
5. Check lights and all warning signals for proper operation

Many motorists use the seasonal changes as a reminder to make other checks. These are only guidelines. If, for instance, your car begins to show symptoms of needing a tuneup in the middle of December, you should not wait until spring to do the work.

TRIP CHECKS

If you follow a regular maintenance schedule, your car should be ready for long or short trips at any time. For extended trips, however, it is a good idea to make a few special checks.

1. Have wheel alignment and balance checked. Wheels that are out of line or unbalanced often go unnoticed when you are driving around town, but they can cause severe vibration at high speed or create uneven tire wear in just a few hundred miles of highway travel.
2. Check oil level. Add oil if dipstick shows it at or below the ADD mark. Change oil if it is dirty or if a change is due.
3. Check coolant level and inspect radiator hoses. Replace hoses if they show any sign of wear or look ready to collapse.
4. Check automatic-transmission-fluid level.

5. Check level of power-steering fluid in power-steering reservoir.
6. Check brake-fluid level in master cylinder and look for signs of leaks.
7. Check tire pressure on all tires, including the spare, when tires are cold. Inflate tires four pounds extra if you are going to carry a full carload or if you will be driving at high speed. Check depth of tire tread and look for damaged tires.
8. Clean headlights and windshield.
9. Fill windshield-washer reservoir with fluid.
10. Check windshield-wiper blades and replace them if they are worn and brittle.
11. Inspect for loose or frayed fan belts. Replace them if they are damaged. Adjust to proper tension.
12. Check battery electrolyte level and battery charge.
13. Check operation of turn signals, hazard-warning-flasher lights, stoplights, tail lights, and backup lights.
14. Get and store your on-the-road emergency kit.
15. Fill fuel tank.
16. Check instrument panel lights and gauges, especially alternator, oil, temperature, and gas gauges.

ON-THE-ROAD EMERGENCY KIT

1. Copy of a troubleshooting guide and the owner's manual for your car
2. Flares
3. Lug wrench and jack
4. Jumper cables
5. Screwdrivers, pliers, and wrenches
6. Strong tow rope or chain
7. Old blankets
8. Folding camp shovel
9. Fire extinguisher
10. Rags or strong paper towels
11. Cream hand cleaner
12. First-aid kit
13. Pencils and notebook
14. Coins for meters and phone calls
15. Flashlight
16. Road maps
17. Extra fuses
18. Tire-pressure gauge
19. Extra drive belts
20. Plastic electrician's tape for small temporary repair of small leaks in radiator and heater hoses
21. In winter only: windshield-scraper brush; small snow shovel; bag of sand; extra blankets and coats

BATTERY

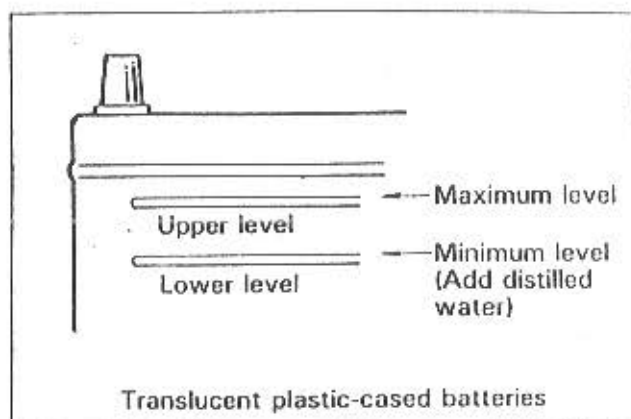
INSPECTION OF BATTERY

CHECK BATTERY ELECTROLYTE LEVEL (Translucent Plastic-cased Batteries)

The level should be between the upper and lower lines indicated on the battery case.

IMPORTANT !

If the fluid level is difficult to read, lightly bounce the vehicle body. The fluid level will move and be easy to see.



IF BATTERY ELECTROLYTE LEVEL IS LOW, ADD DISTILLED WATER TO SPECIFIED LEVEL

Specific gravity and discharged % (at 20°C)

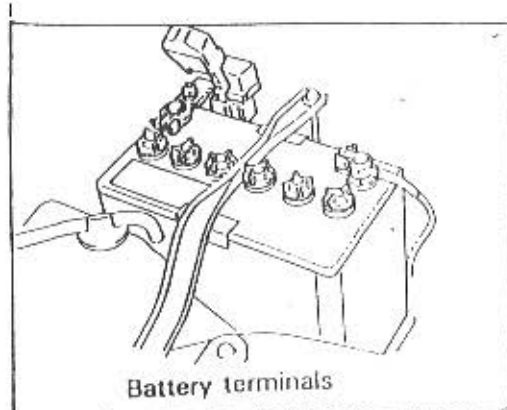
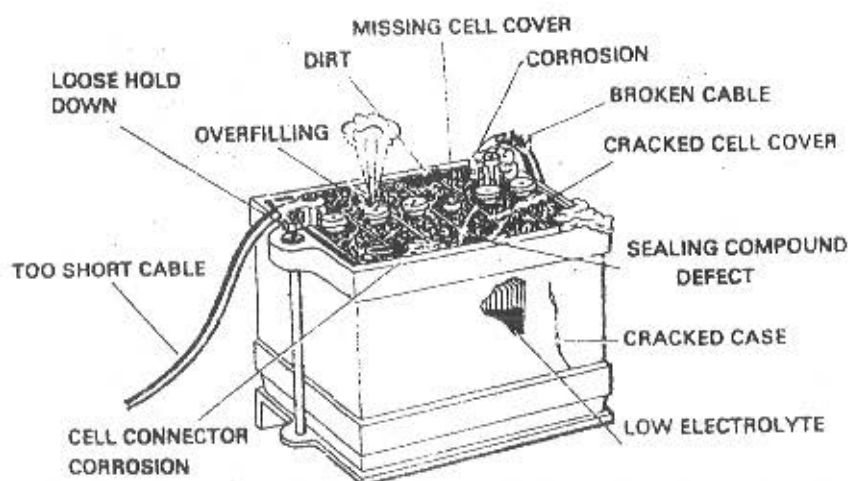
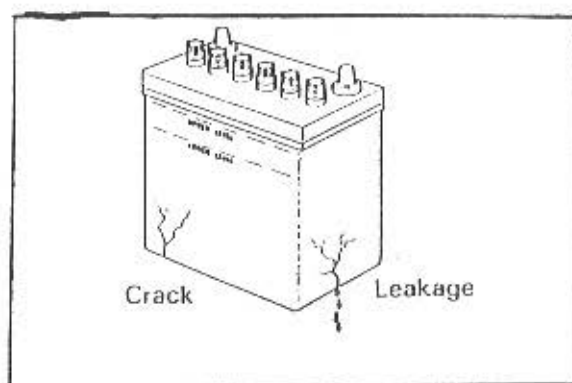
Specific gravity	% discharged	Need for recharging
More than 1.230	Less than 25%	No need for recharging
1.230 to 1.190	25%	All right to recharge with quick charger
Less than 1.190	More than 50%	Charging with bench charger necessary

CHECK BATTERY CASE FOR CRACKS

Check the battery case for cracks or electrolyte leakage.

REFERENCE

If electrolyte is leaking from the battery case, the battery carrier or the parts near the battery will be corroded.



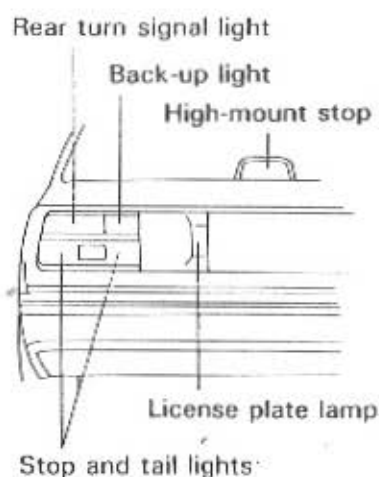
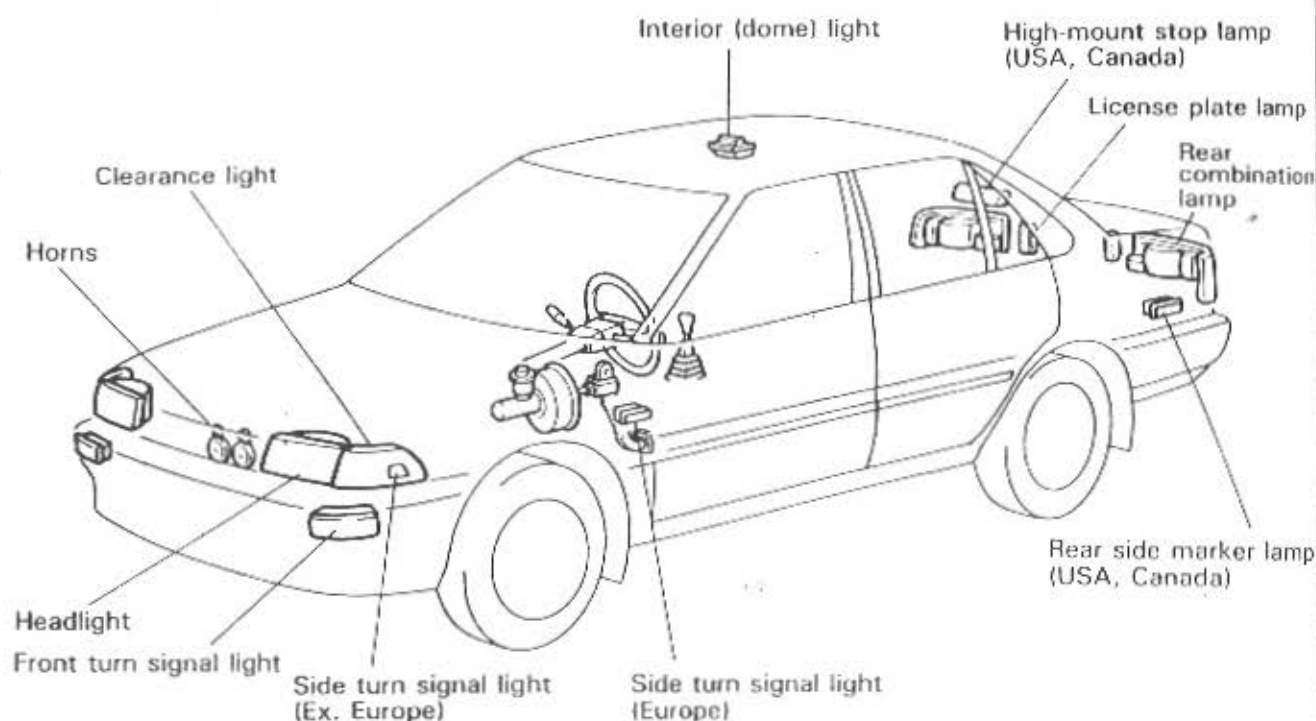
LIGHTS & HORNS

NECESSITY FOR MAINTENANCE

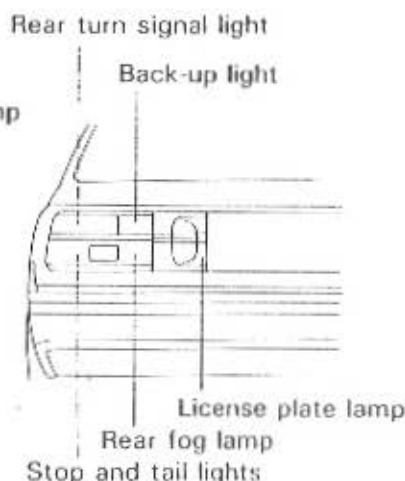
In order to drive safely and comfortably during the day, at night and when it is raining, lights, horns, wipers and washers are provided on vehicles. If any of these are not operating

properly, it can make driving impossible or extremely dangerous.

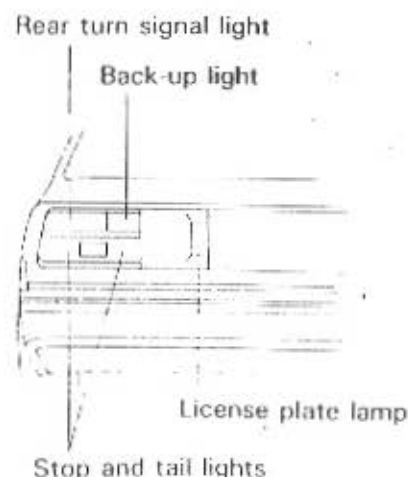
Therefore, it is necessary for the lights, horns, wipers and washers to be checked periodically.



USA and Canada

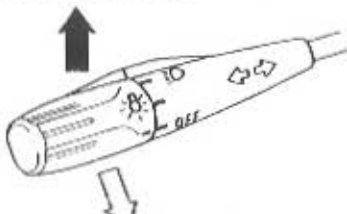
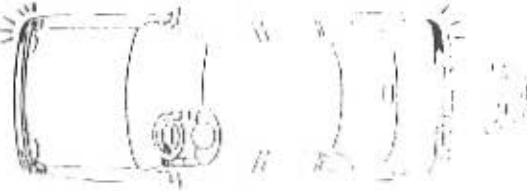
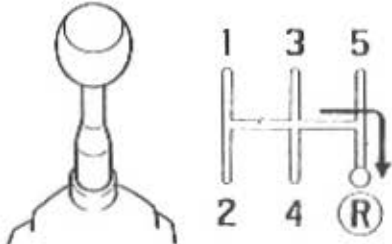
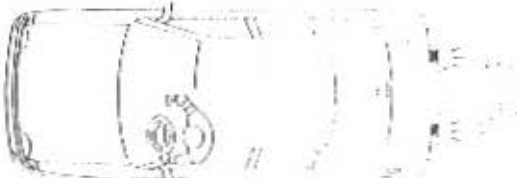
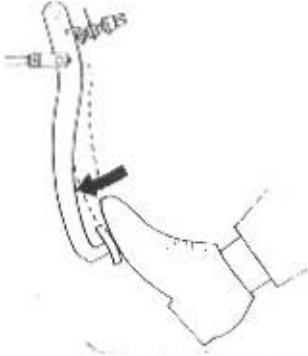



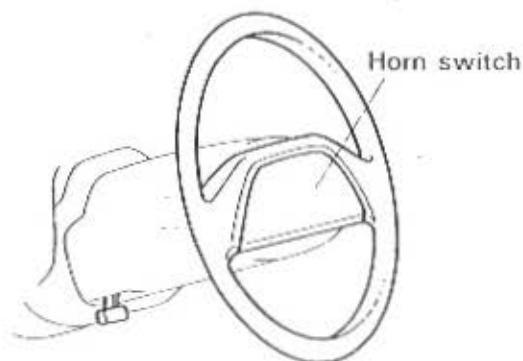
Europe



Ex. USA, Canada and Europe

3
350
6
2100

ACTION	RESULT
<ul style="list-style-type: none"> • Turn signal switch <p>Move upward.</p>  <p>Move downward.</p> <p>With the ignition switch ON</p>	 <p>Turn signal lights flash 70–100 times/min. If any bulb is burnt out or has poor contact, flashing will be faster.</p>
<ul style="list-style-type: none"> • Shift into reverse gear.  <p>With the ignition switch ON</p>	 <p>Back-up lights come on.</p>
<ul style="list-style-type: none"> • Depress brake pedal. 	 <p>Stoplights, which are brighter than tail lights, come on.</p>



INSPECTION OF HORNS

Push the horn switch (steering wheel pad) and check the horn tone and loudness.

OIL/ FLUID

ENGINE OIL

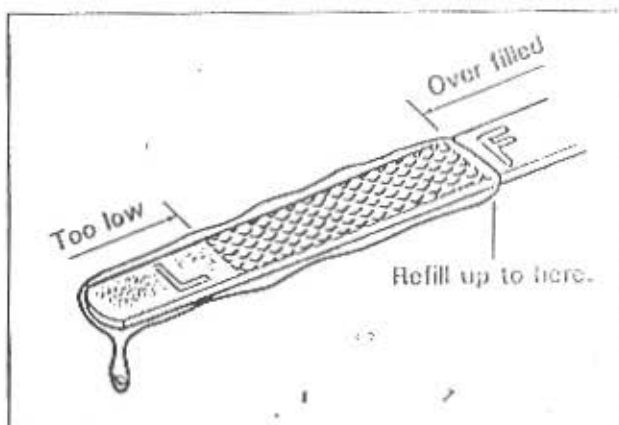
NECESSITY FOR MAINTENANCE

Engine oil does more than reduce wear and friction in the pistons, bearings and other moving parts. It also helps to seal the high-temperature, high-pressure gas into the combustion chambers, as well as transfer heat from high temperature areas to the oil pan where it is dissipated into the air. It prevents the corrosion of metal

parts and cushions moving parts, as well as absorbing noxious substances resulting from engine combustion. In accomplishing these many functions, oil loses its effectiveness with use, making it necessary to change it periodically.

Engine Oil

- Put out the dipstick and wipe it clean.
- Then, reinsert, pull out again and check the level. If low, replenish with the specified engine oil.
- Wait for five (5) minutes after engine stop, then recheck the oil level.

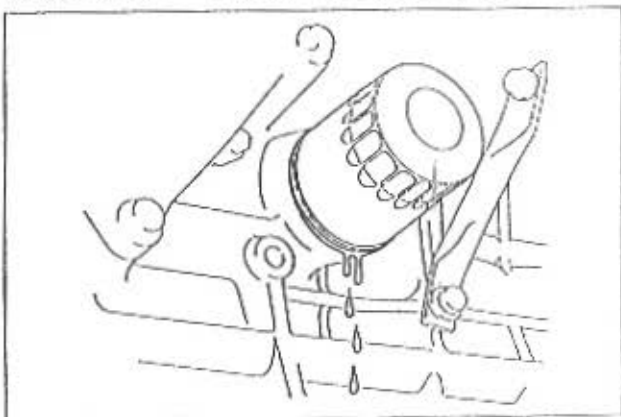


REFILL ENGINE WITH NEW ENGINE OIL AND CHECK OIL LEVEL

Refer to the previous section on "Changing Engine Oil".

CHECK FOR OIL LEAKAGE

Start the engine and inspect for oil leakage, visually and by touch.



ENGINE OIL FILTER

NECESSITY FOR MAINTENANCE

While the engine oil is being used, carbon resulting from engine combustion and metal particles enter the oil, making it dirty. When such impurities accumulate, they cause accelerated wear and scoring of the moving parts.

For this reason, a filter is included in the oil line

to catch and remove these impurities from the oil.

Because such impurities accumulate in the filter, causing the filter's filtration capacity to drop, it is necessary to periodically replace it.

AUTOMATIC TRANSMISSION FLUID

NECESSITY FOR MAINTENANCE

The specified type and amount of transmission fluid is poured into an automatic transmission (transaxle).

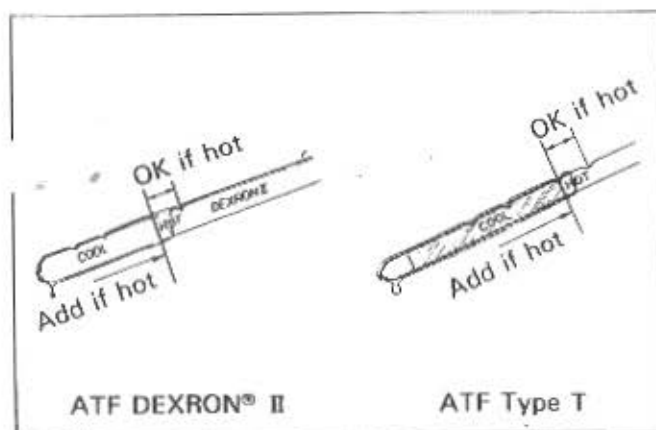
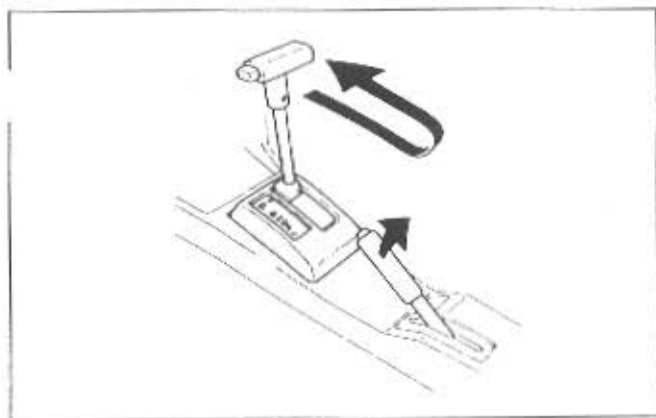
This fluid serves to lubricate the planetary gear unit (gears, bearings, multi-plate clutch/brake discs and brake band) and is used as hydraulic fluid for the valves and clutch/brake pistons in the hydraulic control circuit and in the torque converter.

In addition, in 4WD vehicles, the specified grade, viscosity and quantity of oil is used in the transfer to lubricate the gears, bearings, chain

and other parts.

As automatic transmission fluid and transfer oil are used, they gradually deteriorate and if there is leakage of fluid or oil, it could cause the bearings and gears, etc. to seize up. Particularly in the case of automatic transmission fluid, if the level is not normal, the automatic transmission will not operate smoothly.

Therefore, it is necessary to check the automatic transmission fluid and transfer oil and replace them periodically.



- Park the vehicle on a level surface and apply the parking brake fully.
- Put the shift lever in P (park) and let the engine idle.
- Depress the brake pedal and move the gear shift lever through each range from "P" to "L", then from "L" to "P".
- With the engine idling and the gear shift lever in "P", pull out the fluid level dipstick (gauge) and wipe off the fluid on it with a clean rag. Insert the dipstick (gauge) into the transmission and pull it out again. The fluid level is okay if it is within the "HOT" range.
- If the fluid level is too low, add fluid to the proper level.

