



Chapter 10

Vehicle Maintenance, Fluid Service, and Recycling

Contents

(8 Topics)

- ▶ Vehicle maintenance
- ▶ Lubrication service
- ▶ Fluid service
- ▶ Filter service
- ▶ Chassis lubrication

Contents

- ▶ Service Intervals
- ▶ General inspection and problem location
- ▶ Recycling and disposal of auto shop wastes

Vehicle Maintenance

- ▶ *Includes any operation that will keep a vehicle in good operating condition*
- ▶ Without proper care, the life of an automobile may be reduced by thousands of miles or kilometers

Lubrication Service

- ▶ Vital to keeping a vehicle in good working order
- ▶ A technician must be familiar with all aspects of lubrication service

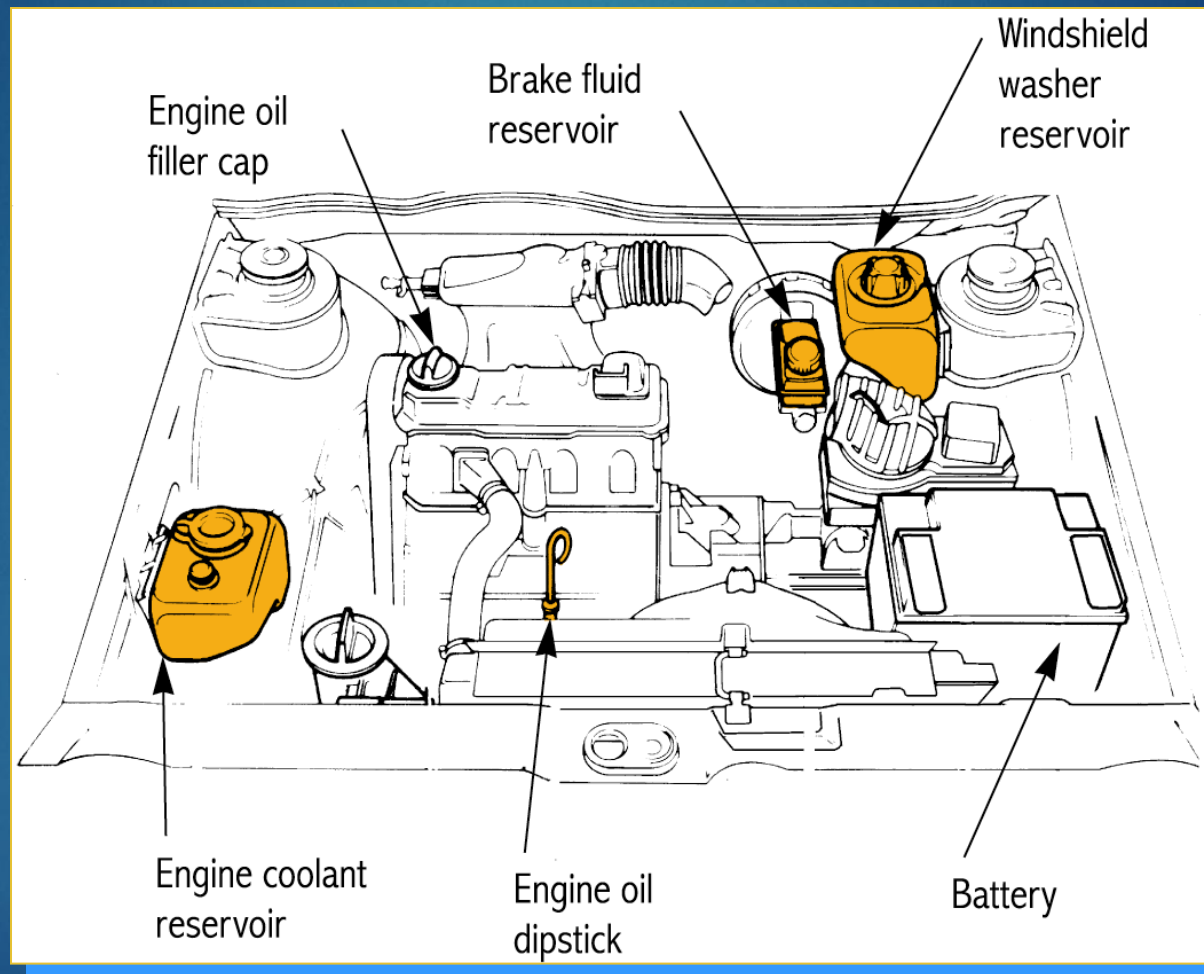
Lubrication Service Tasks

- ▶ *Checking fluid levels and conditions*
- ▶ *Adding fluids as needed*
- ▶ *Changing engine oil and filter*
- ▶ *Changing automatic transmission fluid*
- ▶ *Lubricating certain chassis parts*
- ▶ *Locating fluid leaks and other problems*
- ▶ *Recycling and disposing of fluids*

Fluid Service

- ▶ A **service manual** contains detailed information on how to check fluid levels
- ▶ The manual will usually describe:
 - ▶ **location** of fluid check points
 - ▶ location of fluid **fill** points
 - ▶ **interval** between fluid checks and changes
 - ▶ **type** and **quantity** of fluid to be used

Fluid Checkpoints



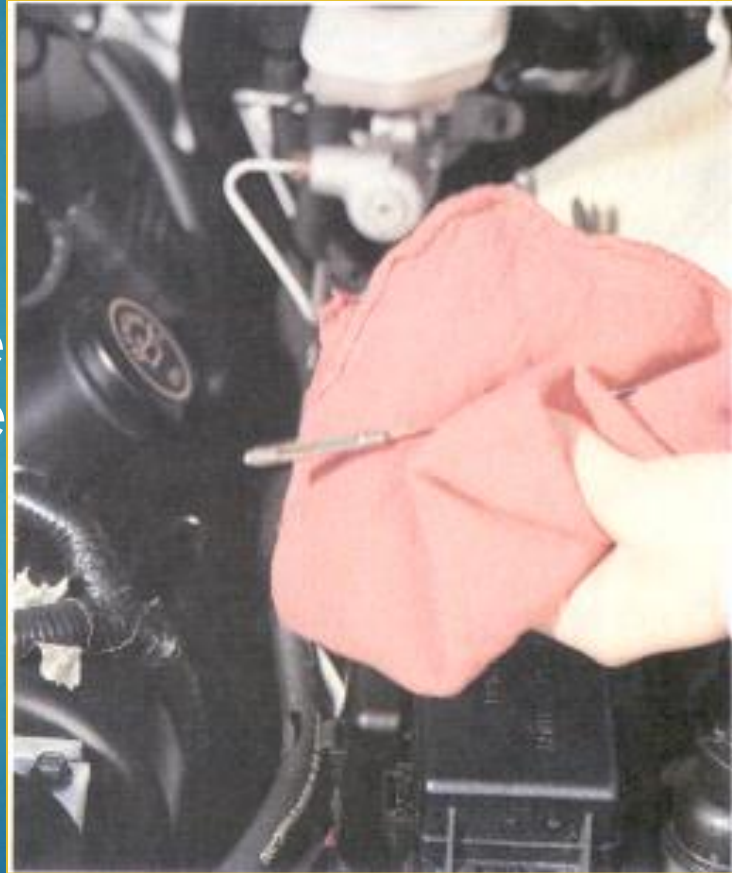
Checking Engine Oil

1. **Warm** the engine to operating temperature and shut it **off**
2. Locate and remove the dipstick



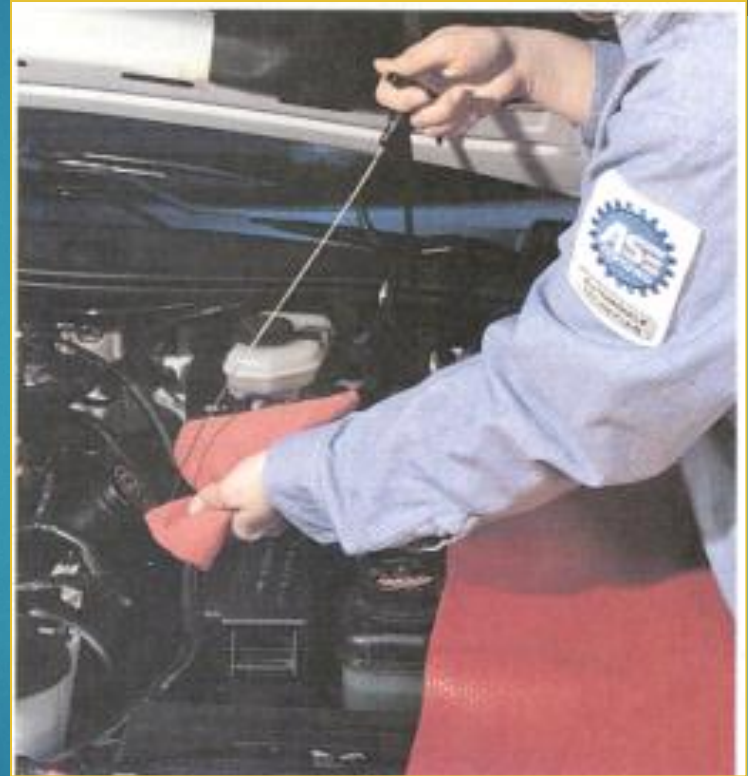
Checking Engine Oil

3. Wipe off the dipstick and replace it all the way into its tube



Checking Engine Oil

4. Pull the dipstick back out and hold it over a shop rag



Checking Engine Oil

- ▶ Oil level should be between the **add** and **full** marks
- ▶ Oil should not be too thick or thin, smell like **gasoline**, or be too dirty