Fluid:

A131L, A132L, A240L (2WD)

ATF DEXRON® II

A241H (4WD)

ATF Type T (08886-00405)

or equivalent

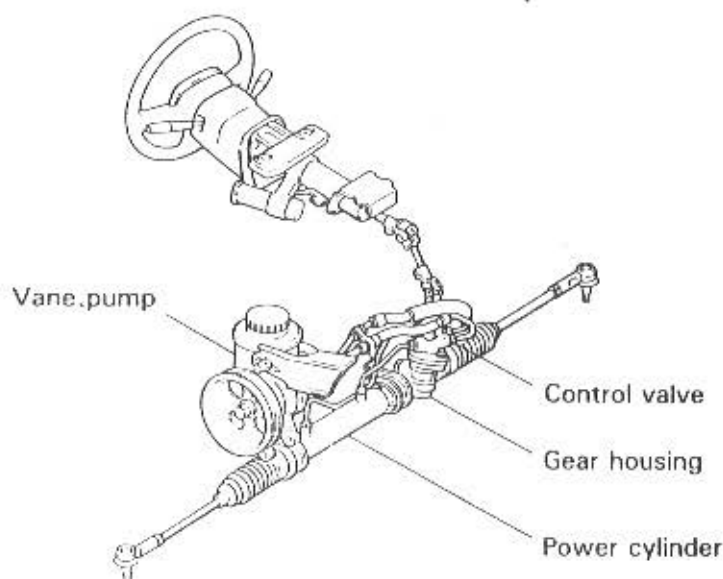
POWER STEERING FLUID

NECESSITY FOR MAINTENANCE

In the power steering system, power steering fluid is sent to the steering gear housing (power cylinder) by the power steering pump (vane pump), where its fluid pressure operates a piston inside the gear housing (power cylinder), assisting the steering effort as the steering wheel is

turned. If the fluid level becomes low, or if fluid leaks, inadequate fluid pressure will be generated, causing the steering operation to be heavy and generating an abnormal noise.

Therefore, it is necessary that the power steering fluid be checked periodically.



POWER STEERING SYSTEM

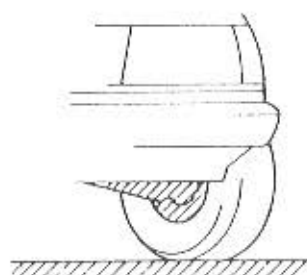
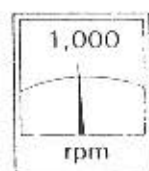
INSPECTION OF POWER STEERING FLUID

1. CHECK FOR FLUID LEAKAGE

Check the connections of the hydraulic fluid lines, steering gear housing and the power steering pump for fluid leakage or oozing.

REFERENCE

- After applying fluid pressure to the power steering system as shown below, it becomes easier to discover leakage when a leakage check is conducted.
- With the engine running at 1,000 rpm or less, turn the steering wheel fully to the right or left and hold it there for a few seconds. Then turn it fully in the opposite direction and hold it for a few seconds.
- Do not keep the steering wheel turned fully for more than 10 seconds.



MANUAL TRANSMISSION OIL AND TRANSFER OIL

NECESSITY FOR MAINTENANCE

Manual transmissions (transaxles) are filled with the specified grade, viscosity and quantity of oil to lubricate the gears and bearings.

In addition, in 4WD vehicles, the specified grade, viscosity and quantity of oil is used in the transfer to lubricate the gears, bearings, chain and other parts.

As these oils are used, they gradually deteriorate and if there is leakage of oil, it could cause the bearings and gears, etc. to seize up.

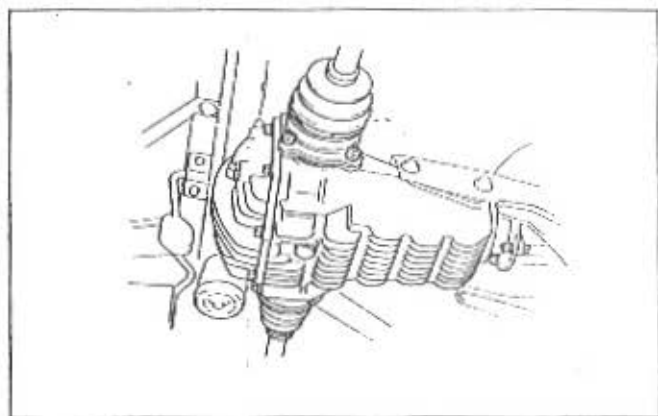
Therefore, it is necessary to check the manual transmission oil and transfer oil and replace them periodically.

DIFFERENTIAL OIL

NECESSITY FOR MAINTENANCE

In order to lubricate the gears and bearings, etc. inside the differential carrier (axle housing), the specified grade, viscosity and quantity of oil is used. However, as the vehicle is used, this oil gradually deteriorates, and if the oil leaks, it could result in the gears, bearings and other parts seizing up.

Therefore, it is necessary to check and replace the differential oil periodically.



INSPECTION OF DIFFERENTIAL OIL (Cressida)

Here we will describe the inspection of the Cressida.

1. CHECK FOR DIFFERENTIAL OIL LEAKAGE

Visually check the differential carrier for oil leaks. Check the underside of the brake backing plate for oil adhesion to determine if there is leakage from either end of the axle housing.

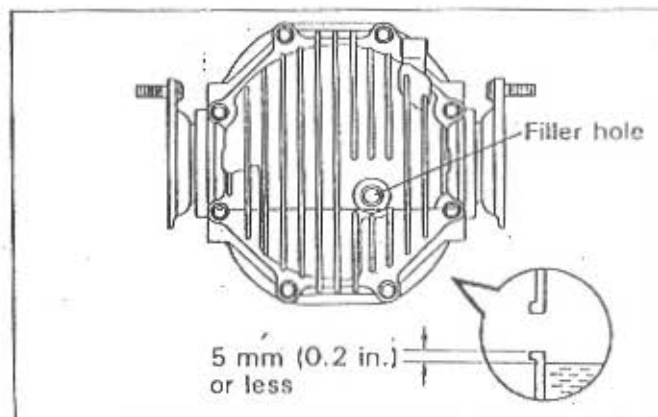
2. INSPECT DIFFERENTIAL OIL LEVEL

- Raise the vehicle, keeping it level.
- Remove the oil filler plug.
- Insert your finger into the oil filler hole and check that the oil level is within 5 mm (0.20 in.) of the hole bottom edge.
- Add the specified hypoid gear oil if the oil level is low.

Oil type: API GL-5 hypoid gear oil
or LSD oil (LSD only)

Viscosity: Above - 18°C (0°F)
SAE 90

Below - 18°C (0°F)
SAE 80W-90 or 80W



BRAKE AND CLUTCH FLUID

NECESSITY FOR MAINTENANCE

Brake fluid is used to fill the brake pipe line. When the brake pedal is depressed, the fluid pressure of the brake fluid is transmitted to each wheel cylinder (disc brake cylinder) from the brake master cylinder.

Clutch fluid is used to fill the clutch pipe line. When the clutch pedal is depressed, the fluid pressure of the clutch fluid is transmitted to the clutch release cylinder from the clutch master cylinder.

If brake fluid or clutch fluid is leaking, the brakes or clutch will fail to operate properly.

Therefore, it is necessary to check the fluid level in the brake and clutch master cylinder reservoirs periodically for the purpose of deciding whether there is leakage of fluid or not.

In addition, brake fluid has hygroscopic properties. When it absorbs air-borne moisture, its boiling point is lowered.

Thermally speaking, brake fluid is used under severe conditions, so if the boiling point of the fluid is lowered, it is easy for vapor lock to occur in the brake system. Therefore, it is necessary to replace the brake fluid periodically.

INSPECTION OF BRAKE AND CLUTCH FLUID

1. CHECK BRAKE FLUID LEVEL

Check that the fluid level in the master cylinder is between the MAX line and MIN line.

If the fluid level is below or near the minimum line, check for leaks in the hydraulic system and add fluid up to the MAX line.

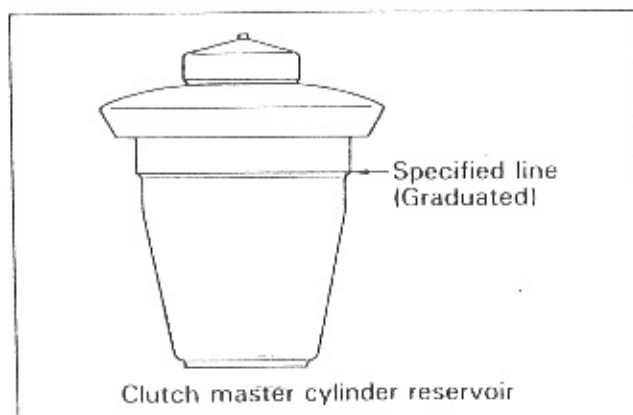
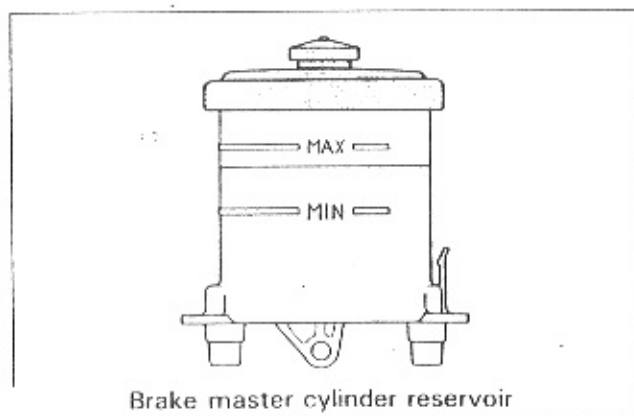
IMPORTANT !

If the fluid level is low when there is no leakage, it could cause wear of the disc brake pads. Therefore, check the thickness of the disc brake pads when the fluid level is at the extreme low level.

2. CHECK CLUTCH FLUID LEVEL

Check that the fluid level in the clutch master cylinder is up to the specified line.

If the fluid level is below the specified line, check for leaks in the hydraulic system and add fluid up to the line.



WATER, WIPER & WASHERS

ENGINE COOLANT

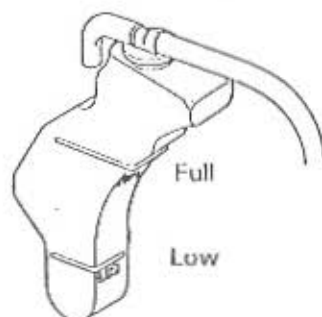
NECESSITY FOR MAINTENANCE

There are two types of engine coolant. One type prevents corrosion and the other type acts both to prevent corrosion and as an antifreeze solution. Both of these engine coolants under-

go drops in their capacity due to heat and chemical changes over time, so they need to be replaced periodically.

Engine Coolant

Visually check the level of coolant. If the level is low, add the coolant to the full level.

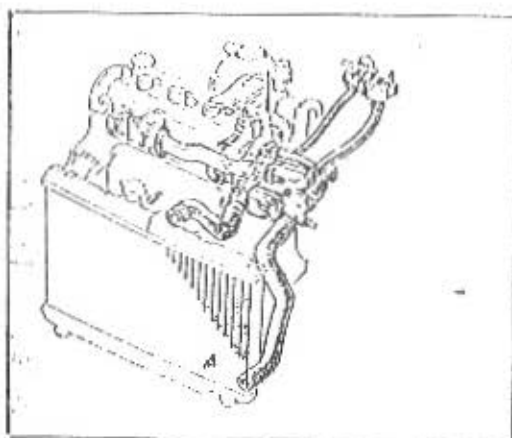


Checking engine coolant level

INSPECT FOR COOLANT LEAKAGE

Check the following points for coolant leaks:

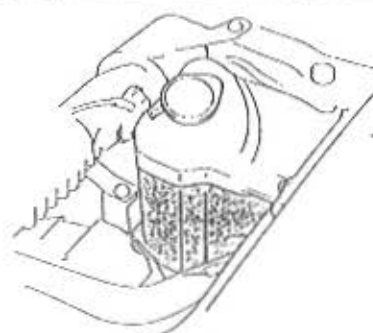
- Radiator drain plug
- Cylinder block drain plug
- Heater inlet hose connection



INSPECTION OF WIPERS AND WASHERS

Windshield Washer Fluid

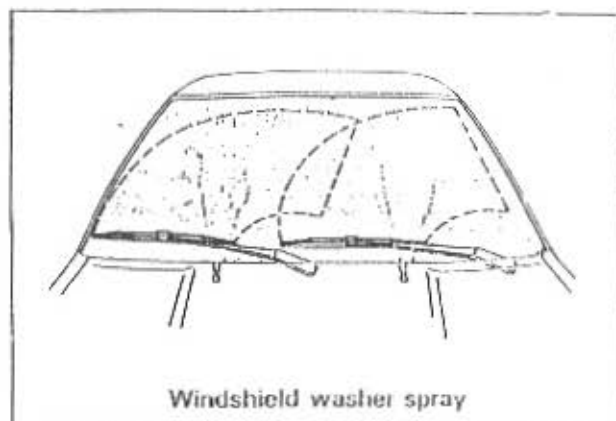
Visually check the level of fluid. If low, replenish with washer fluid.



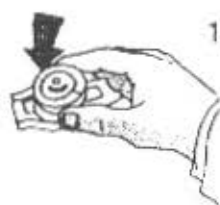
Checking washer fluid level

Inspect Windshield Wiper/Washer

- a) Push on the tip of the wiper switch and check that washer fluid squirts onto the proper area of the windshield.



Checklist for locating faults in your cooling system.



1. Inspect the radiator cap. Its valves may be stuck or the gasket may be hard and/or cracked. If so, replace the cap. Inspect the radiator through the filler neck for rust deposits.



3. Check the tension of the fan belt. If too tight, the coolant pump bearing can be overloaded. If too loose, it can slip and wear easily with possible overheating of the engine. Check the belt for excessive wear and cracks. Replace and adjust tension as needed.



2. Look at and squeeze the radiator and heater hoses. Hoses may become excessively soft or hard and the clamps may be loosened in service. Replace hoses where necessary and tighten all hose clamps.



4. Inspect the radiator, the coolant pump, hose connections and other fittings for rust or coolant dye stains that indicate leakage. If you find a leak it must be repaired mechanically. If the coolant pump is leaking it must be replaced.

BELTS, BRAKES, BOLTS, & BODY

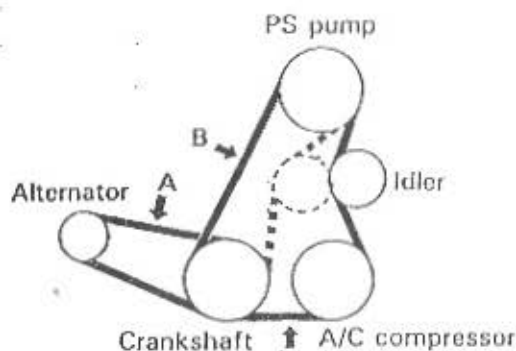
DRIVE BELTS

NECESSITY FOR MAINTENANCE

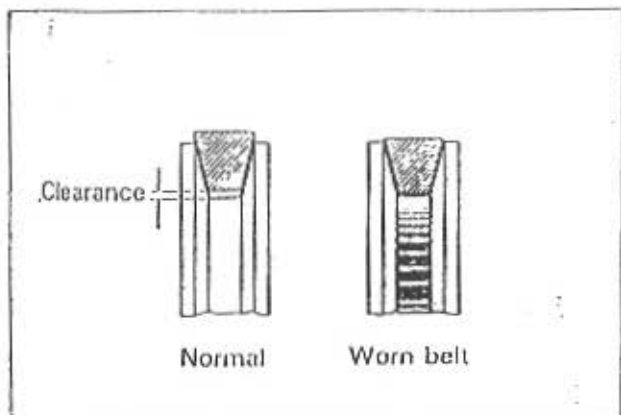
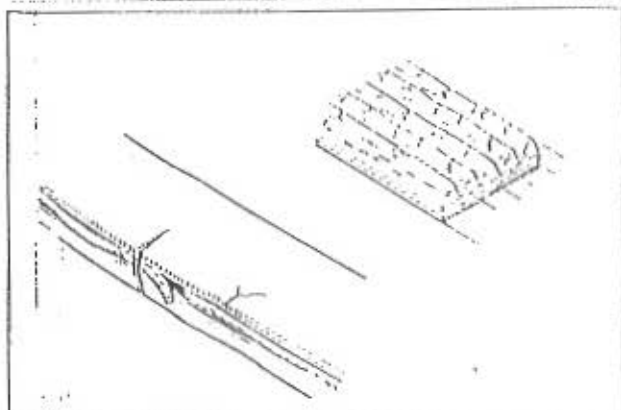
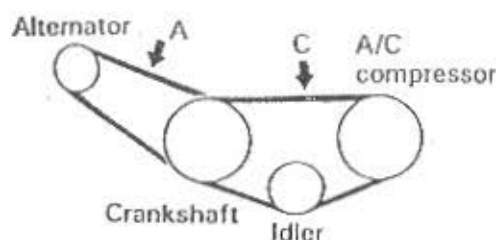
The drive belts transfer engine power from the crankshaft pulley to drive other auxiliary parts of the engine such as the water pump, cooling fan, alternator generator, power steering vane pump, and air conditioner compressor. Drive

belts are usually most elastic when they are new. As they are used, they gradually become worn and harden, then begin to crack. Therefore it is necessary to check and replace the drive belts periodically.

With power steering



Without power steering



INSPECTION OF DRIVE BELTS (4A-F)

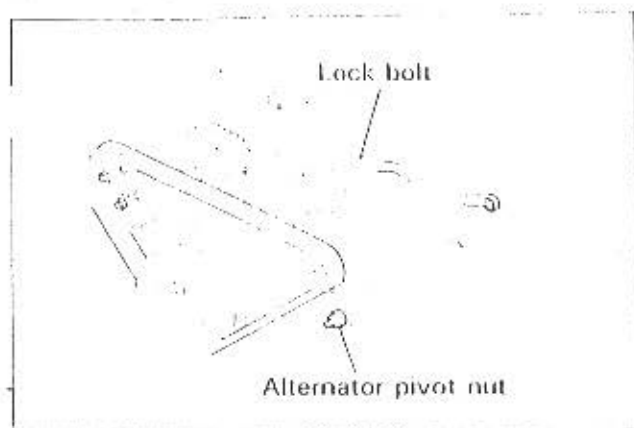
1. INSPECT DRIVE BELTS FOR DAMAGE

Visually check the belts for cracks, wear, separation, tearing or oiliness.

If necessary, replace the drive belts.

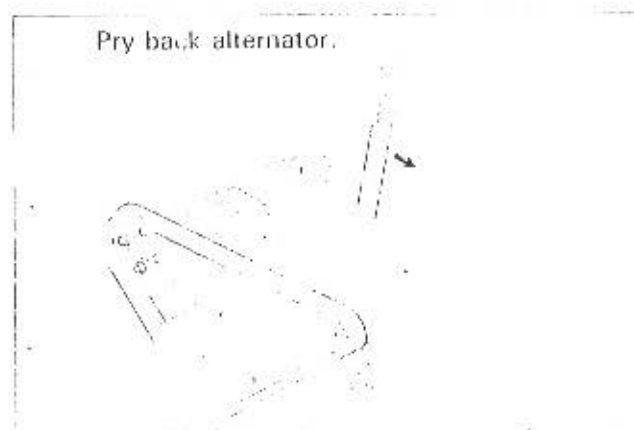
IMPORTANT !

- Rotate the crankshaft pulley a little at a time in the clockwise direction, checking for damage of the drive belt.
- Remove the service hole cover in the right fender to rotate the crankshaft pulley.



ADJUST ALTERNATOR DRIVE BELT TENSION, IF NECESSARY

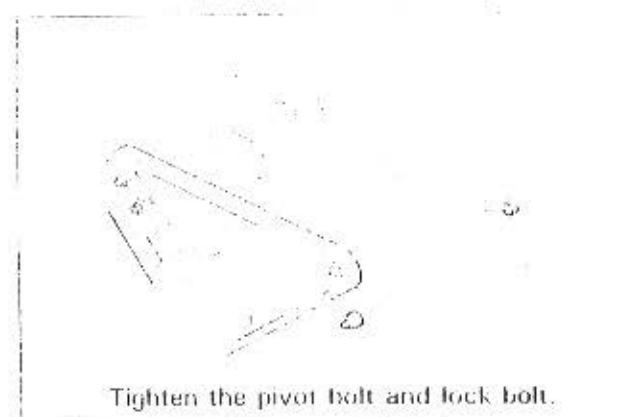
- Loosen the alternator pivot bolt and lock bolt several turns.
- Tighten the lock bolt as much as possible without allowing the alternator's position to shift.



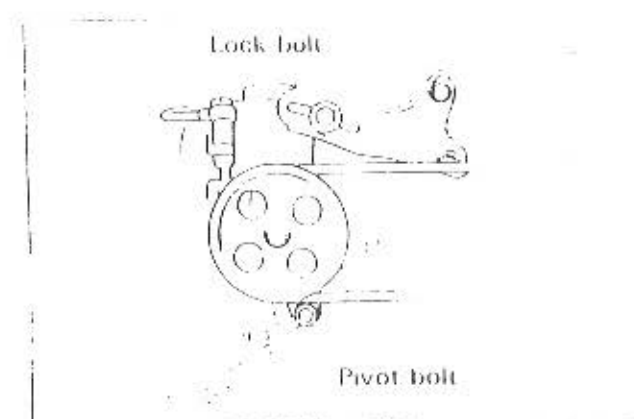
- Insert a pry bar between the cylinder block and alternator, then pry back the alternator to apply tension to the drive belt.

IMPORTANT !

Do not pry against the timing belt cover.



- Holding the pry bar, tighten the lock bolt and check the belt tension using a belt tension gauge.
- Tighten the pivot bolt and lock bolt securely.



5. ADJUST POWER STEERING PUMP DRIVE BELT TENSION, IF NECESSARY

Adjust the power steering drive belt tension in the same manner as the alternator drive belt.

BRAKE PEDAL AND PARKING BRAKE

NECESSITY FOR MAINTENANCE

The brake pedal plays a very important role in the function of the brakes. It must be at the specified height; if it is too high, more time will be required for the driver to move his foot from the accelerator pedal to the brake pedal, resulting in delayed braking. On the other hand, if it is too low, there will not be sufficient pedal reserve distance, resulting in insufficient braking force.

The pedal must also have a proper degree of freeplay. Without this freeplay, the master cylinder piston would always be pushed outward, resulting in a condition in which the brakes are constantly applied due to hydraulic pressure built up in the system.

In addition, there must be a sufficient amount of pedal reserve distance when the pedal is depressed or the amount of ineffective stroke

would be too long, causing delayed and insufficient braking.

Therefore, it is necessary to check the brake pedal periodically.

The parking brake is applied to the two rear wheels through the cables and locks the wheels to keep the vehicle stationary.

Insufficient parking brake lever travel has the same effect as when there is no freeplay in the rear brakes, causing the rear brake shoes to drag on the brake drum and creating excessive heat in the rear brakes and poor fuel consumption. On the other hand, excessive parking brake lever travel cannot provide enough braking force to keep the vehicle stationary.

Therefore, it is also necessary to check the parking brake periodically.

CLUTCH PEDAL

NECESSITY FOR MAINTENANCE

In manual transmission models, operation of the clutch pedal cuts off the transfer of the engine's power to the transmission.

If the clutch pedal height and pedal freeplay are not correct, the vehicle cannot be driven smoothly (it is difficult to start the vehicle moving and the transmission cannot be shifted smoothly).

In clutches with a self-adjusting release cylinder, even if the clutch disc becomes worn over the passage of time as the vehicle is used, pedal freeplay is maintained at a constant level.

However, in clutches where an adjustable

release cylinder and clutch cable are used, if the clutch disc becomes worn, pedal freeplay decreases. If use in this state continues, pedal freeplay eventually disappears. This causes the clutch to slip and the engine seems to have insufficient power, or it may become impossible to start the vehicle moving, etc. Furthermore, once the clutch starts slipping, the clutch disc starts to wear rapidly and could become damaged.

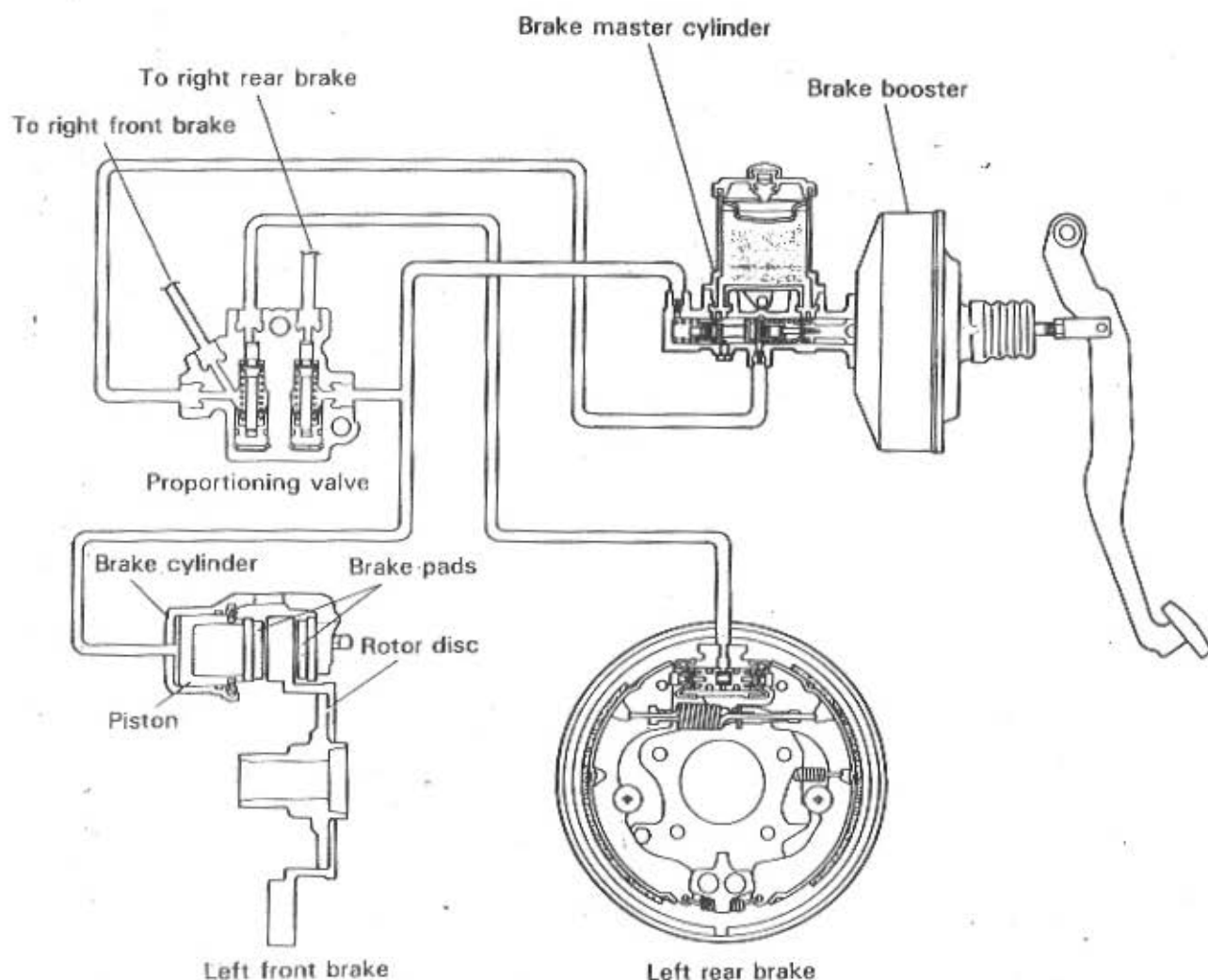
It is therefore necessary to check the clutch pedal periodically.

BRAKE PADS AND DISCS

NECESSITY FOR MAINTENANCE

In disc brakes, the rotor disc, which turns together with the wheel, is caught between the opposing brake pads installed in the brake cylinder. When the brake pedal is depressed in order to reduce the vehicle's speed or to stop, a piston (or pistons) in the brake cylinder pushes the brake pads against the rotor disc. At this time, friction force generated between the rotor disc and brake pads stops the rotor

disc. This friction also causes wear of the brake pads and rotor disc. The brake pads in particular wear more rapidly than the rotor disc. If the brake pads are used after they are worn to the limit or beyond, it causes the base plates of the brake pads to come in direct contact with the rotor disc. Therefore, it is necessary to check the brake pads and rotor discs periodically.



BRAKE LININGS AND DRUMS

NECESSITY FOR MAINTENANCE

Drum brakes consist of the brake drum which turns together with the wheel, the wheel cylinder(s) mounted on the backing plate, the brake shoes to which the brake linings are affixed, etc.

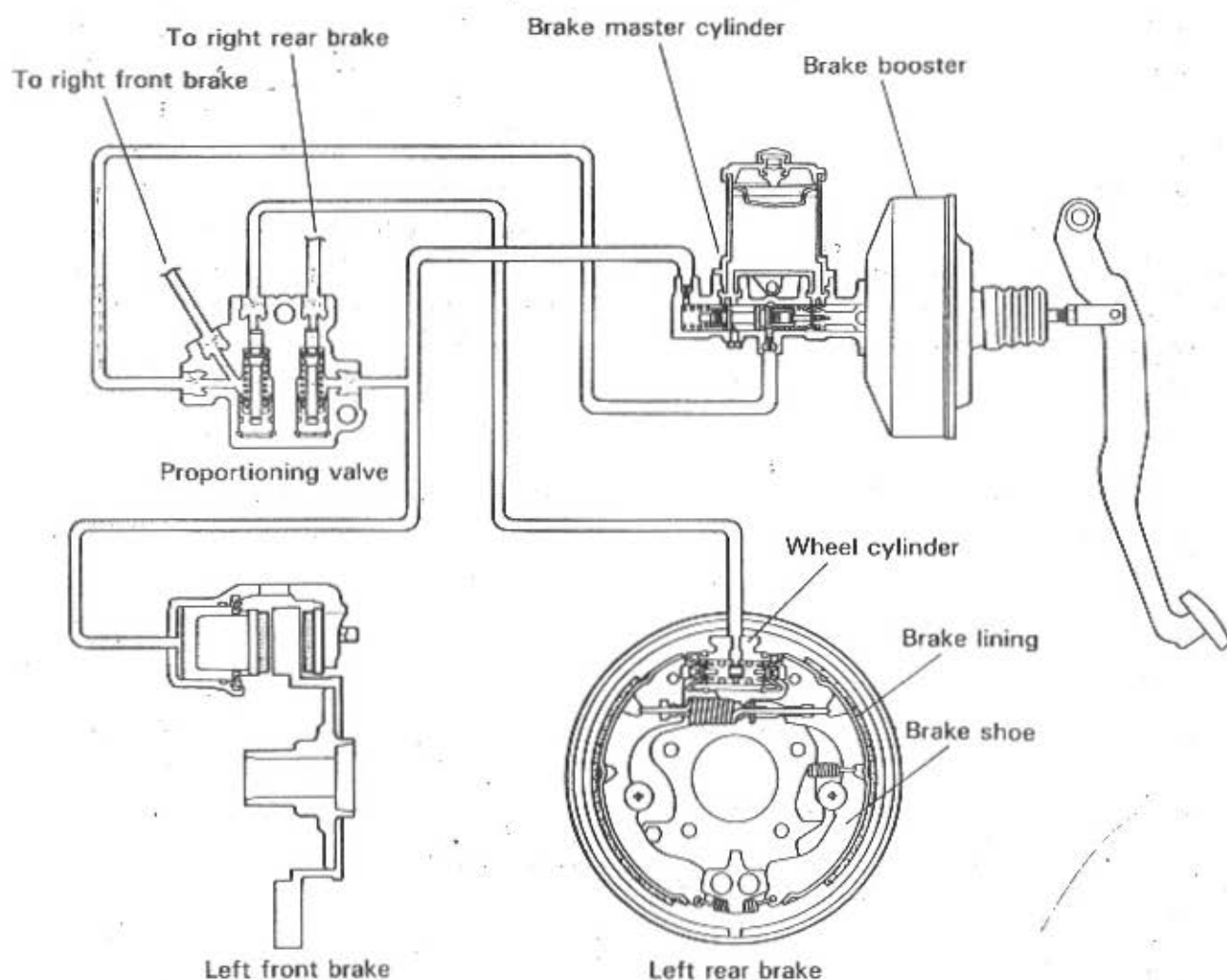
If the brake pedal is depressed in order to reduce a vehicle's speed and stop it, the brake shoes are spread by the wheel cylinder(s), causing the brake linings to push against the rotating brake drum. The friction force generated between the brake drum and the brake lining at this time stops the brake drum.

In addition, this friction causes wear of the brake

linings and brake drum. The brake linings especially wear more rapidly than the brake drum. If the brakes are used after the linings have been worn to the limit or beyond, the effectiveness of the brakes is reduced (making them unstable) or other troubles, such as the brake shoes coming in direct contact with the brake drum, could occur.

It is therefore necessary to check the brake linings and brake drums periodically.

It is also necessary to check the parking brake linings and parking brake drums periodically for the same reasons.



BRAKE SYSTEM

BODY CORROSION

NECESSITY FOR MAINTENANCE

Body panels are painted after undergoing anti-rust treatment.

However, as a vehicle is used, body rust can occur, usually due to the following causes.

- Road salt, dirt and moisture accumulate in hard-to-reach areas on the underside of the vehicle.
- Paint or undercoating becomes chipped from minor accidents or from flying stones and gravel.

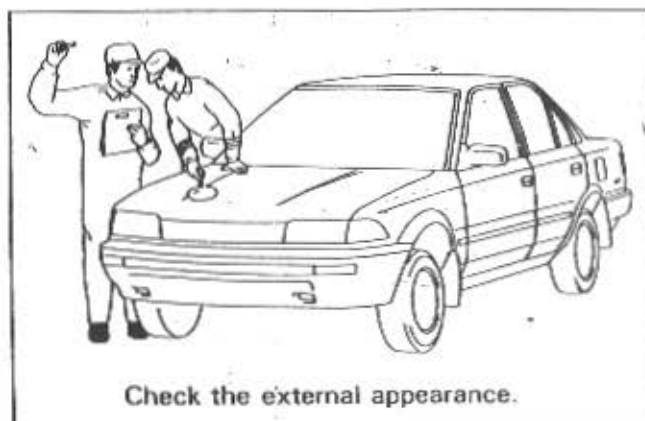
If left as it is, body rust will lead to the development of corrosion or perforation.

Therefore, it is necessary to check for body rust periodically.

Furthermore, body corrosion can also be influenced by road salt, dust control chemicals, high humidity, wetness or dampness, high temperatures, customer treatment or other use conditions.



Wash the vehicle.



Check the external appearance.

INSPECTION OF BODY RUST

1. WASH VEHICLE

Wash the vehicle thoroughly before conducting an especially cleaning of dirt off body outer panels and mud from underneath.

2. VISUALLY INSPECT BODY OUTER PANEL SURFACES

- (a) Inspect the body outer panels for corrosion, scratches, chipping or other surface damage.
- (b) Inspect for damage to body sealer.

BOLTS AND NUTS ON CHASSIS AND BODY

NECESSITY FOR MAINTENANCE

Chassis and body components are fastened to each other or to the body or frame with bolts and nuts.

If these bolts and nuts become loose, the bolts

could be damaged or the chassis and body components themselves could be damaged.

Therefore, it is necessary to tighten the bolts and nuts on the chassis and body periodically.

TIGHTENING OF BOLTS AND NUTS ON CHASSIS AND BODY

1. CHECK TIGHTNESS OF BOLTS AND NUTS ON CHASSIS COMPONENTS

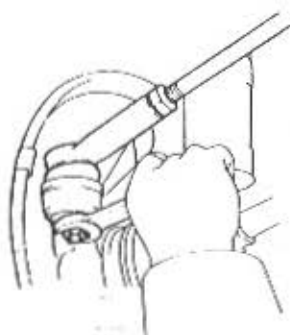
Check that all the mounting bolts and nuts of the chassis components shown below are tightened to the specified torque.

- Front axle and suspension
- Drive train
- Rear axle and suspension
- Steering system
- Brake system
- Engine mountings, etc.

IMPORTANT !

- Various bolt and nut strengths are used, depending on the load which each component will be subjected to. Therefore, refer to the repair manual when making your check.
- When checking the tightness of the castle nuts for the steering linkages, do not remove the cotter pin, and be sure to use an open-end wrench. However, if the nut turns easily, remove the cotter pin and tighten the nut to the specified torque.

Checking castle nut tightness



AIR & AIR(TIRE) PRESSURE

AIR FILTER

NECESSITY FOR MAINTENANCE

The air taken in by the engine contains dust and other particles which clog the carburetor passage, cause rapid engine cylinder wear and oil deterioration.

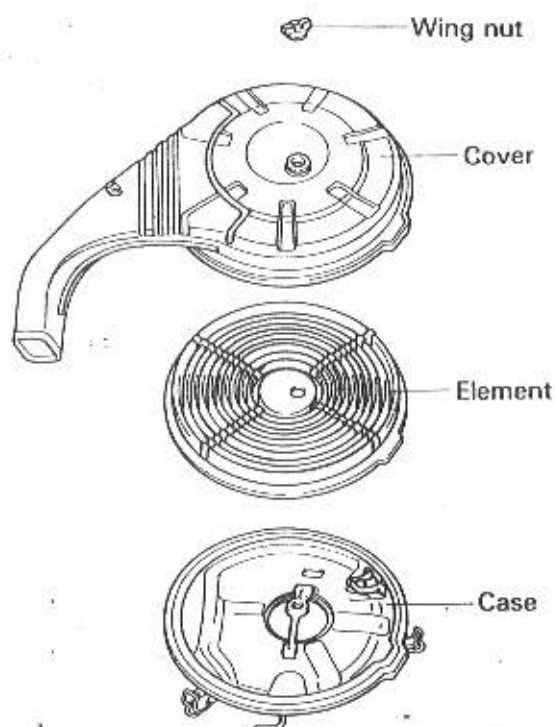
The air cleaner traps the dust and dirt particles in the air with its filter, preventing them from entering the carburetor and engine

cylinders.

If the filter becomes clogged with dirt, the air flow will be restricted, diminishing engine performance.

For these reasons, the air filter must be inspected periodically.

4A-F Engine



INSPECTION OF AIR FILTER (Paper Filter Type, AE92)

1. REMOVE AIR CLEANER ELEMENT

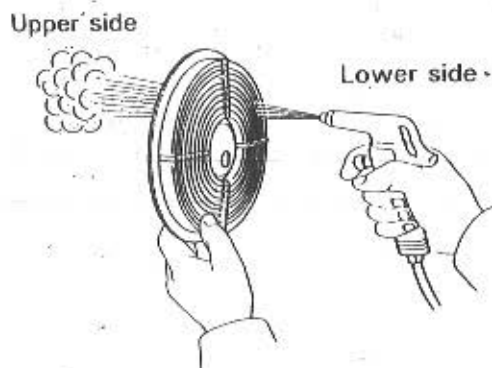
- Unscrew the wing nut and release the clips.
- Remove the air cleaner cover and take out the element.

2. INSPECT AIR CLEANER ELEMENT

- If the element is full of dirt and dust, replace it.
- The effectiveness of a filter element that is nearly ready for regular periodic replacement will not be recovered by cleaning, so it should be replaced.
- A filter element impregnated with water or oil should be replaced, as trapped dust and sand cannot be removed with compressed air.

3. CLEAN AIR CLEANER ELEMENT

- Using an air gun, blow the dust and sand particles out from the lower surface.
- Next, clean the upper surface and once again blow evenly from the lower surface.



TIRES AND INFLATION PRESSURE

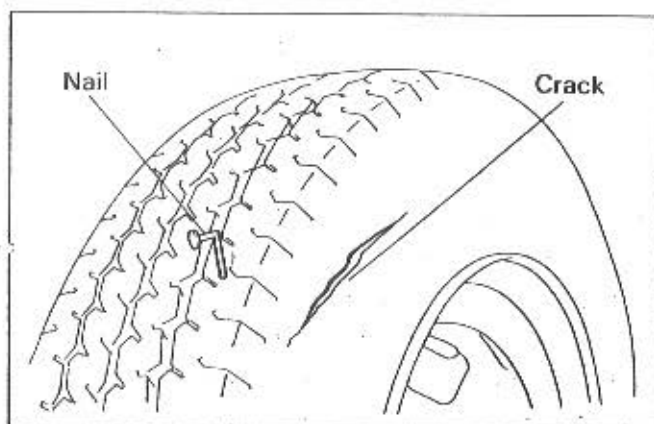
NECESSITY FOR MAINTENANCE

The tire, while carrying the vehicle on a cushion of air for ride comfort, must withstand various conditions. It must be strong enough to withstand damage, yet flexible enough to absorb many road shocks. It must grip well for traction, cornering and braking. It must respond accurately to steering when turning.

The tire is designed with these points in mind. However, tire performance and overall life are greatly affected by the inflation pressure. Over-inflation causes a rough ride, excessive center

tread wear and can cause slipping due to less gripping capability. Under inflation causes excessive tread edgeward, high rolling resistance and excessive heat buildup which can result in tire failure at high speeds.

For these reasons, it is necessary to check the tires and tire inflation pressure periodically. Further, if the tire is used in the same position on the vehicle for a long period, uneven tire wear can result, reducing tire life. To avoid this, it is necessary to rotate the tires periodically.



INSPECTION OF TIRE EXTERIOR

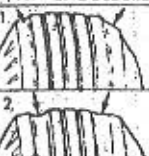






1. RAISE VEHICLE

2. INSPECT EXTERNAL APPEARANCE OF ALL TIRES (Including Spare Tire)

(a) Inspect for damage on the tire crown, shoulders and sidewalls.

(b) Inspect the tire for nails.

(c) Inspect the tread wear by either measuring the tread depth with a depth gauge, or looking for the tread wear indicator.

CONDITION	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
EFFECT							
CAUSE	UNDER-INFLATION OR LACK OF ROTATION	OVER-INFLATION OR LACK OF ROTATION	UNDER-INFLATION OR EXCESSIVE SPEED*	EXCESSIVE CAMBER	INCORRECT TOE	UNBALANCED WHEEL OR TIRE DEFECT*	LACK OF ROTATION OF TIRES OR WORN OR OUT-OF-ALIGNMENT SUSPENSION
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES			ADJUST CAMBER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION

TIRE ROTATION

1. REMOVE WHEEL COVERS

Insert a pry bar between the wheel cover and the wheel and pry off the cover.

2. REMOVE WHEELS

(a) Before raising the vehicle, use a wheel nut wrench to loosen the wheel nuts (counter-clockwise) $1/4$ to $1/2$ turn in crisscross sequence.

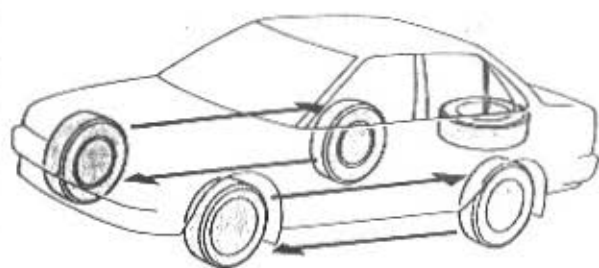
(b) Raise the vehicle and remove all the wheels.

3. ROTATE TIRES

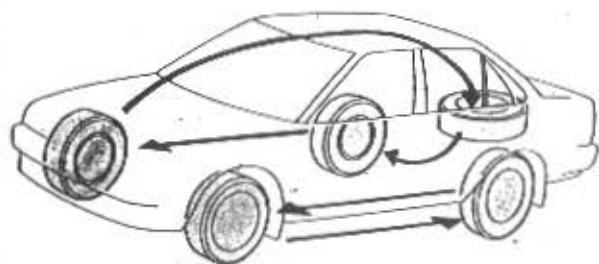
Radial-ply tires

(Front and rear tires with the same size and ply rating)

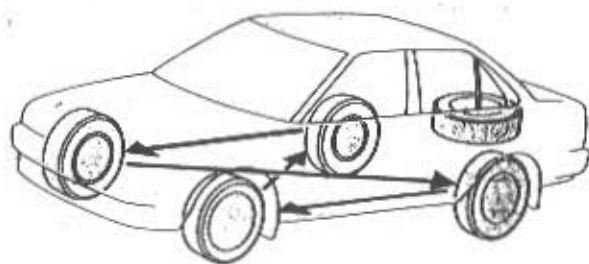
For radial-ply tires, only the front and rear tires on the same side of the vehicle should be changed, without changing their direction of rotation.