Adding Engine Oil

- ▶ Look for a lubrication sticker in the **engine** compartment or on the **driver's** door **jamb**
- ▶ Use the **same type** of oil that was installed during the last **oil** change
- ▶ Remove the oil cap and slowly pour in the new oil through a clean funnel
- ▶ Do not **overfill** the engine

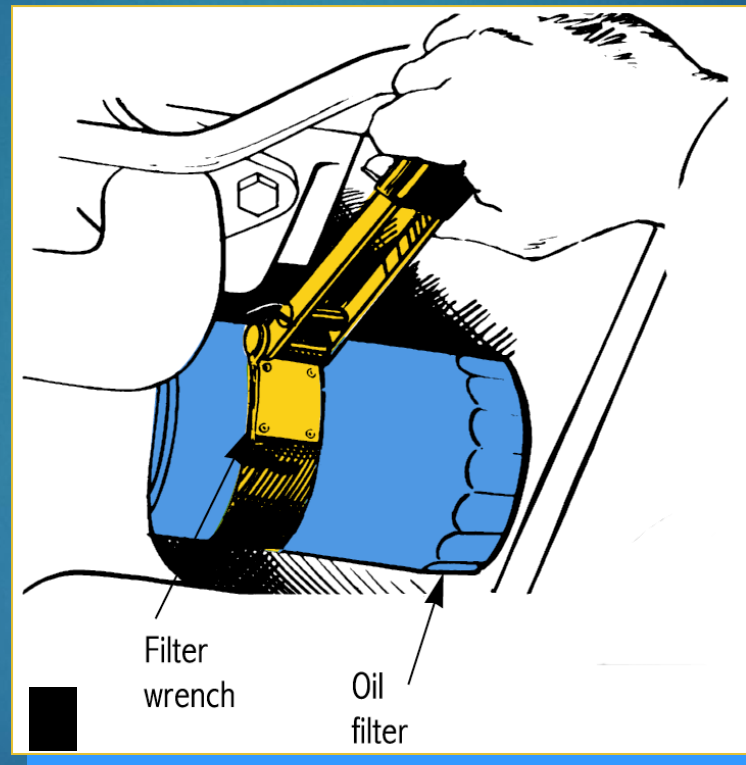
Changing Engine Oil and Filter

- ▶ *Warm the engine to operating temperature and shut it off*
- ▶ *Raise the car on a lift or place it on jack stands in a level position*
- ▶ *Place a catch pan under the oil drain plug*

Changing Engine Oil and Filter

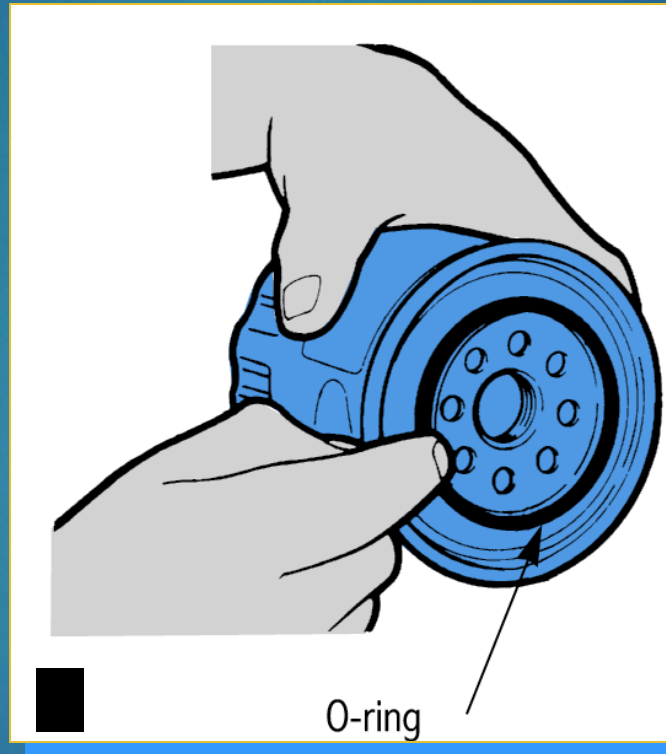
- ▶ *Unscrew the plug and allow enough time for the oil to drain completely*
- ▶ *Reinstall the drain plug*
- ▶ *Position your catch pan under the oil filter*

Changing Engine Oil and Filter



Using an oil filter wrench, unscrew the filter

Changing Engine Oil and Filter



Wipe some clean oil on the O-ring and install the new filter

Changing Engine Oil and Filter

- ▶ *Tighten the filter by hand only*
- ▶ *Lower the car to the ground and add the correct amount and type of oil*
- ▶ *Start the engine and make sure the oil pressure light goes out*
- ▶ *Let the engine run while checking for leaks under the engine*

Automatic Transmission Fluid and Filter Service

- ▶ Automatic transmission and transaxle fluid should be checked and changed at specified intervals
- ▶ Fluid can become contaminated with **metal, dirt, moisture, and friction material**—this can cause wear and premature transmission failure

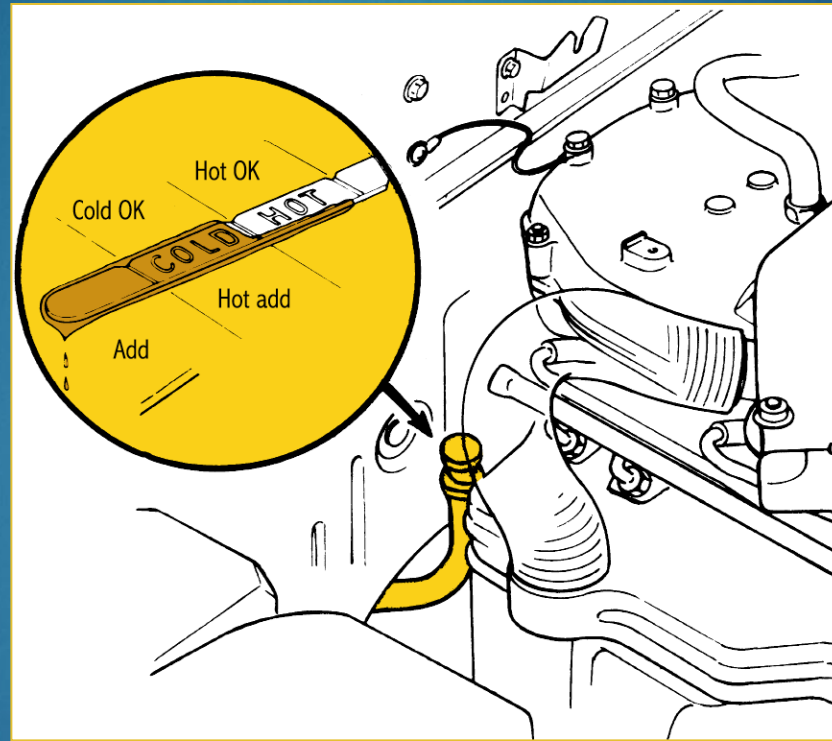
Checking Transmission Fluid

- ▶ With the engine and transmission at operating temperature, move the gear selector through all positions
- ▶ Apply the parking brake
- ▶ Place the transmission in park and block the wheels

Checking Transmission Fluid

- ▶ Consult the service manual or owner's manual to see if the engine should be **running** or **off**
- ▶ Locate and remove the dipstick
- ▶ Wipe it off and reinsert it into the tube
- ▶ Remove the dipstick and hold it over a shop rag

Checking Transmission Fluid



Fluid level should be between the **add** and **full** marks

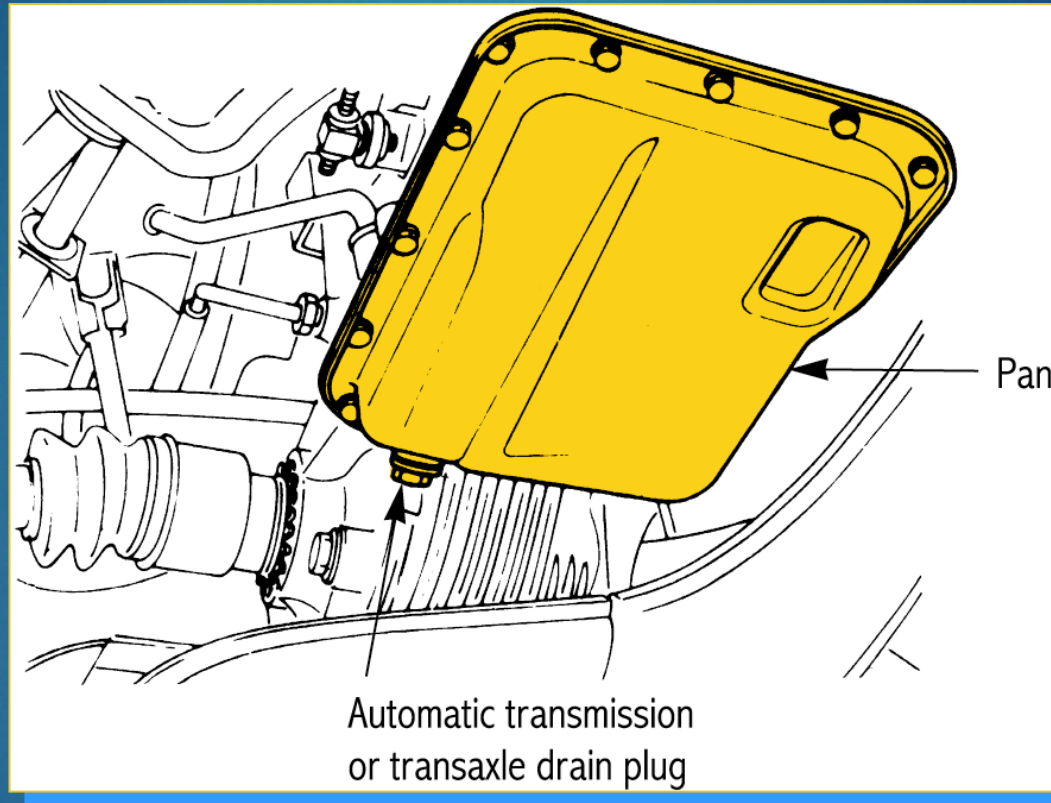
Checking Transmission Fluid

- ▶ Inspect the fluid for discoloration and odor
 - ▶ if it smells **burned** or looks **dirty**, change the fluid
- ▶ When adding fluid, add only a fraction of a quart or liter at a time and recheck the level