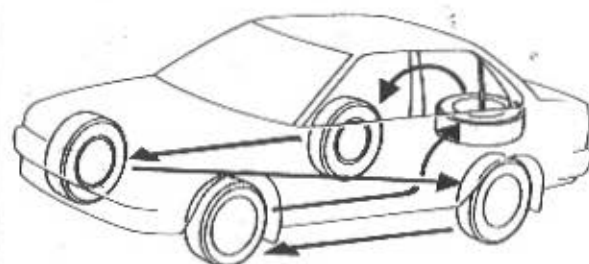
• 4 wheels (excl. spare tire)



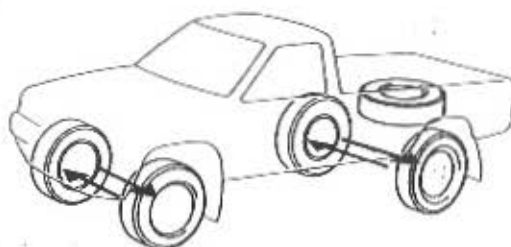
• 5 wheels (incl. spare tire)



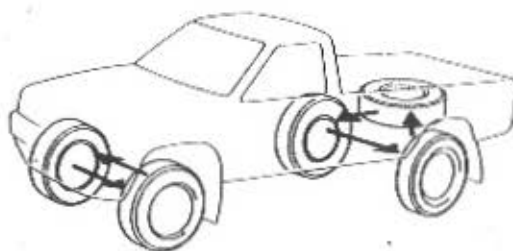
• 4 wheels (excl. spare tire)



• 5 wheels (incl. spare tire)



• 4 wheels (excl. spare tire)



• 5 wheels (incl. spare tire)

Bias-ply tires

(Front and rear tires with the same size and ply rating)

The tires can be cross-changed.

YOU

THE DRIVER'S PHYSICAL CONDITION

It is not enough to have a vehicle in good condition to ensure safety in driving. As a driver you must be physically, emotionally, and mentally fit to operate your vehicle on the road. This is vital to safe driving.

Vision

A driver must see quickly, clearly, and accurately. Ninety percent of decisions made while driving are based on what driver sees. If the eyes do not see properly, it can be corrected by using corrective lenses.

Sense of Smell

By smelling, you can tell the presence of gas that may be coming out of your car. Symptoms of carbon monoxide poisoning may result in drowsiness, headaches, nausea, or mental dullness that impair your driving ability.

Sense of Hearing

A driver who has impaired hearing may not hear important sounds like police vehicles, sirens of fire engines, and horns of other drivers wishing to pass.

Sense of Touch

Proper hand and feet coordination helps control the vehicle while in motion. Sensitivity to the important parts of the car such as the brakes, steering system, accelerator, lights and signals through your sense of touch enables you to determine any incoming failure that may surprise you and other drivers to an emergency.

Emotions

Emotions affect driving performance. Failure to control the emotions may lead to driving errors. Anger impairs the performance of smooth braking and accelerating due to changes in some body function such as increase heartbeats. Anxiety, on the other hand, may lead to panic decisions.

Fatigue is the most common condition that lowers a driver's fitness. Caused by lack of sleep, excessive physical exercise, or mental and emotional stress. Fatigue dulls the mind and slows down nerves and muscular response.

As a good driver, you must learn to cope with all these emotions to perform the driving task safely and effectively.

GAS / FUEL SYSTEM

FUEL FILTER

NECESSITY FOR MAINTENANCE

The gasoline in the fuel tank can contain a considerable amount of dirt and water which, if passed through the carburetor or the injectors, will clog and cause the engine to malfunction.

In diesel engines, too, dirt or moisture can get mixed into the diesel fuel. If this dirt or moisture passes as is through the injection pump or injection nozzles, it could cause

clogging, wear or seizing of precision parts.

The fuel filter separates the impurities from the fuel and prevents the above-mentioned problems.

However, if impurities accumulate in the fuel filter, the filter performance of the filter will drop. For these reasons, the fuel filter must be replaced periodically.

REPLACEMENT OF FUEL FILTER (Carburetted Engine)

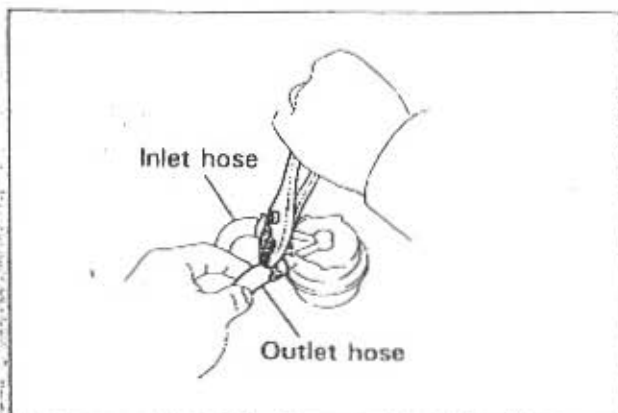
1. OPEN FUEL TANK CAP

Remove the fuel tank cap to release the fuel vapor.

2. PLACE CONTAINER UNDER FUEL FILTER

3. REMOVE FUEL FILTER

(a) Grip the clamp with pliers and move it away from the filter pipe.



FUEL TANK CAP, FUEL LINES, CONNECTIONS AND FUEL VAPOR CONTROL VALVE

NECESSITY FOR MAINTENANCE

The fuel tank is filled with fuel-vapor. If the fuel tank cap is poorly closed, the fuel or fuel vapor could leak out, causing air pollution.

If the vacuum check valve in the fuel tank cap is not operating normally, a strong vacuum pressure will develop, possibly causing deformation or cracking of the fuel tank.

Fuel flows through the fuel line. If the fuel line becomes damaged, it could cause fuel to leak out.

The fuel vapor control valve works to maintain the pressure of the fuel vapor within a constant range. If the fuel vapor control valve is not operating normally, the fuel vapor will escape into the surrounding atmosphere, causing air pollution.

For these reasons, these parts must be inspected periodically.

In the U.S. and Canada, the fuel tank cap gasket must also be replaced periodically.

IDLE SPEED, FAST IDLE SPEED AND IDLE MIXTURE

NECESSITY FOR MAINTENANCE

The engine's idle speed, fast idle speed and idle mixture have the following influences on the vehicle.

Idle speed:

- If the idle speed is too high, automatic transmission shift shock will be great when the transmission is initially shifted (from N to D).
- If the idle speed is too high, fuel consumption will be high.
- If the idle speed is too low, the engine will stall easily when the vehicle starts moving.
- If the idle speed is too low, there will be a lot of vibration during idling.

Fast idle speed:

- Period until the engine is warming up

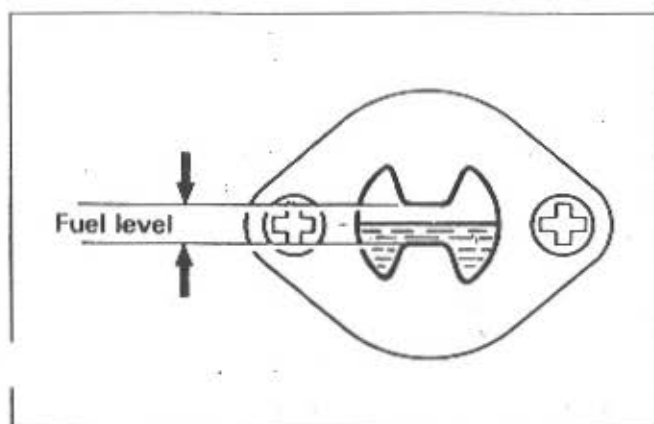
- Drivability while the engine is warming up
- Fuel consumption
- Automatic transmission shift shock during initial shifting while the engine is warming up

Idle mixture:

- Concentration of CO (Carbon monoxide) in exhaust gases
- Engine vibration during idling
- Fuel consumption

For these reasons the idle speed, fast idle speed and idle mixture must be adjusted periodically.

In engines where the idle mixture adjusting screw is sealed, maintenance of the idle mixture is unnecessary.



ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE (4A-F, Non-sealed Idle Mixture Adjusting Screw)

IMPORTANT !

Adjustment of the idle speed and idle mixture should be done under the following conditions.

- Air cleaner installed
- Normal operating coolant temperature
- Choke valve fully open
- All accessories switched off
- All vacuum lines connected
- Ignition timing set correctly
- Automatic transmission in P range
- Fuel level about even with correct level in carburetor sight glass

FUEL FEED PUMP FILTER (Diesel Engine, In-line Injection Pump)

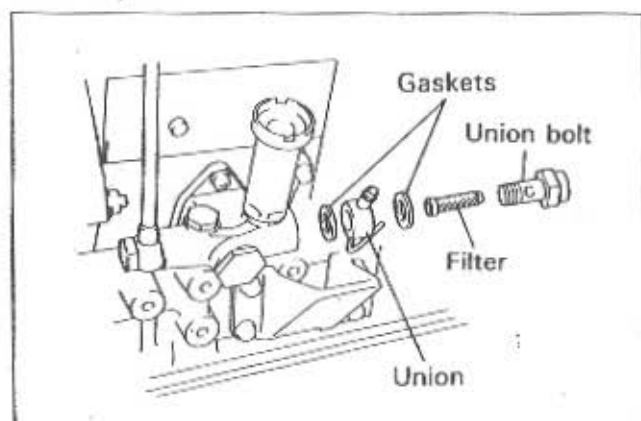
NECESSITY FOR MAINTENANCE

The fuel feed pump is mounted on the side of the fuel injection pump. This pump sends fuel from the fuel tank to the fuel filter under pressure.

The fuel feed pump filter is built in the fuel inlet union bolt of the feed pump and acts to

remove large foreign particles mixed into the fuel as it comes from the fuel tank.

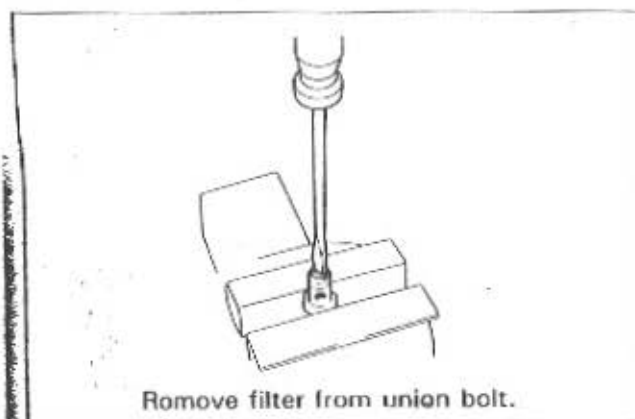
However, since there is a possibility of the feed pump filter becoming clogged with accumulated foreign matter during use, the feed pump filter must be inspected periodically.



INSPECTION OF FUEL FEED PUMP FILTER

1. PLACE CONTAINER UNDER INJECTION PUMP
2. REMOVE FEED PUMP FILTER

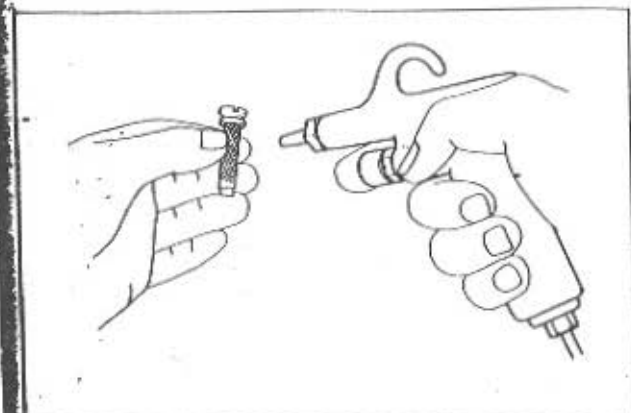
(a) Remove the fuel inlet union bolt and two gaskets from the feed pump.



(b) Using a vise, fix the union bolt, then loosen and remove the filter from the union bolt.

3. CLEAN FEED PUMP FILTER

- (a) Clean the filter and the union bolt inside with clean fuel.
- (b) Using compressed air, blow out the fuel from the filter and union bolt.
- (c) Check the filter for damage.



DIESEL SMOKE (Diesel Engine)

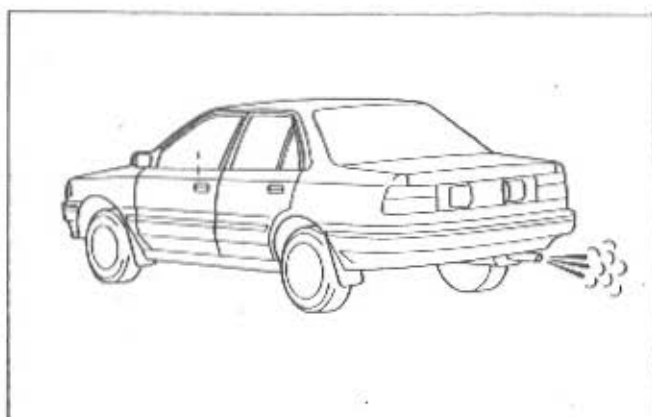
NECESSITY FOR MAINTENANCE

The volume of hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx) in the exhaust gases of diesel engines is so low as to not pose a problem as compared to gasoline engines.

However, there are a lot of extremely small carbon particles in diesel smoke, and if a lot of smoke is emitted, it obstructs vision and

makes people uncomfortable.

In addition, by inspecting the exhaust smoke, the fuel combustion conditions can be ascertained to a certain extent and engine troubles can be detected before they become serious. For these reasons, the smoke of diesel engines must be checked periodically.



CHECKING DIESEL SMOKE

1. WARM UP ENGINE

2. CHECK DIESEL SMOKE

Check if the color of the diesel smoke is abnormal while the engine is idling and while it is racing. It is difficult to judge if the condition is good or bad, so it is necessary to gain experience through comparisons with other vehicles, etc.

In cases where judgment is especially difficult, ask an expert.

REFERENCE

Emission of Black Smoke

- One explanation of the mechanism for emission of black smoke is that fine fuel particles are injected from the injection nozzles when there is insufficient oxygen. These particles are exposed to high temperatures and baked in the combustion chambers, changing to carbon soot, then are exhausted from the tail pipe.
- When the engine is running under a heavy load, excess fuel is injected so that the air introduced into the engine is completely used and this results in the emission of slightly more black smoke. However, this does not indicate any trouble.
- When the engine is racing, carbon soot which has built up in the exhaust pipe may be exhausted from the tail pipe as diesel smoke.

In some cases, where a lot of carbon soot has accumulated in the exhaust pipe, the emission of black smoke may not be totally eliminated even by racing the engine 20 or 30 times.

Emission of White Smoke

- One explanation of the mechanism for emission of white smoke is that, when the temperature of the compressed air is too low, the fuel injected from the injection nozzles is vaporized but not completely burnt, and is emitted as is from the tail pipe.
- Another explanation could be that engine oil is burnt in the combustion chamber, which would then cause white smoke to be exhausted from the tail pipe.

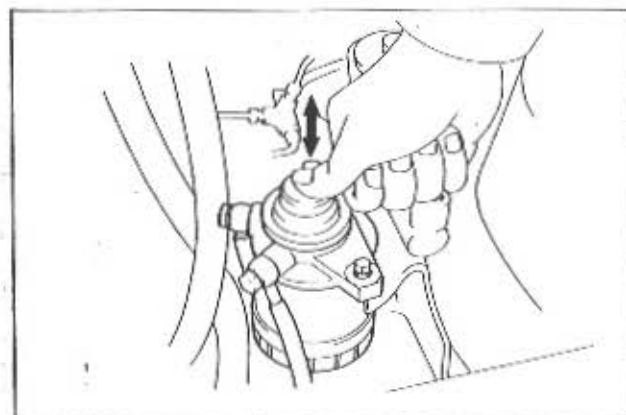
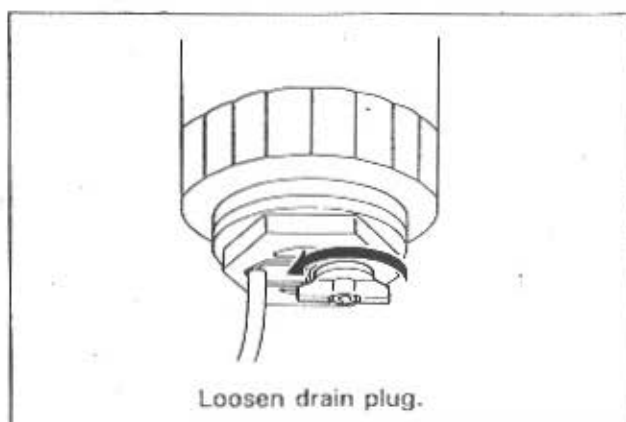
WATER SEDIMENTER (Diesel Engine)

NECESSITY FOR MAINTENANCE

No matter how small the amount of diesel fuel in the fuel tank, there is some moisture present. The water separator is mounted between the fuel tank and fuel filter or underneath the fuel filter. When fuel passes through it, the water, which has a higher specific gravity than the fuel, collects in the bottom of the water separator. However, if the

amount of water in the water separator exceeds the capacity of the water separator, the moisture in the fuel will flow as is through the injection pump and injection nozzles, causing accelerated wear or seizing of the pump and nozzles.

For this reason the water must be removed from the water separator periodically.



DRAINING OF WATER SEDIMENTER (Water Separator Integrated with Fuel Filter)

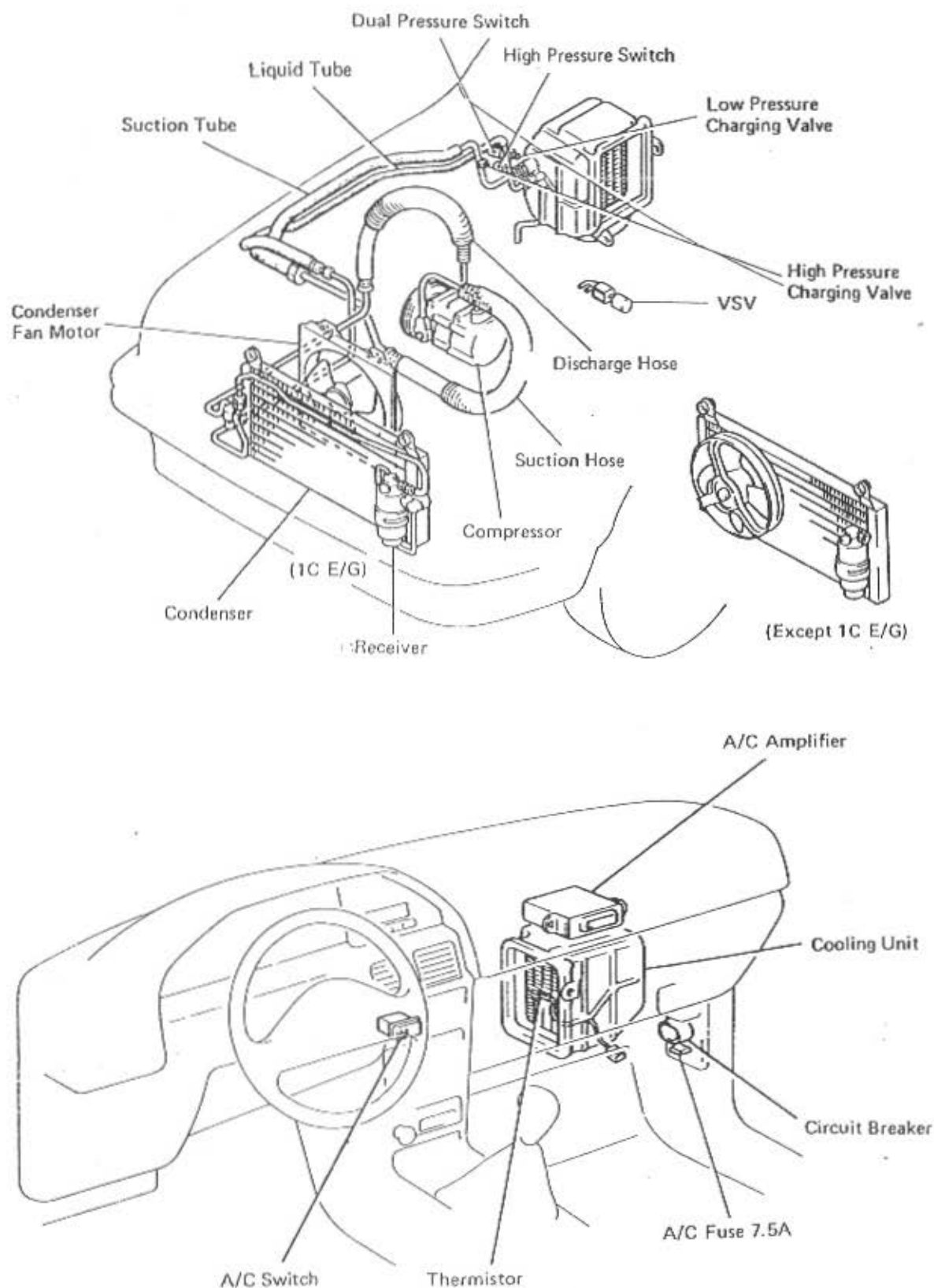
1. PLACE CONTAINER UNDER FUEL FILTER
2. DRAIN WATER FROM FUEL FILTER
 - (a) Turn the drain plug counterclockwise about 2 turns.
 - (b) Operate the priming pump until fuel begins to run out.

3. RETIGHTEN DRAIN PLUG
4. CHECK FOR FUEL LEAKAGE

Start the engine and check for fuel leakage from the fuel filter drain plug.

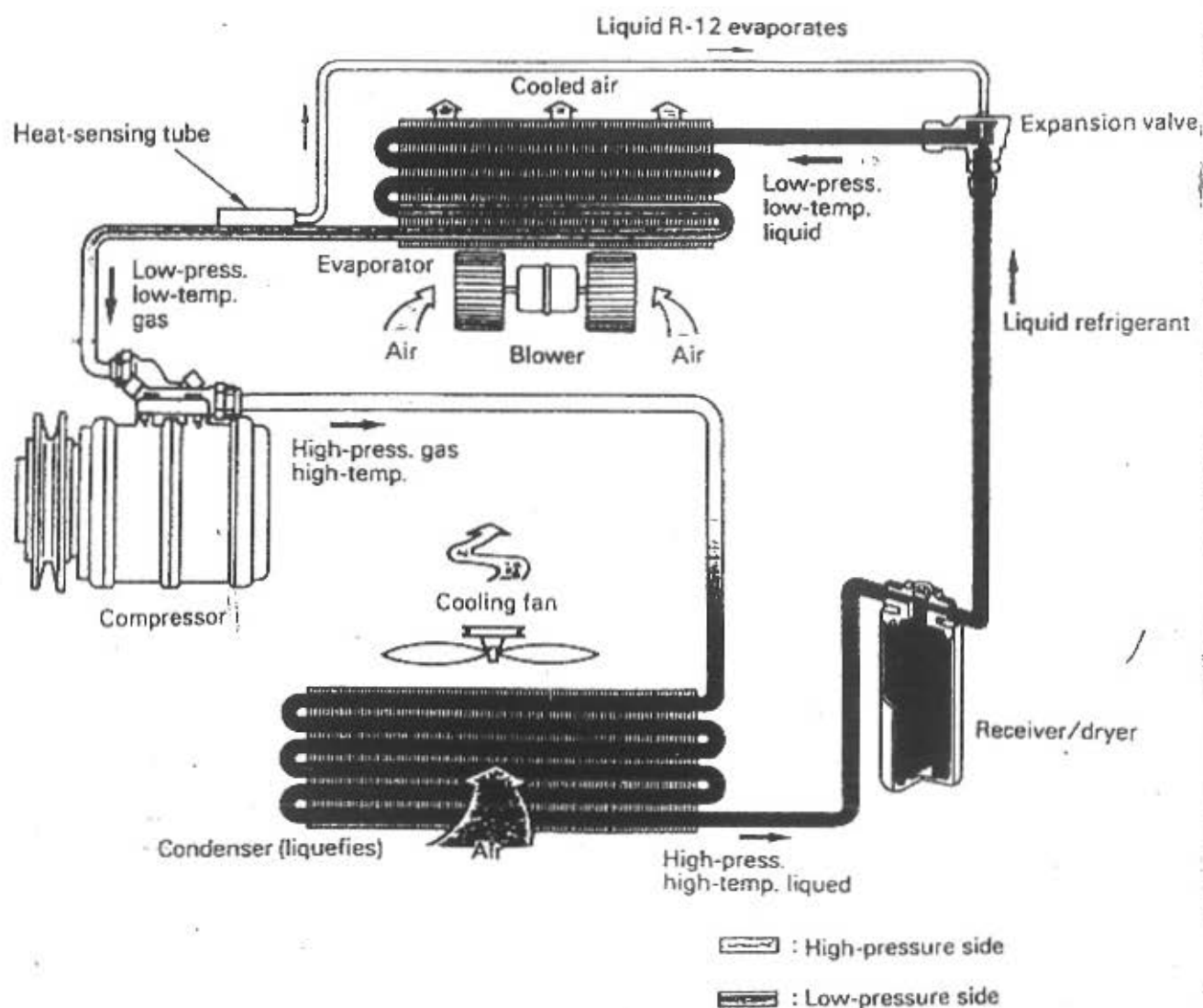
AIR-CON SYSTEM

SYSTEM COMPONENTS



REFRIGERATION CYCLE

- ① The compressor discharges high-temperature, high-pressure refrigerant that contains the heat absorbed from the evaporator plus the heat created by the compressor in the discharge stroke.
- ② This gaseous refrigerant flows into the condenser. In the condenser, the gaseous refrigerant condenses into liquid refrigerant.
- ③ This liquid refrigerant flows into the receiver, which stores and filters the liquid refrigerant until the evaporator requires the refrigerant.
- ④ The expansion valve changes the liquid refrigerant into low-temperature, low-pressure liquid/gaseous mixture.
- ⑤ This cold liquid/gas refrigerant flows to the evaporator. Vaporizing the liquid in the evaporator, the heat from the warm air stream passing through the evaporator core is transferred to the refrigerant. All the liquid changes into the gaseous refrigerant in the evaporator and only heat-laden gaseous refrigerant goes into the compressor. Then the process is repeated again.



TROUBLESHOOTING CHART

(A) Blower motor does not operate

Possible cause	Inspection	Remedy
1. Blown fuse.	Inspect the fuse/wiring.	Replace fuse/repair wiring.
2. Broken wiring or bad connection.	Check the fan motor ground and connectors.	Repair the wiring or connector.
3. Fan motor malfunction.	Check the lead wires from the motor with a circuit tester.	Replace.
4. Broken resistor wiring.	Check resistor using a circuit tester.	Replace.
5. Fan motor switch malfunction.	Operate the fan switches in sequence and check whether the fan operates.	Replace.

(B) Blower motor operates normally, but air flow is insufficient

Possible cause	Inspection	Remedy
1. Evaporator inlet obstruction.	Check the inlet.	Remove the obstruction and clean.
2. Air leak.	Check the cooling unit case joints.	Repair or adjust.
3. Defective thermo switch, (frozen evap.).	Check the switch using a circuit tester.	Replace.

(C) Insufficient cooling although air flow and compressor operation are normal

Possible cause	Inspection	Remedy
1. Insufficient refrigerant.	There will be little temperature difference between the low and high-pressure sides.	Repair any leaks and recharge the refrigerant to the correct level.
2. Excessive refrigerant.	Verify by gauge reading.	Utilize your refrigerant recovery equipment to capture excess refrigerant. Charge to the correct refrigerant level.

(D) The compressor does not operate at all, or operates improperly

Possible cause	Inspection	Remedy
1. Loose drive belt.	The belt oscillates considerably.	Adjust the tension.
2. Internal compressor malfunction.	The drive belt slips.	Replace compressor.
• Magnetic clutch related		
3. Low battery voltage.	Clutch slips.	Recharge the battery.
4. Faulty coil.	Clutch slips.	Replace the magnetic clutch.
5. Oil on the clutch surface.	The magnetic clutch face is dirty, causing it to slip.	Replace, or clean the clutch surface.
6. Excessive clearance between the clutch plate and clutch disk. The clutch plate clings when pushed.	Check clutch gap according to specifications.	Adjust the clearance, or replace the clutch.
7. Open coil.	Clutch does not engage and there is no reading when a circuit tester is connected between the coil terminals.	Replace.
8. Broken wiring or poor ground.	Clutch will not engage at all. Inspect the ground and connections.	Repair.
9. Wiring harness components.	Test the conductance of the pressure switch, thermoswitch, relay, etc.	Check operation, referring to the wiring diagram, and replace defective parts.

SUSPENSION SYSTEM

FRONT AND REAR SUSPENSIONS

NECESSITY FOR MAINTENANCE

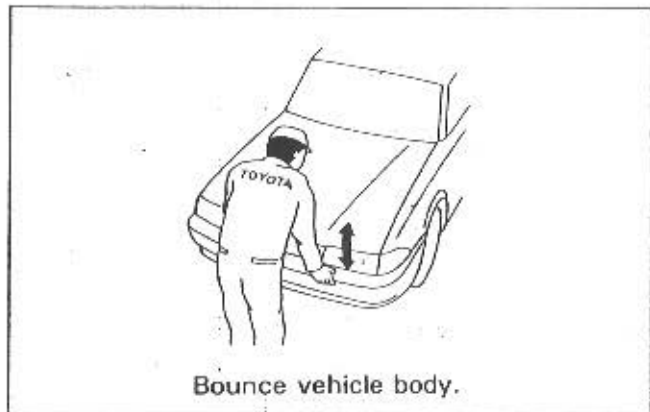
The front and rear suspensions consist of springs, shock absorbers, arms and rods, etc., which support the vehicle body on the axles. They act to absorb road shock, making the ride more comfortable.

They respond to the variations in the road surface to keep the wheels in contact with the road. The front suspension in particular, together with

the steering system has a great influence on steering stability.

If the front and rear suspension systems are not operating properly, riding comfort, controllability and stability will suffer.

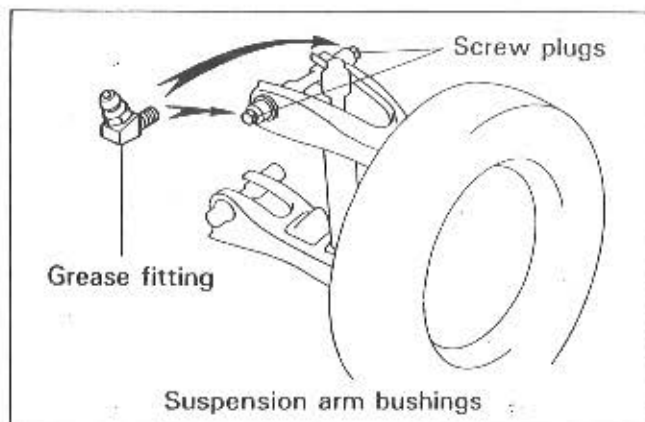
Therefore, it is necessary to check the front and rear suspension systems periodically.



INSPECTION OF FRONT AND REAR SUSPENSIONS

CHECK DAMPING PERFORMANCE OF SHOCK ABSORBERS

- Bounce the front end of the vehicle and check that the bound and rebound action is quickly damped.
- Do the same for the rear end of the vehicle.



GREASING OF SUSPENSION PARTS

Since the procedure for greasing of suspension parts is the same as that for greasing the steering linkage and king pin, refer to *steering system*.

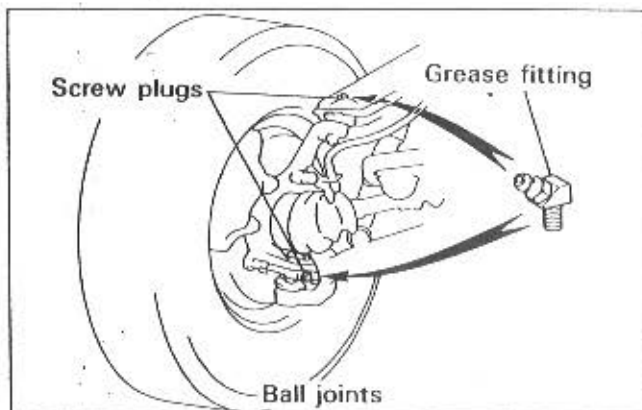
Recommended grease:

Suspension parts ex. ball joint

Lithium base chassis grease, NLGI No.2

Ball joint

Molybdenum disulfide lithium base chassis grease, NLGI No.2



BALL JOINTS AND DUST COVERS

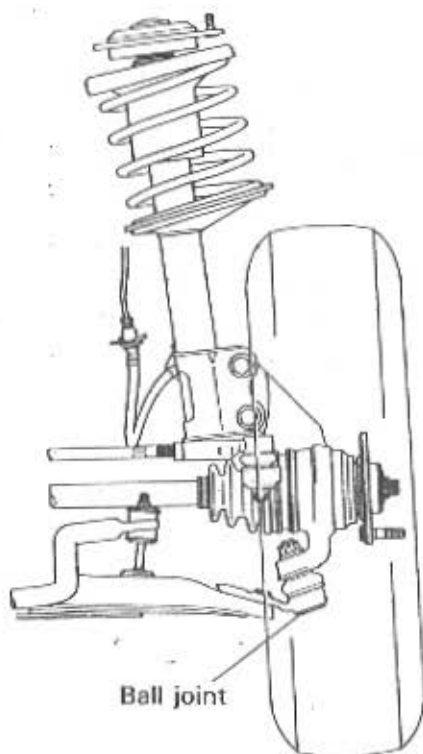
NECESSITY FOR MAINTENANCE

In Macpherson strut type and wishbone type suspensions, the steering knuckle and suspension arms are connected by ball joints. These ball joints are lubricated with grease and covered with dust covers to prevent the grease from leaking and keep water and mud from penetrating.

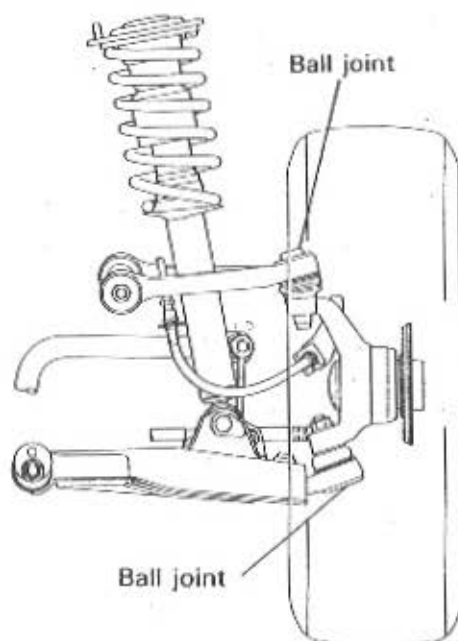
These parts allow the steering knuckle to move freely up and down as well as to rotate.

If there is a large amount of looseness in the ball joints, it could generate abnormal noise and cause instability during driving.

It is therefore necessary to check the ball joints and dust covers periodically.



**MACPHERSON STRUT TYPE SUSPENSION
(COROLLA)**



**WISHBONE TYPE SUSPENSION
(TOYOTA SUPRA)**



INSPECTION OF BALL JOINTS AND DUST COVERS

1. INSPECT BALL JOINTS FOR VERTICAL PLAY (Macpherson Strut Type Suspension, Corolla)

- (a) Jack up the front of the vehicle and place a wooden block with a height of 180 — 200 mm (7.09 — 7.87 in.) under one front tire.

STEERING SYSTEM

STEERING WHEEL, STEERING LINKAGE AND STEERING GEAR BOX OIL

NECESSITY FOR MAINTENANCE

The steering system consists of the steering wheel, steering main shaft, gear housing, linkage, and other components connected by flexible couplings, ball joints, etc.

The steering wheel must turn smoothly and the front wheels must turn in accordance with the rotations of the steering wheel.

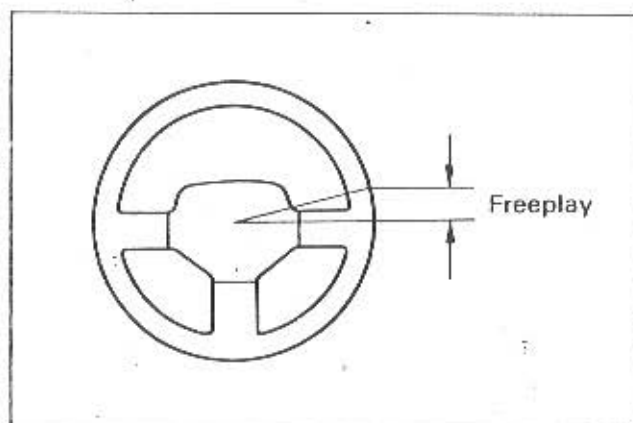
If the steering system is used for a long period of time, the joints in the steering linkage, gears in the gear housing and bearings, etc. become worn, making it possible for steering and vehicle

handling to become unstable.

In addition, a specified level of oil is maintained inside the steering gear housing (in the manual recirculating ball type steering system) to lubricate the gears and bearings.

If this oil is leaking from the gear housing, the steering operation becomes heavy and steering cannot be carried out smoothly.

Therefore, it is necessary to check the steering wheel, steering linkage and steering gear oil periodically.



INSPECTION OF STEERING WHEEL

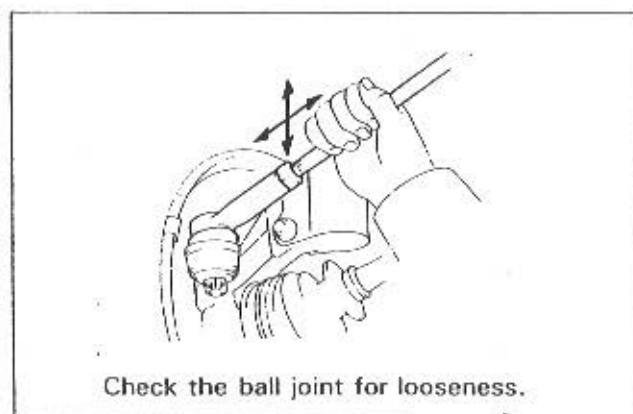
1. POSITION FRONT WHEELS STRAIGHT AHEAD
2. CHECK STEERING WHEEL FREEPLAY

With your fingers, lightly move the steering wheel left and right until it meets resistance.

Measure the movement on the outside circumference of the steering wheel with a ruler.

Maximum steering wheel freeplay:

30 mm (1.18 in.)



INSPECTION OF STEERING LINKAGE

1. CHECK STEERING LINKAGE FOR LOOSENESS

Check the ball joints of the linkage for looseness by rocking them in the vertical and axial directions.

IMPORTANT !

Linkage looseness can be checked more accurately in the following manner:

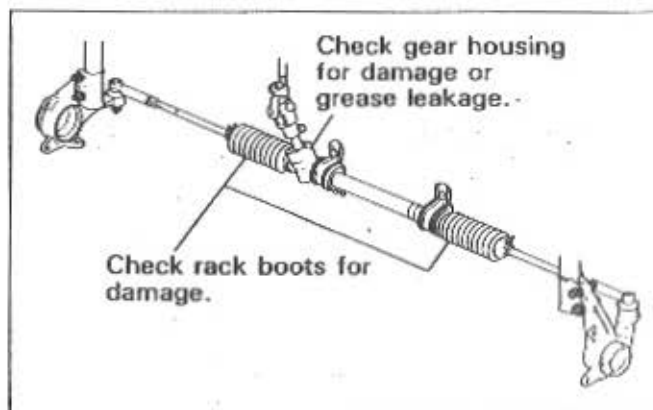
With the vehicle's weight placed on the front wheels, ask someone to turn the steering wheel left and right approximately 30° and observe the motion of the front wheels.

The motion of the front wheels should coincide with that of the linkage with no delay.



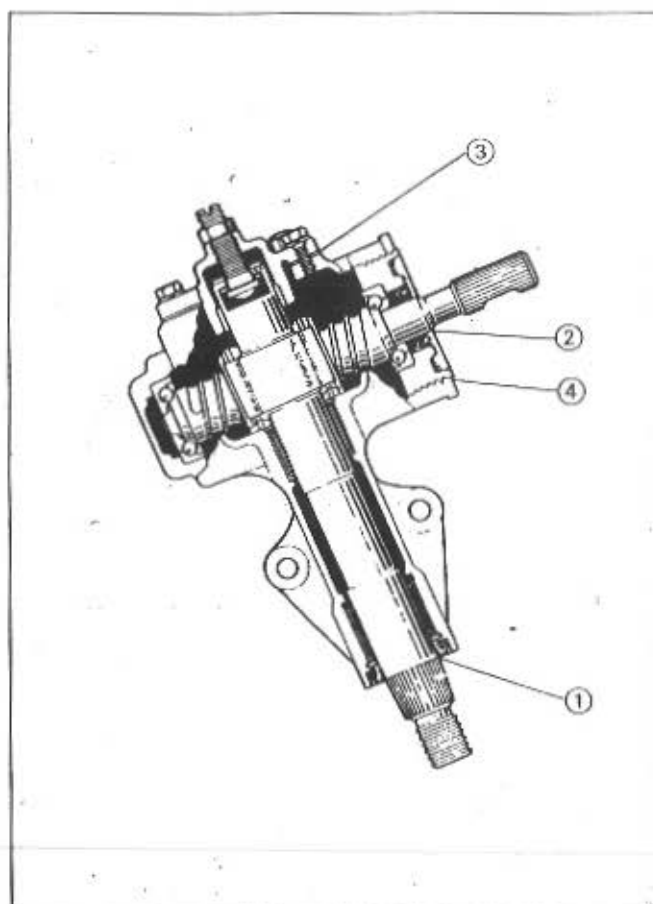
2. CHECK EACH COMPONENT OF LINKAGE FOR DAMAGE

- Visually check the rods and arms for damage or bending.
- In particular, carefully inspect the dust boots of the ball joints for cracks or damage both visually and by hand.



3. CHECK GEAR HOUSING FOR GREASE LEAKAGE AND DAMAGE (Manual Rack and Pinion Type)

To check the rack boots, turn the steering wheel as far as possible to the right or left, then carefully check them visually or by hand.



INSPECTION OF STEERING GEAR BOX OIL (Recirculating Ball Type)

CHECK STEERING GEAR HOUSING FOR OIL LEAKAGE

Check visually and by hand for leakage of oil from the following points in particular.

- Sector shaft oil seal
- Worm shaft oil seal
- Sector shaft end cover
- Worm bearing adjusting screw or end cover

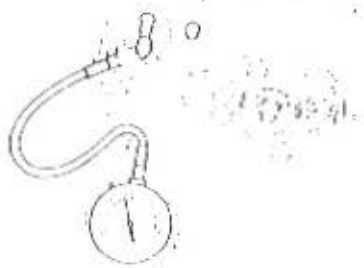
FRONT WHEEL ALIGNMENT (SIDE SLIP)

NECESSITY FOR MAINTENANCE

Front wheel alignment is the installation angle and position of the front wheels with respect to the body and related parts and is determined by 5 factors; camber, caster, steering axis (king-pin) inclination, toe angle and turning radius. Front wheel alignment has a great influence on the vehicle's controllability and on the durability of the parts related to front wheel alignment. If the front wheel alignment is not correct, it is

possible that the vehicle could vibrate or that the tires could wear abnormally, etc.

It is therefore necessary to check the front wheel alignment periodically. However, if there is no abnormal tire wear or steering wheel vibration during driving, or if there is no vehicle vibration, etc., the front wheel side slip should be checked as an index of front wheel alignment.



Check the tire inflation pressure.

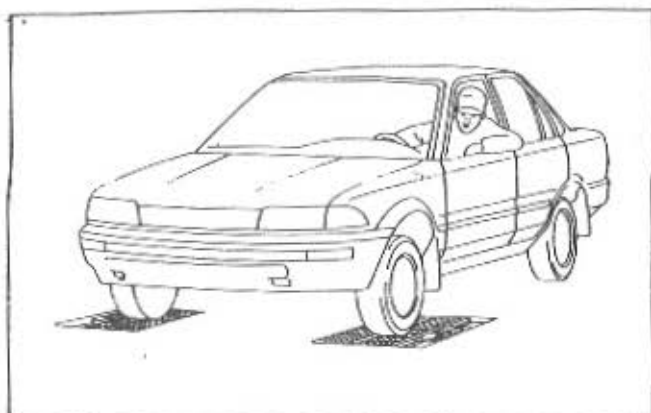


Conduct a shock absorber bounce test by rocking the bumper.

INSPECTION OF SIDE SLIP

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

- (a) Check the tires for wear, size and proper inflation.
- (b) Check the wheel bearings for looseness.
- (c) Check the wheel runout.
Lateral runout: Less than 1.0 mm (0.039 in.)
- (d) Check the suspension for looseness.
- (e) Check the steering linkage for looseness.
- (f) Check that the absorbers function properly by using the standard bounce test.
- (g) Check that the chassis ground clearance (of suspension springs and suspension parts) is not abnormal.



2. MEASURE SIDE SLIP OF FRONT WHEELS

Drive the vehicle onto the side slip tester slowly and straight forward.

Read the side slip indication as the wheels cross over the tester.

Side slip limit:

Less than 3.0 mm/m (0.118 in./3.3 ft)

If the side slip exceeds the limit, the toe-in or other front wheel alignment may not be correct. Do not stop while the front wheels are on the tester.