Changing the Fluid and Filter

- ▶ Warm the engine and transmission
- ▶ Raise the vehicle
- ▶ Remove the bolts securing the transmission pan

Changing the Fluid and Filter

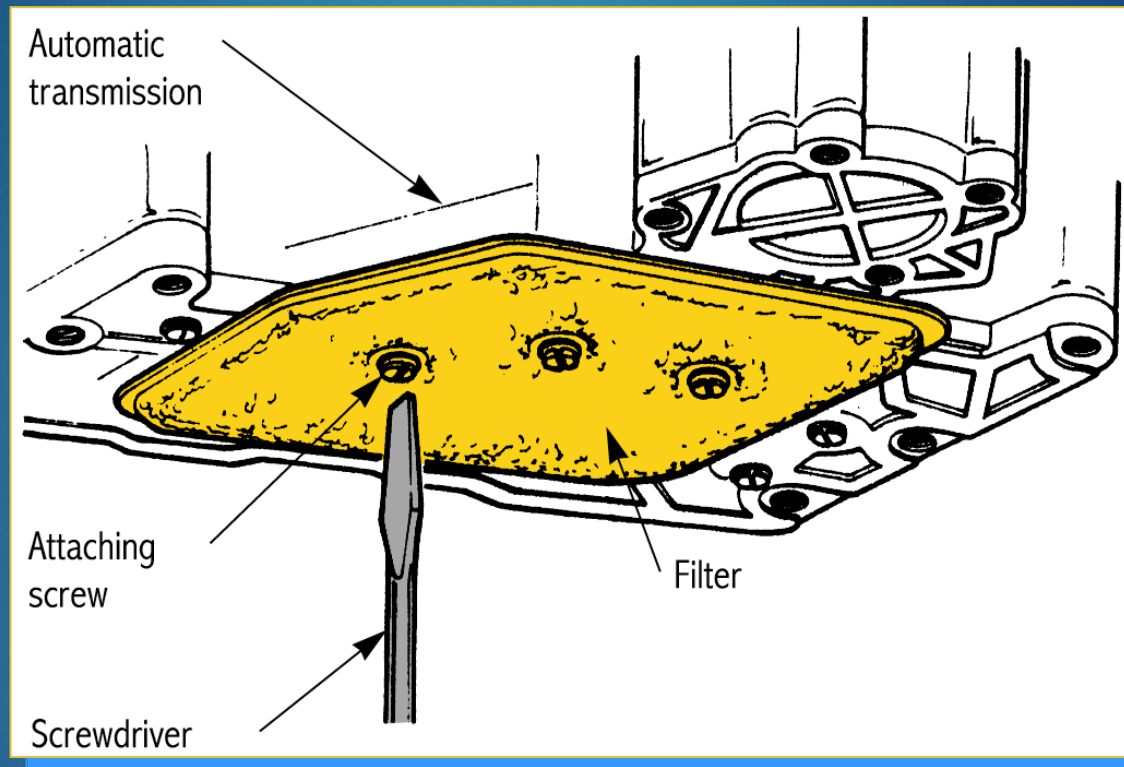


Some pans have a drain plug

Changing the Fluid and Filter

- ▶ Unscrew the last pan bolt while holding the pan with a shop rag
- ▶ Let the fluid pour into a catch pan
- ▶ Scrape the old gasket off the transmission pan and housing

Changing the Fluid and Filter



Clean or replace the transmission filter

Changing the Fluid and Filter

- ▶ Start all the pan bolts by hand
- ▶ Tighten the pan bolts in a crisscross pattern to their specified torque
- ▶ If recommended, drain the torque converter

Changing the Fluid and Filter

- ▶ Refill the transmission with the correct type and amount of fluid
- ▶ Start the engine and shift through the gears
- ▶ Check under the car for leaks

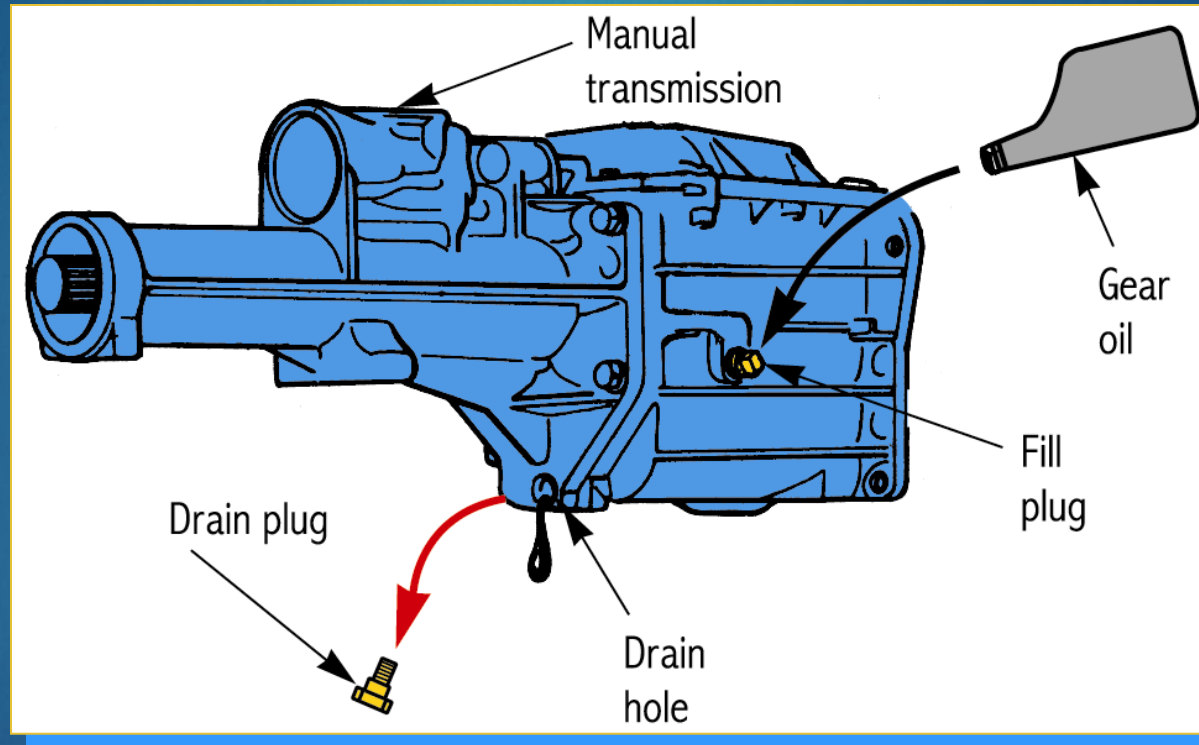
Manual Transmission Fluid service

- ▶ To check the fluid, locate and remove the transmission **fill plug**
- ▶ Generally, warm fluid should be **even** with the fill hole
- ▶ If a fluid change is needed, remove the **drain plug** on the **bottom** of the transmission to drain the fluid

Manual Transmission Fluid service

- ▶ Reinstall the transmission drain plug
- ▶ Refill with the correct type and amount of fluid
- ▶ Lubricate the gear shift and clutch release mechanisms
- ▶ Some manual transmissions do not require routine oil changes

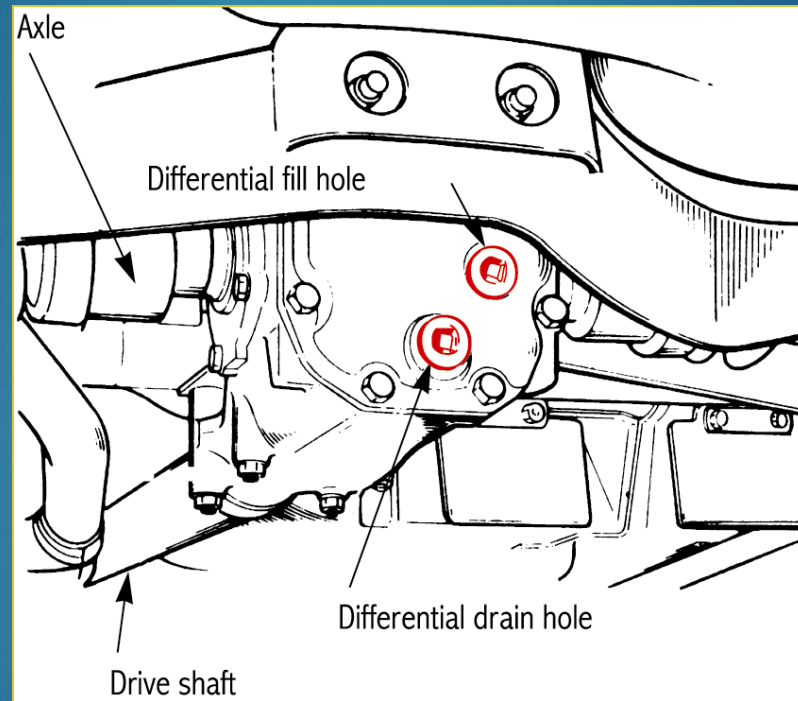
Manual Transmission Service Plugs



Differential Fluid Service

- ▶ To measure the fluid level, **remove** the fill plug
- ▶ Fluid should be **even** with the fill hole
- ▶ At the recommended change **interval**, remove the **drain** plug
- ▶ After **draining**, reinstall the plug and fill with the proper **lubricant**

Differential Service Plugs



If a drain plug is not provided, a **siphon gun** must be used to draw out the fluid

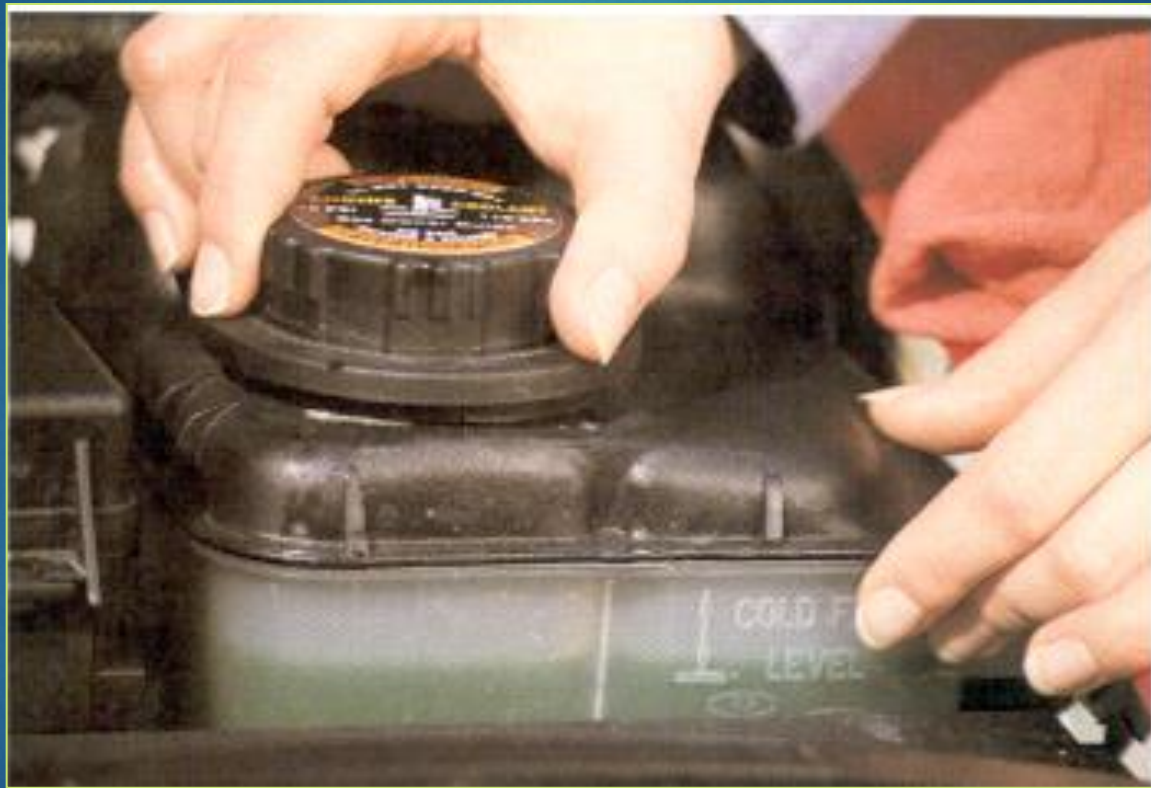
Checking Engine Coolant

- ▶ Coolant must be changed at least once every **two** years
- ▶ After prolonged use, coolant can become **corrosive**, and filled with **rust**
 - ▶ this can result in premature water pump, thermostat, and radiator failure

Checking Engine Coolant

- ▶ To check the coolant level, look at the side of the plastic **overflow** tank
 - ▶ coolant should be between the **hot** and **cold** marks
- ▶ On an **older** car without an **overflow tank**, carefully remove the radiator cap and check the level in the radiator
 - ▶ coolant should be about **1" (25 mm)** from the top

Checking Engine Coolant



Checking Coolant Condition

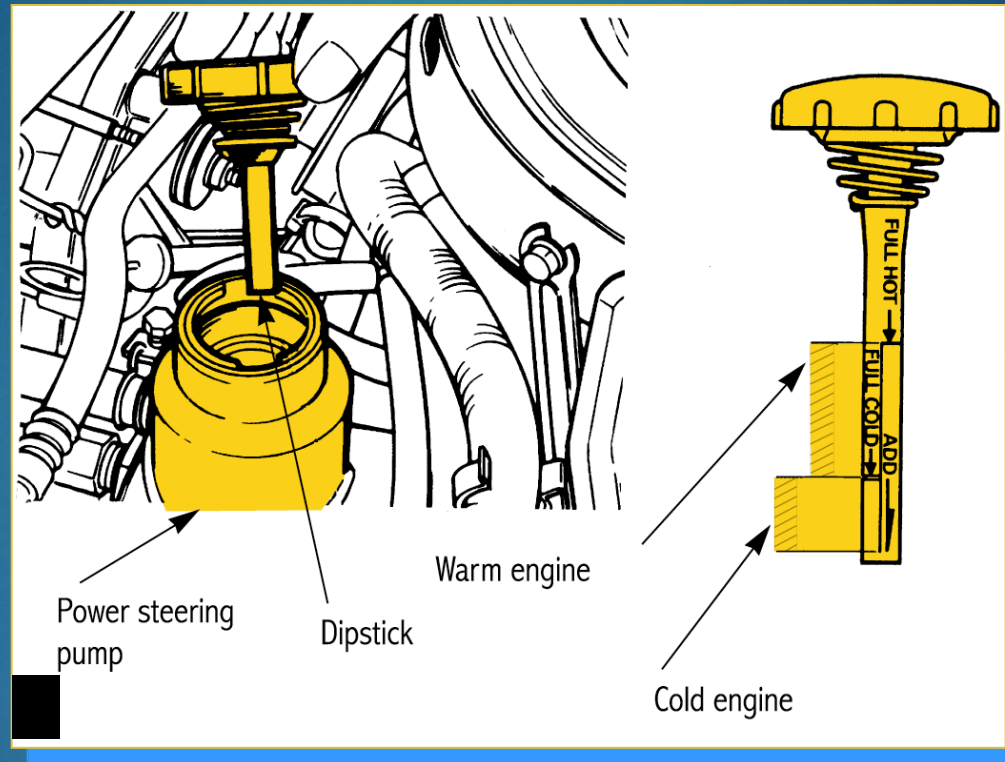


If the coolant is rusty or dirty, it should be drained and replaced

Checking Power Steering Fluid

If the fluid is contained in a clear plastic **reservoir**, compare the fluid level to the markings on the **side** (engine **off**)

Checking Power Steering Fluid



If the vehicle has a dipstick in the reservoir, compare the fluid level to the dipstick (engine off)

Checking Brake Fluid



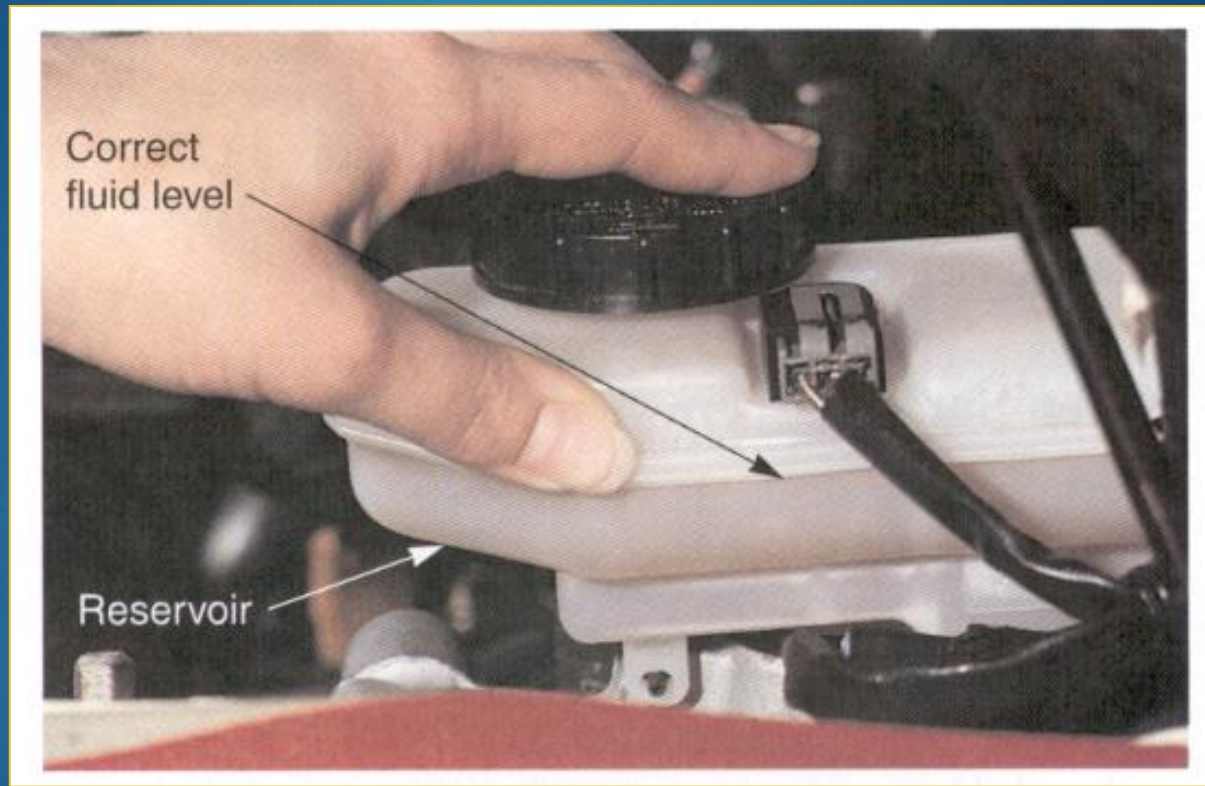
- ▶ Brake fluid level should be checked at least **twice** a year
- ▶ If the reservoir is metal, remove the cover to check the fluid level
 - ▶ generally, the fluid should be about 1/4" (6 mm) from the top of the reservoir