If using a portable side slip tester, place a wooden block having the same height as the tester under the rear wheels in order to keep the vehicle level.

3. IF VEHICLE HAS INDEPENDENT REAR SUSPENSION, MEASURE SIDE SLIP OF REAR WHEELS

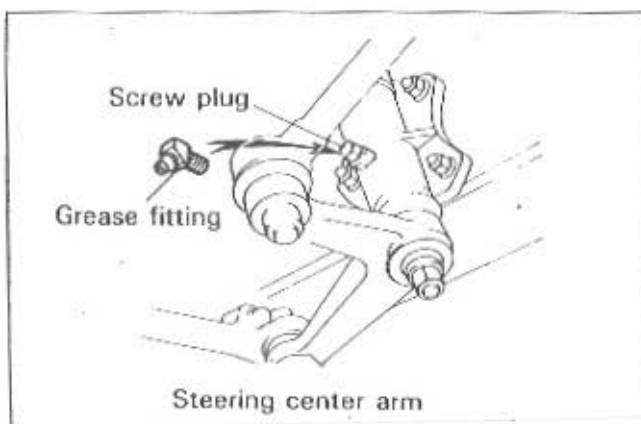
GREASING OF STEERING LINKAGE, KING PIN AND STEERING KNUCKLE

NECESSITY FOR MAINTENANCE

The steering linkage ball joints and king pin, etc. are lubricated with grease. Even if the front wheels move up and down during driving, these parts allow the steering wheel's movements to be transmitted smoothly to the front wheels. However, the properties of this lubricating

grease deteriorate over time with use, making turning of the steering wheel heavy and accelerating the wear of sliding parts.

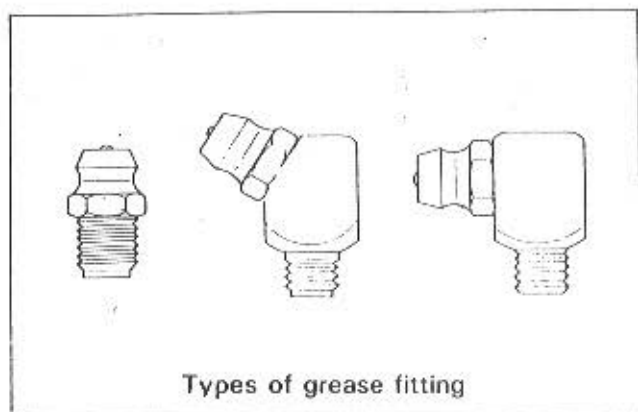
Therefore, it is necessary to grease the steering linkage, king pin and steering knuckle periodically.



GREASING OF STEERING LINKAGE AND KING PIN

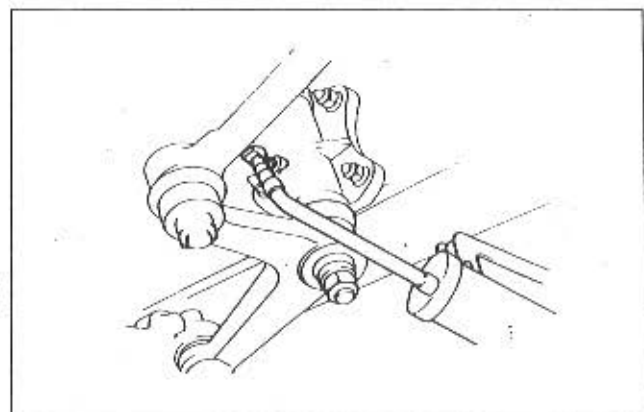
1. WIPE OFF ANY MUD AND DUST ON GREASE FITTINGS

If the screw plug is fitted, replace it with a standard grease fitting.



IMPORTANT !

- There are various shapes and sizes of grease fitting, so select the appropriate fitting and install it.
- Be sure to save the screw plug for reinstallation.



2. PUMP GREASE INTO EACH FITTING

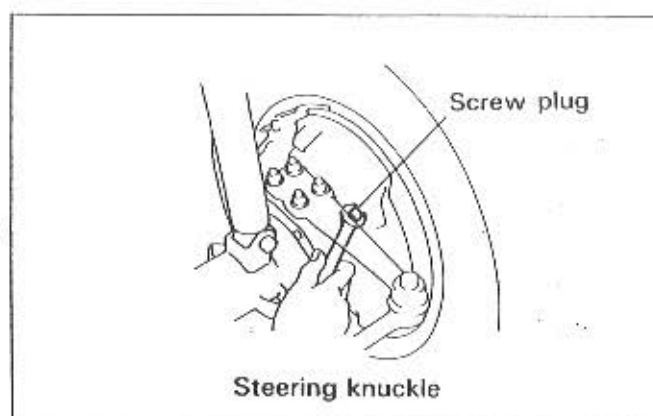
With a grease gun, pump grease into each fitting. Continue pumping until fresh grease appears from the grease outlet.

Recommended grease:

Lithium base chassis grease, NLGI No.2

3. WIPE OFF OOZING GREASE

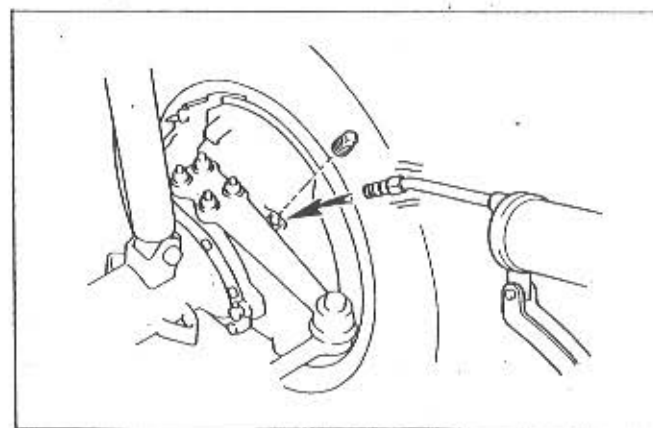
Wipe off any grease oozing out around the joint. If the grease fitting has been installed temporarily, replace it with the original screw plug.



GREASING OF STEERING KNUCKLE (Rigid Axle 4WD)

1. REMOVE STEERING KNUCKLE SCREW PLUG

Wipe off any mud and dust around the steering knuckle screw plug, then remove the screw plug.



2. PUMP GREASE INTO STEERING KNUCKLE

Recommended grease:

Molybdenum disulfide lithium base chassis grease, NLGI No.2

3. REINSTALL SCREW PLUG

WHEEL BEARING GREASE

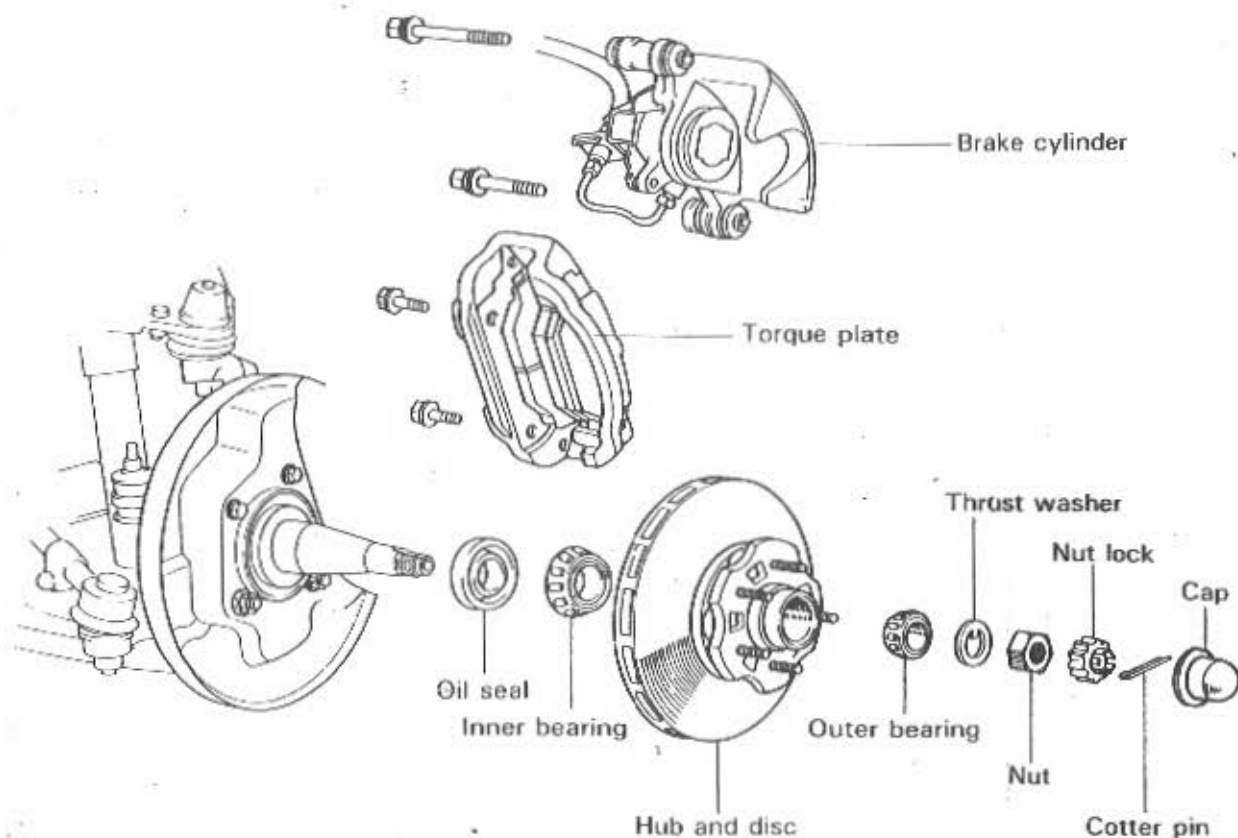
NECESSITY FOR MAINTENANCE

A vehicle's wheels are mounted on the axles via wheel bearings, which turn as they hold the vehicle. Wheel bearings are lubricated with grease, which helps the wheels to turn smoothly. (The bearings on the semi-floating (3/4) type rear axle shaft used on some commercial vehicles are lubricated with differential oil.) However, as the vehicle is used, this grease gradually deteriorates. This could cause the

wheel bearings to generate abnormal noises as well as preventing the wheels from rotating smoothly.

Therefore, it is necessary to replace the wheel bearing grease periodically.

If angular ball bearings are used for wheel bearings, replacement of grease is unnecessary. Grease replacement is required only in cases where tapered roller bearings are used.



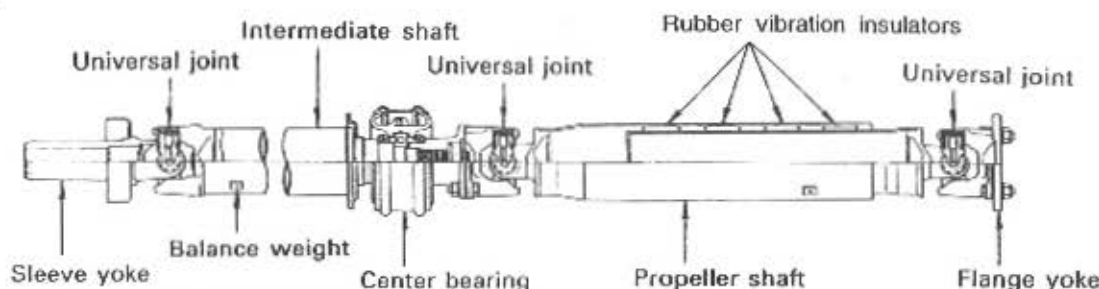
FRONT AXLE HUB (HILUX 2WD)

PROPELLER SHAFT

The propeller shaft is a lightweight hollow carbon steel tube which is strong enough to resist twisting and bending. Universal joint yokes are welded to both ends of this tube.

The propeller shaft is normally a single piece tube having two joints at both ends that form universal joints.

A two-piece, three-joint type propeller shaft is sometimes used incorporating a center bearing which is designed to reduce vibration and noise.



NECESSITY FOR MAINTENANCE

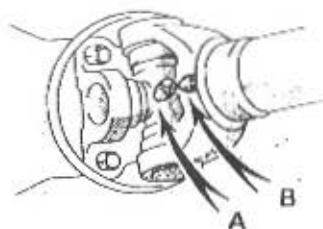
The joints in the propeller shaft and the sleeve yoke spline are lubricated with grease. They act to transmit the driving force from the transmission to the differential smoothly.

However, this grease deteriorates over time as the vehicle is used, and this could cause the propeller shaft joints and sleeve yoke spline to

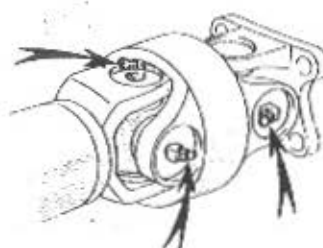
be inadequately lubricated.

If this happens, the propeller shaft joints and sleeve yoke spline become worn and it is possible that they could cause abnormal noise or vibration.

Therefore, it is necessary to grease the propeller shaft periodically.



A: Spider joint
B: Sleeve yoke



Double cardan joint

GREASING OF PROPELLER SHAFT

Since the procedure for greasing of the propeller shaft is the same as that for greasing the steering linkage, **Refer to figure shown.**

Recommended grease:

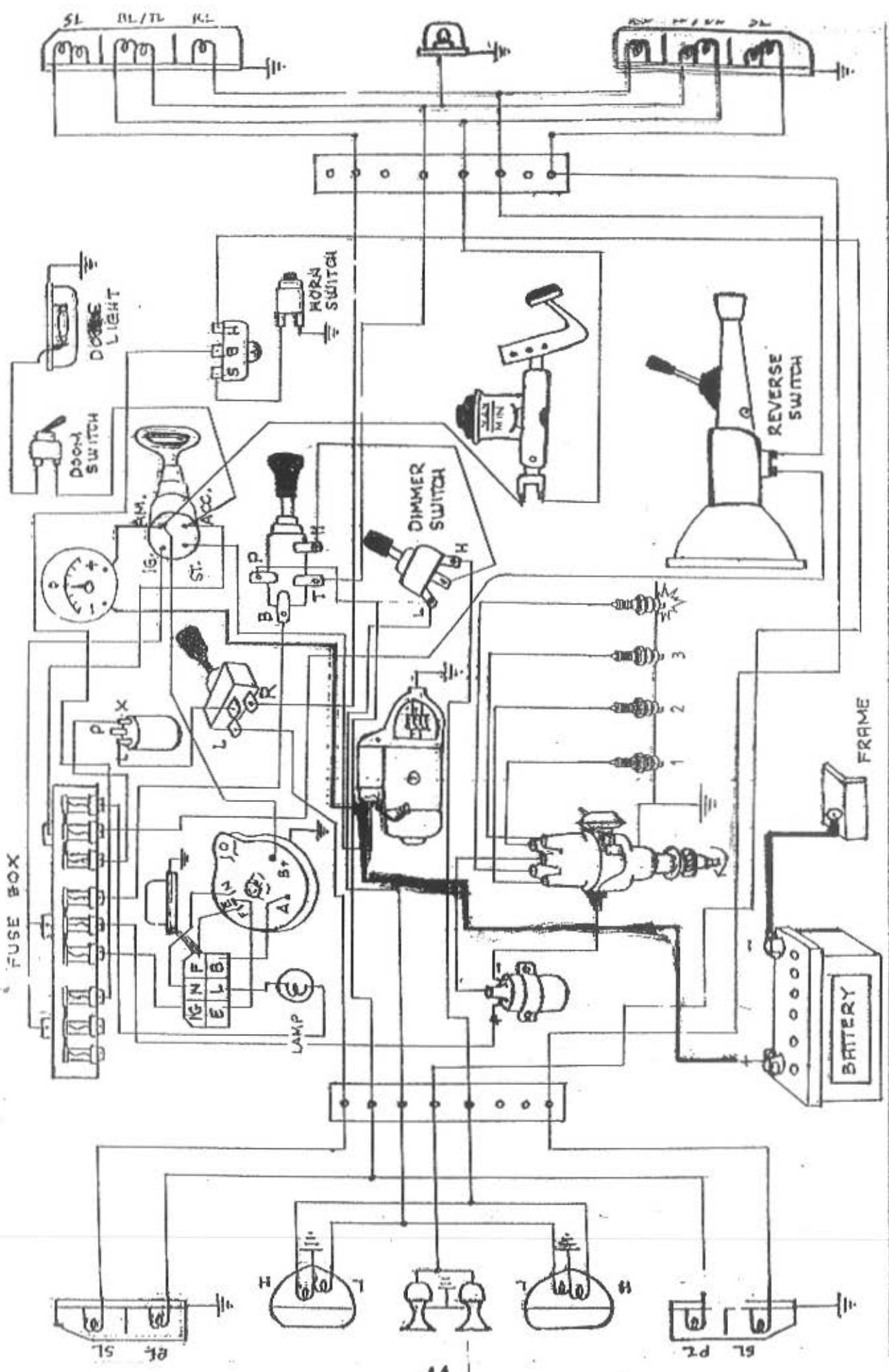
Spider joint and slide yoke

Lithium base chassis grease, NLGI No.2

Double cardan joint

Molybdenum disulfide lithium base chassis grease, NLGI No.2

ENGINE ELECTRICALS:

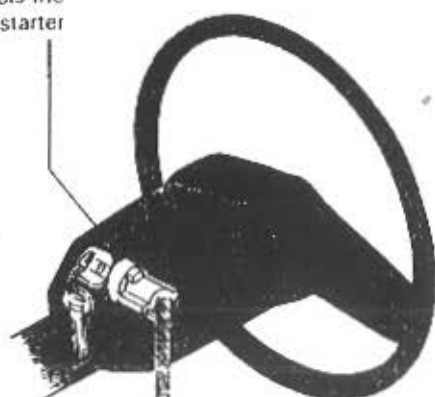
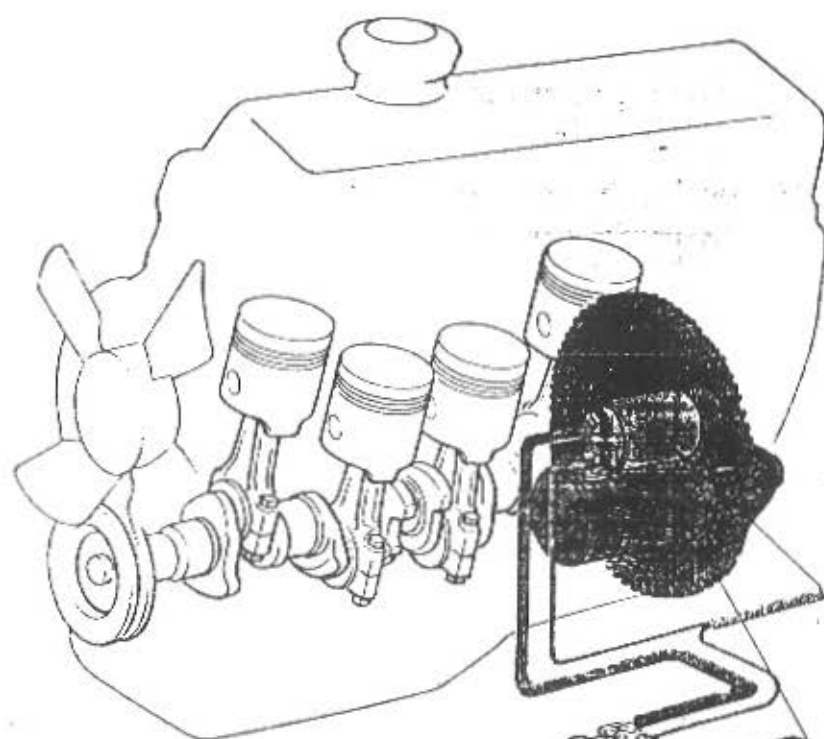


AUTOMOTIVE ENGINE and LIGHTING CIRCUITS

STARTING SYSTEM

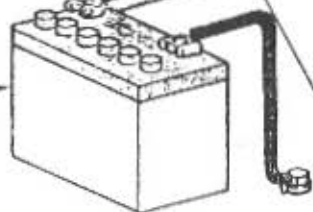
WHAT COMPRISES THE STARTING SYSTEM

THE IGNITION SWITCH controls the electric power supply to the starter motor.



THE SOLENOID SWITCH controlled by the ignition switch forces the starter pinion gear to engage with the flywheel ring gear and allows heavy current to flow to the starter motor from the battery.

THE BATTERY stores energy chemically and supplies electrical energy to the starter motor when the engine is started.



THE STARTER MOTOR operates to convert electrical energy into turning force; it turns the flywheel ring gear by the starter motor pinion gear.

(Actual wiring of the vehicle differs from the illustration)

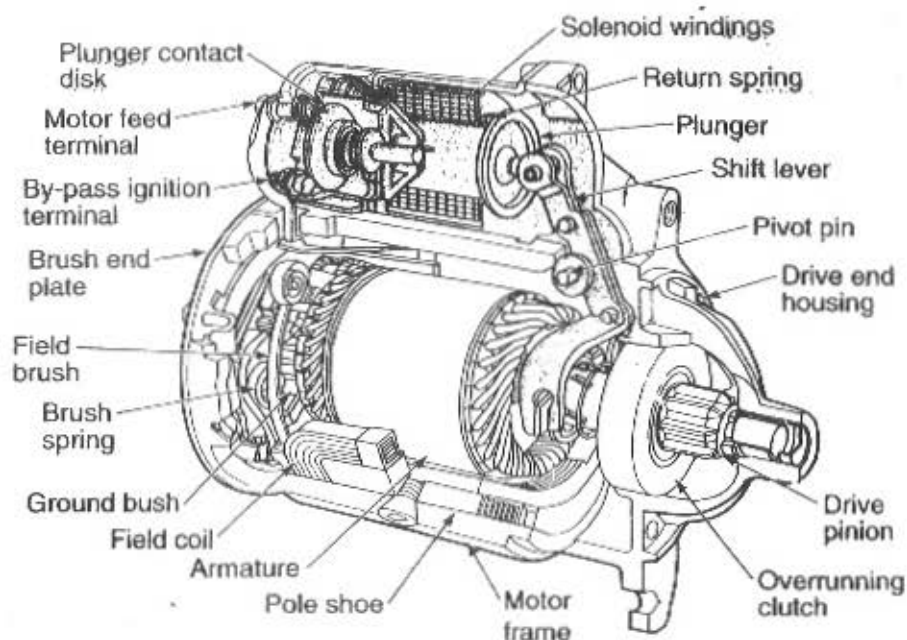


FIGURE 15-21 A solenoid-operated starter motor has the solenoid mounted directly to the motor.