Checking Brake Fluid



- ▶ When the reservoir is **clear** plastic, compare the fluid level to the marks on the side
- ▶ Fluid level should be between the **Add** and **Full** marks
- ▶ If no marks are provided, the fluid should be just below the top of the reservoir

Checking Brake Fluid



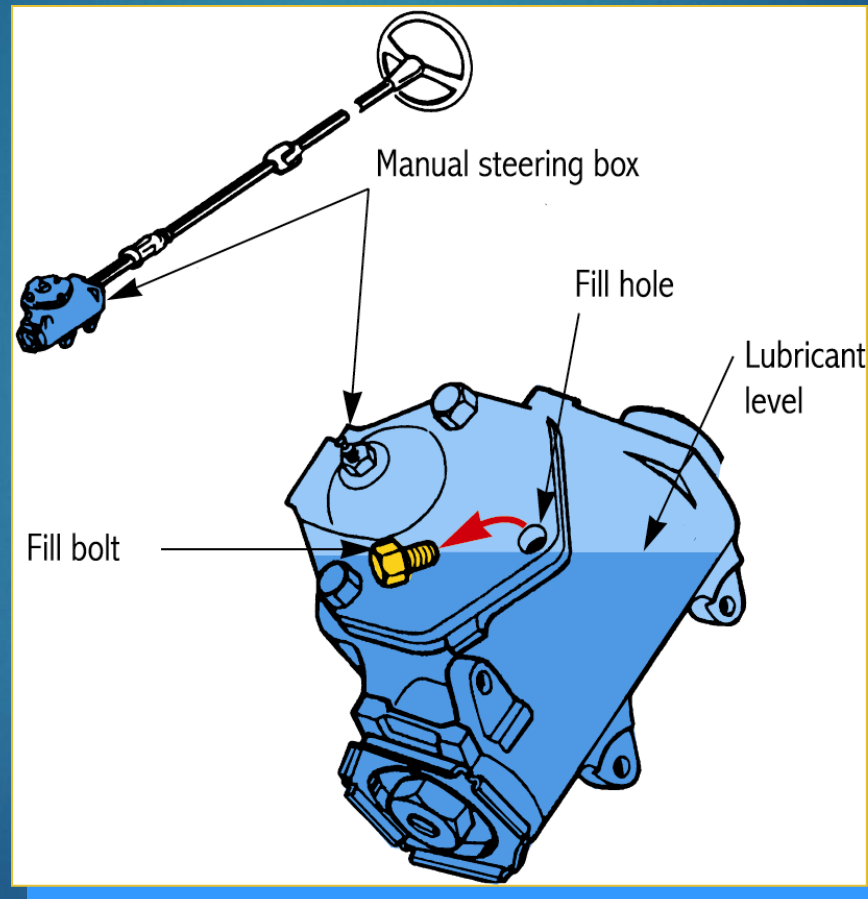
Checking Clutch Fluid

- ▶ Some manual transmission clutches use a **hydraulic** system to disengage the clutch
- ▶ Fluid level in the clutch master cylinder reservoir should be checked
- ▶ If low, add **brake** fluid to fill the reservoir almost full
- ▶ Always watch for leaks

Checking Manual Steering Box Fluid

- ▶ Fluid is checked by removing either a **fill plug** or designated **bolt** from the top of the box
- ▶ Lubricant should be almost **even** with the **opening**
- ▶ If the fluid level is low, add the **recommended** type fluid

Checking Manual Steering Box Fluid



Checking Windshield Washer Solvent

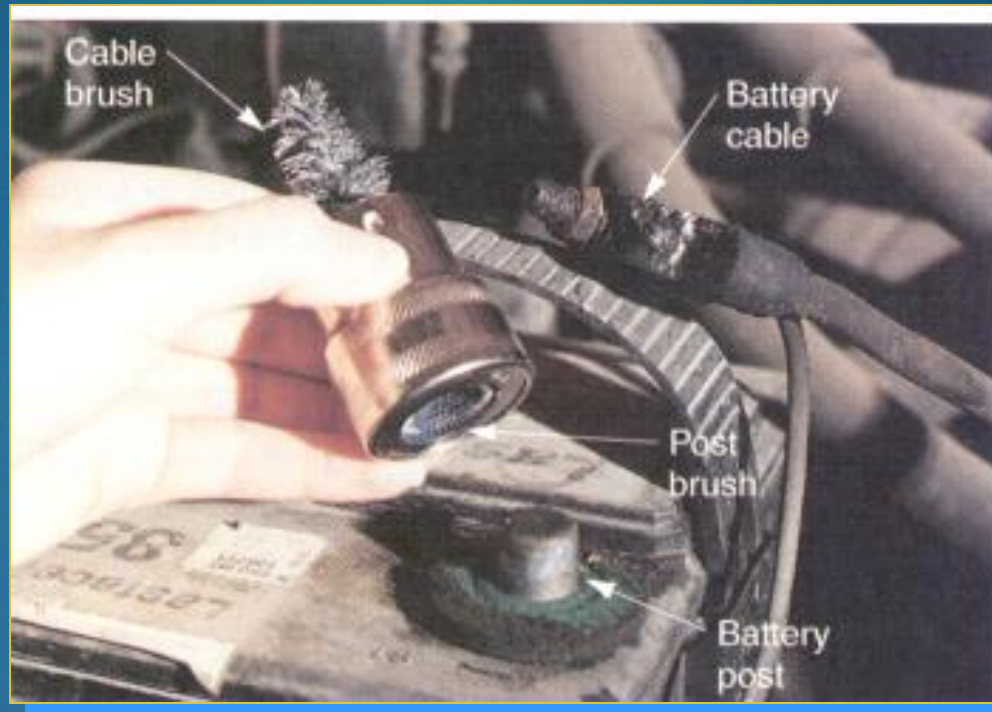
- ▶ Windshield washer solution is normally visible through the side of the plastic storage tank
- ▶ If low, add an approved washer solution
- ▶ Solution aids windshield cleaning and also prevents ice formation in cold weather

Checking the Battery



Make sure the **terminals** and **case top** are clean

Checking the Battery



Use a post cleaning tool to remove **corrosion** from the posts and cable ends

Checking the Battery



Wash the top of the battery with baking soda solution and secure the terminals

Filter Service

- ▶ Various filters used in a vehicle are replaced during lubrication service
- ▶ In addition to the oil and transmission filters, the technician may need to change or clean the **air** and **fuel** filters

Air Filters

- ▶ Dirty air filters are usually **replaced**
- ▶ Some manufacturer's permit light dirt and dust to be blown from the filter
- ▶ Foam or oil-bath air filters can be cleaned as described in a service manual