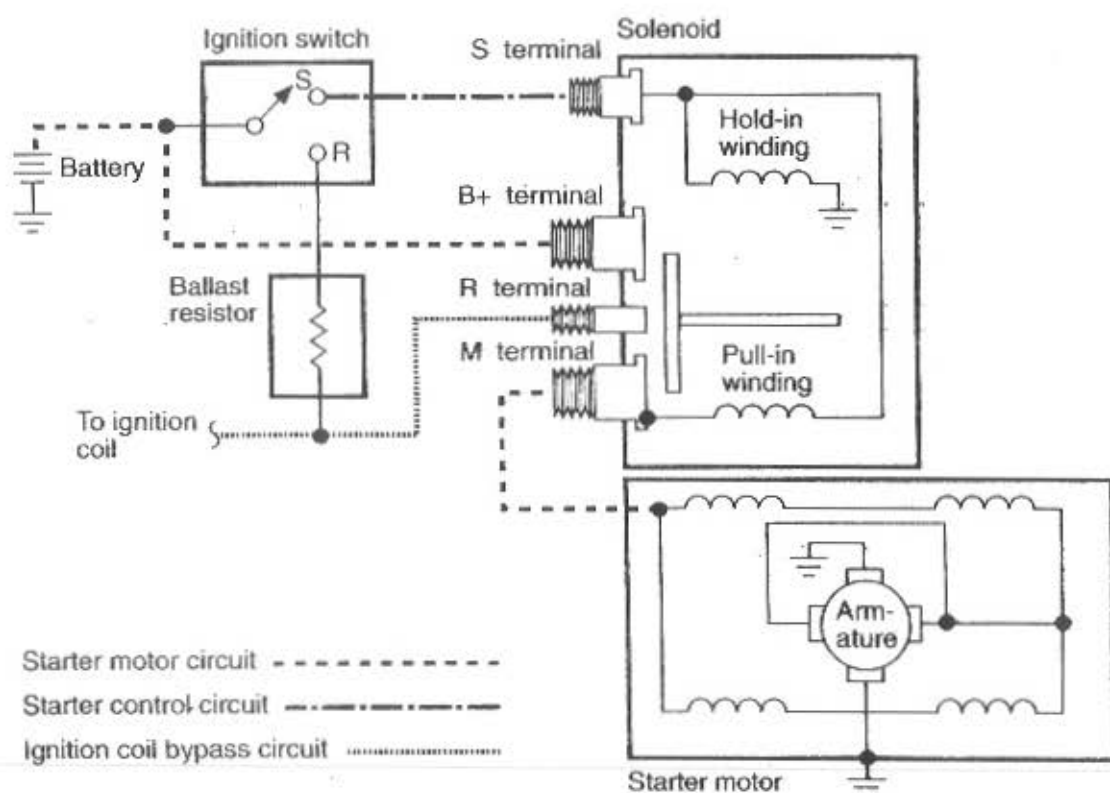
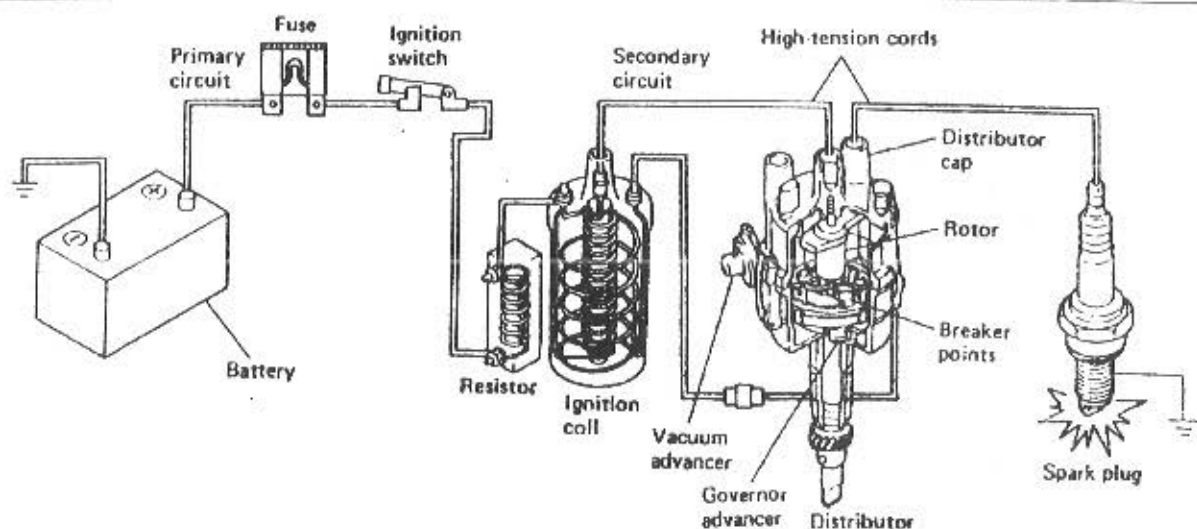


FIGURE 15-22 Schematic of a solenoid-operated starter motor circuit.

IGNITION SYSTEM

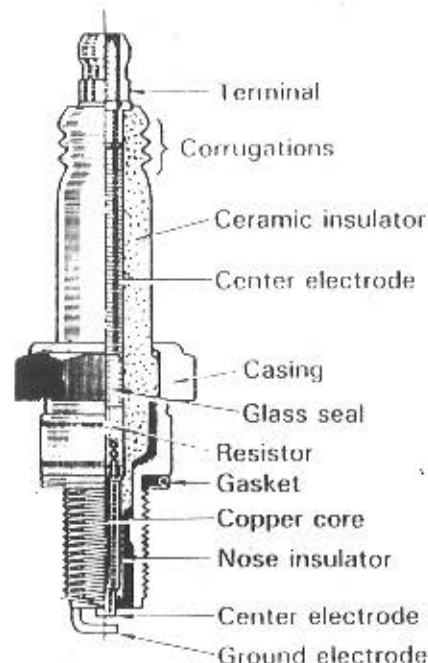


SPARK PLUGS

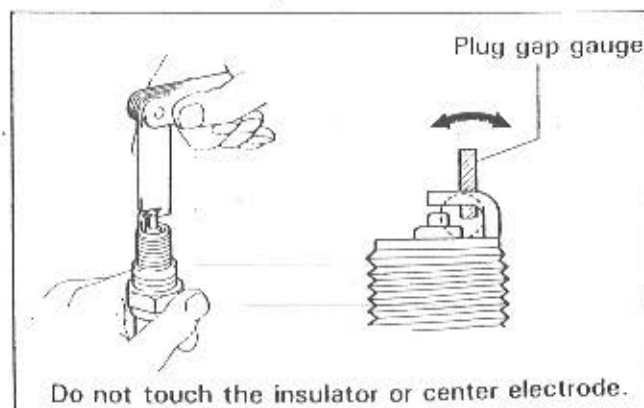
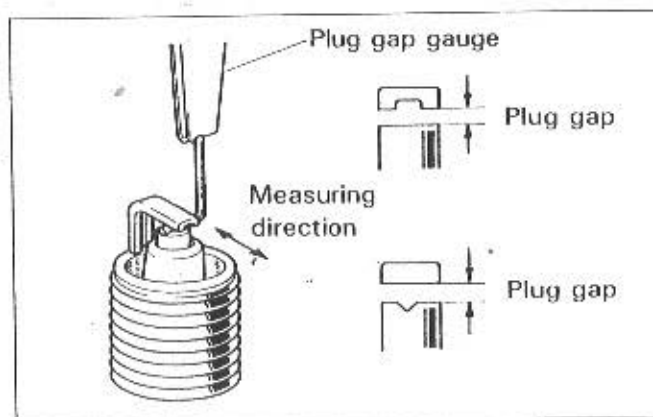
IGNITION SYSTEM CONSTRUCTION

NECESSITY FOR MAINTENANCE

The spark plug generates an electric spark to ignite the air/fuel mixture, which is exposed to high temperatures of over $2,000^{\circ}\text{C}$ and high pressures of over 40 kg/cm^2 in the cylinder. With use, the spark plug electrodes experience a gradual erosion and widening of the gap between them, making spark generation difficult. At the same time, combustion deposits on the insulator tip and the electrodes tend to short the current rather than allowing the spark to jump. For efficient ignition of the air/fuel mixture, the spark plugs must therefore be periodically cleaned and replaced.



CONSTRUCTION OF SPARK PLUG



NORMAL



CARBON FOULING



OIL FOULING



OVERHEATING



INSPECTION OF SPARK PLUGS

1. REMOVE SPARK PLUGS

(See page 2-46)

2. INSPECT CONDITION OF SPARK PLUGS

Visually check that the electrodes and insulator nose are in a normal condition.

• Normal

If leaded gasoline is used, the insulator nose will look tan or gray. If unleaded gasoline is used, the plug may appear white or grayish, but this is normal.

• Carbon fouling

The insulator and electrodes will be covered with dry, fluffy carbon deposits.

REFERENCE

Carbon fouling may occur when the air-fuel mixture is too rich or the ignition timing is retarded.

• Oil fouling

Wet oil deposits on the insulator and electrodes. Shiny black appearance from fuel or lubricating oil.

REFERENCE

Oil fouling may be caused by wearing of the valve stem oil seal or the cylinder.

• Overheating

The insulator portion will appear bleached, and the electrodes will be burned and look white or purplish. This will lead to fast electrode wear.

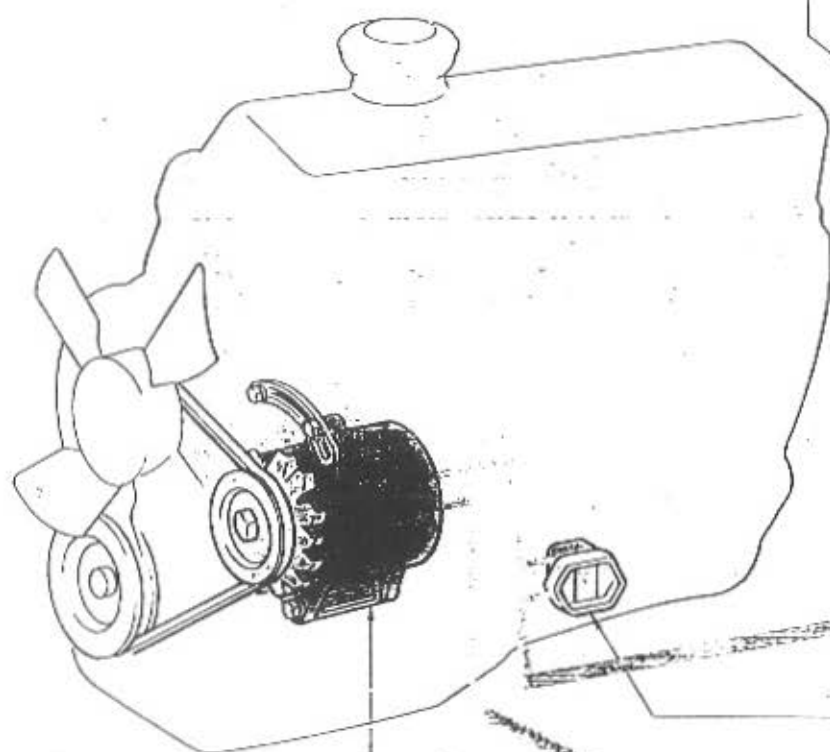
REFERENCE

Overheating may be caused by an air-fuel mixture which is too lean or retarded ignition timing.

CHARGING SYSTEM

WHAT UNITS COMPRISE THE CHARGING SYSTEM

THE IGNITION SWITCH controls the supply of power to the alternator to develop magnetic force when the engine is running.



THE ALTERNATOR operates to produce electrical energy from mechanical energy and to supply power to the electrical demands of the vehicle.

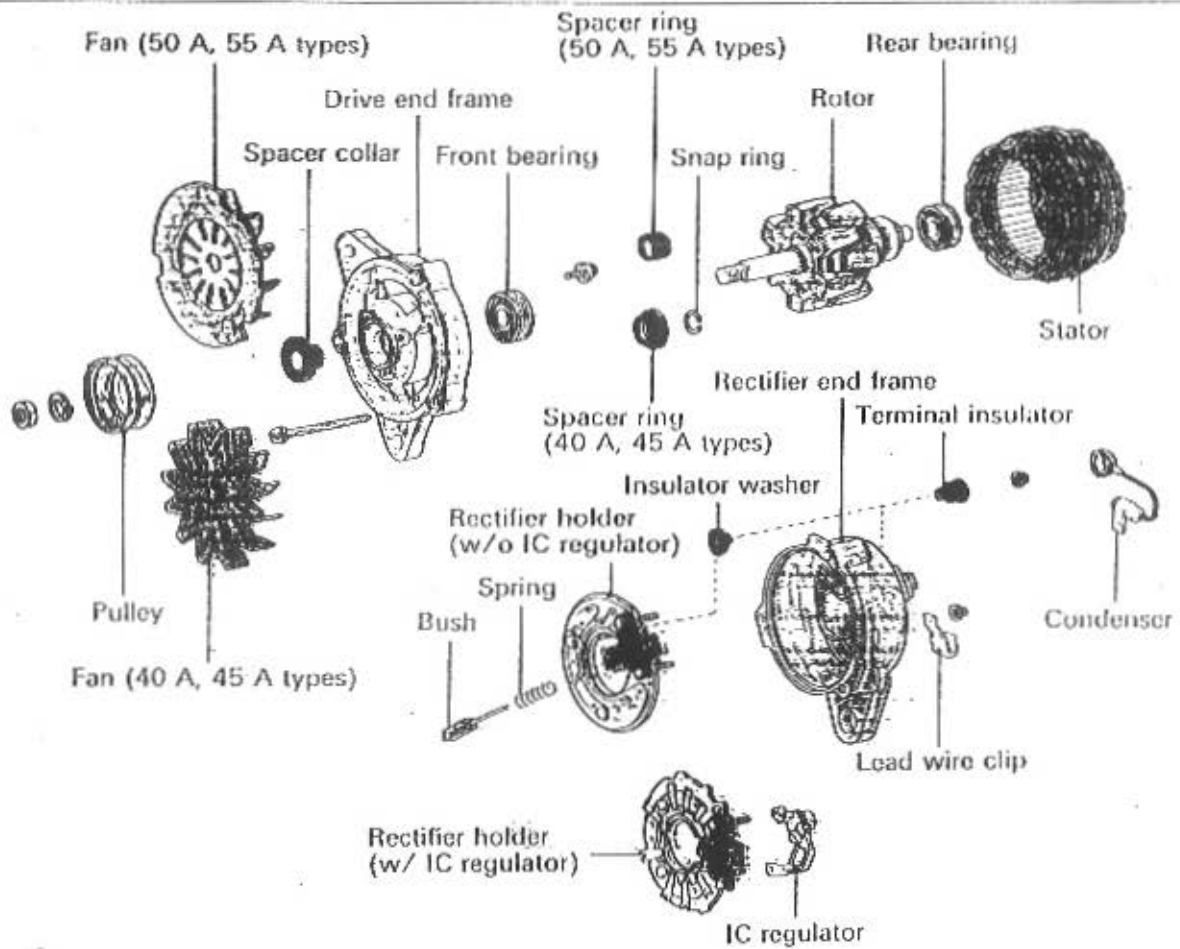
THE ALTERNATOR REGULATOR controls alternator output voltage at slightly higher than battery voltage

THE BATTERY chemically stores electrical energy produced by the alternator.

(Actual wiring of the vehicle differs from the illustration.)

ALTERNATOR COMPONENTS

(Conventional Type)

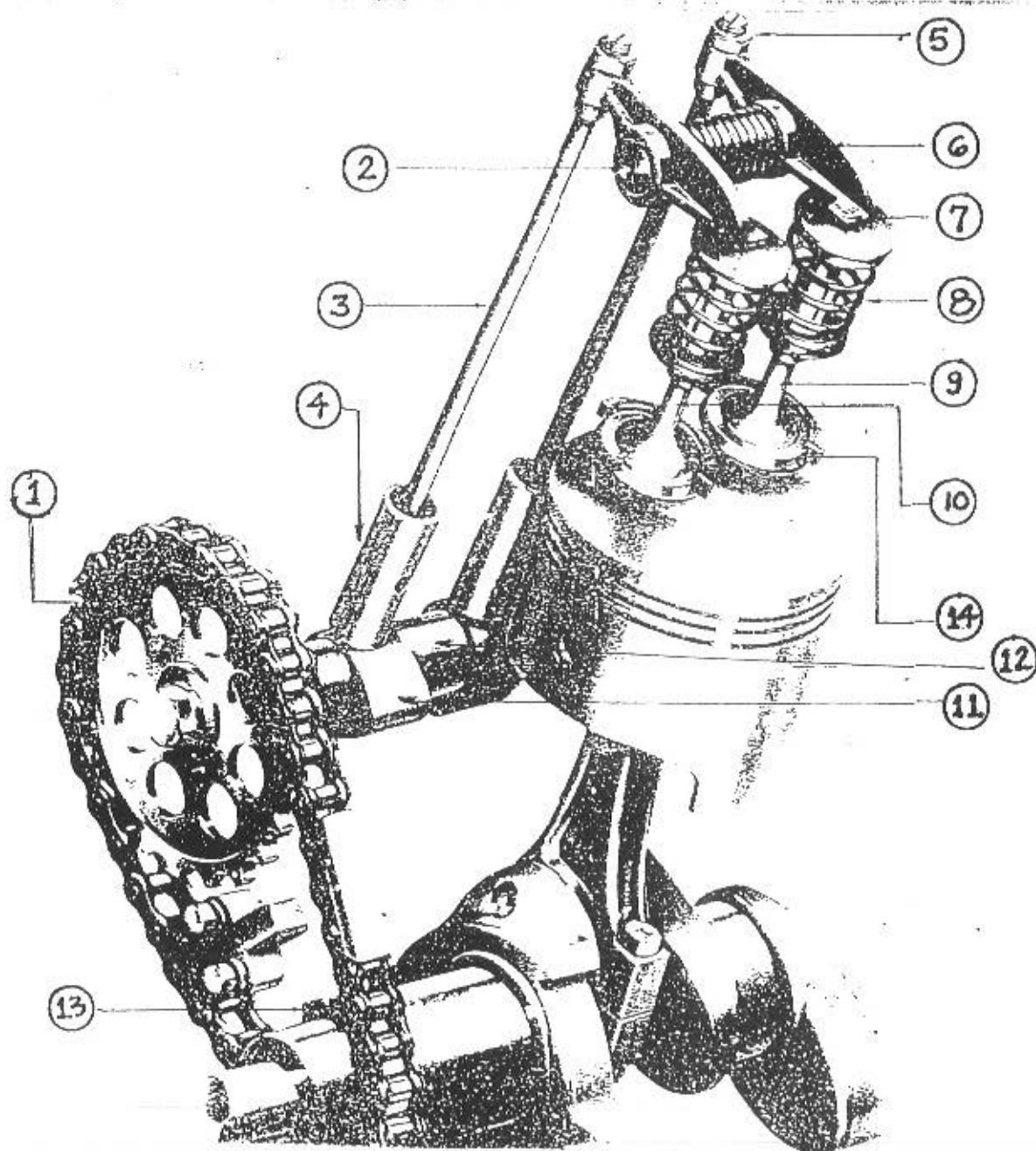


VALVE CLEARANCE

NECESSITY FOR MAINTENANCE

For efficient engine operation, the valves should make air-tight contact with their valve seats when they close. To ensure this, a gap called 'valve clearance' is provided between each closed valve and cam. (Depending on the engine type, this gap is between the closed valve and the rocker arm or between the rocker arm and the cam when the valve is closed.) This gap allows the valve to return to the valve seat

without fail during engine operation, even if there is heat expansion of the components. During use, the valves and cams gradually become worn, causing changes in the valve clearance. This, in turn, causes a deterioration in the performance of the engine and an increase in tappet noise. It is therefore necessary to check and adjust the valve clearance periodically.



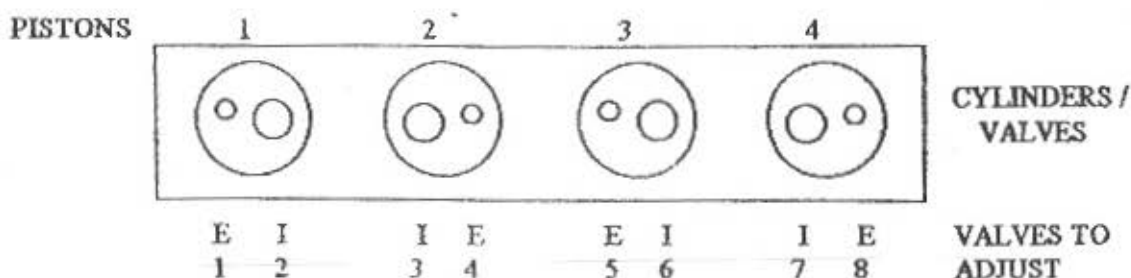
III. Working Parts

1. Camshaft Timing Gear - in a 4 stroke engine must turn at half engine speed so has twice as many teeth as crankshaft timing gear .
2. Rocker Arm Shaft - part where the rockers pivot.
3. Push Rod - a long steel rod which moves the rocker .
4. Valve Lifter - a cylinder type that transfers the movement from cam to push rod .
5. Lock Nut - purpose of which is for adjusting the valve clearance .
6. Rocker Arm - part that moves for opening the valves .
7. Valve Clearance - see definition .
8. Spring - used for closing the valve
9. Intake Valve - valve that allows air -fuel mixture to enter the cylinder .
10. Exhaust Valve - valve that allows burnt gases to escape from cylinder to muffler .
11. Cam - a rotating lobe or eccentric .
12. Camshaft - a shaft which has a series of cams for operating valve mechanism .
13. Crankshaft Gear - used to drive the camshaft gear and linked by belt or chain .
14. Valve Seat - where valve rest and provide a seal against leakage .

IV. Valve Clearance Adjustment Procedures

1. Start the engine and let it warm - up.
2. Remove cylinder head cover .
3. Torque the bolts of cylinder according to specifications. And in sequence. See figure.
4. Turn the crankshaft and set piston no.1 to top dead center compression stroke (TDC), with the timing mark in line with each other. See figure .
5. Check the valve clearance with the specified thickness gauge, adjust if necessary .