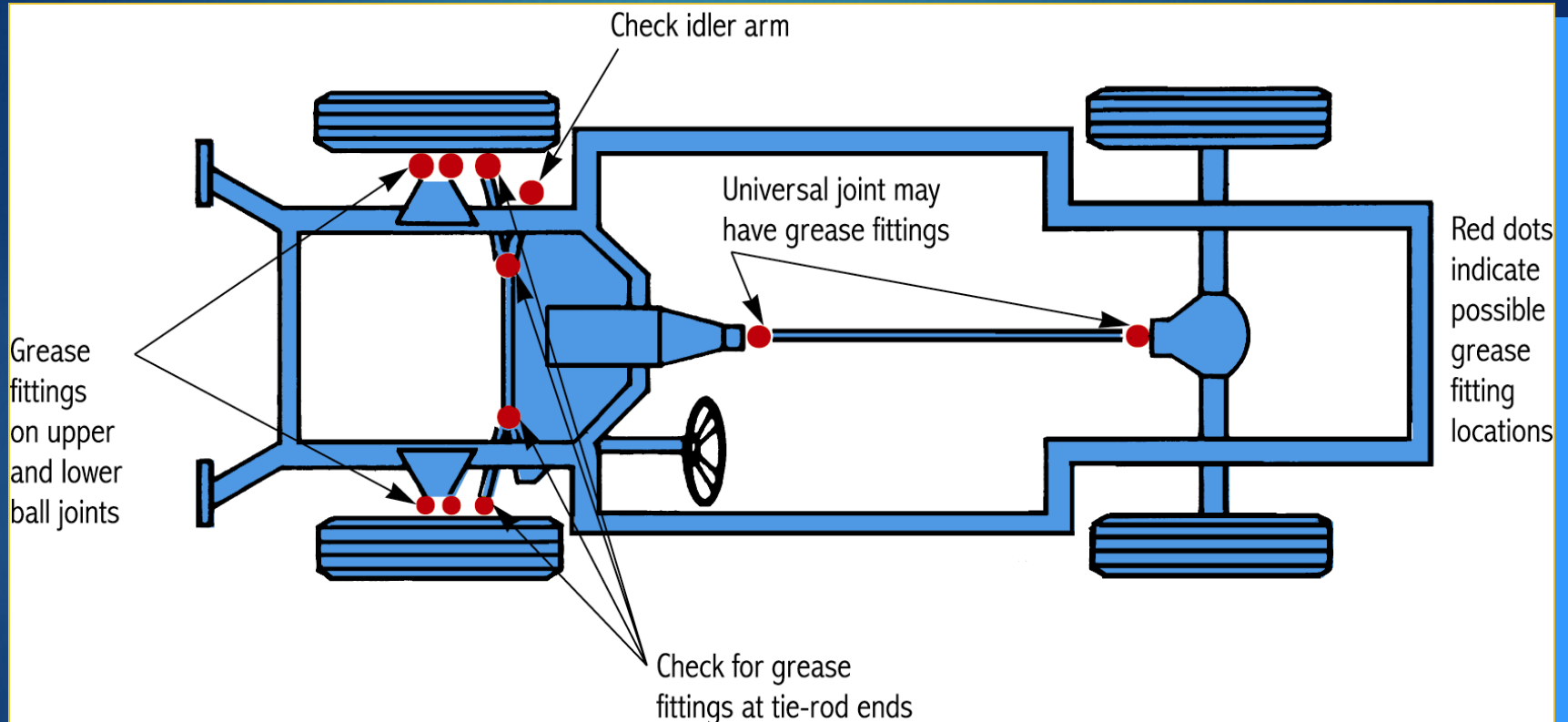
Fuel Filters

- ▶ Located almost anywhere in the fuel circuit
- ▶ Most vehicles have an inline fuel filter between the fuel tank and the fuel injectors or carburetor
- ▶ Refer to the **service** manual or **owner's** manual for the recommended service interval

Chassis Lubrication

- ▶ Generally involves greasing high-friction points in the **suspension, steering, and drive train systems**
- ▶ May also involve lubricating locks, hinges, latches, and other body parts

Grease Job



Lubricate high-friction pivot points

Grease Gun

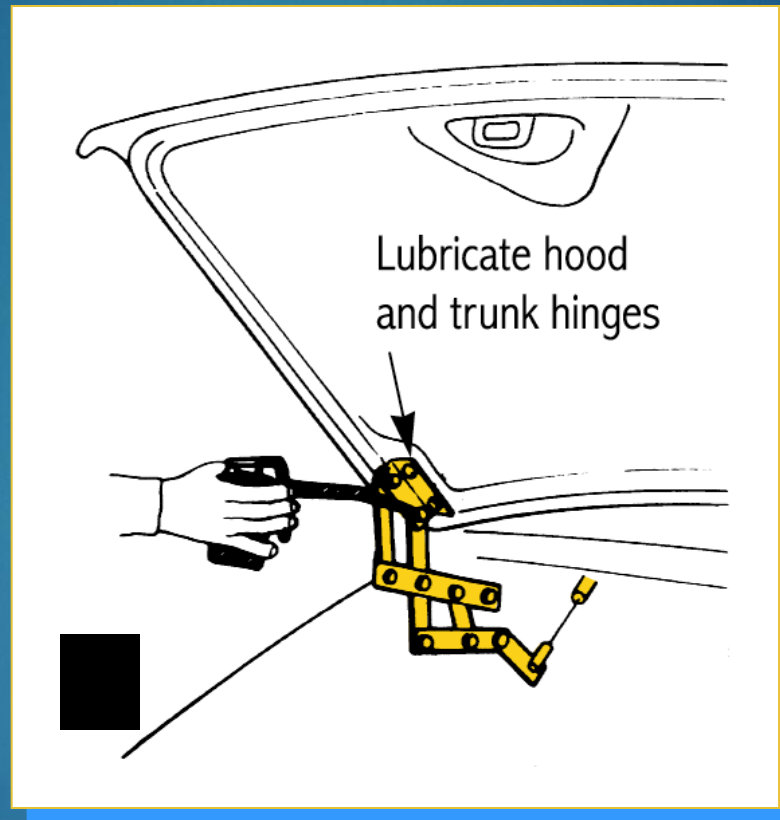


This technician is using a power **grease gun** to lubricate fittings

Body Lubrication

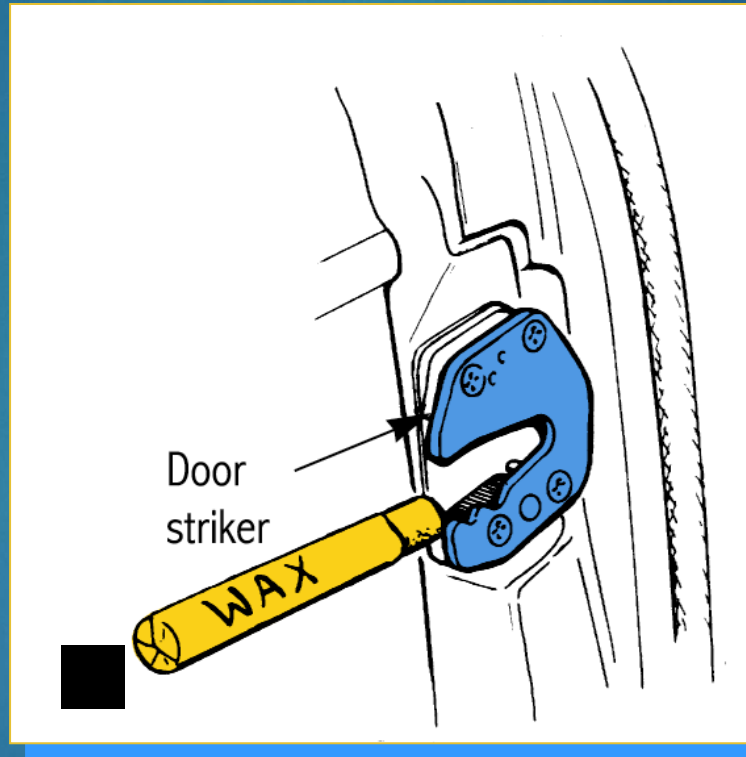
- ▶ Lubricate high-friction points on the body
- ▶ These points include:
 - ▶ hinges
 - ▶ latches
 - ▶ hood
 - ▶ trunk
- ▶ Lubrication prevents squeaking doors, sticking hinges, and premature wear

Body Lubrication



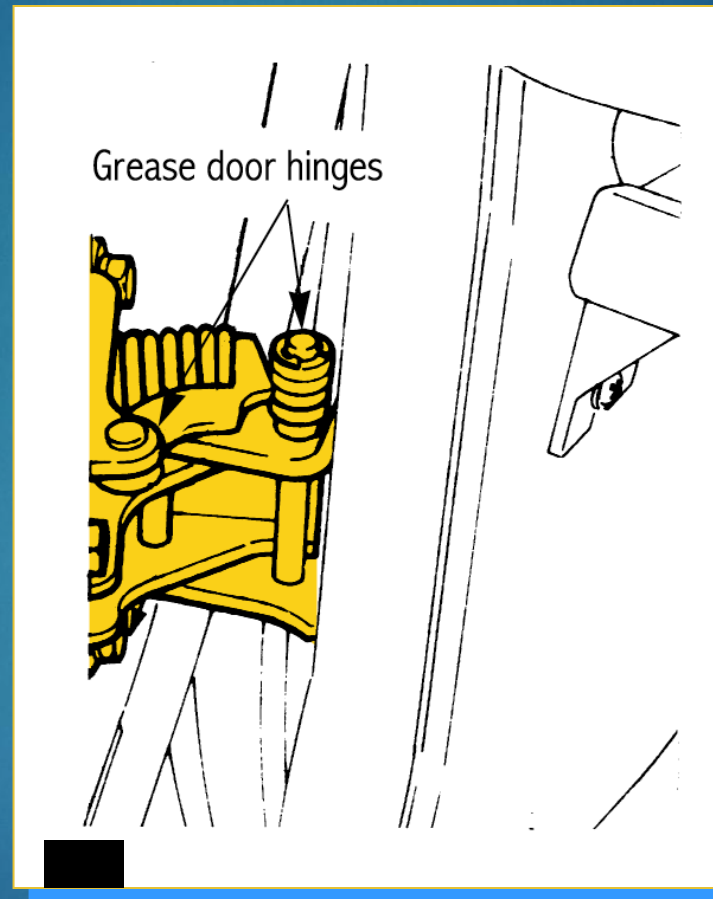
Lubricate hood and trunk hinges

Body Lubrication



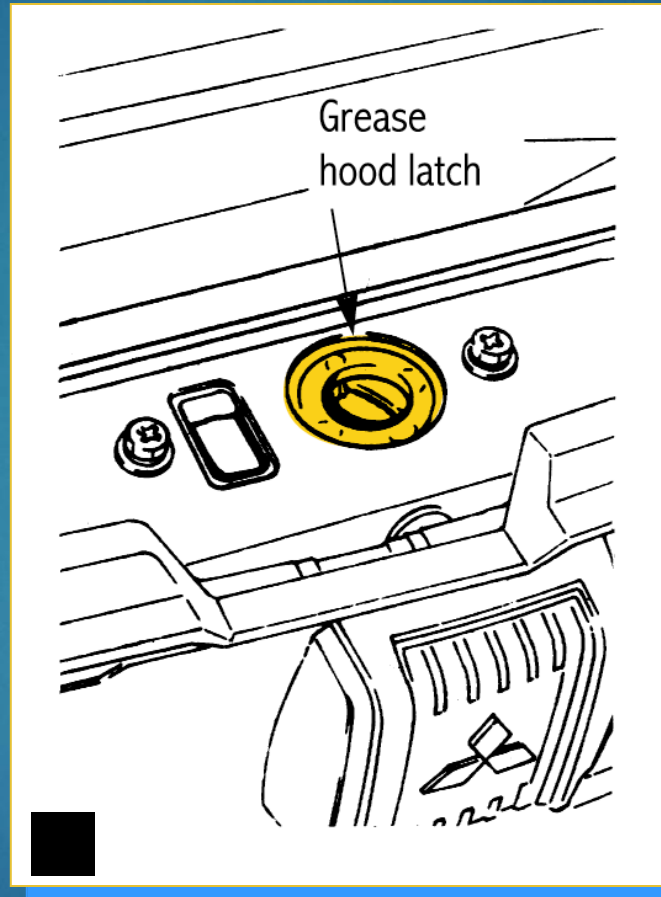
Use wax on door strikers

Body Lubrication



Grease the door hinges

Body Lubrication



Hood latch is a common rust problem

Lubricants

- ▶ Engine oil
 - ▶ used on hard-to-reach high-friction points
- ▶ Graphite
 - ▶ excellent for door and trunk locks
- ▶ Dry stick (wax) lubricant
 - ▶ desirable on door latches and strikers
 - ▶ will not stain clothes