1. When the number 1 cylinder is at top dead center position of the compression stroke, the valve clearance can be check .
2. Insert a thickness gauge with a specified thickness between the valve stem and the rocker arm and inspect the clearance .
3. The valve clearance is Okey if the thickness gauge can be pushed in while encountering slight resistance . If the clearance is either too large or too small, loosen the lock nut and adjust the screw .
4. Rotate the crankshaft pulley 360 degrees clockwise once again so the "V" groove on the pulley aligns with the zero timing mark (bringing the number 4 cylinder to the top dead center position of the compression stroke). The valve clearances of the remaining cylinders should be checked .
(On engines with firing order 1 - 3 - 4 - 2 , adjust valves 1 , 2 , 3 , and 5 . After rotating 360 degrees adjust valves 4 , 6 , 7 , and 8) .

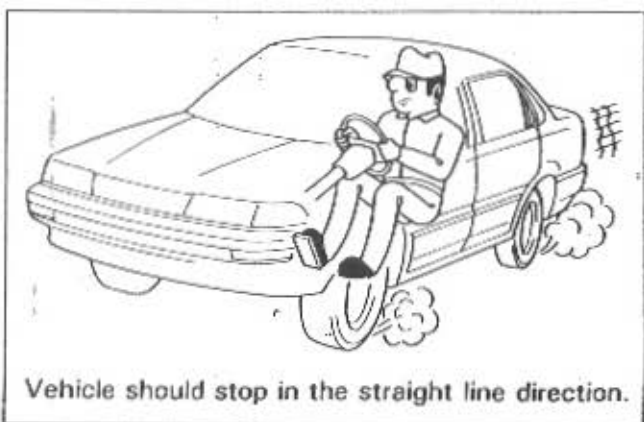
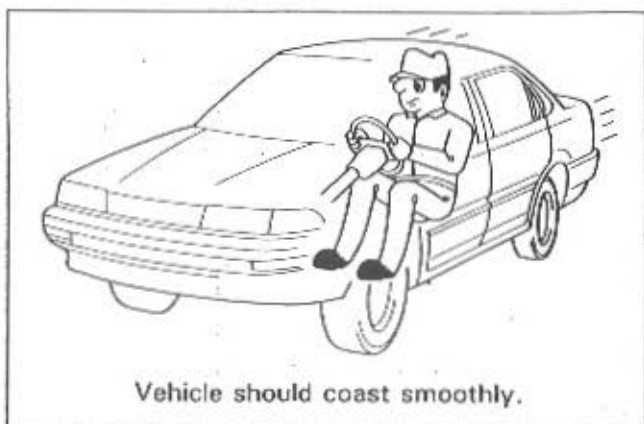


ROAD TEST

NECESSITY FOR MAINTENANCE

A vehicle is meant for travel on the road. If there is trouble in any of the basic functional systems of the vehicle, it may not be possible to discover what the trouble is by checking the vehicle while it is stopped.

Therefore, it is necessary to conduct road tests periodically. Road tests are also necessary in order to confirm the results of maintenance operations which have been performed.



BRAKE SYSTEM

1. CHECK BRAKE PULL

While driving straight ahead at low speed, check that the vehicle coasts smoothly when the transmission is shifted into neutral.

2. CHECK BRAKE EFFORT

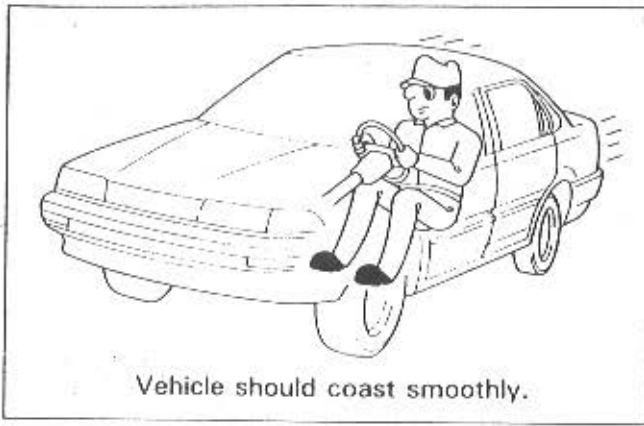
- While driving straight in a safe, flat, paved area, check that the vehicle decelerates in response to the pedal force applied and stops in the straight line direction when the brake pedal is depressed.
- Check that the brakes do not squeak, that the steering wheel does not jerk to one side or the other, or that the vehicle does not veer sideways.

3. CHECK BRAKE PEDAL FEELING

- Check that the brake pedal has sufficient reserve distance during braking.
- Check that the brake pedal does not have a spongy feel or pulsate during braking.

IMPORTANT !

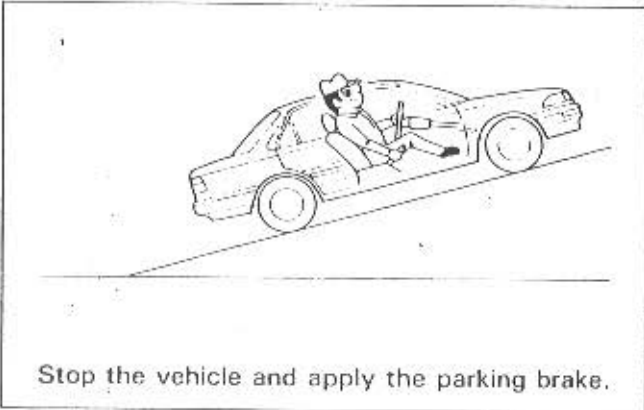
- During braking, be careful of conditions behind the vehicle.
- If there are any passengers in the vehicle, give them notice before applying the brakes.



PARKING BRAKE SYSTEM

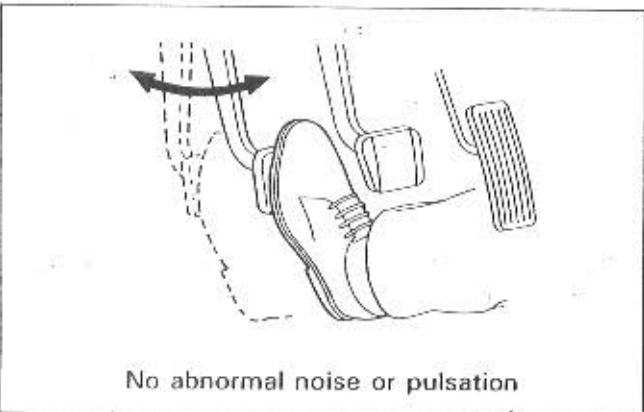
1. CHECK PARKING BRAKE PULL

With the parking brake lever in the release condition, and while driving straight at low speed, check that the vehicle coasts smoothly when the transmission is shifted to neutral.



2. CHECK PARKING BRAKE EFFORT

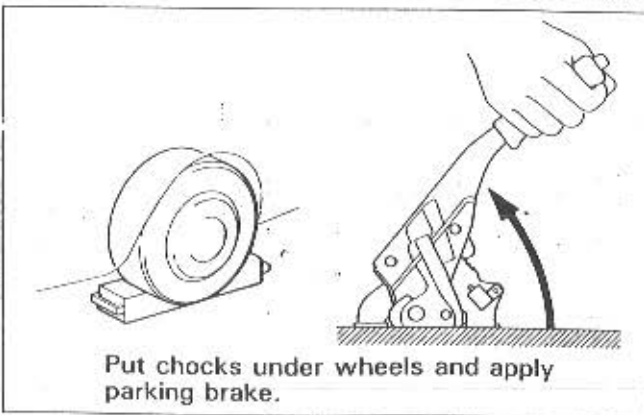
- Check that the lever has the proper travel.
- On a safe incline, check that the vehicle is held securely with only the parking brake applied.



CLUTCH SYSTEM

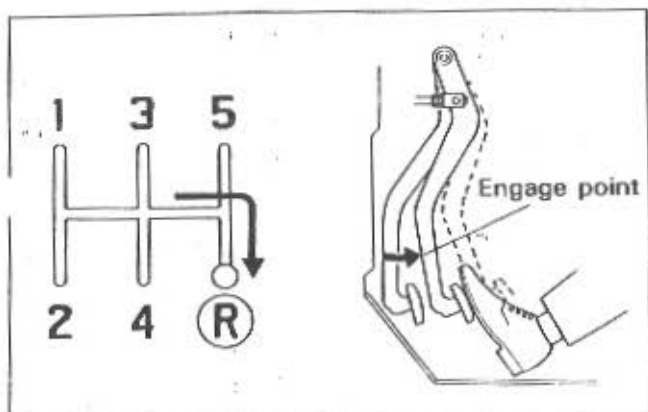
1. CHECK CLUTCH PEDAL FEELING

- With the engine stopped, check that there is no abnormal noise or catching when the clutch pedal is operated.
- With the engine idling, check that there is no abnormal noise or vibration (pulsation) when the clutch pedal is operated.

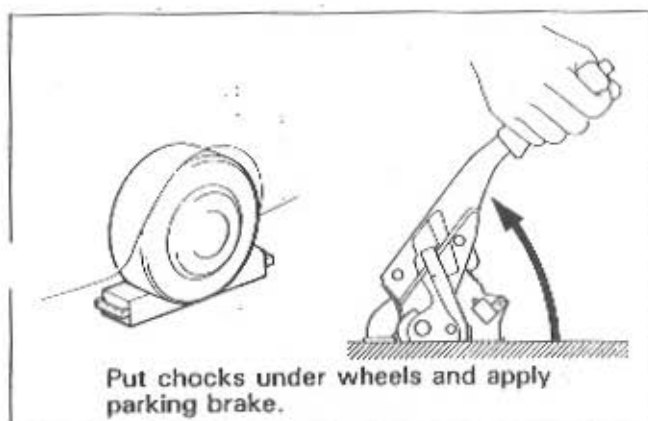


2. CHECK RELEASING OF CLUTCH

- During shifting of gears while driving, check that there is no grinding of gears.
- Put chocks under the wheels and apply the parking brake fully.
- With the engine idling, depress the clutch pedal fully and check that there is no grinding of gears when the transmission is shifted into reverse.

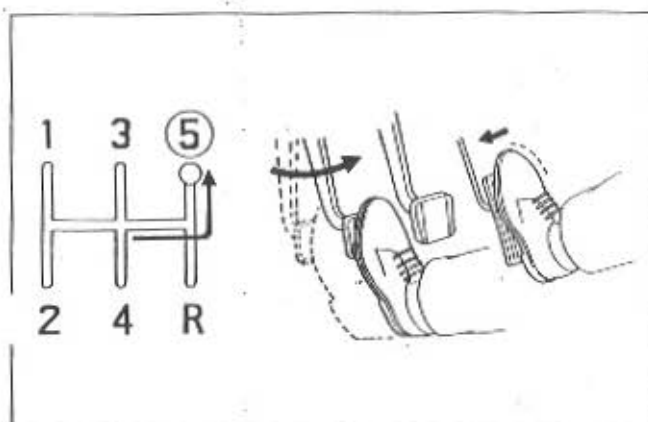


- (d) After the check in (c), and in the same state, release the clutch pedal gradually and check that there is adequate stroke until just before the clutch engages (at this time, the engine's condition will change).



3. CHECK FOR CLUTCH SLIPPAGE

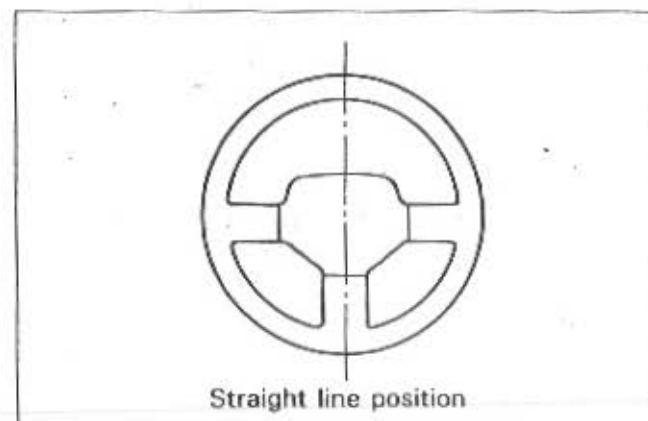
- (a) Check that the vehicle starts moving smoothly without abnormal vibration of the body when starting out in 1st gear.
(b) Put chocks under the wheels and apply the parking brake fully.



- (c) Shift to the top gear (4th or 5th gear), then while gradually increasing the engine's speed, gradually release the clutch pedal. Check that the engine stops when the clutch engages.

IMPORTANT !

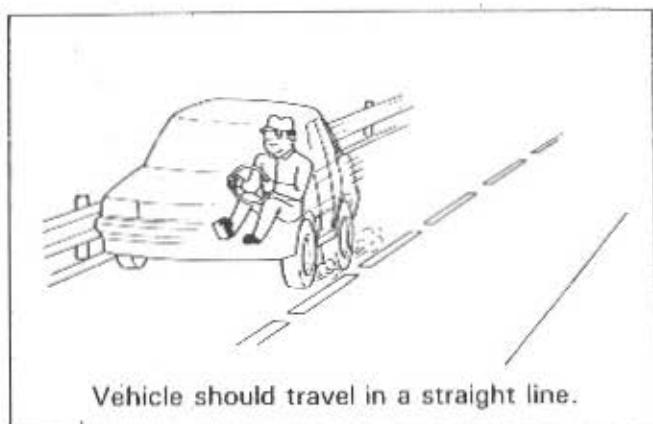
- The engine's speed should not be too high.
- This check should not be repeated again and again.



STEERING SYSTEM

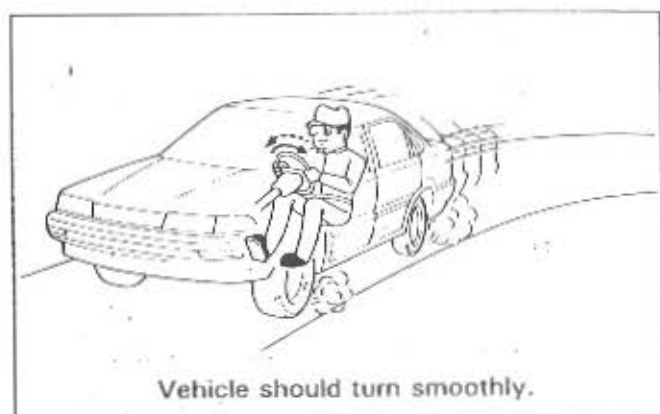
1. CHECK STEERING WHEEL FREEPLAY
2. CHECK STRAIGHT LINE POSITION OF STEERING WHEEL

While driving straight on a level paved road, check that the steering wheel is in the straight ahead position.



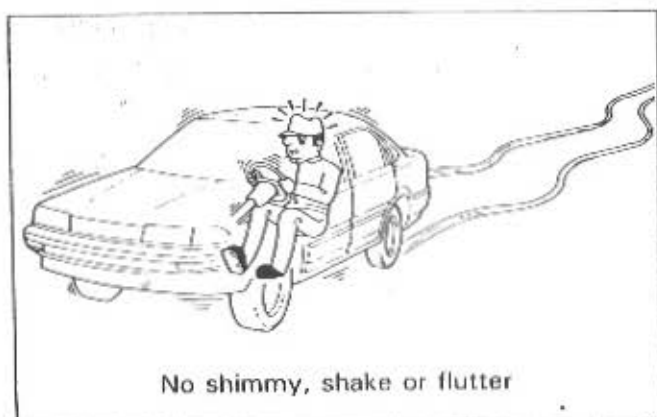
3. CHECK STRAIGHT LINE CHARACTERISTICS

While driving straight on a flat paved road and check that the vehicle travels in a straight line without frequent corrections to the steering wheel.



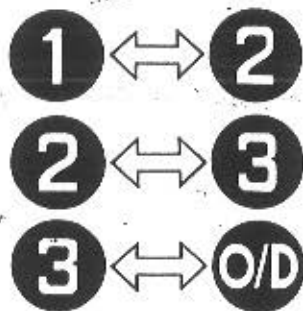
4. CHECK CONTROLLABILITY

- (a) Check that the vehicle turns smoothly when the steering wheel is turned to the right and the left during driving, and that the steering wheel returns to virtually the straight line position naturally when the steering force is lightened.
- (b) Check that there is no abnormal noise or catching during the above check.



5. CHECK FOR SHIMMY, SHAKE AND FLUTTER

Check that there is no shimmy, shake, flutter, etc. in the steering wheel or in the body during driving.



Transmission should shift up or shift down automatically.



No shock, jerk or slipping.

AUTOMATIC TRANSMISSION

1. CHECK UP-SHIFT AND DOWN-SHIFT OPERATIONS

Check that the transmission shifts up or shifts down automatically while driving in the "2" and "D" ranges.

2. CHECK FOR SHOCK, JERKING AND SLIPPING

Check that there is any shock, jerking and slipping when starting out, during driving and while shifting gears.

VIBRATION AND ABNORMAL NOISE

Check for vibration and abnormal noise from the engine, drive train, suspension system, steering system, brake system and body while the vehicle is in motion.

DON BOSCO TECHNICAL INSTITUTE
AUTOMOTIVE TECHNOLOGY DEPARTMENT
MAKATI CITY

CAR PREVENTIVE MAINTENANCE CHECKLIST

CUSTOMER'S / DRIVER'S NAME: _____
 VEHICLE TYPE / MODEL : _____

DATE: _____
 PLATE NO.: _____

LEGEND: ☐ = items to check ; OK = good condition ; TRIAL (Tighten ; Replace ; Inspect & correct ; Add / adjust ; Lubricate)

	FINDINGS			FINDINGS	
	OK	TRIAL		OK	TRIAL
1 BATTERY			8 GAS / FUEL SYSTEM		
<input type="checkbox"/> 1 : 2 : 3 : 4 : 5 : 6 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Fuel filter, tank, lines	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Visual Inspection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Fuel / feed pump	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/> Carburetor / Injection pump	<input type="checkbox"/>	<input type="checkbox"/>
2 LIGHTS			9 AIR - CON SYSTEM		
<input type="checkbox"/> Horns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Compressor	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Park & Plate lights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Condenser	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Head lights			<input type="checkbox"/> Hoses	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Low beam	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Receiver / Dryer	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> High beam	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Signal lights			10 SUSPENSION SYSTEM		
Front <input type="checkbox"/> L <input type="checkbox"/> R	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Shock Absorber	<input type="checkbox"/>	<input type="checkbox"/>
Rear <input type="checkbox"/> L <input type="checkbox"/> R	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Springs	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Tail lights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Joints	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Stop lights	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Reverse lights	<input type="checkbox"/>	<input type="checkbox"/>	11 STEERING SYSTEM		
3 OIL / FLUID			<input type="checkbox"/> Propeller Shafts & Joints	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Engine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Drive Shafts & Joints	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Brake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Wheel Alignment	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Auto Transmission	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Clutch	<input type="checkbox"/>	<input type="checkbox"/>	12 ENGINE COMPONENTS & ELECTRICALS		
<input type="checkbox"/> Steering pump	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Valve Clearance	<input type="checkbox"/>	<input type="checkbox"/>
4 WATER, WIPERS & WASHERS			<input type="checkbox"/> Exhaust Manifold	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Water / Coolant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Engine Timing	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Washer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Starting System	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Wiper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ignition System	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Windshield & Mirrors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Charging System	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/> EFI System	<input type="checkbox"/>	<input type="checkbox"/>
5 BELTS, BRAKES, BOLTS & BODY			13 Safety & Systems Test		
<input type="checkbox"/> Water pump belt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Safety Belts	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Alternator belt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Head Restraint	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Compressor belt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Air Bag	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Brakes (F & R)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Road Test	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Bolts	<input type="checkbox"/>	<input type="checkbox"/>	Road Test Remarks: _____		
<input type="checkbox"/> Body	<input type="checkbox"/>	<input type="checkbox"/>			
6 AIR, TIRE PRESSURE	<input type="checkbox"/>	<input type="checkbox"/>	<u>Other Services Needed / Remarks:</u> _____		
<input type="checkbox"/> Air filter	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Air (tire pressure)	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Tire condition	<input type="checkbox"/>	<input type="checkbox"/>			
7 YOU (AS DRIVER)					
<input type="checkbox"/> Vision	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Emotion	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Touch	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Hearing	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/> Smell	<input type="checkbox"/>	<input type="checkbox"/>			

Prepared By: _____

(Signature over your printed name)



DON BOSCO TECHNICAL INSTITUTE

P.O. BOX Commercial Center

City of Makati 1200

Tel Nos.: 892 - 0101 to 10

DESCRIPTION

This course is designed for High School Graduates, College Students, Car Enthusiasts and others who are interested in acquiring knowledge and skills in Automotive Technology. The approach is one-on-one instruction and only 5 to 10 particular per course.

SCHEDULE

Monday to Friday 5:00 pm to 8:00 pm

DURATION

3 weeks (45 hours)

PROGRAM COST

Php 5 000.00 / module + 200.00 registration fee

COURSES OFFERED

- Module 1 : BASIC ENGINE SERVICING**
This course deals with engine construction and operation of gasoline engine, tune-up procedures, preventive maintenance and trouble shooting.
- Module 2 : ADVANCED ENGINE SERVICING**
This course deals with engine overhauling, preventive maintenance, troubleshooting and servicing. Pre-requisite is Module 1
- Module 3 : DIESEL ENGINE SERVICING**
This course deals with the construction and operation of diesel engine, tune-up procedures, preventive maintenance, trouble shooting and calibration.
- Module 4 : AUTOMOTIVE ELECTRICAL SERVICING**
This course deals with the construction and operation, preventive maintenance, trouble shooting and servicing of electrical system of a passenger and commercial vehicles.
- Module 5 : POWER TRAIN AND CHASSIS SERVICING**
This course deals with the construction and operation, troubleshooting, servicing and preventive maintenance of the power train and chassis system.
- Module 6 : CAR AIR-CON SERVICING**
This course deals with the construction and operation, troubleshooting, servicing and preventive maintenance of car airconditioning units.
- Module 7 : ELECTRONIC FUEL INJECTION**
This course deals with the construction and operation, troubleshooting, servicing and preventive maintenance of electronic fuel injection engines.

FOR MORE INFORMATION PLEASE SEE OR CALL

Mr. Bernie Dulva

Shop Head

Automotive Technology

Telephone no. - 892-01-07 to 09 local 309

Tel/Fax no. - 817-5807

Cellphone no. - [REDACTED]



Turn Into Gold