Lubricants

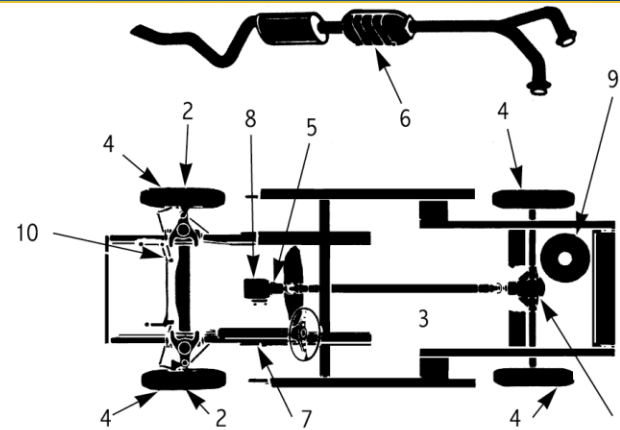
- ▶ Chassis grease
 - ▶ good all-around body lubricant
- ▶ Silicone lubricant
 - ▶ suited for rubber door weather stripping and windows
 - ▶ will not soil windows and clothing

Service Intervals

- ▶ Service Interval is the amount of time or the number of miles between recommended service checks or maintenance operations
 - ▶ found in the factory service manual and the owner's manual for the vehicle

Chassis Maintenance Interval

Recommendations for one
vehicle



Component	Service	Interval
1. Axle differential	✓ ↓	5000 mi (8 000 km) 30,000 mi (48 000 km)
2. Bearings, front wheel	✓ a.	30,000 mi (48 000 km)
3. Body lubrication	✓ b.	15,000 mi (24 000 km)
4. Brake inspection	✓ c.	15,000 mi (24 000 km)
5. Clutch lever	✓	30,000 mi (48 000 km)
6. Exhaust system inspection	✓ d.	15,000 mi (24 000 km)
7. Manual steering gear	✓ e.	5000 mi (8 000 km)
8. Manual transmission	✓ e.	5000 mi (8 000 km)
9. Spare tire	✓ f.	7500 mi (12 000 km)
10. Steering, suspension, and chassis	✓ g.	15,000 mi (24 000 km)
	h.	30,000 mi (48 000 km)

General Inspection and Problem Location

- ▶ As you perform lubrication service or any kind of auto repair, always watch for mechanical problems
- ▶ Visually inspect the vehicle for any signs of wear, deterioration, loose parts, or leaks

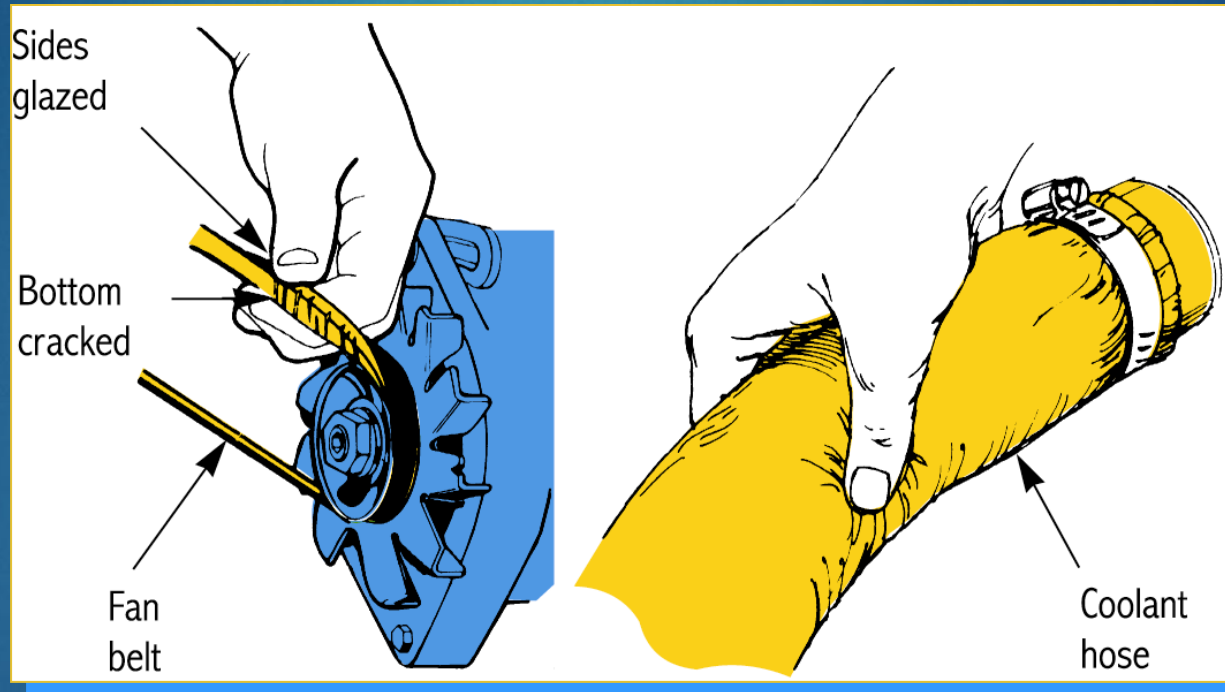
Visual Inspection

- ▶ Hose inspection
 - ▶ check for hardening, softening, cracking, splitting, or other signs of impending failure
- ▶ Drive belt inspection
 - ▶ look for splitting, tears, cuts, and wear
- ▶ Wiring inspection
 - ▶ look for improper routing, cracked or brittle insulation, or other signs of problems

Visual Inspection

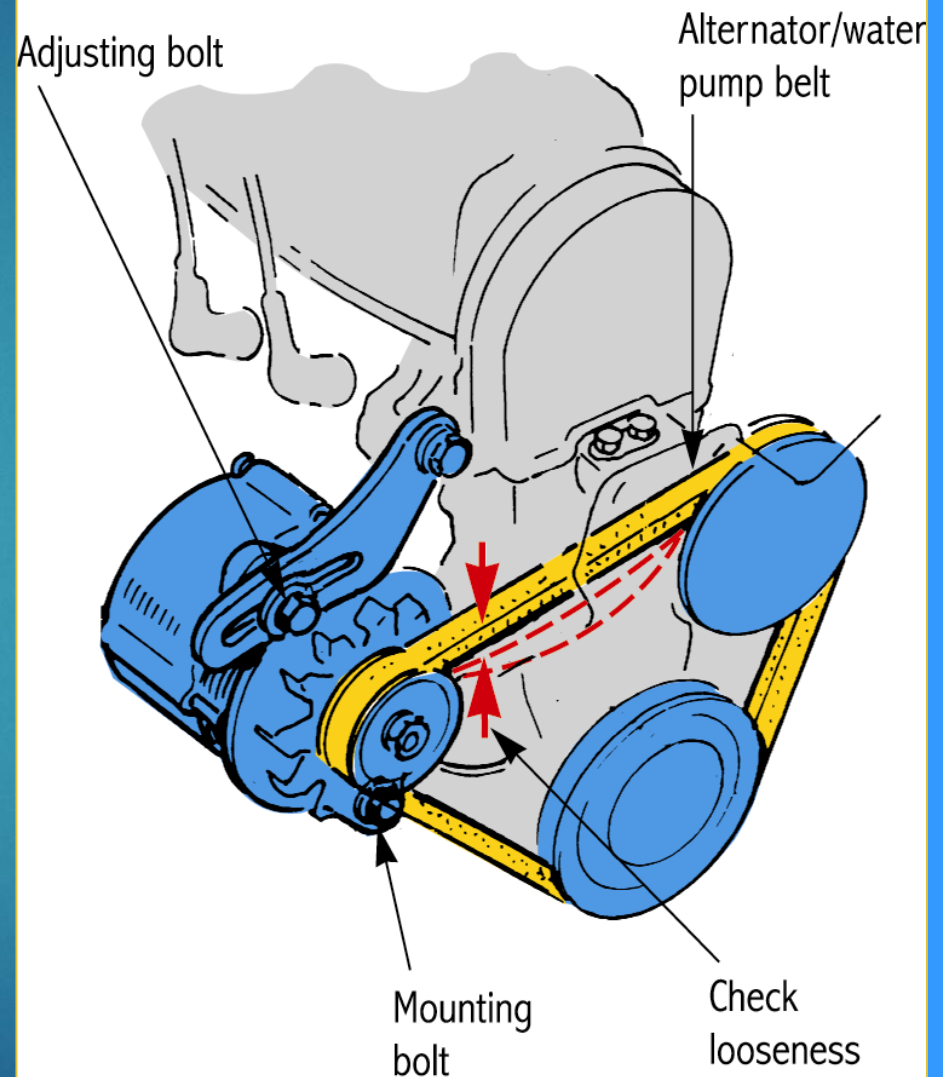
- ▶ Tire inspection
 - ▶ look for excessive wear, improper inflation, or physical damage
- ▶ Steering system inspection
 - ▶ check for excessive wear and play in moving parts
- ▶ Exhaust system inspection
 - ▶ look for damaged, rusted, or leaking parts

Belt and Hose Inspection



Belt Adjustment

Loosen the adjusting bolts, carefully pry the component outward and tighten the adjusting bolts



Fluid Leaks



Result from bad gaskets, seals, hoses and cracked parts

Fluid Leaks

- ▶ Become familiar with the color, smell, and texture of the different fluids
- ▶ Oil
 - ▶ slippery, dark brown or black
- ▶ Brake fluid
 - ▶ “squeaky” when rubbed between your fingers

Fluid Leaks

- ▶ Antifreeze
 - ▶ “slick” texture, green, orange, or rust colored
- ▶ Automatic transmission fluid
 - ▶ dark brown, red, or dark green
- ▶ Power steering fluid
 - ▶ amber, red, or clear

Fluid Leaks

- ▶ Tend to flow downward and to the rear of the vehicle
 - ▶ look for leaks above and in front of where you find fluid dripping
- ▶ If multiple leaks are indicated, fix the leak located the highest and farthest forward on the vehicle, then recheck for leaks

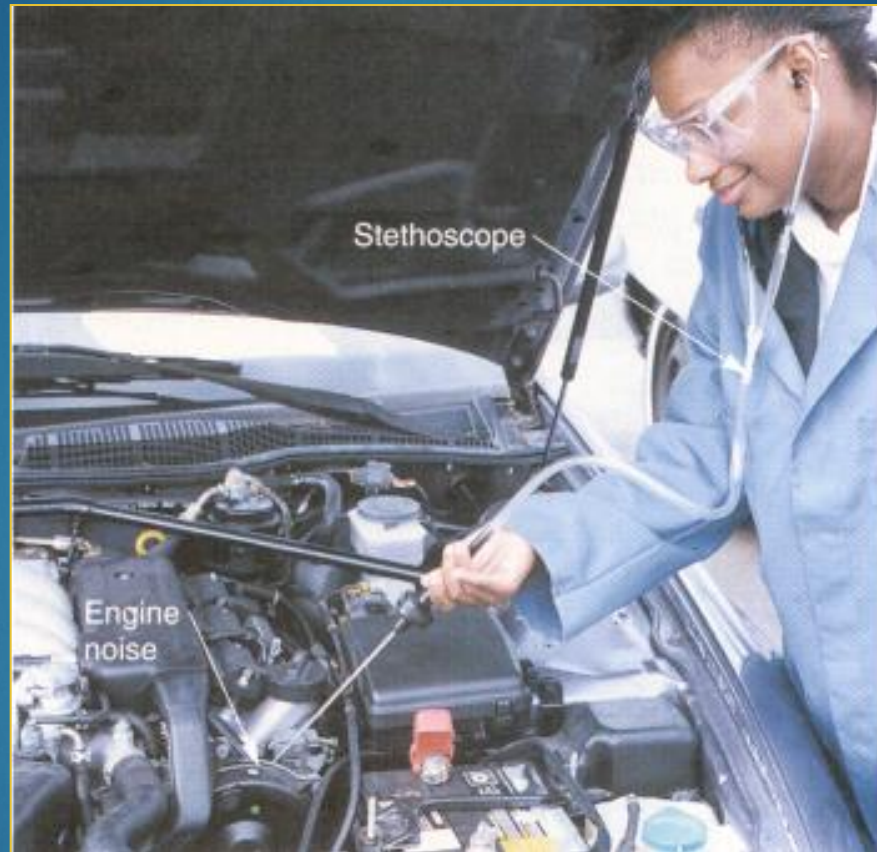
Noise Detection and Location

- ▶ Abnormal noises are unwanted sounds that indicate part wear or other mechanical problems
- ▶ As you work, always listen for abnormal noises

Stethoscope

- ▶ Used to help pinpoint the source of internal part noises
- ▶ To use the stethoscope:
 - ▶ touch the probe on the component near the unwanted sound
 - ▶ move the stethoscope around until the sound is loudest

Stethoscope

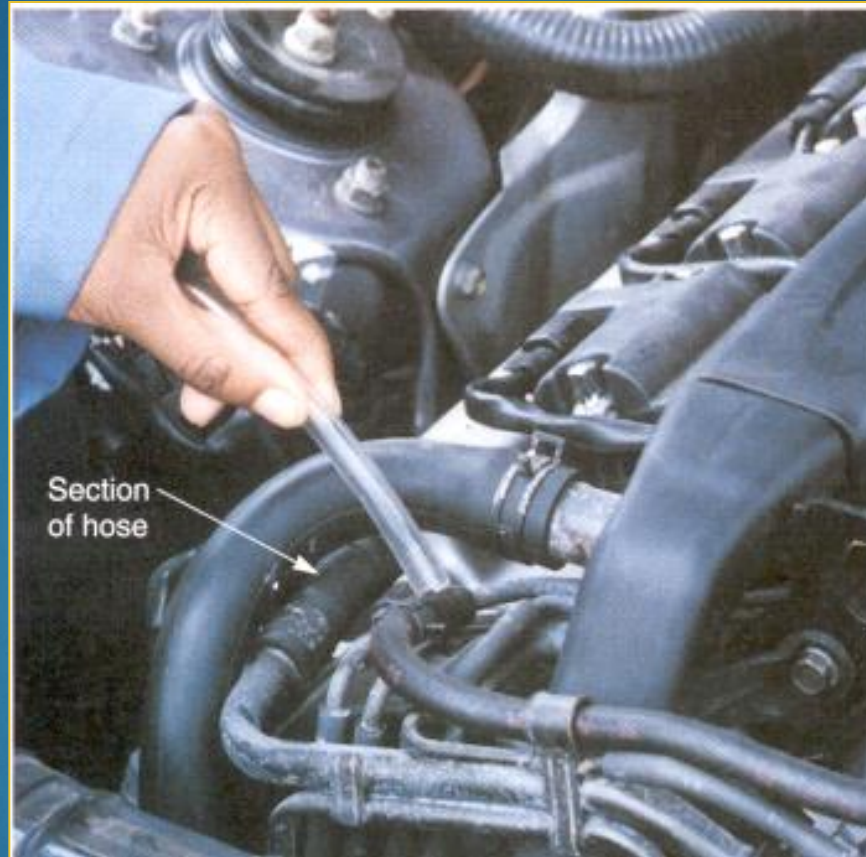


When the sound becomes the loudest, you have found the source of the noise

Other Tools

- ▶ Use a piece of hose, or an object like a screwdriver, bar, or piece of wood to locate the source of a noise
- ▶ Probe the noisy area with one end, while holding the other end to your ear
 - ▶ use extreme caution - stay away from moving parts

Vacuum Hose



Using a piece of vacuum hose to pinpoint a vacuum leak

Recycling and Disposal of Auto Shop Wastes

- ▶ Needed to help save our planet's natural resources and to reduce the amount of materials being sent to landfills
- ▶ Laws have been passed that require specific procedures when handling and discarding potentially harmful materials

Auto Shop Wastes

- ▶ Automotive maintenance may generate hazardous wastes that come under the requirements of the Resource Conservation and Recovery Act
- ▶ Repair and maintenance facilities that generate 220 lb. (100 kg) of hazardous waste monthly must file a Uniform Hazardous Waste Manifest before removing the wastes

Auto Shop Wastes

- ▶ Vehicle maintenance fluid and solid wastes include:
 - ▶ used motor oil and other lubricants
 - ▶ used parts
 - ▶ cleaners and degreasers including carburetor and fuel injection cleaners
 - ▶ rust removers, paint thinners, or reducers
 - ▶ used batteries
 - ▶ tires and catalytic converters

Recycling

- ▶ No manifest is needed for used oil or lead-acid batteries if they are sent for recycling
- ▶ Used oil filters must be included on the monthly manifest if they are not recycled
- ▶ Check state legislation before proceeding

Recycling Motor Oil



- ▶ Used motor oil should be stored in an approved container and sent for recycling
- ▶ One gallon of used motor oil can be refined into two and one-half quarts of high-quality motor oil
- ▶ It takes about 40 gallons of crude oil to produce this much motor oil

Recycling Coolants

- ▶ Antifreeze has been classified as a hazardous waste due to heavy metal and chlorinated solvents that it picks up circulating through cooling systems
- ▶ Regulations require that spent antifreeze solutions be collected by a registered hazardous waste hauler

Recycling Refrigerants

- ▶ Refrigerants, such as R-12 and R-134a should not be vented to the atmosphere
- ▶ Regulations require that refrigerants be recovered and recycled
- ▶ Most shops use recovery/recycling equipment that will pull old refrigerant out of the air conditioning system, then treat it for reuse in the vehicle

Recovery Station

Recovers and recycles
refrigerant



Other Automotive Recyclables

- ▶ Catalytic converters
 - ▶ contain valuable platinum
- ▶ Worn tires
 - ▶ sold to a retreader or to a shredder
- ▶ Batteries
 - ▶ recycled and used to make new batteries

Other Automotive Recyclables

- ▶ Brake shoes
 - ▶ recycled and sold as cores for making reconditioned brake shoes
- ▶ Small assemblies
 - ▶ starters, alternators, etc
 - ▶ recycled and made into rebuilt parts
- ▶ Plastic bumpers and other body parts
 - ▶ recycled into a variety of new products